Xlib - C Language X Interface

X Consortium Standard

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Xlib - C Language X Interface: X Consortium Standard

! "
#
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((
) ! "
*))
(& + %
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) " -

! "

! "
- .
' / $ "

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% - © 1345! 1346! 1342! 1344! 1343! 1331! 1337! 1336! 8998 $% %

+ - ! - ! % - % &
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& & ! / & - ?

@ % - % % %
&

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$ ", $,,A "$, " ((A $' A $ (A C A $ $ (A BA E", ", (A $' A

A % ! $% % @ - &
% ! - & & % & F $% %

% - G 1345! 1346! 1342! 1344! 1343! 1331 B - AH % %

+ ! %! % % & - !
% @ @ % - %% % % - %
%% %% - ! B - @ -
% % - & & % ! & % % B -
% & % ! @ ;
< & % % &

(# ! "

Table of Contents

& -
1 " 0 1
$@ @ & 0 & 1
A I
(' I
% 7
, - - @ & 0 7
+ - - 5
A - 5
' - @ 6
8 B % ' 2
$% - B % 2
$ - " B % ! " - ' ! 4
B %) 3
" - ' ') 15
") 12
- , $% + H 89
' - B 89
- B % 89
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C - 0 & 88
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* I1
@ I1
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* - + * - + II
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- - & 79
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- ' - + % 65
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- 25
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4 % ' 1I8
- 1I8
% - 1II
B & - + ! E ! - ! 1I5
B & - -) % + 1I6
B & - -) % E 1I2

B & - -) % - 1I4
B & - -) % 1I3
' - 171
' - -) % - 171
' - - + - 178
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- @ - ' + 162
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D + A@ 14I
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) %% -, A@ 898

% , A@ 89I
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, A@ 897
A@ 895
H A@ 896
- H A@ 896
) % H A@ 892
F H A@ 894
% - A@ 894
A@ 893
) - A@ 893
+ % , A@ 819
A@ 811
H A@ 811
, A@ 818
11 A@ (- ' 817
- A@ 817
(- $ % * 815
A@ J) - 815
) % - A@ J 816
- , A@ 816
- A@ C - + + 812
- A@ C - & A@) 814
+ - A@ * J 889
- A@ $ %% 881
- +) (888
(- + A 88I
A - B - F 88I
C - B A (887
18 " % B @ ' 883
+ - 883
D - 8I7
- A@ + - 8I2
) @ - + 8I3
- " % ' 879
) % - D + - 871
) % - D A - 876
1I E " F ' 858
0 E) - 85I
E) B % 857
- E 856
$ %) 856
$ %) $@ @ & 852
$ %) ' 852
0 $ %) # 853
$ % ' 861
$ % # 86I
- ' - ' 866
$ - ') 829
B & - C - ' 825
" %) 824
" %) $@ @ & 824
" %)) - 846
" %) ' 844

" %) # 839
" % ' 837
" % # 832
" %) I94
A@ ' - I12
- D " % I12
" %) @ I13
- I89
17 " ' I88
&) - I87
) % - % E @ & I87
@ - - E I86
- - + % II9
- -)K,)A + % II1
- -)K" $,K,)A + % II8
- -)K(", + % III
- -)K,$) EK(", + % II5
- -)K E + % II3
- -)K , "A, K'$ + % I79
- -)K+ $ $ $E + % I71
- -)K E) +K ",B$ + % I78
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- + - I25
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A 796
* + %% 796
(- 0 792
(E 794
(0 B 717
- 715
% * - 716
- A 712
H ! % ! 0% 712
H ' 712
- + 713
E - B 789
- + H - 789
E - - 781
% 788
- 787
- B -) 787
+ 785
B @ - A $% 785
B % ' 782
0 # 11 % ' 782
- + % 782
- - & F - (784
- - 0 % 7I9
+ - & 7I1
- 0 A @ B 7I8
0 # 19 % ' 7I8
B & - ' - + - @ 7I8
- C B & # 7I5
7I2
" 759

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1 + H 0 I31
8 0 & + H I32

Acknowledgments

- % 19 @ 0 & % &
@ ?)" E %
B - AH % % , &)" !
)" + / 0 @ 11! & @ ! F
@ - F -
% ! & & & - % %
& @ % - & 0 $ % -
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Release 1

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% % @ & @ (-
& & &

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- % O & & @ &

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O (/ & :B - CA E= & ! - & A :)C
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@ 11) % % %
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Release 4

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) B - -
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% @ & - -

Release 5

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& ' = *)) :(& + = % %
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- % - & - !
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' :, =! & :B - =! (@ :"*)=! (
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. D : C @ =! D : =! D :,A =!
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,- : =! , :, =!) , :"*)=! $
:, =! + :)" =! - : P =!) : P =!
) F :, =!) - :B - =! / - :"*)=! A /
:"*)=

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/ D & :$) $,=!) F :, =! E . - :$) $,= %
- % % % F
! (" :, =! ' / & :' / =! ((
: =! . D & :$ E =! D F , :'
/ 0 =!) : =! D . : =!)
: % = % - % % %
F

% % : - % = 0 -
: = : =

: =! * : =! D + :)" 0 =
- - $ & ? (*
:D =! D * :(+=! , : "=! B @ :)" 0
=! A " :" =! B : =! D - : =!)
:(+=! + :"*)=! + :"*)=! B @ :)" 0 =!
D : P =! # - :"*)=

-) B - & -
- ! % - % - @
' :"0"= % - -

Release 6

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- $: = - %
- -

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- & - ! @
- % ? ' /
& :' / =! . (:"*)=!) " :B - =! (" :,
=! - D - :D " =! ' E - :B - =!) ' :(+=! (
) :B - =!) , :' / =! ' / :"*)=! (
/ :(+=!) : =!) : =!)
:"*)=! D . : = . :D " =

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? * :' / $ "=! ' / & :' / =! (
(: =! . (:"*)=!) " :B - =! (" :,
=! - D - :D " =! D & - :' / =! ' E - :B -
=! ( ) :B - =! (/ :(+=! F :'
/ =!) : =!) :"*)=! - . :' /
$ "= D . : =

- ! -! %
F , : =)
: =

$ & @ - -
% % F ? (:B - =!
) D - :"*)=! % D& :B - =! ( ) : =! , ,-
: =! ' / :"*)=! . - & :' / $ "=!)
:' / =! / - :"*)=! E - : "=!) : =!
. :D " = L :(+=

- E
B - AH % %

E %
) " -

Chapter 1. Introduction to Xlib

0 & & % & & & -
)" 0 % @ % & %
% & @ % % % H
@ % - &
& 0 %% % - : =
& & & -
0 @ - !

- & @ - -
0 & % " Q -
% - - 0 & ! % @ %
& -
-
- % & & % - - - - $ - @
: % ! % @ 0= %
0 ' - @ !
%% % % @
@ & @ 0 - %% !
% -

% @ 0 % - -! % ?

R $@ @ & 0 &

R A

R

R @ %

R , - - @ & 0

R + - -

R -

R ' - @

Overview of the X Window System

H 0!
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% - ! &

0 & %% - @ %% - &
& & & % &
! - ! % %
& - 0 @ % @ % @
- & % :
=

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& & % % @ & & & & ! %
& & ! @ % & & %%
% - & & @ & " & !
%% % - % 0 % @
- % ! ! % & &

& & - % ! % & &
% ! % & & %%
% " @ & & @ @ %% - !
% @ ! -
$ % @ & & %% & &
& & - " & & & &!
& & & &
& &

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% ! & & % & & & @ &
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A & & % % &
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- ! % ! & %
' & &! - ! %%

0 - % @ & & %
& & - !
@ % - Expose @ %
& & % + - % % -
& &

0 % @ - - % / ! -
% : % 1=% % + %
- % - & & & @
- % % % & % % -
&

) 0 / H % H
0 @ ' @
@ : ! = % %
@ . % @ ! & &
& %

" & H ! &
H & XSync! & % @
@ @ % ! %
0 & @ @
& %

) 0 & - "B! & &
/ 0 @ % &! ' ! + %!
%! ! ! <X11/X.h>

H : = H &
) % & %%
! ! & & % % & & - %
- ' % '
% '
@ 0 % @ %% - - %
& %%

% - @ A@
H : % ! - & & - Expose @ = %
: % ! = % -
@ * %% @ %% !
% - % % : - = @ %

" % @ : % ! % % @ = @
@ H H % :
% ! XNextEvent XWindowEvent= " ! :
% ! XRaiseWindow=- A % - H @ @
@ ! & % &
- XSync - @ - @

Errors

! - " !
F " F ! %
- * % @ % @ !
& - % - * !
% @ '
% - ,CEE % -

0 @ % % "
- - @ H ! @ %

* 0 H @ : !
=! % '
-- - % % ! & @ ! 0 % @ -
@ : 11 4 1 = F ! %
-

0 ! ! & % - %
@ " % @ ! % ! % -

Standard Header Files

& - % 0 ?

```
<X11/Xlib.h>

<X11/X.h>

<X11/Xcms.h>

<X11/Xutil.h>

<X11/Xresource.h>

<X11/Xatom.h>

<X11/cursorfont.h>
```

```
<X11/keysym.h>

<X11/Xlibint.h>

<X11/Xproto.h>

<X11/Xprotostr.h>

<X11/X10.h>
```

Generic Values and Types

& - 0 - ?

R 0 % * * @ '

R , @ "B

R % 0"B - "B

R % 0+ V - % H %

Naming and Argument Conventions within Xlib

0 & @ -
@ & H ! @
%

/ - @ ?

R 0 !
" @ & @ %%
! % - @

R 0 - & % 0

R - - % F

R @ - & % 0) - ! -
- - & % 0

R) - & % 0 -
! & % F

R @ & % & !
& ! & :K=

R % - ! & ! & -

R / ! & ! - - -
% -

R - % % - & % :
! & =! - % -
B &

R & - & % - - -

R ! ! & ! - - - ! -
& % & - -

R % & ! & %
% -

Programming Considerations

/ % - - ?

R F 0 16 H &
F & H - @ @ %
- 16
F :& - = - H

R D - @ & N &
" & % - % ! %
@ @

R) % @ " !
F % % -

R @ ! &
%% & & - %
% @ & &! & @ ! %
%% ' ! % 17
! "

Character Sets and Encodings

0 %
- & - ?

32 ! &
%% 0
& - ?

F L 9 3 WUXYZPN:=V[! >?O\]^_‘SaaTbKMcdef \ % ^! \ ^! \ & ^

> & - %
" $4453 1 % % ! ! & "
- % 2 "" %

- %

$ # - 0 +
% -
! -
%% 0 " -
(+ A -!

0 +
! -

& " $4453 1

- 0 + -
% E 1 % % ""
" - E +
A -!
0 + ! E 1

′( )* % E 1! % &

+ , 65 ! &
# - +$ "0 % !
% ?

F L 9 3 K

Formatting Conventions

& - @ ?

R % this special font
! !
! - % " %
& ! % - %

R A - -
& ! - %
% - , " % % ! 0
- % % , " @
! H ! & -
%% ! % - % % %
0 - ' %
0 ! 11 4 8

R - & - %
! % - %
& & ! % - ! &
% - & &
! % - ! & %
- % & &

R % @ -
- % % %
- & - %
% % - - -

Chapter 2. Display Functions

* % - % ! 0
@ $ @ ! 0
% %
% & ?

R $% : = %

R $ % ! - !

R NoOperation % H

R '

R : = %

R C 0 @ %

R C 0 &

R C

Opening the Display

% 0 @ % ! XOpenDisplay

```
Display *XOpenDisplay(display_name);
```

- % & % ! &
%
$ +$ "0 !
% K ,CEE! @
B" +E . @ @

- % % % %
- (+ A - %% O %%
% % $ +$ "0 !
% B" +E . @ @ - ?

protocol/hostname:number.screen_number

% % %
%% % %
% % % " %
% ! > % - %
%

% &
% % . &
& - :?=
:??=

% % @
. % & %
& % := - +C @
%) % %
-& F

- % @)
% - 0 @
K @
- DefaultScreen
XDefaultScreen -
- - : 8 8 1 =

' % ! & -& % 1 % 9
MM NN?

```
dual-headed:0.1
```

XOpenDisplay B % @
0 @ 0 @
XOpenDisplay %% 0 @ - + BA
% ! - % %
" % % U %U! U U! U 6U! %
% - :?= %
% ! XOpenDisplay - + :"
% % U U! + @ "+@7 " % %
U 6U! + @ "+@6 $ & ! % &
"+ @ = " % % ! 0
& @ @ % "
:??= % % ! XOpenDisplay
- BA - 0 @ %% %
% 0 % %%
%

" ! XOpenDisplay % B % ! &
<X11/Xlib.h> " XOpenDisplay ! ,CEE
XOpenDisplay! %
% % K -
DefaultScreen : XDefaultScreen = .
B % -
' -
B % ! 8 8 1

0 @ % @ % :
3 4 =

Obtaining Information about the Display, Image Formats, or Screens

0 % @ % -
B % % -
-! % - H @ - - -
?

R B %

R " -

R

B % : ! &
= % @ 0 %% @
% % @ B % XDisplay-Width! XDisplayHeight! XDisplayCells! XDisplayPlanes! XDisplayWidthMM! XDisplayHeightMM
# ! 0 # ! ! B % # !
0B % # ! $ % - -

Display Macros

%% % B %
! - -
% %

& - - - ! % - H @
- - -! &

+ :=

0 + :=

* @ & 1 % -
%

* BlackPixel WhitePixel % - %
% % @ %
% *: !- ! = @
! ! &
@ % @

* + : ! - =

```
unsigned long XBlackPixel( *display,  screen_number);
```

% 0 @

- % %% %
@

* % @ %

+ : ! - =

```
unsigned long XWhitePixel( *display,  screen_number);
```

% 0 @

- % %% %
@

* & % @ %

, : =

```
int XConnectionNumber( *display);
```

% 0 @

* % % $ +$ "0
! %

B %: ! - =

```
Colormap XDefaultColormap( *display,  screen_number);
```

% 0 @

- % %% %
@

* % "B %)
%

B B % : ! - =

```
int XDefaultDepth( *display,  screen_number);
```

% 0 @

- % %% %
@

* % : % = & & %
$ % %% : XMatchVisu-
alInfo=

% @ - @ ! XList-
Depths

B : ! - =

```
GC XDefaultGC( *display,  screen_number,  *count_return);
```

% 0 @

- % %% %
@

- :

XListDepths % @ %
" % K @
! XListDepths K @
% $ & ! K ,CEE
% !

B : ! - =

GC **XDefaultGC**(**display*, *screen_number*);

% 0 @

- % %% %
@

* - % & & %
@ % %%
% & - - % @
F & % ! % @ .
0 @

B &: =

Window **XDefaultRootWindow**(**display*);

% 0 @

* & &

B $B % : =

Screen ***XDefaultScreenOfDisplay**(**display*);

% 0 @

* %

$B % : ! - =

Screen ***XScreenOfDisplay**(**display*, *screen_number*);

% 0 @

- % %% %
@

* %

B : =

int **XDefaultScreen**(**display*);

% 0 @

* XOpenDisplay
@ %%
& -

B # : ! - =

```
Visual *XDefaultVisual( *display,  screen_number);
```

% 0 @

- % %% %
@

* @ % % '
@ % ! I 1

B % : ! - =

```
int XDisplayCells( *display,  screen_number);
```

% 0 @

- % %% %
@

* %

B % + : ! - =

```
int XDisplayPlanes( *display,  screen_number);
```

% 0 @

- % %% %
@

* % & & % ' %
% ! -

B % -: =

```
char *XDisplayString( *display);
```

% 0 @

* - & % XOpenDisplay & %
& % $ +$ "0 ! % - & ,CEE!
@ B" +E . @ @ & % &
% %% @ fork &
% & % % &
% - -

E D & H + : =

```
unsigned long XLastKnownRequestProcessed( *display);
```

% 0 @

XExtendedMaxRequestSize F % %
%% - % -O & !

H F : 7 = %% @ -
- - 0 XDrawLines! XDrawArcs! XFillPoly-
gon! XChangeProperty! XSetClipRectangles! XSetRegion &
- - ! %% @ C
- - 0 : % ! XDrawPoints! XDrawRec-
tangles! XDrawSegments! XFillArcs! XFillRectangles! XPutImage= %
H O 0 % %
% H

E D & H + : =

```
unsigned long XLastKnownRequestProcessed( *display);
```

% 0 @

XMaxRequestSize H F : 7 =
%% @ & - - % -
- % H @ - F
- % - %% @ % -
F 7936 :16I47 = 0
% % % H & -
? XDrawPoints! XDrawRectangles! XDrawSegments! XFillArcs! XFillRectan-
gles! XPutImage

E D & H + : =

```
unsigned long XLastKnownRequestProcessed( *display);
```

% 0 @

* H & 0 @
% 0 @ 0 & % ! @ !
@

, H : =

```
unsigned long XNextRequest( *display);
```

% 0 @

* H
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+ # : =

```
int XProtocolVersion( *display);
```

% 0 @

* / @ :11= 0 % &
%

+ @ : =

```
int XProtocolRevision( *display);
```

% 0 @

* % @ 0 @

JE - : =

```
int XQLength( *display);
```

% 0 @

* - @ H % ,
@ @ H : XEventsQueued=

&: ! - =

```
Window XRootWindow( *display,  screen_number);
```

% 0 @

- % %% %
@

* & & & &
% - % @ & &

: =

```
int XScreenCount( *display);
```

% 0 @

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@ # : =

```
char *XServerVendor( *display);
```

% 0 @

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& 0 @ % " @
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A - $ & ! - %
%

: =

```
int XVendorRelease( *display);
```

% 0 @

* @ N 0 @

Image Format Functions and Macros

%% H % 0 @ @
% % %% ! & H @
% @ 0 : 4 2 16 4 =

0+ %' # % @ % %
% " ?

```
typedef struct {
 int depth;
 int bits_per_pixel;
 int scanline_pad;
} XPixmapFormatValues;
```

% % -@ % ! XListPixmapFormats

" -* $: =

```
int XImageByteOrder( *display,  *count_return);
```

% 0 @

- :

XListPixmapFormats 0+ %' #
% L - %% % %
" @ ! XListPixmapFormats ,CEE
- 0+ %' # !

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" -* $: =

```
int XImageByteOrder( *display);
```

% 0 @

* % H - 0.
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E *') *'

* %C : =

```
int XBitmapUnit( *display);
```

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* F %N
% @

* %* $: =

int **XBitmapBitOrder**(**display*);

% 0 @

% ! % %
- -
E *') *'

* %+ : =

int **XBitmapPad**(**display*);

% 0 @

A % %

B % (- : ! - =

int **XDisplayHeight**(**display*, *screen_number*);

% 0 @

- % %% %
@

* - - %

B % (-)): ! - =

int **XDisplayHeightMM**(**display*, *screen_number*);

% 0 @

- % %% %
@

* - %

B % : ! - =

int **XDisplayWidth**(**display*, *screen_number*);

% 0 @

- % %% %
@

* & %

B %)): ! - =

```
int XDisplayWidthMM( *display,  screen_number);
```

% 0 @

- % %% %
@

* & %

Screen Information Macros

& - - - ! % - H @
- - -! &
% %% %

* + $: =

```
unsigned long XBlackPixelOfScreen( *screen);
```

% %% %

* % @ %

+ $: =

```
unsigned long XWhitePixelOfScreen( *screen);
```

% %% %

* & % @ %

$: =

```
int XCellsOfScreen( *screen);
```

% %% %

* % % %

B %$: =

```
Colormap XDefaultColormapOfScreen( *screen);
```

% %% %

* % %

B B % $: =

```
int XDefaultDepthOfScreen( *screen);
```

% %% %

* % & &

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GC **XDefaultGCOfScreen**(**screen*);

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% & & @

B # $: =

Visual ***XDefaultVisualOfScreen**(**screen*);

% %% %

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B * - : =

int **XDoesBackingStore**(**screen*);

% %% %

* @ - & %% -
@) %% !, C ! & : I 8 7 =

B @ C : =

Bool **XDoesSaveUnders**(**screen*);

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* * @ - & %% @
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: I 8 5 =

B % $: =

Display ***XDisplayOfScreen**(**screen*);

% %% %

* % %

A@) $: =

long **XEventMaskOfScreen**(**screen*);

% %% %

XScreenNumberOfScreen %

A@) $: =

```
long XEventMaskOfScreen( *screen);
```

% %% %

* @ & & %
%

$: =

```
int XWidthOfScreen( *screen);
```

% %% %

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(- $: =

```
int XHeightOfScreen( *screen);
```

% %% %

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))$: =

```
int XWidthMMOfScreen( *screen);
```

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```
int XHeightMMOfScreen( *screen);
```

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```
int XMaxCmapsOfScreen( *screen);
```

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: 3 I =

) % $: =

```
int XMinCmapsOfScreen( *screen);
```

% %% %

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: 3 I =

+ $: =

```
int XPlanesOfScreen( *screen);
```

% %% %

* % & &

&$: =

```
Window XRootWindowOfScreen( *screen);
```

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* & & %

Generating a NoOperation Protocol Request

NoOperation % H ! XNoOp

```
XNoOp( *display);
```

% 0 @

XNoOp NoOperation % H 0 @ !
-

Freeing Client-Created Data

& 0 !

```
XFree( *data);
```

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Closing the Display

% 0 @ ! XCloseDisplay

```
XCloseDisplay( *display);
```

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XCloseDisplay 0 @ %
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% ! &
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XCloseDisplay % % - % XCloseDis-
play % XSync %

XCloseDisplay - *

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N - N & !

```
XSetCloseDownMode( *display,  close_mode);
```

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8 6

- * #

Using X Server Connection Close Operations

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XCloseDisplay % ! 0 @ % & -
% ?

R " & & : XSetSelectionOwner=

R " % XUngrabPointer XUngrabKeyboard @
- %

R " % XUngrabServer - @

R " % @ -

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Using Xlib with Threads

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- % -

% @ 0 ! XLockDisplay

```
XLockDisplay( *display);
```

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&
XLockDisplay 0 & F
- XInitThreads

% !

```
XUnlockDisplay( *display);
```

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Threads

Using Internal Connections

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% !

```
type void XConnectionWatchProc( *display, client_data, fd, opening,
*watch_data);
```

```
Status XAddConnectionWatch( *display, procedure, client_data);
```

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% - % ! XRemoveConnectionWatch

:=

```
Status XRemoveConnectionWatch( *display,  procedure,  client_data);
```

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XRemoveConnectionWatch @ % @ -
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& -

% % ! XProcessInternalConnection

:=

```
void XProcessInternalConnection( *display,  fd);
```

% 0 @

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XProcessInternalConnection % % @

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@ O & !

% ! XInternalConnectionNumbers

:=

```
Status XInternalConnectionNumbers( *display,  fd,  count_return);
```

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XInternalConnectionNumbers %
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Chapter 3. Window Functions

Visual Types

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	Color		Gray-Scale	
	R/O	R/W	R/O	R/W
Undecomposed Colormap	Static Color	Pseudo Color	Static Gray	Gray Scale
Decomposed Colormap	True Color	Direct Color		

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@ "B # ! XVisualIDFromVisual

```
VisualID XVisualIDFromVisual(visual);
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Window Attributes

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XCreateWindow XChangeWindowAttributes!
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```
/* Window attribute value mask bits */
#define    CWBackPixmap                    (1L<<0)
#define    CWBackPixel                     (1L<<1)
#define    CWBorderPixmap                  (1L<<2)
#define    CWBorderPixel                   (1L<<3)
#define    CWBitGravity                    (1L<<4)
#define    CWWinGravity                    (1L<<5)
#define    CWBackingStore                  (1L<<6)
#define    CWBackingPlanes                 (1L<<7)
#define    CWBackingPixel                  (1L<<8)
#define    CWOverrideRedirect              (1L<<9)
#define    CWSaveUnder                     (1L<<10)
#define    CWEventMask                     (1L<<11)
```

```
#define    CWDontPropagate                (1L<<12)
#define    CWColormap                     (1L<<13)
#define    CWCursor                       (1L<<14)
```

```
/* Values */

typedef struct {
     Pixmap background_pixmap;     /* background, None, or ParentRelative */
     unsigned long background_pixel;     /* background pixel */
     Pixmap border_pixmap;          /* border of the window or CopyFromParent */
     unsigned long border_pixel;     /* border pixel value */
     int bit_gravity;     /* one of bit gravity values */
     int win_gravity;     /* one of the window gravity values */
     int backing_store;     /* NotUseful, WhenMapped, Always */
     unsigned long backing_planes;     /* planes to be preserved if possible */
     unsigned long backing_pixel;     /* value to use in restoring planes */
     Bool save_under;     /* should bits under be saved? (popups) */
     long event_mask;     /* set of events that should be saved */
     long do_not_propagate_mask;     /* set of events that should not propagate */
     Bool override_redirect;     /* boolean value for override_redirect */
     Colormap colormap;     /* color map to be associated with window */
     Cursor cursor;          /* cursor to be displayed (or None) */
} XSetWindowAttributes;
```

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Gravity Attributes

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Backing Store Attribute

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Save Under Flag

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Backing Planes and Backing Pixel Attributes

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Event Mask and Do Not Propagate Mask Attributes

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Override Redirect Flag

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Colormap Attribute

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Cursor Attribute

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%% & & & & ! XCreateWindow

Window **XCreateWindow**(**display*, *parent*, *y*, *height*, *border_width*, *depth*, *class*, **visual*, *valuemask*, **attributes*);

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XCreateSimpleWindow

Window **XCreateSimpleWindow**(**display*, *parent*, *y*, *height*, *border_width*, *border*, *background*);

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Destroying Windows

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XDestroyWindow(**display, w*);

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XDestroyWindow - * &

& & % & &! XDestroySubwindows

```
XDestroySubwindows( *display,   w);
```

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XDestroySubwindows - * &

Mapping Windows

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XMapWindow( *display,   w);
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XMapRaised(**display*, *w*);

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XMapSubwindows(**display*, *w*);

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Unmapping Windows

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XUnmapWindow(**display*, *w*);

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XUnmapWindow - * &

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XUnmapSubwindows(**display*, *w*);

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Configuring Windows

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```
/* Configure window value mask bits */
```

```
#define      CWX              (1<<0)
#define      CWY              (1<<1)
#define      CWWidth          (1<<2)
#define      CWHeight         (1<<3)
#define      CWBorderWidth    (1<<4)
#define      CWSibling        (1<<5)
#define      CWStackMode      (1<<6)



/* Values */

typedef struct {
     int x, y;
     int width, height;
     int border_width;
     Window sibling;
     int stack_mode;
} XWindowChanges;
```

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XConfigureWindow(**display*, *w*, *value_mask*, **values*);

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XMoveWindow(**display*, *w*, *y*);

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XResizeWindow(**display*, *w*, *height*);

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XMoveResizeWindow(**display*, *w*, *y*, *height*);

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XSetWindowBorderWidth(**display*, *w*, *width*);

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Changing Window Stacking Order

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XRaiseWindow(**display*, *w*);

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XLowerWindow(**display*, *w*);

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& & % &! XCirculateSubwindows

XCirculateSubwindows(**display*, *w*, *direction*);

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! XCirculateSubwindowsUp

XCirculateSubwindowsUp(**display*, *w*);

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! XCirculateSubwindowsDown

XCirculateSubwindowsDown(**display*, *w*);

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XRestackWindows(**display*, *windows[]*, *nwindows*);

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Changing Window Attributes

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XChangeWindowAttributes(*display, w, valuemask, *attributes);

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XSetWindowBackground(**display*, *w*, *background_pixel*);

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XSetWindowBackgroundPixmap(**display*, *w*, *background_pixmap*);

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XSetWindowBorder(**display*, *w*, *border_pixel*);

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Pixmap

XSetWindowBorderPixmap(**display*, *w*, *border_pixmap*);

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XSetWindowColormap(**display*, *w*, *colormap*);

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& & & &! XDefineCursor

XDefineCursor(*display, w, cursor);

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XDefineCursor - * * &

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XUndefineCursor(*display, w);

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Chapter 4. Window Information Functions

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Obtaining Window Information

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XQueryTree

```
Status XQueryTree( *display, w, *root_return, *parent_return,
**children_return, *nchildren_return);
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Status **XGetWindowAttributes**(*display, w, *window_attributes_return);

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```
typedef struct {
     int x, y;                      /* location of window */
     int width, height;             /* width and height of window */
     int border_width;              /* border width of window */
     int depth;                     /* depth of window */
     Visual *visual;                /* the associated visual structure */
     Window root;                   /* root of screen containing window */
     int class;                     /* InputOutput, InputOnly*/
     int bit_gravity;               /* one of the bit gravity values */
     int win_gravity;               /* one of the window gravity values */
     int backing_store;             /* NotUseful, WhenMapped, Always */
     unsigned long backing_planes;  /* planes to be preserved if possible */
     unsigned long backing_pixel;   /* value to be used when restoring planes */
     Bool save_under;               /* boolean, should bits under be saved? */
     Colormap colormap;             /* color map to be associated with window */
     Bool map_installed;            /* boolean, is color map currently installed*/
     int map_state;                 /* IsUnmapped, IsUnviewable, IsViewable */
     long all_event_masks;          /* set of events all people have interest in*/
     long your_event_mask;          /* my event mask */
     long do_not_propagate_mask;    /* set of events that should not propagate */
     Bool override_redirect;        /* boolean value for override-redirect */
     Screen *screen;                /* back pointer to correct screen */
} XWindowAttributes;
```

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Status **XGetGeometry**(*display, d, *root_return, *y_return, *height_return, *border_width_return, *depth_return);

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Translating Screen Coordinates

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XTranslateCoordinates

Bool **XTranslateCoordinates**(**display*, *dest_w*, *src_y*, **dest_y_return*, **child_return*);

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Bool **XQueryPointer**(*display, w, *child_return, *root_y_return, *win_y_return, *mask_return);

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Properties and Atoms

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Atom XInternAtom( *display,  *atom_name,  only_if_exists);
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Status **XInternAtoms**(*display, **names, count, only_if_exists, *atoms_return);

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! XGetAtomNames

Status **XGetAtomNames**(*display, *atoms, count, **names_return);

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Obtaining and Changing Window Properties

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dowProperty

int **XGetWindowProperty**(*display*, *w*, *property*, *long_offset*, *long_length*, *delete*, *req_type*, *actual_type_return*, *actual_format_return*, *nitems_return*, *bytes_after_return*, *prop_return*);

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```
Atom *XListProperties( *display,  w,  *num_prop_return);
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XChangeProperty( *display,  w,  type,  format,  mode,  *data,  nelements);
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& &N % % ! XRotateWindowProperties

XRotateWindowProperties(**display*, *w*, *properties[]*, *num_prop*, *npositions*);

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- % - % %

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XRotateWindowProperties & % % &
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& &! *) " * *) !
% % -

XRotateWindowProperties - * !*) ! * &

% % - @ & &! XDeleteProperty

XDeleteProperty(**display*, *w*, *property*);

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% & &:

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XDeleteProperty % % % % % & % & & 0 @ - + % , @ & & % %

XDeleteProperty - * * &

Selections

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- % ! % ! - MM NN : ! % -! ! = % - % ! % - % - % % % %

& ! XSetSelectionOwner

XSetSelectionOwner(**display*, *selection*, *owner*, *time*);

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XSetSelectionOwner - & - % % - % 0 @ $ & ! - % ! & % @ " & & & % , ! & , : ! & = $ & ! & - H

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- %
0 @ XGetSelectionOwner & & &! & %
H @ - 0 @

XSetSelectionOwner - * * &

& ! XGetSelectionOwner

Window **XGetSelectionOwner**(*display, selection);

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% :

XGetSelectionOwner & & "B & &
& & % " & % !
, " , ! &

XGetSelectionOwner - *

H @ ! XConvertSelection

XConvertSelection(*display, target, property, requestor, time);

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XConvertSelection H % @ %
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Chapter 5. Pixmap and Cursor Functions

Creating and Freeing Pixmaps

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% % - @ F ! XCreatePixmap

```
Pixmap XCreatePixmap( *display,  d,  height,  depth);
```

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#

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XCreatePixmap % % & ! - ! %
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XCreatePixmap - * ! * B & ! * #

- & % % %! XFreePixmap

```
XFreePixmap( *display,  pixmap);
```

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% % @ -

XFreePixmap - * + %

Creating, Recoloring, and Freeing Cursors

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% % %
& % @ % &
F & % XQueryBestCursor
& F % -
! 0 % @
%

! XCreateFontCursor

X \011> ^

```
Cursor XCreateFontCursor( *display,  shape);
```

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% %

0 % @ % % %%
-
F @ % % % - % &
- %

%
- & - : XRecolorCursor=
' % ! %% *

XCreateFontCursor - * * #

- % ! XCreateGlyphCursor

```
Cursor  XCreateGlyphCursor(  *display,  mask_font,  mask_char,
*foreground_color,  *background_color);
```

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. - XFreeFont %

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- 8 -

XCreateGlyphCursor - * !* ' ! * #

& % ! XCreatePixmapCursor

Cursor **XCreatePixmapCursor**(*display, source, mask, *foreground_color, *background_color, y);

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F ! XQueryBestCursor

Status **XQueryBestCursor**(*display, d, height, *height_return);

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% % % %% -

XQueryBestCursor - * B &

- - @ ! XRecolorCursor

XRecolorCursor(*display, cursor, *background_color);

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- % * @ -

. - % * @ -

XRecolorCursor - % !
- % ! - @ %
0 - O * @

XRecolorCursor - *

: = - @ ! XFreeCursor

XFreeCursor(*display, cursor);

% 0 @

%

XFreeCursor & "B
% - &
% "B -

XFreeCursor - *

Chapter 6. Color Management Functions

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<X11/Xcms.h> - % <X11/Xlib.h>

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XUninstallColormap

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Color Structures

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```
typedef struct {
 unsigned long pixel; /* pixel value */
 unsigned short red, green, blue; /* rgb values */
 char flags; /* DoRed, DoGreen, DoBlue */
 char pad;
} XColor;
```

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```
typedef unsigned long XcmsColorFormat;   /* Color Specification Format */

typedef struct {
 union {
  XcmsRGB RGB;
  XcmsRGBi RGBi;
  XcmsCIEXYZ CIEXYZ;
  XcmsCIEuvY CIEuvY;
  XcmsCIExyY CIExyY;
  XcmsCIELab CIELab;
  XcmsCIELuv CIELuv;
  XcmsTekHVC TekHVC;
  XcmsPad Pad;
 } spec;
 unsigned long pixel;
 XcmsColorFormat format;
} XcmsColor;   /* Xcms Color Structure */

*        %                @       %  !
 -     %                    ! &       % 0
   '        & -


#define          XcmsUndefinedFormat   0x00000000
#define          XcmsCIEXYZFormat      0x00000001  /* CIE XYZ */
#define          XcmsCIEuvYFormat      0x00000002  /* CIE u'v'Y */
#define          XcmsCIExyYFormat      0x00000003  /* CIE xyY */
#define          XcmsCIELabFormat      0x00000004  /* CIE L*a*b* */
#define          XcmsCIELuvFormat      0x00000005  /* CIE L*u*v* */
#define          XcmsTekHVCFormat      0x00000006  /* TekHVC */
#define          XcmsRGBFormat         0x80000000  /* RGB Device */
#define          XcmsRGBiFormat        0x80000001  /* RGB Intensity */

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@    %     %       I8     "         !
 %           @    %      O    &  !       @     %
   "    I1        !                 %
0         :                6 18 7      =       @          %
                   % -          "
     %                  :     % !    -      %
         =!                     %     - %    :
XcmsFormatOfPrefix     XcmsPrefixOfFormat=

B    %                %          -      @
 %             & ?



typedef double XcmsFloat;

typedef struct {
 unsigned short red; /* 0x0000 to 0xffff */
```

```
 unsigned short green; /* 0x0000 to 0xffff */
 unsigned short blue; /* 0x0000 to 0xffff */
} XcmsRGB;  /* RGB Device */
```

```
typedef struct {
 XcmsFloat red; /* 0.0 to 1.0 */
 XcmsFloat green; /* 0.0 to 1.0 */
 XcmsFloat blue; /* 0.0 to 1.0 */
} XcmsRGBi;  /* RGB Intensity */
```

```
typedef struct {
 XcmsFloat X;
 XcmsFloat Y; /* 0.0 to 1.0 */
 XcmsFloat Z;
} XcmsCIEXYZ;  /* CIE XYZ */
```

```
typedef struct {
 XcmsFloat u_prime; /* 0.0 to ~0.6 */
 XcmsFloat v_prime; /* 0.0 to ~0.6 */
 XcmsFloat Y;  /* 0.0 to 1.0 */
} XcmsCIEuvY;  /* CIE u'v'Y */
```

```
typedef struct {
 XcmsFloat x;  /* 0.0 to ~.75 */
 XcmsFloat y;  /* 0.0 to ~.85 */
 XcmsFloat Y;  /* 0.0 to 1.0 */
} XcmsCIExyY;  /* CIE xyY */
```

```
typedef struct {
 XcmsFloat L_star;  /* 0.0 to 100.0 */
```

```
 XcmsFloat a_star;
 XcmsFloat b_star;
} XcmsCIELab;  /* CIE L*a*b* */



typedef struct {
 XcmsFloat L_star;  /* 0.0 to 100.0 */
 XcmsFloat u_star;
 XcmsFloat v_star;
} XcmsCIELuv;  /* CIE L*u*v* */



typedef struct {
 XcmsFloat H;  /* 0.0 to 360.0 */
 XcmsFloat V;  /* 0.0 to 100.0 */
 XcmsFloat C;  /* 0.0 to 100.0 */
} XcmsTekHVC;  /* TekHVC */



typedef struct {
 XcmsFloat pad0;
 XcmsFloat pad1;
 XcmsFloat pad2;
 XcmsFloat pad3;
} XcmsPad;  /* four doubles */
```

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& 1 9 ! 9 5 !

R * B @ :0 *=

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Color Strings

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% -
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- & - ?

R XAllocNamedColor

R XcmsAllocNamedColor

R XLookupColor

R XcmsLookupColor

R XParseColor

R XStoreNamedColor

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0 F O ! !
% % - %
" !0 0 @ N
" (+ A -!
% %

% % @
& - ?

<color_space_name>:<value>/.../<value>

& - % @ -

```
"CIEXYZ:0.3227/0.28133/0.2493"
"RGBi:1.0/0.0/0.0"
"rgb:00/ff/00"
"CIELuv:50.0/0.0/0.0"
```

% - @
% & -

RGB Device String Specification

* B @ % % MM - ?NN
& - ?

rgb:*<red>*/*<green>*/*<blue>*

<red>, *<green>*, *<blue>* := *h* | *hh* | *hhh* | *hhhh*

h := single hexadecimal digits (case insignificant)

, # @ 7 ! ## @ 4 ! ###
@ 18 ! #### @ 16 ! % @

% % - MM - ? >25>58NN MM - ? >I89>I89NN!
- - :MM - ? > 5>9NN MM - ? >I8>9NN=
&

' & % ! * B @ %% !
- % -
& % ! & - ?

```
#RGB (4 bits each)
#RRGGBB (8 bits each)
#RRRGGGBBB (12 bits each)
#RRRRGGGGBBBB (16 bits each)
```

! ! * % - - & 16
% ! % - @ : MM - ?NN
! & @ = ' % ! - MMXI 2NN
MMXI999 9992999NN

RGB Intensity String Specification

* % % MM - ?NN
& - ?

rgbi:<*red*>/<*green*>/<*blue*>

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@ % @ % - ! - %
- % ! % % - A
& % - - -

Device-Independent String Specifications

@ % - % @ & - ?

CIEXYZ:<*X*>/<*Y*>/<*Z*>
CIEuvY:<*u*>/<*v*>/<*Y*>
CIExyY:<*x*>/<*y*>/<*Y*>
CIELab:<*L*>/<*a*>/<*b*>
CIELuv:<*L*>/<*u*>/<*v*>
TekHVC:<*H*>/<*V*>/<*C*>

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% ! % % - MMANN MM NN &
% % & - -

Color Conversion Contexts and Gamut Mapping

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Creating, Copying, and Destroying Colormaps

% ! XCreateColormap

```
Colormap XCreateColormap( *display,  w,  *visual,  alloc);
```

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- K ! K @ - % -
% @ (& @ ! !
- XFreeColors

XCreateColormap - * !*) !* # ! * &

& % & % @ %
! XCopyColormapAndFree

```
Colormap XCopyColormapAndFree( *display,  colormap);
```

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XCopyColormapAndFree % @ %
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"B " @ N - % %
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& & ! @

% % @ - XAllocColor! XAllocNamedColor! XAllocColorCells! XAllocColorPlanes @ &

XCopyColormapAndFree - * *

%! XFreeColormap

XFreeColormap(*display, colormap);

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% % :

XFreeColormap & %
"B % % - (& @ !
% " % %
% ! : XUninstallColormap= " %
% % & &: XCreateWindow! XSetWindowColormap! XChangeWindowAttributes=! XFreeColormap - %
& & & , - %, @ 0
% & & & % ,

XFreeColormap - *

Mapping Color Names to Values

% * @ ! XLookupColor

Status **XLookupColor**(*display, colormap, *color_name, *screen_def_return);

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F

XLookupColor - *

% * @ ! XParseColor

Status **XParseColor**(*display, colormap, *spec, *exact_def_return);

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& % % " @ "
(+ A -! %
% C %% & XParseColor
F @ O & ! F

XParseColor - *

% @ % ! XcmsLookupColor

Status **XcmsLookupColor**(**display*, *colormap*, **color_string*, **color_screen_return*, *result_format*);

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Allocating and Freeing Color Cells

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& * @ ! XAllocColor

Status **XAllocColor**(*display, colormap, *screen_in_out);

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XAllocColor - * ZZ

& ! XcmsAlloc-
Color

Status **XcmsAllocColor**(*display, colormap, *color_in_out,
result_format);

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%% & * ! XAllocNamedColor

Status **XAllocNamedColor**(*display, colormap, *color_name, *exact_def_return);

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O & ! F

XAllocNamedColor - *

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%% & ! XcmsAllocNamedColor

Status **XcmsAllocNamedColor**(*display, colormap, *color_string, *color_screen_return, *color_exact_return, result_format);

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XcmsAllocNamedColor - *

>& % +
! XAllocColorCells

Status **XAllocColorCells**(*display, colormap, contig, plane_masks_return[], nplanes, pixels_return[], npixels);

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& % = B * @
XAllocColorCells F F

XAllocColorCells - * * #

>& B ! XAllocColor-
Planes

Status **XAllocColorPlanes**(*display, colormap, contig, pixels_return[], ncolors, nblues, *bmask_return);

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Colors! XStoreColor! XStoreNamedColor=! % % -
! % - % % XAllocColor-
Planes F F

XAllocColorPlanes - * * #

% ! XFreeColors

XFreeColors(*display, colormap, pixels[], npixels, planes);

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* " % ! - %

XFreeColors - * !* ! * #

Modifying and Querying Colormap Cells

* @ - % ! XStoreColor

XStoreColor(*display, colormap, *color);

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XStoreColor - % % @ %
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XStoreColor - * !* ! * #

% * @ % % ! XStoreColors

XStoreColors(*display, colormap, color[], ncolors);

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XStoreColors - * !* ! * #

- % ! XcmsStoreColor

Status **XcmsStoreColor**(*display, colormap, *color);

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XStoreColor & ! XcmsQueryColor *
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XcmsStoreColor - * !* ! * #

% % % ! XcmsS-
toreColors

Status **XcmsStoreColors**(*display, colormap, colors[], ncolors, compression_flags_return[]);

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ors * N & - % !
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XcmsStoreColors - * !* ! * #

% - % ! XStoreNamedColor

XStoreNamedColor(*display, colormap, *color, pixel, flags);

% 0 @

% %

% -: % ! =

% %

% & !- ! %

XStoreNamedColor % & %
& % % %
% - % - -
& !- ! % .
& @ $ B ! B ! B * "
(+ A -! %
% C %% & " % %
@ %! * # " %
% ! *

XStoreNamedColor - * !* !* , ! * #

XQueryColor XQueryColors % @ %
0 * @ %
% % @
- 0
" % @ % %! * #
" % ! - %

H * @ - % ! XQueryColor

XQueryColor(*display, colormap, *def_in_out);

% 0 @

% %

- - % * @ % %

XQueryColor * @ % 0
B ! B ! B * -

XQueryColor - * * #

H * @ % % ! XQueryColors

XQueryColors(*display, colormap, defs_in_out[], ncolors);

% 0 @

% %

- - %
% %

% 0

XQueryColors * @ % 0
B !B ! B * -

XQueryColors - * * #

H - % ! XcmsQuery-
Color

Status **XcmsQueryColor**(*display, colormap, *color_in_out,
result_format);

% 0 @

% %

- - % %
H %
0

- %
%

XcmsQueryColor * @ % @ %
% 0 @ @
- % K - " % @
% %! * #

XcmsQueryColor - * * #

H % % ! XcmsQuery-
Colors

Status **XcmsQueryColors**(*display, colormap, colors_in_out[], ncolors,
result_format);

% 0 @

% %

- - % 0 ! %
- H
%

% 0
%

- %
%

XcmsQueryColors * @ % @ %
0 @ @ -
% K - " % @
% %! * # " % !
- %

XcmsQueryColors - * * #

Color Conversion Context Functions

! ! H @

: =

& % % - 0
! & % % - !
% - 0
?

R +

R % %

R % / %

@ % %
H - -
&

Getting and Setting the Color Conversion Context of a Colormap

& %! XcmsCCCOfColormap

XcmsCCC **XcmsCCCOfColormap**(*display, colormap);

% 0 @

% %

XcmsCCCOfColormap & %
% $! H C
& % % - & XcmsSetCCCOfCol-
ormap! & % % -

- & %! XcmsSetCCCOfColormap

XcmsCCC **XcmsSetCCCOfColormap**(*display, colormap, ccc);

% 0 @

% %

%

XcmsSetCCCOfColormap - & %
% " % @ & % "
- %% ! - XcmsFreeCCC
@ % & O
- 0 & % 0 ! & @ ! & &
& %

Obtaining the Default Color Conversion Context

. - H -
- &

! XcmsDefaultCCC

```
XcmsCCC XcmsDefaultCCC( *display,  screen_number);
```

% 0 @

- % %% %
@

XcmsDefaultCCC % "
@ @ " - % &
% / % & %
%

Color Conversion Context Macros

%% % 0 & -
- - ! % - H @ - -
-! &

```
DisplayOfCCC( ccc);
```

```
Display *XcmsDisplayOfCCC( ccc);
```

%

* % & %

```
VisualOfCCC( ccc);
```

```
Visual *XcmsVisualOfCCC( ccc);
```

%

* @ & %

```
ScreenNumberOfCCC( ccc);
```

```
int XcmsScreenNumberOfCCC( ccc);
```

%

* & %

```
ScreenWhitePointOfCCC( ccc);
```

```
XcmsColor XcmsScreenWhitePointOfCCC( ccc);
```

%

* & % & %

ClientWhitePointOfCCC(*ccc*);

XcmsColor ***XcmsClientWhitePointOfCCC**(*ccc*);

%

* + %

Modifying Attributes of a Color Conversion Context

+ ! XcmsSetWhitePoint

Status **XcmsSetWhitePoint**(*ccc*, *color*);

%

% & +

XcmsSetWhitePoint - + %
, % - %
- % & & % 0 "A0.L
' !0 "A @.' !0 "A .' ! 0 C ' "
- ,CEE! %
+ % 0 C ' ! - +
+

F & & % @ O
& ! F

- % % % - %
! XcmsSetCompressionProc

XcmsCompressionProc **XcmsSetCompressionProc**(*ccc*, *compression_proc*, *client_data*);

%

- % - % %
%% & N
- " ,CEE %
- @ %
@ %
N - !
& 0 '

- % - % %
,CEE

XcmsSetCompressionProc - % %
% & & % %
%

& % / % % -
% ! XcmsSetWhiteAdjustProc

XcmsWhiteAdjustProc **XcmsSetWhiteAdjustProc**(*ccc*, *white_adjust_proc*, *client_data*);

%

 # - 5 - % & % / %

- % & % / %
,CEE

XcmsSetWhiteAdjustProc & % / %
% & & % %
%

Creating and Freeing a Color Conversion Context

. % & %% - XcmsCreateCCC
%

- $ & %%
- XcmsFreeCCC

! XcmsCreateCCC

XcmsCCC **XcmsCreateCCC**(**display*, *screen_number*, **visual*, **client_white_point*, *compression_proc*, *compression_client_data*, *white_adjust_proc*, *white_adjust_client_data*);

% 0 @

- % %% %
@

! % @ %

-# - % + " ,CEE % !
+
+ , %
-

- % - % %
%% & N
- " ,CEE %
- @ %
@ %
N - !
& 0 '

- - % - %
% ,CEE

 # - 5 - % & / %
%% & +
+ ,CEE &
% /

 # - 5 - - % & & %
/ % ,CEE

XcmsCreateCCC % % ! !
@

! XcmsFreeCCC

```
void XcmsFreeCCC( ccc);
```

%

XcmsFreeCCC % ,
& % -

Converting between Color Spaces

@ % -
! XcmsConvertColors

```
Status XcmsConvertColors( ccc, colors_in_out[], ncolors,
target_format, compression_flags_return[]);
```

% " @ &
@ % % : % !
(# "AE @=!
% +

- - % % +
- - %

% 0
%

- % - %

- - * @ -
% " ,CEE % %% !

% - & % ' &
+ ,CEE %

XcmsConvertColors @ % %
0 - - !
- % @ 0 ' !
% -

% : % ! I
"A 0.L! 8 "A E @! = @ %
@ % % - K - %
@ % : % ! 0 *' ! 0 *' =!
% @ "A 0.L - @
%

Callback Functions

- % & % /

- % % % & %
@ % 0 "A0.L @ %
: % 0 * = N - "
- % % H ! % @
- %

B - % @ & @ % @
% % ! & % / % % !
-- & + + " H !

Prototype Gamut Compression Procedure

- % & -?

```
typedef Status(*XcmsCompressionProc)( ccc,  colors_in_out[],  ncolors,
index,  compression_flags_return[]);
```

%

- - % % +
- -
%

% 0
%

% 0
%
N - # @ 9
: = 1

- - * @ -
% " ,CEE % %
% - @ % !
% -
O & !

% - - % % ! & -
% ?

R - % % % % % %

R ! 9 1 %
& N - " ! %
@ % : % 0 * = "
% !
@ % %

R ! % %
- % N -
- " ! %
0 "A0.L C% ! % 0 "A0.L

R ! 1 %
& N - " ! %
0 "A0.L "
% ! 0 "A0.L %

R % % - % % @
/ + %
% N & % +

R " - % % @ % %
- ! XcmsAddColorS-
pace

Supplied Gamut Compression Procedures

& - H -- % ?
ZZ

```
%CIELab~Psychometric~Chroma ~=~ sqrt(a_star sup 2 ~+~ b_star sup 2 )%

%CIELab~Psychometric~Hue ~=~ tan sup -1 left [ b_star over a_star right ]%

%CIELuv~Psychometric~Chroma ~=~ sqrt(u_star sup 2 ~+~ v_star sup 2 )%

%CIELuv~Psychometric~Hue ~=~ tan sup -1 left [ v_star over u_star right ]%
```

- % % % @ 0 & ?

R XcmsCIELabClipL

R - - % N
- - - "A - :EV= "A EV V V
% & - " +
% + (- !
& - + (- ! & %%
"A EV V V + XcmsCIELab-
QueryMaxC ,

R XcmsCIELabClipab

R - - % N
- -+ !& -+ (
- ! & - ,

R XcmsCIELabClipLab

R - - % N
- % - & "A EV V V &
- & - - + (- & @
- ,

R XcmsCIELuvClipL

R - - % N
- - - "A - :EV= "A EV V@V

% & - " +
% + (- ! !
& - + (- ! & %%
"A EV V@V + XcmsCIELu-
vQueryMaxC ,

R XcmsCIELuvClipuv

R - - % N
- -+ !& -+ (
- ! & - ,

R XcmsCIELuvClipLuv

R - - % N
- % - & "A EV V@V &
- & - - + (- & @
- ,

R XcmsTekHVCClipV

R - - % N
- - - # (#
% & - " %
% (! !& - (!
& %% # %
% (,

R XcmsTekHVCClipC

R - - % N
- - (# %
& - ,

R XcmsTekHVCClipVC

R - - % N
- % - & (# & -
& - - (& @ -
,

Prototype White Point Adjustment Procedure

& % / % & -?

typedef Status **(*XcmsWhiteAdjustProc)**(*ccc*, **initial_white_point*, **target_white_point*, *target_format*, *colors_in_out[]*, *ncolors*, *compression_flags_return[]*);

%

-# - % & %

-# - % - & %

- % - %

- - % % +
- -
%

% 0
%

- - * @ -
% " ,CEE % %
% - @ % !
% -
O & !

Supplied White Point Adjustment Procedures

% / % % @ 0 & ?

R XcmsCIELabWhiteShiftColors

R "A EV V V % / -
% &
& % % % @ %
0 "AE - & % @ - %
- N & % ,

R XcmsCIELuvWhiteShiftColors

R "A EV V@V % / -
% &
& % % % @ %
0 "AE @ - & % @ - %
- N & % ,

R XcmsTekHVCWhiteShiftColors

R (# % / -
% &
& % % % @ % 0
(# - & % @ - %
- N & % @ - %
@ % @ % F ,

' % % @ &! & % / %
@ % @ % & % %
% : % ! "A EV V@V! "A EV V V! (# = - & %
@ - % - % -
& % " & ! % - % & &
% & & % ! -
% & & % - & %
"A % & % % "A N@N.!
"A 0.L! "A . @ % - & % / %
@ % %
- ! XcmsAddColorSpace

% ! % & % / %
+ + ! XcmsAllocColor &
& % / % & ?

R $ @ 0 *

R @ 0 *

' % ! % 0 "A @. / %
XcmsCIELuvWhiteShiftColors B - @ 0 *!
XcmsAllocColor & - % @ ?

R ' 0 "A @. 0 "AE @ - +

R ' 0 "AE @ 0 "A @. - +

R ' 0 "A @. 0 "A0.L : "A N@N. 0.L & % %
% =

R ' 0 "A0.L 0 *

R ' 0 * 0 *

- * % % XAllocColor! * %
XAllocColor @ 0 "A @. @ -
@ H

Gamut Querying Functions

- H - 0 % @
& H N -
"A EV V V! "A EV V@V! (# % ' % @
& H % ?

R : ! - ! =

R : & - F =

R : - & F =

R * : & - F =

R * :F ! - ! =

& % & % %
- H - +
% ! - H N
-

& - - @)) ?

Xcms<*color_space*>QueryMax<*dimensions*>

Xcms<*color_space*>QueryMin<*dimensions*>

\ ^
% ' % ! XcmsTekHVCQueryMaxC - @
(# &

Red, Green, and Blue Queries

% :F ! - ! =!
XcmsQueryBlack

```
Status XcmsQueryBlack( ccc,  target_format,  *color_return);
```

% N +
& % / % -

- % - %

- % %
- : & % &
%
+ @ %

XcmsQueryBlack % % -
F ! - !

% : & -
F =! XcmsQueryBlue

```
Status XcmsQueryBlue( ccc,  target_format,  *color_return);
```

% N +
& % / % -

- % - %

- % %
- : & % &
%
+ @ %

XcmsQueryBlue % % -
& - F

% - : - &
F =! XcmsQueryGreen

```
Status XcmsQueryGreen( ccc,  target_format,  *color_return);
```

% N +
& % / % -

- % - %

- % %
- : & % &

%
+ @ %

XcmsQueryGreen % % -
- & F

% : & -
F =! XcmsQueryRed

```
Status XcmsQueryRed( ccc,  target_format,  *color_return);
```

% N +
& % / % -

- % - %

- % %
- : & % &
%
+ @ %

XcmsQueryRed % % -
& - F

% & : !- ! =!
XcmsQueryWhite

```
Status XcmsQueryWhite( ccc,  target_format,  *color_return);
```

% N +
& % / % -

- % - %

- % %
- : & % &
%
+ @ %

XcmsQueryWhite % % -
!- !

CIELab Queries

& - H - "AE H ?
ZZ

```
%CIELab~Psychometric~Chroma ~=~ sqrt(a_star sup 2 ~+~ b_star sup 2 )%

%CIELab~Psychometric~Hue ~=~ tan sup -1 left [ b_star over a_star right ]%
```

"A EV V V + - @
+ (- "A - :EV=! XcmsCIELabQueryMaxC

Status **XcmsCIELabQueryMaxC**(*ccc*, *hue_angle*, *L_star*, **color_return*);

% N +
& % / % -

- % - : - = &
:(

- % - :EV= & :E

- "A EV V V :E
% - @ : &
% & %
+ @
%

XcmsCIELabQueryMaxC ! - @ - - ! %
% " % "A EV V V

"A EV V V "A - :EV=
- @ + (- + ! XcmsCIELabQuery-MaxL

Status **XcmsCIELabQueryMaxL**(*ccc*, *hue_angle*, *chroma*, **color_return*);

% N +
& % / % -

- % - : - = &
:(

% & :

- "A EV V V :E
% - @ : &
% & %
+ @
%

XcmsCIELabQueryMaxL ! - @ - ! %
"A EV V V % - :EV= % "
% "A EV V V 0 ' @
- @ - @ -

"A EV V V + - @
+ (- ! XcmsCIELabQueryMaxLC

Status **XcmsCIELabQueryMaxLC**(*ccc*, *hue_angle*, **color_return*);

% N +
& % / % -

- % - : - = &
:(

- "A EV V V :E
% - @ : &
% & %
+ @
%

XcmsCIELabQueryMaxLC !- @ - ! %
% " % "A EV V V

"A EV V V "A - :EV= - @
+ (- + ! XcmsCIELabQueryMinL

```
Status XcmsCIELabQueryMinL( ccc, hue_angle, chroma, *color_return);
```

% N +
& % / % -

- % - : - = &
:(

% & :

- "A EV V V :E
% - @ : &
% & %
+ @
%

XcmsCIELabQueryMinL !- @ - ! %
- :EV= % " % "A
EV V V 0 ' @ - @
- @ -

CIELuv Queries

& - H - "AE @ H ?
ZZ

```
%CIELuv~Psychometric~Chroma ~=~ sqrt(u_star sup 2 ~+~ v_star sup 2 )%

%CIELuv~Psychometric~Hue ~=~ tan sup -1 left [ v_star over u_star right ]%
```

"A EV V@V + - @
+ (- "A - :EV=! XcmsCIELuvQueryMaxC

```
Status XcmsCIELuvQueryMaxC( ccc, hue_angle, L_star, *color_return);
```

% N +
& % / % -

- % - : - = &
:(

- % - :EV= & :E

- "A EV V@V :E
% - @ : &
% & %
+ @
%

XcmsCIELuvQueryMaxC !- @ - - ! %
% " % "A EV V@V

"A EV V@V "A - :EV=
- @ + (- + ! XcmsCIELuvQueryMaxL

Status **XcmsCIELuvQueryMaxL**(*ccc*, *hue_angle*, *chroma*, **color_return*);

% N +
& % / % -

- % - : - = &
:(

- % - :EV= & :E

- "A EV V@V :E
% - @ : &
% & %
+ @
%

XcmsCIELuvQueryMaxL !- @ - ! %
"A EV V@V % - :EV= % "
% "A EV V@V 0 ' @
- @ - @ -

"A EV V@V + - @
+ (- ! XcmsCIELuvQueryMaxLC

Status **XcmsCIELuvQueryMaxLC**(*ccc*, *hue_angle*, **color_return*);

% N +
& % / % -

- % - : - = &
:(

- "A EV V@V :E
% - @ : &
% & %
+ @
%

XcmsCIELuvQueryMaxLC !- @ - ! %
% " % "A EV V@V

"A EV V@V "A - :EV= - @
+ (- + ! XcmsCIELuvQueryMinL

```
Status XcmsCIELuvQueryMinL( ccc, hue_angle, chroma, *color_return);
```

% N +
& % / % -

- % - : - = &
:(

% & :

- "A EV V@V :E
% - @ : &
% & %
+ @
%

XcmsCIELuvQueryMinL ! - @ - ! %
- :EV= % " % "A
EV V@V 0 ' @ - @
- @ -

TekHVC Queries

- @ (# ! XcmsTekHVCQuery-MaxC

```
Status XcmsTekHVCQueryMaxC( ccc, hue, value, *color_return);
```

% N +
& % / % -

% (:(

! % # & :#

- :E & : & &
% & %
+ @
%

XcmsTekHVCQueryMaxC ! - @ (# !
(# % % "
- & (# &
&

- @ (! XcmsTekHVCQuery-MaxV

```
Status XcmsTekHVCQueryMaxV( ccc, hue, chroma, *color_return);
```

% N +
& % / % -

% (:(

% & :

- :E & : & &
% & %
+ @
%

XcmsTekHVCQueryMaxV !- @ (!
(# % % "
(& # &

& %
(! XcmsTekHVCQueryMaxVC

Status **XcmsTekHVCQueryMaxVC**(*ccc*, *hue*, **color_return*);

% N +
& % / % -

% (:(0 (#
! # & a
! (

- :E & : & &
% & %
+ @
%

XcmsTekHVCQueryMaxVC !- @ (!
(# % % # &
" ! # &
! (&
&

% (# %
# % (& #
! XcmsTekHVCQueryMaxVSamples

Status **XcmsTekHVCQueryMaxVSamples**(*ccc*, *hue*, *colors_return[]*, *nsamples*);

% N +
& % / % -

% (:(

% %

- % % 0
(#
(& %
& %
+ @ %

XcmsTekHVCQueryMaxVSamples % # !
& # ! (&

& % % %
# > N - % (
(# %

- @ (! XcmsTekHVC-QueryMinV

```
Status XcmsTekHVCQueryMinV( ccc,  hue,  chroma,  *color_return);
```

% N +
& % / % -

% (:(

! % # & :#

- :E & : & &
% & %
+ @
%

XcmsTekHVCQueryMinV ! - @ (!
(# % % "
(& # &

Color Management Extensions

0 - & & ?

R B @ " % %

R B @ % % @ "A 0.L %
- XcmsAddColorSpace

R F '

R F ' @ % %
@ & % "A 0.L
% ! - % % @
- XcmsAddFunctionSet

Color Spaces

"A 0.L % @ @ & @
% @ % % ! & - @
0 "A 0.L &
% ' % ! @ "A EV V@V * H & -
@ "A EV V@V "A 0.L "A 0.L * & -
! & %% ! & @ 0
"A 0.L % @
%

$! & @ - & @ % %
@ % % ! & @ % '
% ! @ (# "A EV V@V % @

"A V@V. "A EV V@V! % - @ & "A V@V. "A 0.L

Adding Device-Independent Color Spaces

@ % % ! XcmsAddColorSpace

```
Status XcmsAddColorSpace( *color_space);
```

- % @ % %

XcmsAddColorSpace @ % % :
0 % = - *
@ - % - !
% @ " -
% : % ! - %
- - % =!
% % : XcmsFormatOfPrefix XcmsPrefixOfFormat=

" 0 % -
! XcmsAddColorSpace 0

, 0 % 0

Querying Color Space Format and Prefix

& % & %
-% ! XcmsFormatOfPrefix

```
XcmsColorFormat XcmsFormatOfPrefix( *prefix);
```

% - % %

XcmsFormatOfPrefix % %
% : % ! - MM "A0.LNN= % @ "
% - ! XcmsFormatOfPrefix
0 C '

-% & % %
! XcmsPrefixOfFormat

```
char *XcmsPrefixOfFormat( format);
```

% %

XcmsPrefixOfFormat -% &
% - % - $ & !
- ! ,CEE -

Creating Additional Color Spaces

% % % @
-% - 0 % ! &
- H % "
@ % % ! & : !

- @ = % - &
XcmsAddColorSpace

" & 0 % % % - &
0 ! % @ @
- % - "
- % : % ! -
% - - % =!
% % : XcmsFormatOfPrefix XcmsPrefixOfFormat=

```
typedef (*XcmsConversionProc)();
typedef XcmsConversionProc *XcmsFuncListPtr;
  /* A NULL terminated list of function pointers*/

typedef struct _XcmsColorSpace {
 char *prefix;
 XcmsColorFormat format;
 XcmsParseStringProc parseString;
 XcmsFuncListPtr to_CIEXYZ;
 XcmsFuncListPtr from_CIEXYZ;
 int inverse_flag;
} XcmsColorSpace;
```

% % % -
% N - ' % ! - MM FNN MM "A0.LNN "A 0.L!
MM - NN MM *NN * % @
% % ' - %
- % - %
% - 0
- : =? F F & K "A0.L
K "A0.L % ! ,CEE
% ! & @
% 0 > % >
"A 0.L A - : =? F
F & & % & %
% ! @ - & % @ K - !
F ! % K "A0.L! @
K "A0.L ?

```
Given:  n = number of functions in each list

for each i, such that 0 <= i < n
    from_CIEXYZ[n - i - 1] is the inverse of to_CIEXYZ[i].
```

& 0 @ % ! % - "A 0.L
% : % ! (# "A EV V@V=

Parse String Callback

0 % % - -
% % & - & % ?

```
Status XcmsParseStringProc( *color_string,  *color_return);
```

- % - %

- % % N

Color Specification Conversion Callback

0 % @ - %
& @ % % & - &
% ?

```
Status ConversionProc( ccc,  *white_point,  *colors_in_out,  ncolors);
```

%

- % & % & %
% - !
- %

- - % % +
- -
%

% 0
%

0 % @ - %
@ % % & - &
% ?

```
Status ConversionProc( ccc,  *colors_in_out,  ncolors,
compression_flags_return[]);
```

%

- - % % +
- -
%

% 0
%

- - * @ -
% " ,CEE % %
% - @ % !
% -
O & !

@ @ - %
@ % @ 0 ?

XcmsCIELabToCIEXYZ	0	"AE '	0	"A0.L'
XcmsCIELuvToCIEuvY	0	"AE @'	0	"A @.'
XcmsCIEXYZToCIELab	0	"A0.L'	0	"AE '
XcmsCIEXYZToCIEuvY	0	"A0.L'	0	"A @.'
XcmsCIEXYZToCIExyY	0	"A0.L'	0	"A .'
XcmsCIEXYZToRGBi	0	"A0.L'	0	*'
XcmsCIEuvYToCIELuv	0	"A @.'	0	"AE '
XcmsCIEuvYToCIEXYZ	0	"A @.'	0	"A0.L'
XcmsCIEuvYToTekHVC	0	"A @.'	0	(#'
XcmsCIExyYToCIEXYZ	0	"A .'	0	"A0.L'
XcmsRGBToRGBi	0	*'	0	*'
XcmsRGBiToCIEXYZ	0	*'	0	"A0.L'
XcmsRGBiToRGB	0	*'	0	*'
XcmsTekHVCToCIEuvY	0	(#'	0	"A @.'

Function Sets

' @ & @ % % "A 0.L
% @ : % ! @ - =
! F ' @ %
@ % %
@ % & @ % % "A
0.L % %% % % % @
F & &
% % " F & & @ &
% @ ' & F
& & % % ! B @ F
! " E",A K *
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E",A K * " !
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Adding Function Sets

! XcmsAddFunctionSet

```
Status XcmsAddFunctionSet( *function_set);
```

-

%

XcmsAddFunctionSet -
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- ! XcmsAddFunctionSet "
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Creating Additional Function Sets

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```
typedef struct _XcmsFunctionSet {
 XcmsColorSpace **DDColorSpaces;
 XcmsScreenInitProc screenInitProc;
 XcmsScreenFreeProc screenFreeProc;
} XcmsFunctionSet;
```

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```
typedef Status (*XcmsScreenInitProc)( *display, screen_number,
*screen_info);
```

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```
typedef struct _XcmsPerScrnInfo {
 XcmsColor screenWhitePoint;
 XPointer functionSet;
 XPointer screenData;
 unsigned char state;
 char pad[3];
} XcmsPerScrnInfo;
```

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```
typedef void (*XcmsScreenFreeProc)( screenData);
```

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Chapter 7. Graphics Context Functions

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Manipulating Graphics Context/State

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! %% % 0 #
$ % - @ H XCreateGC
@ 0 # ?

```
/* GC attribute value mask bits */

#define     GCFunction              (1L<<0)
#define     GCPlaneMask             (1L<<1)
#define     GCForeground            (1L<<2)
#define     GCBackground            (1L<<3)
#define     GCLineWidth             (1L<<4)
#define     GCLineStyle             (1L<<5)
#define     GCCapStyle              (1L<<6)
#define     GCJoinStyle             (1L<<7)
```

```
#define     GCFillStyle             (1L<<8)
#define     GCFillRule              (1L<<9)
#define     GCTile                  (1L<<10)
#define     GCStipple               (1L<<11)
#define     GCTileStipXOrigin       (1L<<12)
#define     GCTileStipYOrigin       (1L<<13)
#define     GCFont                  (1L<<14)
#define     GCSubwindowMode         (1L<<15)
#define     GCGraphicsExposures     (1L<<16)
#define     GCClipXOrigin           (1L<<17)
#define     GCClipYOrigin           (1L<<18)
#define     GCClipMask              (1L<<19)
#define     GCDashOffset            (1L<<20)
#define     GCDashList              (1L<<21)
#define     GCArcMode               (1L<<22)



/* Values */

typedef struct {
     int function;                  /* logical operation */
     unsigned long plane_mask;      /* plane mask */
     unsigned long foreground;      /* foreground pixel */
     unsigned long background;      /* background pixel */
     int line_width;                /* line width (in pixels) */
     int line_style;                /* LineSolid, LineOnOffDash, LineDoubleDash */
     int cap_style;                 /* CapNotLast, CapButt, CapRound, CapProjecting
     int join_style;                /* JoinMiter, JoinRound, JoinBevel */
     int fill_style;                /* FillSolid, FillTiled, FillStippled FillOpaqu
     int fill_rule;                 /* EvenOddRule, WindingRule */
     int arc_mode;                  /* ArcChord, ArcPieSlice */
     Pixmap tile;                   /* tile pixmap for tiling operations */
     Pixmap stipple;                /* stipple 1 plane pixmap for stippling */
     int ts_x_origin;               /* offset for tile or stipple operations */
     int ts_y_origin
     Font font;                     /* default text font for text operations */
     int subwindow_mode;            /* ClipByChildren, IncludeInferiors */
     Bool graphics_exposures;       /* boolean, should exposures be generated */
     int clip_x_origin;             /* origin for clipping */
     int clip_y_origin;
     Pixmap clip_mask;              /* bitmap clipping; other calls for rects */
     int dash_offset;               /* patterned/dashed line information */
     char dashes;
} XGCValues;
```

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((src FUNC dst) AND plane-mask) OR (dst AND (NOT plane-mask))
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[x1-(w*sn/2), y1+(w*cs/2)], [x1+(w*sn/2), y1-(w*cs/2)],
[x2-(w*sn/2), y2+(w*cs/2)], [x2+(w*sn/2), y2-(w*cs/2)]
```

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XCreateGC

GC **XCreateGC**(**display*, *d*, *valuemask*, *values*);

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% % ! XCopyGC

XCopyGC(**display*, *dest*, *valuemask*);

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XCreateGC

XCopyGC - * !* ! *)

- % - @ ! XChangeGC

XChangeGC(**display*, *gc*, *valuemask*, **values*);

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XChangeGC - * ! * ' ! * ! *) ! * + %!
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% - @ ! XGetGCValues

Status **XGetGCValues**(**display*, *gc*, *valuemask*, **values_return*);

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- @ ! XFreeGC

```
XFreeGC( *display,  gc);
```

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"B - @ ! XGContextFromGC

```
GContext XGContextFromGC( gc);
```

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% - ! XFlushGC

```
void XFlushGC( *display,  gc);
```

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Using Graphics Context Convenience Routines

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Setting the Foreground, Background, Function, or Plane Mask

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! XSetState

XSetState(*display, gc, background, function, plane_mask);

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XSetState - * !* ! * #

- -@ ! XSetForeground

XSetForeground(*display, gc, foreground);

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XSetForeground - * *

- -@ ! XSetBackground

XSetBackground(*display, gc, background);

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XSetBackground - * *

% -@ ! XSetFunction

XSetFunction(*display, gc, function);

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XSetFunction - * !* ! * #

% - @ ! XSetPlaneMask

XSetPlaneMask(**display*, *gc*, *plane_mask*);

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XSetPlaneMask - * *

Setting the Line Attributes and Dashes

& - % - @ ! XSetLineAttributes

XSetLineAttributes(**display*, *gc*, *line_width*, *line_style*, *cap_style*, *join_style*);

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XSetLineAttributes - * !* ! * #

- @ ! XSet-
Dashes

XSetDashes(**display*, *gc*, *dash_offset*, *dash_list[]*, *n*);

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XSetDashes - * !* ! * #

Setting the Fill Style and Fill Rule

- @ ! XSetFillStyle

XSetFillStyle(**display*, *gc*, *fill_style*);

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XSetFillStyle - * !* ! * #

- @ ! XSetFillRule

XSetFillRule(**display*, *gc*, *fill_rule*);

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XSetFillRule - * !* ! * #

Setting the Fill Tile and Stipple

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F ! %% ! ! XQueryBestSize

```
Status XQueryBestSize( *display, class, which_screen, height,
*height_return);
```

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XQueryBestSize - * B & !*) ! * #

% ! XQueryBestTile

```
Status XQueryBestTile( *display, which_screen, height,
*height_return);
```

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XQueryBestTile - * B & *)

%% % ! XQueryBestStipple

```
Status XQueryBestStipple( *display, which_screen, height,
*height_return);
```

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XQueryBestStipple - * B & *)

- @ ! XSetTile

```
XSetTile( *display, gc, tile);
```

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XSetTile - * !* !*) ! * + %

%% - @ ! XSetStipple

```
XSetStipple( *display, gc, stipple);
```

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XSetStipple - * !* !*) ! * + %

%% - - @ ! XSetTSOrigin

XSetTSOrigin(*display, gc, ts_y_origin);

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XSetTSOrigin - * *

Setting the Current Font

- @ ! XSetFont

XSetFont(*display, gc, font);

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XSetFont - * !* ' ! *

Setting the Clip Region

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XSetClipOrigin(*display, gc, clip_y_origin);

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XSetClipOrigin - * *

% - @ % % %! XSetClipMask

XSetClipMask(**display*, *gc*, *pixmap*);

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ClipRectangles

XSetClipRectangles(**display*, *gc*, *clip_y_origin*, *rectangles[]*, *n*, *ordering*);

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Setting the Arc Mode, Subwindow Mode, and Graphics Exposure

- @ ! XSetArcMode

XSetArcMode(**display*, *gc*, *arc_mode*);

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XSetArcMode - * !* ! * #

& & - @ ! XSetSubwindowMode

XSetSubwindowMode(**display*, *gc*, *subwindow_mode*);

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XSetSubwindowMode - * !* ! * #

- % % - - @ ! XSetGraphicsExposures

XSetGraphicsExposures(**display*, *gc*, *graphics_exposures*);

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XSetGraphicsExposures - * !* ! * #

Chapter 8. Graphics Functions

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Clearing Areas

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XClearArea(**display*, *w*, *y*, *height*, *exposures*);

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XClearWindow(**display*, *w*);

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XClearWindow - *) * &

Copying Areas

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XCopyArea(**display*, *dest*, *gc*, *src_y*, *height*, *dest_y*);

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XCopyPlane(**display*, *dest*, *gc*, *src_y*, *height*, *dest_y*, *plane*);

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Drawing Points, Lines, Rectangles, and Arcs

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typedef struct {
     short x1, y1, x2, y2;
} XSegment;
```

```
typedef struct {
     short x, y;
} XPoint;
```

```
typedef struct {
     short x, y;
     unsigned short width, height;
```

```
} XRectangle;
```

```
typedef struct {
     short x, y;
     unsigned short width, height;
     short angle1, angle2;             /* Degrees * 64 */
} XArc;
```

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Drawing Single and Multiple Points

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XDrawPoint(**display*, *d*, *gc*, *y*);

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XDrawPoints(**display*, *d*, *gc*, **points*, *npoints*, *mode*);

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Points - * B & !* !*) ! * #

Drawing Single and Multiple Lines

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XDrawLine(**display*, *d*, *gc*, *y2*);

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6

6 % % : 1! 1= : 8! 8=

& % - @ & ! XDrawLines

XDrawLines(**display*, *d*, *gc*, **points*, *npoints*, *mode*);

% 0 @

% &

%

% %

% %

% . %)
$ -) + @

& % ! - @ & ! XDrawSegments

XDrawSegments(**display*, *d*, *gc*, **segments*, *nsegments*);

% 0 @

% &

%

% -

% -

XDrawLine % % &
& % % : 1! 1= : 8! 8= " % / -
% ' - @ ! XDrawLine & %
" ! - % & %

XDrawLines % % & % 1
& % % :% S T! % S [1T= 0+
" & /
% ! % !
/ ' - @ ! XDrawLines & %
" :F & = ! - % &
% " & ! - % & !
- PolyLine % H & - ! %
) $ - @ - !) + @
@ % @ %

XDrawSegments & % ! ' - !
XDrawSegments & & : 1! 1= : 8! 8= " &
0 - % / -
% ' - @ ! XDrawSegments & %
" ! - % & %

% ? ! % ! & !
! % ! ! & & ! % - ! % - ! %
XDrawLines /
% % ? - ! - !
! %% ! %% - ! %% - ! !

XDrawLine! XDrawLines! XDrawSegments - * B & ! * !
*) XDrawLines - * #

Drawing Single and Multiple Rectangles

& - - - @ & ! XDrawRectangle

XDrawRectangle(**display*, *d*, *gc*, *y*, *height*);

% 0 @

% &

%

% :0

#

% & - :

& % - -@ & ! XDrawRectangles

XDrawRectangles(*display, d, gc, rectangles[], nrectangles);

% 0 @

% &

%

% -

% -

XDrawRectangle XDrawRectangles & %
- - @ % PolyLine % H & %
- ?

R S!TS[& !TS[& ![- TS![- TS!T

' % - - ! & %
XDrawRectangles & -
" - ! - % & %

* % ? ! % ! & !
! % ! / ! ! & & ! % - ! % - !
% % % ? - !
- ! ! %% ! %% - ! %% - ! !

XDrawRectangle XDrawRectangles - * B & ! * !
*)

Drawing Single and Multiple Arcs

& - -@ & ! XDrawArc

XDrawArc(*display, d, gc, y, height, angle2);

% 0 @

% &

% % %%
- -

% :0

#

% & - :

& % @ N
% ! - V 67

6 % % @
! - V 67

& % - @ & ! XDrawArcs

XDrawArcs(**display*, *d*, *gc*, **arcs*, *narcs*);

% 0 @

% &

%

%

%

ZZ XDrawArc & - % ! XDrawArcs &
% % A % - &
- % - ! /
% & - + @ -
& ! - @ - & " -
- 8 - I69 - ! XDrawArc XDrawArcs
I69 -

' % ZS f ! f ! f & ! f - ! f - 1 ! f - 8 TZ! -
/ Z S [b c& @ 8e ! f [b c - @
8e TZ! % - %
F Z S ! f [b c - @ 8e TZ Z S [b & ! f
[b c - @ 8 eT Z @ Z S [b c & @
8 e ! f TZ Z S [b c & @ 8 e! f [b - TZ
%
% ' & & & &!
- - - @ & % -
% & % % % > % H
&>8 :& @ = % / %%
% - - > % %

' % ZS f ! f ! f & ! f - ! f - 1 ! f - 8 TZ! -
% @ & % :
! - = % &
- - %
: & % = & ?

```
% roman "skewed-angle" ~ = ~ atan left ( tan ( roman "normal-angle" )
 * width over height right ) +^ adjust%
```

& - - % :
- 67= - Z S 9 ! f8 % TZ & @
- Z S % @ 8 ! f% @ 8 T Z / ?

```
%0%     for normal-angle in the range % [ 0 , ~pi over 2  ]%
%pi%     for normal-angle in the range % [ pi over 2 , ~{3 pi} over 2  ]%
%2 pi%     for normal-angle in the range % [ {3 pi} over 2 , ~2 pi  ]%
```

' - @ ! XDrawArc XDrawArcs & %
" & / & - F
! XDrawArc XDrawArcs & % $ & !
- % - & % % -
& % & & % % -
% H @ & ! %
/

" % & % & - ! &
& / " % & %
! & & / * % - F !
F @ & - %
- %

* % ? ! % ! & !
! % ! / ! ! & & ! % - ! % - !
% % % ? - !
- ! ! %% ! %% - ! %% - ! !

XDrawArc XDrawArcs - * B & !* ! *)

Filling Areas

0 % @ ?

R - - % -

R - % -

R - %

Filling Single and Multiple Rectangles

- - - @ & ! XFillRectangle

XFillRectangle(*display, d, gc, y, height);

% 0 @

% &

% % %%
-

% :0

#

% & - :

% - - @ & ! XFillRectangles

XFillRectangles(**display*, *d*, *gc*, **rectangles*, *nrectangles*);

% 0 @

% &

%

% -

% -

XFillRectangle XFillRectangles % -
- % FillPolygon % H & %
- ?

[x,y] [x+width,y] [x+width,y+height] [x,y+height]

A ! & - !
%

XFillRectangles - ' - @
- ! XFillRectangle XFillRectangles & %
" - ! - % & %

* % ? ! % ! ! &
& ! % - ! % - ! %
% % ? - ! - ! ! %% ! %% - !
%% -

XFillRectangle XFillRectangles - * B & ! * !
*)

Filling a Single Polygon

% - - @ & ! XFillPolygon

XFillPolygon(**display*, *d*, *gc*, **points*, *npoints*, *shape*, *mode*);

% 0 @

% &

%

% %

% %

% % % @ % @ %
. % % ! @ ! , @

% . %)
$ -) + @

XFillPolygon - % % %
% & % XFillPoly-
gon & % -) $ -
@ - !) + @
@ % @ %

B % - % % ! & - ?

R " % % ! % , -
% %

R " % @ ! @ % % % - ! -
- % " & ! % -
@ % @ % " % @ %
@ ! - %

R " % , @ ! % ! % &
@ " & ! % - , @ %
% @ % " % , @ - % !
- %

- @ - % -

% ? ! % ! ! !
& & ! % - ! % - ! % "
% % ? - ! - ! ! %% ! %%
- ! %% -

XFillPolygon - * B & !* !*) ! * #

Filling Single and Multiple Arcs

- - @ & ! XFillArc

XFillArc(**display, d, gc, y, height, angle2*);

% 0 @

% &

% % %%
- -

% :0

#

% & - :

& % @ N
% ! - V 67

6 % % @
! - V 67

% - @ & ! XFillArcs

```
XFillArcs( *display, d, gc, *arcs, narcs);
```

% 0 @

% &

%

%

%

' ! XFillArc XFillArcs -
% % ! % - %
! & - ' ! - - / -
% ' + ! & - / -
% & % XFillArcs
' - @ ! XFillArc XFillArcs &
% " - ! -% & %

* % ? !% ! ! !
& & ! % - ! % - ! %
% % ? - ! - ! ! %% ! %%
- ! %% -

XFillArc XFillArcs - * B & !* ! *)

Font Metrics

- % %
& @ ! F % %

& ?

R E

R $

R % - F

R % -

R J - F

0 @ & @ % - H & @
H % ' - @ @
@ % & - &) %% % XLoad-
QueryFont H

- A % - H !
% & 1

& - %% : % ! -
=

0'
% & % 0
0' ! 0' + %!
0 ?

```
typedef struct {
     short lbearing;               /* origin to left edge of raster */
     short rbearing;               /* origin to right edge of raster */
     short width;                  /* advance to next char's origin */
     short ascent;                 /* baseline to top edge of raster */
     short descent;                /* baseline to bottom edge of raster */
     unsigned short attributes;    /* per char flags (not predefined) */
} XCharStruct;
```

```
typedef struct {
     Atom     name;
     unsigned long card32;
} XFontProp;
```

```
typedef struct {     /* normal 16 bit characters are two bytes */
    unsigned char byte1;
    unsigned char byte2;
} XChar2b;
```

```
typedef struct {
     XExtData *ext_data;               /* hook for extension to hang data */
     Font fid;                         /* Font id for this font */
     unsigned direction;               /* hint about the direction font is painted
     unsigned min_char_or_byte2;       /* first character */
     unsigned max_char_or_byte2;       /* last character */
     unsigned min_byte1;               /* first row that exists */
     unsigned max_byte1;               /* last row that exists */
     Bool all_chars_exist;             /* flag if all characters have nonzero size
```

```
    unsigned default_char;          /* char to print for undefined character */
    int n_properties;               /* how many properties there are */
    XFontProp *properties;          /* pointer to array of additional propertie
    XCharStruct min_bounds;         /* minimum bounds over all existing char */
    XCharStruct max_bounds;         /* maximum bounds over all existing char */
    XCharStruct *per_char;          /* first_char to last_char information */
    int ascent;                     /* logical extent above baseline for spacin
    int descent;                    /* logical descent below baseline for spaci
} XFontStruct;
```

0 %% - > ! & > ! 16
% , & ! -
> H % - : ! &
8 = . @ & 8 &
? 1 % - & 8 -
- > @ & !
8 - % -

- 0
! K @
F ! 0'

0' @ & - ?

R ' E - ' - E " /
& 0 @ % @ :' E - =
- @ :' - E = & %
%% @

R " K 1 K 1 F ! K K K 8 %
% - % K
! K K K 8 %

R " K 1 K 1 F ! K K K 8
K K K 8 856! 8 @
% - % K , : - 9= ?

R 1] ,>B [K 1 8] ,aaB [K K K 8

R & ?

R B] K K K 8 K K K 8 [1 >] - @ aa] -

R " % K % ,CEE! - % &
@ @ ! - @ K
K

R " K K ! % K @ F
-

R K % & &
% K 16
: 8 = ' - 8 ! K

1 - 8 - "
K % ! % -
%

R K K @
@ 0 % @ : -
= - :
- - % % % -
- S ! T= %% ?

```
[x + min_bounds.lbearing, y - max_bounds.ascent]
```

R " & ?

```
max_bounds.rbearing - min_bounds.lbearing
```

R " - ?

```
max_bounds.ascent + max_bounds.descent
```

R - @
- % - %

R - &
- % - %

R " . ! - @
& . @ : = : [1= % !
% - & & - @ [

' - S ! T! - : !
- N % = 0
% - & %% ?

```
[x + lbearing, y - ascent]
```

" & ?

```
rbearing - lbearing
```

" - ?

```
ascent + descent
```

- ?

```
[x + width, y]
```

- -
- - - -

- % -
-
- - & -
&

, : % - = - @ &
- / & - F !
% & . & ! - - @ &
- & - -
F ! % & 0 & 0
- @ " & - @ ! &
%

0 % %
0 % &
0 F

- @ % % % % %
@ : % ! - - -= @ & -
% % % % % 0
, / !

Loading and Freeing Fonts

0 % @ ! - !
! & "B
"B -

- @ ! XLoadFont

```
Font XLoadFont( *display,  *name);
```

% 0 @

% ! &
-

XLoadFont % "B
" (+ A -!
% % C %% &
MM_NN MMVNN ! % %
- " % ! MM_NN & -
! MMVNN &
% 0 , /
! " XLoadFont & - % !
* , ' & %
% - ! XUnloadFont

XLoadFont - * * ,

@ ! XQueryFont

```
XFontStruct *XQueryFont( *display,  font_ID);
```

% 0 @

-/ % "B "B

XQueryFont % 0' !&
& . H
"B 0' & "B!
& - "B : XGContextFromGC=
" ! XQueryFont ,CEE ! XFree-
FontInfo

% XLoadFont XQueryFont - % ! XLoadQueryFont

```
XFontStruct *XLoadQueryFont( *display,  *name);
```

% 0 @

% !&
-

XLoadQueryFont % @ & -
XLoadQueryFont % : = % %
%% % 0' " (+
A -! % % " !
XLoadQueryFont ,CEE

XLoadQueryFont - *

- &
XQueryFont XLoadQueryFont! XFreeFont

```
XFreeFont( *display,  *font_struct);
```

% 0 @

- % - &

XFreeFont & "B
% 0' &
&
-

XFreeFont - * '

- @ % % ! XGetFontProperty

```
Bool XGetFontProperty( *font_struct,  atom,  *value_return);
```

- % - &

% % % &

! - @ % %

@ % % ! XGetFontProperty @
% % % XGetFontProperty ' % %
& & %
% % !& <X11/Xatom.h>

% % & - - !
% % % & %

& XLoadFont! XUnloadFont

XUnloadFont(*display, font);

% 0 @

%

XUnloadFont & "B
% & &
-

XUnloadFont - * '

Obtaining and Freeing Font Names and Information

. - & % &
H - % @ F

@ ! XListFonts

char **XListFonts(*display, *pattern, *maxnames, *actual_count_return);

% 0 @

% % -
&

%

- -

XListFonts @ :
% O XSetFontPath= - %
% - % - !
:V= & ! H :_= &
- " % - (+
A -! % % C %% &
A - "
@ E + A -! -
(+ A - $ & ! %
% " - ! XListFonts ,CEE
XFreeFontNames & &

! XFreeFontNames

XFreeFontNames(*list[]);

% - &

XFreeFontNames - XListFonts
XListFontsWithInfo

@ ! XListFontsWith-Info

char **XListFontsWithInfo(*display, *pattern, maxnames, *count_return, **info_return);

% 0 @

% % -
&

%

-

-

XListFontsWithInfo %
%
F %
& XLoadQueryFont & % %
% - ! :V=
& ! H :_= &
- " % - (+
A -! % % C %% &
A - "
@ E + A -! -
(+ A - $ & ! %
% " - ! XListFontsWithInfo ,CEE

! XFreeFontNames
/
! XFreeFontInfo

! XFreeFontInfo

XFreeFontInfo(**names, *free_info, actual_count);

%

- %

- %

XFreeFontInfo
% " ,CEE % !
" % : XLoadQueryFont= % !
! O XUnloadFont

Computing Character String Sizes

0 % @ % & ! - !
@ 4 8 - &
% - & "

4 8
%

& 4 -! XTextWidth

```
int XTextWidth( *font_struct,  *string,  count);
```

- % & %

% -

% % -

& 8 -! XTextWidth16

```
int XTextWidth16( *font_struct,  *string,  count);
```

- % & %

% -

% % -

Computing Logical Extents

% - 4 - - @ ! XTextExtents

```
XTextExtents( *font_struct,  *string,  nchars,  *direction_return,
*font_descent_return,  *overall_return);
```

- % 0'

% -

% -

- @ :' E
- ' - E =

- -

- -

! - @ F % 0

% - 8 - - @ ! XTextExtents16

```
XTextExtents16( *font_struct,  *string,  nchars,  *direction_return,
*font_descent_return,  *overall_return);
```

- % 0'

% -

%
-

- @ :' E
- ' - E =

- -

- -

! - @ F % 0

XTextExtents XTextExtents16 % F %
! ! @ % @ XQueryTextExtents
XQueryTextExtents16 * 0 ! &
@ &

-
& &
- ' -! &
% - - E E -
% E - -
% - E
- -

' & - 8 -!
0 8 % 16 & 1 -
" !
- @ F

Querying Character String Sizes

H @ - 4 - - @ !
XQueryTextExtents

XQueryTextExtents(**display*, *font_ID*, **string*, *nchars*, **direction_return*, **font_descent_return*, **overall_return*);

% 0 @

-/ % "B "B

% -

%
-

- @ :' E
- ' - E =

- -

- -

! - @ F % 0

H @ - 8 - - @ !
XQueryTextExtents16

XQueryTextExtents16(*display, font_ID, *string, nchars, *direction_return, *font_descent_return, *overall_return);

% 0 @

-/ % "B "B

% -

%
-

- @ :' E
- ' - E =

- -

- -

! - @ F % 0

XQueryTextExtents XQueryTextExtents16 -
% 4 16 - %
% H 0 @ !
! % @ @ XTextExtents XTextExtents16 * 0 ! &
@ &

-
& &
- ' -! &
% - - E E -
% E - -
% - E
- -

' & - 8 -!
0 8 % 16 & 1 -
" !
- @ F

& F - " K !
- -

XQueryTextExtents XQueryTextExtents16 - * ' *

Drawing Text

& &?

R %

R

R " -

XDrawText XDrawText16 & -

?

```
typedef struct {
     char *chars;     /* pointer to string */
     int nchars;      /* number of characters */
     int delta;       /* delta between strings */
     Font font;       /* Font to print it in, None don't change */
} XTextItem;
```

```
typedef struct {
     XChar2b *chars;     /* pointer to two-byte characters */
     int nchars;         /* number of characters */
     int delta;          /* delta between strings */
     Font font;          /* font to print it in, None don't change */
} XTextItem16;
```

" , ! - % -
" & - - & -! % @
@ & & -
% & -

' % ! - - & XDrawImageString "
& %% - - %
: ! =! % : ! [= -
! - @ 0' " &
& - - % : ! =! %
: ! [1= -
! - @ 0'

Drawing Complex Text

& 4 - @ & ! XDrawText

XDrawText(*display, d, gc, y, *items, nitems);

% 0 @

% &

% -

% :0

%

%

& 8 - @ & ! XDrawText16

XDrawText16(*display, d, gc, y, *items, nitems);

% 0 @

% &

% -

% :0

%

%

XDrawText16 XDrawText % 8 16
* & % % - &
-

A % ,
H
% - % - -
& & - %
A - !
! % &
& & 1 "
- * ' ! % @ @ &

' & - 8 -!
0 8 % 16 & 1 -

* % ? ! % ! ! !
& & ! % - ! % - ! %
% % ? - ! - ! ! %% ! %%
- ! %% -

XDrawText XDrawText16 - * B & !* ' !* ! *
)

Drawing Text Characters

& 4 - @ & ! XDrawString

```
XDrawString( *display, d, gc, x, y, *string, length);
```

% 0 @

% &

% -

% :0

% -

% - -

& 8 - @ & ! XDrawString16

```
XDrawString16( *display, d, gc, y, *string, length);
```

% 0 @

% &

% -

% :0

% -

% - -

A - ! !
% & & &
1 ' & 8 -
& XDrawString16! 8 & 1 F

* % ? ! % ! ! !
& & ! % - ! % - ! %
% % ? - ! - ! ! %% ! %%
- ! %% -

XDrawString XDrawString16 - * B & ! * ! *
)

Drawing Image Text Characters

%% ! % ! % -
& - - %
% @ - %

& 4 - - @ & ! XDrawImageString

XDrawImageString(**display*, *d*, *gc*, *y*, **string*, *length*);

% 0 @

% &

% -

% :0

% -

% - -

& 8 - - @ & ! XDrawImageString16

XDrawImageString16(**display*, *d*, *gc*, *y*, **string*, *length*);

% 0 @

% &

% -

% :0

% -

% - -

XDrawImageString16 XDrawImageString %
8 16 * -
- %

- & - %
% & - % %%
- ?

[x, y - font-ascent]

& ?

overall-width

- ?

font-ascent + font-descent

@ & ! ! &
XQueryTextExtents -- -

- @ 0 %!
@ '

' & 8 - & XDrawImageString!
8 & 1 F

* % ? % ! - ! - !
! & & ! % - ! % - ! %

XDrawImageString XDrawImageString16 - * B & ! * !
*)

Transferring Images between Client and Server

0 % @ - &
@ * @ H @ ! 0 % @
- / % @ %
. - - /
- (& @ ! % 0
& H % -
% @ & % %% %
- - ! - - % ! - % ! - -
- ! - - : 16 4 =

- % 0"
- ! & - N

```
typedef struct _XImage {
     int width, height;          /* size of image */
     int xoffset;                /* number of pixels offset in X direction */
     int format;                 /* XYBitmap, XYPixmap, ZPixmap */
     char *data;                 /* pointer to image data */
     int byte_order;             /* data byte order, LSBFirst, MSBFirst */
     int bitmap_unit;            /* quant. of scanline 8, 16, 32 */
     int bitmap_bit_order;       /* LSBFirst, MSBFirst */
     int bitmap_pad;             /* 8, 16, 32 either XY or ZPixmap */
     int depth;                  /* depth of image */
     int bytes_per_line;         /* accelerator to next scanline */
     int bits_per_pixel;         /* bits per pixel (ZPixmap) */
     unsigned long red_mask;     /* bits in z arrangement */
     unsigned long green_mask;
     unsigned long blue_mask;
     XPointer obdata;            /* hook for the object routines to hang on */
     struct funcs {              /* image manipulation routines */
          struct _XImage *(*create_image)();
          int             (*destroy_image)();
          unsigned long   (*get_pixel)();
          int             (*put_pixel)();
```

```
            struct _XImage  *(*sub_image)();
            int             (*add_pixel)();
        } f;
} XImage;
```

F - % - ! XInitImage

```
Status XInitImage( *image);
```

% -

XInitImage F - %
- ! @ @
% F "
K% K F ! XInitImage & - -
K% K %% % @
O & ! @ K% K -
% F 0 - %
% % - %

- % -
0 " - 0
F

F F
" F ! &
- -

- & - & % ! XPutImage

```
XPutImage( *display,  d,  gc,  *image,  src_y,  dest_y,  height);
```

% 0 @

% &

%

% - & & -

- % 0 - -
0" -

- % . % - -
0" -
-

-

- % :B

#

% & - :

XPutImage - & - % &
- K ! K! & ! - -

& % % & " 0.* % !
% - ! *) -
% - ! -
% F ' 0.+ % L+ %! %
- % & ! *)

" - : % ! K %K =
& @ H ! XPutImage %% %
@

% ? ! % ! & & !
% - ! % - ! % " %
% ? - -

XPutImage - * B & !* !*) ! * #

- - @ & % ! XGetI-
mage % %% %

XImage *__XGetImage__(*display, d, y, height, plane_mask, format);

% 0 @

% & %%
-

% :0

#

% & - :

- . % %

% - . % 0.+
% L+ %

XGetImage % 0" -
% @ & % - &
% " - 0.+ %! -
% % % K - " % K -
H % % ! % - &
% H " - L+ %! XGetImage
F % % % K -
% - - @ % K -

XGetImage % - % 0" -
% - % & & & ! %
& - - % 0.+ % ! & % - @
1 % K

" & % %! - @ - & &
% %! *) " & & &! & &
@ & ! & @ %% -

& & ! % - & & & @
& & - & &! *)
, & & &
H " & & - ! -
- & & & & " & &
@ - ! -
@ - %
% & &N % % -
" % ! XGetImage
,CEE

XGetImage - * B & !*) ! * #

% - % & % -
- ! XGetSubImage

XImage ***XGetSubImage**(**display*, *d*, *y*, *height*, *plane_mask*, *format*, **dest_image*, *dest_y*);

% 0 @

% & %%
-

% :0

#

% & - :

- . % %

% - . % 0.+
% L+ %

- % - % %%
! & - a %
-

-

- % :B

XGetSubImage % K - & % -
XGetImage " - 0.+ %! -
% % % K - " -
L+ %! XGetSubImage F % %
% K - % - - @
% K - @ ! XGetSubImage
% 0" - % K -

% 0" -
& " % - %
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XGetSubImage - * B & !* !*) ! * #

Chapter 9. Window and Session Manager Functions

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Changing the Parent of a Window

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XReparentWindow(**display*, *w*, *parent*, *y*);

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UnmapWindow H ! @ % !
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XReparentWindow - *) * &

Controlling the Lifetime of a Window

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@ & & N @ ! XChangeSaveSet

XChangeSaveSet(*display, w, change_mode);

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- % . %) "
) B

B % - % ! XChangeSaveSet
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! *)

XChangeSaveSet - *) !* # ! * &

& & N @ ! XAddToSaveSet

XAddToSaveSet(*display, w);

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% & &:

XAddToSaveSet % & & N @
% & & @ ! *)

XAddToSaveSet - *) * &

@ & & N @ ! XRemoveFromSaveSet

XRemoveFromSaveSet(**display*, *w*);

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XRemoveFromSaveSet @ % & & N
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*)

XRemoveFromSaveSet - *) * &

Managing Installed Colormaps

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% XInstallColormap! O
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XUninstallColormap H ! @
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%! XInstallColormap

XInstallColormap(**display*, *colormap*);

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% %

XInstallColormap % %
& & & % % &
. & & & % &
- XCreateWindow! XCreateSimpleWindow! XChangeWindowAttributes!
XSetWindowColormap

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%, @ & & % " !
@ % XInstallColormap!
0 @ - %, @ & & %

XInstallColormap - *

%! XUninstallColormap

XUninstallColormap(*display, colormap);

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XUninstallColormap @ % %
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% XUninstallColormap!
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%

XUninstallColormap - *

% - @ ! XListInstalledColormaps

Colormap ***XListInstalledColormaps**(*display, w, *num_return);

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- %

XListInstalledColormaps
% % & & %
- % H
- ! -

XListInstalledColormaps - * &

Setting and Retrieving the Font Search Path

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@ % @

% ! XSetFontPath

XSetFontPath(*display, **directories, ndirs);

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- % %
% 0 @

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XSetFontPath % %
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%

XSetFontPath - * #

- % ! XGetFontPath

```
char **XGetFontPath( *display,  *npaths_return);
```

% 0 @

- - %

XGetFontPath - -
% - % %
% %% - !
% - XFreeFontPath

XGetFontPath! XFreeFontPath

```
XFreeFontPath( **list);
```

% - &

XFreeFontPath XGetFontPath

Grabbing the Server

0 % @ - - @
% - % &
& @ @ - ! % - H
& & -
- @ - - - @ - - !

- @ ! XGrabServer

```
XGrabServer( *display);
```

% 0 @

XGrabServer % - H &
H @ . - 0
@

- @ ! XUngrabServer

XUngrabServer(*display);

% 0 @

XUngrabServer % - H &
. @ - - 0 @ %

Killing Clients

0 % @
! XKillClient

XKillClient(*display, resource);

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& %

XKillClient &
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XKillClient - * #

Controlling the Screen Saver

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@ ! XSetScreenSaver

XSetScreenSaver(*display, interval, prefer_blanking, *allow_exposures*);

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XSetScreenSaver - * #

@ ! XForceScreenSaver

XForceScreenSaver(*display, mode);

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@ ! XForceScreenSaver @
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XForceScreenSaver - * #

@ @ ! XActivateScreenSaver

XActivateScreenSaver(*display);

% 0 @

@ ! XResetScreenSaver

XResetScreenSaver(*display);

% 0 @

- @ @ ! XGetScreenSaver

XGetScreenSaver(*display, *interval_return, *prefer_blanking_return, *allow_exposures_return);

% 0 @

- ! !
@

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Controlling Host Access

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& BA ?? -
"

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@ % % %
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% !

Adding, Getting, or Removing Hosts

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0(!
& ?

```
typedef struct {
     int family;         /* for example FamilyInternet */
     int length;         /* length of address, in bytes */
     char *address;      /* pointer to where to find the address */
} XHostAddress;
```

% & % : % !
+>"+ BA = ' " !' " 6!' @ "
% !' BA ! ' - % -
% %

' +>"+! & ' "+ @ 7 !
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6 ! ' " 6 - 16

' BA ! @ % & %% -
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4 - 8
- 8
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```
typedef struct {
     int typelength;     /* length of type string, in bytes */
     int valuelength;    /* length of value string, in bytes */
     char *type;         /* pointer to where to find the type string */
     char *value;        /* pointer to where to find the address */
} XServerInterpretedAddress;
```

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- % @ -

- ! XAddHost

XAddHost(*display, *host);

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XAddHost %
% @ - !
*

XAddHost - * * #

% ! XAddHosts

XAddHosts(*display, *hosts, num_hosts);

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-# %

XAddHosts %
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*

XAddHosts - * * #

! XListHosts

XHostAddress ***XListHosts**(*display, *nhosts_return, *state_return);

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-

-

XListHosts & &
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@ - ! XRemoveHost

XRemoveHost(*display, *host);

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XRemoveHost @ %
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* " @ !
- @ ! % @
@

XRemoveHost - * * #

@ % ! XRemoveHosts

XRemoveHosts(*display, *hosts, num_hosts);

% 0 @

% :(

-# %

XRemoveHosts @ %
% 0 @ % !
* " @ !
- @ ! % @
@

XRemoveHosts - * * #

Changing, Enabling, or Disabling Access Control

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- ! XSetAccessControl

XSetAccessControl(*display, mode);

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% . % A B

XSetAccessControl
%

XSetAccessControl - * * #

! XEnableAccessControl

XEnableAccessControl(*display);

% 0 @

XEnableAccessControl
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XEnableAccessControl - *

! XDisableAccessControl

XDisableAccessControl(*display);

% 0 @

XDisableAccessControl
%

XDisableAccessControl - *

Chapter 10. Events

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Event Types

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Event Structures

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```
typedef struct {
     int            type;
     unsigned long serial;     /* # of last request processed by server */
     Bool           send_event; /* true if this came from a SendEvent request */
     Display        *display;   /* Display the event was read from */
     Window         window;
} XAnyEvent;
```

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```
typedef union _XEvent {
     int                         type;          /* must not be changed */
     XAnyEvent                   xany;
     XKeyEvent                   xkey;
     XButtonEvent                xbutton;
     XMotionEvent                xmotion;
     XCrossingEvent              xcrossing;
     XFocusChangeEvent           xfocus;
     XExposeEvent                xexpose;
     XGraphicsExposeEvent        xgraphicsexpose;
     XNoExposeEvent              xnoexpose;
     XVisibilityEvent            xvisibility;
     XCreateWindowEvent          xcreatewindow;
     XDestroyWindowEvent         xdestroywindow;
     XUnmapEvent                 xunmap;
     XMapEvent                   xmap;
     XMapRequestEvent            xmaprequest;
     XReparentEvent              xreparent;
     XConfigureEvent             xconfigure;
     XGravityEvent               xgravity;
     XResizeRequestEvent         xresizerequest;
     XConfigureRequestEvent      xconfigurerequest;
     XCirculateEvent             xcirculate;
     XCirculateRequestEvent      xcirculaterequest;
     XPropertyEvent              xproperty;
     XSelectionClearEvent        xselectionclear;
     XSelectionRequestEvent      xselectionrequest;
     XSelectionEvent             xselection;
     XColormapEvent              xcolormap;
     XClientMessageEvent         xclient;
     XMappingEvent               xmapping;
     XErrorEvent                 xerror;
     XKeymapEvent                xkeymap;
     long                        pad[24];
} XEvent;
```

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Event Masks

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Event Processing Overview

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Keyboard and Pointer Events

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Pointer Button Events

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XChangeActivePointerGrab

Keyboard and Pointer Events

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```
typedef struct {
     int             type;             /* ButtonPress or ButtonRelease */
     unsigned long   serial;           /* # of last request processed by server */
     Bool            send_event;       /* true if this came from a SendEvent request
     Display         *display;         /* Display the event was read from */
     Window          window;           /* ``event'' window it is reported relative t
     Window          root;             /* root window that the event occurred on */
     Window          subwindow;        /* child window */
     Time            time;             /* milliseconds */
     int             x, y;             /* pointer x, y coordinates in event window *
     int             x_root, y_root;   /* coordinates relative to root */
     unsigned int    state;            /* key or button mask */
     unsigned int    button;           /* detail */
     Bool            same_screen;      /* same screen flag */
} XButtonEvent;
typedef XButtonEvent XButtonPressedEvent;
typedef XButtonEvent XButtonReleasedEvent;
```

```
typedef struct {
     int            type;            /* KeyPress or KeyRelease */
     unsigned long  serial;          /* # of last request processed by server */
     Bool           send_event;      /* true if this came from a SendEvent request
     Display        *display;        /* Display the event was read from */
     Window         window;          /* ``event'' window it is reported relative t
     Window         root;            /* root window that the event occurred on */
     Window         subwindow;       /* child window */
     Time           time;            /* milliseconds */
     int            x, y;            /* pointer x, y coordinates in event window *
     int            x_root, y_root;  /* coordinates relative to root */
     unsigned int   state;           /* key or button mask */
     unsigned int   keycode;         /* detail */
     Bool           same_screen;     /* same screen flag */
} XKeyEvent;
typedef XKeyEvent XKeyPressedEvent;
typedef XKeyEvent XKeyReleasedEvent;


typedef struct {
     int            type;              /* MotionNotify */
     unsigned long  serial;            /* # of last request processed by server */
     Bool           send_event;        /* true if this came from a SendEvent reque
     Display        *display;          /* Display the event was read from */
     Window         window;            /* ``event'' window reported relative to */
     Window         root;              /* root window that the event occurred on *
     Window         subwindow;         /* child window */
     Time           time;              /* milliseconds */
     int            x, y;              /* pointer x, y coordinates in event window
     int            x_root, y_root;    /* coordinates relative to root */
     unsigned int   state;             /* key or button mask */
     char           is_hint;           /* detail */
     Bool           same_screen;       /* same screen flag */
} XMotionEvent;
typedef XMotionEvent XPointerMovedEvent;

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@ @ ! & ?

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)	:1\\9=
E)	:1\\1=
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Window Entry/Exit Events

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         XGrabPointer     XUngrabPointer

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           @   %     ?
```

```
typedef struct {
     int            type;            /* EnterNotify or LeaveNotify */
     unsigned long serial;          /* # of last request processed by server */
     Bool           send_event;      /* true if this came from a SendEvent request *
     Display        *display;        /* Display the event was read from */
     Window         window;          /* ``event'' window reported relative to */
     Window         root;            /* root window that the event occurred on */
     Window         subwindow;       /* child window */
     Time           time;            /* milliseconds */
     int            x, y;            /* pointer x, y coordinates in event window */
     int            x_root, y_root;  /* coordinates relative to root */
     int            mode;            /* NotifyNormal, NotifyGrab, NotifyUngrab */
     int            detail;
                    /*
                     * NotifyAncestor, NotifyVirtual, NotifyInferior,
                     * NotifyNonlinear,NotifyNonlinearVirtual
                     */
     Bool           same_screen;     /* same screen flag */
     Bool           focus;           /* boolean focus */
     unsigned int   state;           /* key or button mask */
} XCrossingEvent;
typedef XCrossingEvent XEnterWindowEvent;
typedef XCrossingEvent XLeaveWindowEvent;
```

```
  &  &          &  &  &    A  ,    E @ ,
 @  &  -                 @  &  &       &  &
     0  @    %    @  !      @      &  &  &
   @                       &  &
&     @
```

' E @ , @ ! @ & & %
% ! & & % $ & ! 0 @
& & , ' A , @ !
@ & & % % ! & & %
,

& @ & - %
% %
@ & & % & % N % !
% " @ & & & &!
% @ @ & &N - $ & !
F K K % N
@ & &N - @

K & @ & &
& & ' " ! @
& & " ' ! @ & &

& @ & & & &
& & 0 @
' " ! @ & & & &
& & " ' ! @ & & & &
& &

%
/ % @ 0 @ &
@ $? * 1) !
* 8) ! * I) ! * 7) ! * 5) !) ! E) !
) !) 1) !) 8) !) I) !) 7) !) 5)

& @ @ ! %
@ & - @ ! % @ & -
@ 0 @ , , ! , ! ,
C -

, !
, # !, " !, , ! , , #

Normal Entry/Exit Events

A , E @ , @ - & % @
& & & & , @ 0A &A@
0E @ &A@ & , ,

R % @ & & & & * *!
0 @ & -?

R " - E @ , @ & & ! &
0E @ &A@ ,

R " - E @ , @ & & & & & & &
*! @ ! & 0E @ &A@
, #

R " - A , @ & & *! &
0A &A@ , "

R % @ & & & & * * !
0 @ & -?

R " - E @ , @ & & ! &
0E @ &A@ , "

R " - A , @ & & & & & & &
*! @ ! & 0A &A@
, #

R " - A , @ & & *! &
0A &A@ ,

R % @ & & & & * & &
! 0 @ & -?

R " - E @ , @ & & ! &
0E @ &A@ , ,

R " - E @ , @ & & & & & & &
! @ ! & 0E @ &A@
, , #

R " - A , @ & & & & & & &
*! @ ! & 0A &A@
, , #

R " - A , @ & & *! &
0A &A@ , ,

R % @ & & & & * ! 0
@ & -?

R " - E @ , @ & & ! &
0E @ &A@ , ,

R " & & & &! - E @ , @ & &
@ & & % - ! &
0E @ &A@ , , #

R " & & * & &! - A , @ &
& & & *N & - & & *! &
0A &A@ , , #

R " - A , @ & & *! &
0A &A@ , ,

Grab and Ungrab Entry/Exit Events

+ A , E @ , @ - &
% - @ @ A@ & % - @
0A &A@ 0E @ &A@ &

, A@ & % - @
0A &A@ 0E @ &A@ &
, C - : XGrabPointer=

R % - @ & % K & &
- - * + @ @ - !
- K& & - ! + & & % ! 0 @
& -?

R " - A , E @ , @ : 19 6 1 = &
0A &A@ 0E @ &A@
, @ - % &
& % % + % (& @ ! %
& %! 0 @ % %
% @

R % - @ - - * @
@ - ! - K& & - ! + & &
% ! 0 @ & -?

R " - A , E @ , @ : 19 6 1 = &
0A &A@ 0E @ &A@
, C - @ - % &
& % % % + (& @ ! %
& %! 0 @ % %
% @

Input Focus Events

% - % @ ' "
' $ 0 @ % ' " ' $ @
& - & % - &
& &: % ! & & % @ & &=!&
& & & & % %
& & @ % & & %
- - - -

@ ' " ' $ @ ! ' -) @
& &

@ % ?

```
typedef struct {
     int            type;       /* FocusIn or FocusOut */
     unsigned long  serial;     /* # of last request processed by server */
     Bool           send_event; /* true if this came from a SendEvent request */
     Display        *display;   /* Display the event was read from */
     Window         window;     /* window of event */
     int            mode;       /* NotifyNormal, NotifyGrab, NotifyUngrab */
     int            detail;
                    /*
```

```
                    * NotifyAncestor, NotifyVirtual, NotifyInferior,
                    * NotifyNonlinear,NotifyNonlinearVirtual, NotifyPointer,
                    * NotifyPointerRoot, NotifyDetailNone
                    */
} XFocusChangeEvent;
typedef XFocusChangeEvent XFocusInEvent;
typedef XFocusChangeEvent XFocusOutEvent;
```

```
  &  &          &  &  &    '  "  '  $  @
&  -          &  &      0  @    %     @
             &        @          @  !
   @   &   -   !    @   &   -    @  !      @
&   -     @     0  @              ,  ,  !
,        !,    !  ,  C -

  '  $  @         &  &   %   -         C  %
,   @  O  & @ !   0 %                  -  '  $
 @   &    %    -     A  ,  ! E  @ ,  ! #    ,  !  A
%   @

B %   -     @     !
        ,      !,   #   !,   "   !,   ,    !,
 ,    #   !,   +   !,   +     !  ,   B   ,
```

Normal Focus Events and Focus Events While Grabbed

```
,       @            0'  " A@    0'  $  A@
&                ,   ,    '   @   &   -
    0'  " A@    0'  $  A@         &
,            0   @   %                  @   &
-        -        &  -?

R          @     &   &    &   & *!           *!
  %        &   & +!   0   @          &  -?

R " -      '  $   @     &   &  ! &                0'
    $  A@            ,

R " -      '  $   @        &   &   &   &   &     &   &
  *!     @ ! &                  0'  $  A@
  ,   #

R " -      '  "  @     &   & *! &                0'
   $  A@            ,   "

R " &   & +          &   & *   &   & +     &   &
           &   &  !   -      '  "  @       &   &   &
  &   & *!  &          - &   & +! &                0'
    " A@            ,   +

R          @     &   &    &   & *! *           !
  %        &   & +!   0   @          &  -?

R " &   & +          &   &     +            &   & *
        *!   -      '  $   @       &   &    &   & + %
```

- & & ! & 0' $ A@
, +

R " - ' $ @ & & ! & 0'
$ A@ , "

R " - ' " @ & & & & & & & *!
@ ! & 0' " A@ ,
#

R " - ' " @ & & *! & 0'
" A@ ,

R @ & & & & *! & &
! % & & +! 0 @ & -?

R " & & + & & ! - ' $ @
& & & & + % - & & ! &
0' $ A@ , +

R " - ' $ @ & & ! & 0'
$ A@ , ,

R " - ' $ @ & & & & & & &
! @ ! & 0' $ A@
, , #

R " - ' " @ & & & *! @ ! &
0' " A@ , , #

R " - ' " @ & & *! & 0'
" A@ , ,

R " & & + & & *! - ' " @
& & & & & * & - & & +! &
0' " A@ , +

R @ & & & & *
% & & +! 0 @ & -?

R " & & + & & ! - ' $ @
& & & & + % - & & ! &
0' $ A@ , +

R " - ' $ @ & & ! & 0'
$ A@ , ,

R " & & & &! - ' $ @ & &
@ & & % - ! &
0' $ A@ , , #

R " & & * & &! - ' " @ & &
& & *N & - & & *! &
0' " A@ , , #

R " - ' " @ & & *! & 0'
" A@ , ,

R " & & + & & *! - ' " @
& & & & & * & -& & +! &
0' " A@ , +

R @ & & + : @ & &
% = , : =! % & & +! 0 @
& -?

R " & & + & & ! - ' $ @
& & & & + % -& & ! &
0' $ A@ , +

R " - ' $ @ & & ! & 0'
$ A@ , ,

R " & & & &! - ' $ @ & &
@ & & % - ! &
0' $ A@ , , #

R " - ' " @ & & ! &
0' " A@ , + : , B
, =

R " & + ! - ' " @ & &
& & +N & -& & +! &
0' " A@ , +

R @ + : @ & &
% = , & & ! % & & +! 0 @
& -?

R " + ! - ' $ @ & &
& & + % -& & +N ! &
0' $ A@ , +

R " - ' $ @ & & ! &
0' $ A@ , + : , B , =

R " & & & &! - ' " @ & &
& & N & -& & ! &
0' " A@ , , #

R " - ' " @ & & ! & 0'
" A@ , ,

R " & & + & & ! - ' " @
& & & & & & -& & +! &
0' " A@ , +

R @ + : @ & &
% = , : @ @ =! % & & +! 0 @
& -?

R " + ! - ' $ @ & &
& & + % -& & +N ! &
0' $ A@ , +

R " - ' $ @ & & ! &
0' $ A@ , + , B ,

R " - ' " @ & & ! &
0' " A@ , B , , +

R " & + ! - ' " @ & &
& & +N & - & & +! &
0' " A@ , +

Focus Events Generated by Grabs

' @ & - @ 0' " A@
0' $ A@ & , '
@ & - @ 0' " A@
0' $ A@ & , C - :
XGrabKeyboard=

R - @ - - D + @
@ - ! - K& &! ' ! 0 @
& -?

R " - ' " ' $ @ ! & 0'
" A@ 0' $ A@ , @
- & - '

R - @ - - D @
@ - ! - K& &! ' !
0 @ & -?

R " - ' " ' $ @ ! & 0'
" A@ 0' $ A@ , C - @
- & - '

Key Map State Notification Events

0 @ % D %, @ &
-

@ D %, @ ! D %) @
& & 0 @ - @ @
A , ' " @

@ % ?

```
/* generated on EnterWindow and FocusIn when KeymapState selected */
typedef struct {
     int            type;           /* KeymapNotify */
     unsigned long  serial;         /* # of last request processed by server */
```

```
    Bool            send_event;     /* true if this came from a SendEvent request
    Display         *display;       /* Display the event was read from */
    Window          window;
    char            key_vector[32];
} XKeymapEvent;
```

& & % K@
@ A 1
% - % @ % I8 *
, : 9= 4, 4, [2 & -
% - 4,

Exposure Events

0 % - % @ & & - &
& & - % % @
& & $ %
& & & % 0 % %% %
- % & & - : % & & -
& & & - @ = !
0 @ A % @ - & & - &
& % @ %% &
& & % %% & % -

Expose Events

0 @ % A % @ & - &
& & - @ & 0
@ - A % @ @ (&
@ ! 0 @ @ - A % @ & & & %
" % $ 0 @ - A % @ & @
@ - & & - @ ! -
@ & @ :% % & = - -
& &! & & @ & @ :% % & = -
& &N - &) %% -
% : = - ! A % @ -
- ' - @ & &! 0 @ - % -
- % A % @ !
- & &

@ A % @ ! A %) @
& &

@ % ?

```
typedef struct {
    int             type;           /* Expose */
    unsigned long serial;           /* # of last request processed by server */
```

```
    Bool           send_event;     /* true if this came from a SendEvent request *
    Display        *display;       /* Display the event was read from */
    Window         window;
    int            x, y;
    int            width, height;
    int            count;          /* if nonzero, at least this many more */
} XExposeEvent;
```

& & % : - =& &
@ & &N - %%
- & - F : =
- A % @
& " F ! A % @ & & & (& @ !
F ! A % @ : % = &
& & % %% & % F %
- - & & & / - A % @ &
F % % @ & F

GraphicsExpose and NoExpose Events

0 @ % % A % @ & -
& - % - - %
H ? XCopyArea XCopyPlane 0 @ - @ & @
- %
- " ! 0 @ - % -
- % - % H : % ! % -
& & =

0 @ - , A % @ & @ - % H -
% % A % @ % " & !
- % A % @ @ , A % @

@ % A % , A % @ ! - %
% - % . - %
% & - - % - XCreateGC - XSet-GraphicsExposures

@ % ?

```
typedef struct {
    int            type;           /* GraphicsExpose */
    unsigned long  serial;         /* # of last request processed by server */
    Bool           send_event;     /* true if this came from a SendEvent request
    Display        *display;       /* Display the event was read from */
    Drawable       drawable;
    int            x, y;
    int            width, height;
    int            count;          /* if nonzero, at least this many more */
    int            major_code;     /* core is CopyArea or CopyPlane */
```

```
     int            minor_code;     /* not defined in the core */
} XGraphicsExposeEvent;
```

```
typedef struct {
     int            type;          /* NoExpose */
     unsigned long serial;         /* # of last request processed by server */
     Bool           send_event;    /* true if this came from a SendEvent request */
     Display        *display;      /* Display the event was read from */
     Drawable       drawable;
     int            major_code;    /* core is CopyArea or CopyPlane */
     int            minor_code;    /* not defined in the core */
} XNoExposeEvent;
```

```
*          @              ?   &  !  / K  !
  K       &              &            -
 &     - %    H   &     %        / K
     - %    H                        0K %
 0K % +   "     0K %   !                    XCopyArea        H   "
  0K % +  !              XCopyPlane        H
         <X11/Xproto.h>       K     !     / K
 !      &   - %    H   &              ( & @ !
  K                  0 %      &    F
  !   -

  0  %   A %  A@                      ? ! ! &  !
 - !                                @
 &  N   -          %%              -    &
 -               F :   =        -
             %   A %   @       & "      F  !
 %   A %   @     &     &  & ( & @ !       F  !
         %   A %   @   :  %      =       &
&  &
```

Window State Change Events

```
     & -          ?

R      ,    @

R    - ,    @

R     ,    @

R B    ,    @

R   @  ,    @

R ) %,     @

R ) %% -,     @
```

R % , @

R C %, @

R # , @

CirculateNotify Events

0 @ % , @ & -
& & & - % 0 @ - @
% & @ & & %%
- XCirculateSubwindows! XCirculateSubwindowsUp! XCirculateSubwindowsDown

@ , @ ! ,) @
& & ,) @
% & & : & ! - -
@ =

@ % ?

```
typedef struct {
     int type;      /* CirculateNotify */
     unsigned long serial;      /* # of last request processed by server */
     Bool send_event;      /* true if this came from a SendEvent request */
     Display *display;      /* Display the event was read from */
     Window event;
     Window window;
     int place;      /* PlaceOnTop, PlaceOnBottom */
} XCirculateEvent;
```

@ & & % ! % -
& StructureNotify SubstructureNotify & & &
& & & %
& &N % + $ % + $ *
" + $ %! & & & % - " + $
* ! & & & & -

ConfigureNotify Events

0 @ % - , @ & -
- & &N ! F ! % ! !
- 0 @ - @ % & @ & -
- & & H %% % ?

R & &N F ! % ! ! > - - -
XConfigureWindow

R & &N % - - - XLowerWindow!
XRaiseWindow! XRestackWindows

R & & @ - XMoveWindow

R & &N F - - XResizeWindow

R & &N F - - XMoveResizeWindow

R & & %% % - - -
XMapRaised

R & &N & - - XSetWindowBorderWidth

@ - , @ ! ,) @
& & ,) @
% & & : & ! - - -
@ =

@ % ?

```
typedef struct {
     int            type;        /* ConfigureNotify */
     unsigned long  serial;      /* # of last request processed by server */
     Bool           send_event;  /* true if this came from a SendEvent request */
     Display        *display;    /* Display the event was read from */
     Window         event;
     Window         window;
     int            x, y;
     int            width, height;
     int            border_width;
     Window         above;
     Bool           override_redirect;
} XConfigureEvent;
```

@ - & & % !
% - & StructureNotify SubstructureNotify &
& & & & & F ! % ! ! > -
& -

@ % & &N
- % %% & &
& - F & &! -
K& & & &N !
%

@ -& & - %
" 0 @ , ! & & & & - -
& % -& & (& @ !
-& &! & & & & - % %
-& &

@ K @
& & & - - & &
@ K

CreateNotify Events

0 @ % , @ & -
& & 0 @ - @ & @ %%
& & - XCreateWindow XCreateSimpleWindow

@ , @ ! ,) @
& & - - @

@ % ?

```
typedef struct {
     int            type;               /* CreateNotify */
     unsigned long  serial;             /* # of last request processed by server */
     Bool           send_event;         /* true if this came from a SendEvent reque
     Display        *display;           /* Display the event was read from */
     Window         parent;             /* parent of the window */
     Window         window;             /* window id of window created */
     int            x, y;               /* window location */
     int            width, height;      /* size of window */
     int            border_width;       /* border width */
     Bool           override_redirect;  /* creation should be overridden */
} XCreateWindowEvent;
```

% & &N % & &
% & & & &N
@ % & &N - %
%% & & & -
F & & : - =
& F K& & & &N
! % @ K @
& & & - - & &
@ K

DestroyNotify Events

0 @ % B , @ & -
& & & 0 @ - @ & @
%% & & - XDestroyWindow XDestroySubwindows

- B , @ - @ & &! B
, - & & - -
& & 0 % - - -

@ B , @ ! ,) @
& & ,) @
% & & : & ! - -
@ =

@ % ?

```
typedef struct {
     int            type;       /* DestroyNotify */
     unsigned long  serial;     /* # of last request processed by server */
     Bool           send_event; /* true if this came from a SendEvent request */
     Display        *display;   /* Display the event was read from */
     Window         event;
     Window         window;
} XDestroyWindowEvent;
```

@ & & % ! % -
& StructureNotify SubstructureNotify & & &
& &

GravityNotify Events

0 @ % @ , @ & -
& & & @ - F % 0 @
- @ & @ %% @ & &
F - % - XConfigureWindow! XMoveResizeWindow!
XResizeWindow

@ @ , @ ! ,) @
& & ,) @
% & & : & ! @
% F - @ =

@ % ?

```
typedef struct {
     int            type;       /* GravityNotify */
     unsigned long  serial;     /* # of last request processed by server */
     Bool           send_event; /* true if this came from a SendEvent request */
     Display        *display;   /* Display the event was read from */
     Window         event;
     Window         window;
     int            x, y;
} XGravityEvent;
```

@ & & & @ % !
% - & StructureNotify SubstructureNotify &
& & & & & @
@ & % & &N -
% %% & &

MapNotify Events

0 @ %) %, @ & -
& & & %% 0 @ - @ % & @
%% - & &N %% %% -
XMapWindow! XMapRaised! XMapSubwindows! XReparentWindow! @
% -

@) %, @ ! ,) @
& & ,) @
% & & : & ! %% - - @ =

@ % ?

```
typedef struct {
     int            type;                /* MapNotify */
     unsigned long  serial;              /* # of last request processed by server
     Bool           send_event;          /* true if this came from a SendEvent re
     Display        *display;            /* Display the event was read from */
     Window         event;
     Window         window;
     Bool           override_redirect;   /* boolean, is override set... */
} XMapEvent;
```

@ & & & %% % !
% - & StructureNotify SubstructureNotify&
& & & & & %% @ K
@ & & & -
- & & @ !
@ - % % % ! & @

MappingNotify Events

0 @ %) %% -, @
% @ 0 @ - @ % & @
%% ?

R XSetModifierMapping & D

R XChangeKeyboardMapping - %% -

R XSetPointerMapping % %% -

@ % ?

```
typedef struct {
     int            type;            /* MappingNotify */
     unsigned long  serial;          /* # of last request processed by server */
     Bool           send_event;      /* true if this came from a SendEvent request *
     Display        *display;        /* Display the event was read from */
     Window         window;          /* unused */
     int            request;         /* one of MappingModifier, MappingKeyboard,
                    MappingPointer  */
     int            first_keycode;   /* first keycode */
     int            count;           /* defines range of change w. first_keycode*/
} XMappingEvent;
```

H %% - -
) %% -) !) %% -D !) %% -+ ") %
% -) ! %% - & - ") %% -D !
%% - & - ") %% -+ ! % %
% - & - K H
&) %% -D K %
- %% -! %

% %% N & - ! XRe-freshKeyboardMapping

ReparentNotify Events

0 @ % % , @ & -
- - & &N % 0 @ - @ & @
%% XReparentWindow & & %

@ % , @ ! ,) @
& & ,) @
& % & & : & ! % -
- @ =

@ % ?

```
typedef struct {
     int            type;        /* ReparentNotify */
     unsigned long  serial;      /* # of last request processed by server */
     Bool           send_event;  /* true if this came from a SendEvent request */
     Display        *display;    /* Display the event was read from */
     Window         event;
     Window         window;
     Window         parent;
     int            x, y;
     Bool           override_redirect;
} XReparentEvent;
```

@ % & & &
% ! % - & StructureNotify SubstructureNotify &
& & & & & % %
& % & &
% & &N @ & % & &N -
%% % & & @ K
@ @ & & % &
& & - - & &
@ K

UnmapNotify Events

0 @ % C %, @ & -
& & & %% 0 @ - @ % & @
%% - & &N %% %%

@ C %, @ ! ,) @
& & ,) @
% & & : & ! %% - & & -
@ =

@ % ?

```
typedef struct {
     int            type;        /* UnmapNotify */
     unsigned long  serial;      /* # of last request processed by server */
     Bool           send_event; /* true if this came from a SendEvent request */
     Display        *display;    /* Display the event was read from */
     Window         event;
     Window         window;
     Bool           from_configure;
} XUnmapEvent;
```

@ %% & & % ! %
- & StructureNotify SubstructureNotify &
& & 0 @ % @ & &
& & & %% K - @
& - F - & &N % & & &
& K- @ C % @

VisibilityNotify Events

0 @ % # , @ & - -
@ % & & - & & @ -
0 @ - @ & @
@ - (& @ ! @ @ - & & &
" % $

, @ - -
@ :C %, !) %, ! - , ! @ , !

, = - # , @ - @ & &
- A % @ & &! H
, @ & & - A % @
& & 0 % - # , @
& % ' $! A , ! E @ , @

@ # , @ ! # -) @
& &

@ % ?

```
typedef struct {
     int            type;        /* VisibilityNotify */
     unsigned long  serial;      /* # of last request processed by server */
     Bool           send_event;  /* true if this came from a SendEvent request */
     Display        *display;    /* Display the event was read from */
     Window         window;
     int            state;
} XVisibilityEvent;
```

& & & & & @ -
& &N @ # C !
# + $! # ' $ 0 @ -
& &N & & & - @ & &
% # , @ - & -?

R & & - % ! !
@ & @ & % ! 0 @ -
@ & 0# A@ #
C

R & & - @ & %
@ & @ & % ! 0 @ - @
& 0# A@ # +
$

R & & - @ & % ! @ &
% ! @ & @ & !
0 @ - @ & 0# A@
' $

Structure Control Events

?

R H @

R - H @

R) % H @

R F H @

CirculateRequest Events

0 @ % H @ & -
& & & H % &
& 0 @ - @ % & @
& & H & & & & &
& & H & & - XCirculateSubwindows! XCirculateSubwindowsUp! XCirculateSubwindowsDown

@ H @ !) @
& & ! ! & & H
% & & ! ! & &N %
- ' % ! %% %% XCirculateSubwindowsUp & & % "
) & &! 0 @ %
H @ & & %

@ % ?

```
typedef struct {
     int            type;        /* CirculateRequest */
     unsigned long  serial;      /* # of last request processed by server */
     Bool           send_event;  /* true if this came from a SendEvent request */
     Display        *display;    /* Display the event was read from */
     Window         parent;
     Window         window;
     int place;                  /* PlaceOnTop, PlaceOnBottom */
} XCirculateRequestEvent;
```

% % & & & &
& & % & & %
- + $ % + $ * "
+ $ %! & & % - " + $ * !
& & & -

ConfigureRequest Events

0 @ % - H @ & -
& - & & H
% & & - & & H % -
& &N F ! % ! ! - 0 @ -
@ & @ - & & H & &
- XConfigureWindow! XLowerWindow! XRaiseWindow! XMapRaised! XMoveResizeWindow! XMoveWindow! XResizeWindow! XRestackWindows! XSetWindowBorderWidth

@ - H @ !)
@ & & - H @ - &

ConfigureWindow % H & &
' % ! %% %% XLowerWindow & & & "
) % & & @
& & ' ! 0 @ % -
H @ & % & &

@ % ?

```
typedef struct {
     int            type;          /* ConfigureRequest */
     unsigned long serial;         /* # of last request processed by server */
     Bool           send_event;    /* true if this came from a SendEvent request */
     Display        *display;      /* Display the event was read from */
     Window         parent;
     Window         window;
     int            x, y;
     int            width, height;
     int            border_width;
     Window         above;
     int            detail;        /* Above, Below, TopIf, BottomIf, Opposite */
     unsigned long value_mask;
} XConfigureRequestEvent;
```

% % & & & &
& & & F ! % ! & ! > - -
@ K & % & %
ConfigureWindow % H % - @ % - @
H - @ -
& &! % @ : -= : =! &
% , @ ! % @ ! - @ H

MapRequest Events

0 @ %) % H @ & -
N % & & & & %% &
% & & H % 0 @ - @ & @
% & & H %% & & &
@ K ' % & & H
- XMapWindow! XMapRaised! XMapSubwindows

@) % H @ !) @
& & N % %
& & - % & & H % !
) % H ' % ! %% %%
XMapWindow % & & " : & & - =
) % & & @
& & ' ! 0 @ %) % H @
% % & & ! @ - @ & & -
% & &

@ % ?

```
typedef struct {
     int           type;       /* MapRequest */
     unsigned long serial;     /* # of last request processed by server */
     Bool          send_event; /* true if this came from a SendEvent request */
     Display       *display;   /* Display the event was read from */
     Window        parent;
     Window        window;
} XMapRequestEvent;
```

% % & & & &
& & %%

ResizeRequest Events

0 @ % F H @ & -
N % - F & & 0 @ -
@ & @ % - F %
& & - XConfigureWindow! XResizeWindow! XMoveResizeWindow

@ F H @ ! F @
& & % - F

@ % ?

```
typedef struct {
     int           type;         /* ResizeRequest */
     unsigned long serial;       /* # of last request processed by server */
     Bool          send_event;   /* true if this came from a SendEvent request */
     Display       *display;     /* Display the event was read from */
     Window        window;
     int           width, height;
} XResizeRequestEvent;
```

& & & & & F %
- & - F & &!
-

Colormap State Change Events

0 @ % %, @ & -
& % - & %
0 @ - @ % & @ %% ?

R - % 0 & -
XChangeWindowAttributes! XFreeColormap! XSetWindowColormap

R " % - XInstallColormap XUninstall-
Colormap

@ %, @ ! % -) @
& &

@ % ?

```
typedef struct {
     int            type;        /* ColormapNotify */
     unsigned long  serial;      /* # of last request processed by server */
     Bool           send_event;  /* true if this came from a SendEvent request */
     Display        *display;    /* Display the event was read from */
     Window         window;
     Colormap       colormap;    /* colormap or None */
     Bool           new;
     int            state;       /* ColormapInstalled, ColormapUninstalled */
} XColormapEvent;
```

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! ' % - ! ! !
% % & & & '
% - XFreeColormap! %
, & & % %
& & & - ' "
! % & - " ' ! % &
& & %
%" %C

Client Communication Events

?

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R + % , @

R @

R , @

R H @

ClientMessage Events

0 @ -) - @ &
XSendEvent

@ % ?

```
typedef struct {
     int           type;           /* ClientMessage */
     unsigned long serial;         /* # of last request processed by server */
     Bool          send_event;     /* true if this came from a SendEvent request *
     Display       *display;       /* Display the event was read from */
     Window        window;
     Atom          message_type;
     int           format;
     union         {
                     char  b[20];
                     short s[10];
                     long  l[5];
                   } data;
} XClientMessageEvent;
```

- K % &
% @ - 4! 16! I8
% & @ & ! ! -
! ! ! !
% & 4 @ ! 16 @ ! @ I8
@ + - % - @ 0
@ % % @ & &! - K % !

PropertyNotify Events

0 @ % + % , @ & -
% % - % & &

@ + % , @ ! + % -) @
& &

@ % ?

```
typedef struct {
     int           type;       /* PropertyNotify */
     unsigned long serial;     /* # of last request processed by server */
     Bool          send_event; /* true if this came from a SendEvent request */
     Display       *display;   /* Display the event was read from */
     Window        window;
     Atom atom;
     Time time;
     int state;                /* PropertyNewValue or PropertyDelete */
```

```
} XPropertyEvent;
```

& & & & & % % & -
% % N & % % &
- @ & % %
& - & % % &
- & @ + % , &# + % B
+ % , &# & % % & &
- - XChangeProperty XRotateWindowProperties : @ & -
F - - XChangeProperty= & % - % % %
& - XChangeProperty XRotateWindowProperties
+ % B & % % & &
- XDeleteProperty ! - ! XGetWindowProperty

SelectionClear Events

0 @ % @ - & %
0 @ - @ % & &
% - XSetSelectionOwner

@ % ?

```
typedef struct {
    int            type;       /* SelectionClear */
    unsigned long  serial;     /* # of last request processed by server */
    Bool           send_event; /* true if this came from a SendEvent request */
    Display        *display;   /* Display the event was read from */
    Window         window;
    Atom           selection;
    Time           time;
} XSelectionClearEvent;
```

- & & & &
& % & : & - = XSetS-
electionOwner

SelectionRequest Events

0 @ % H @ & 0
@ - @ & @ H @
- XConvertSelection &

@ % ?

```
typedef struct {
     int           type;       /* SelectionRequest */
     unsigned long serial;     /* # of last request processed by server */
     Bool          send_event; /* true if this came from a SendEvent request */
     Display       *display;   /* Display the event was read from */
     Window        owner;
     Window        requestor;
     Atom          selection;
     Atom          target;
     Atom          property;
     Time          time;
} XSelectionRequestEvent;
```

& & & & % &
XSetSelectionOwner H & & H -
'
% ! + ") . % -
% % %
% % , %
@ ConvertSelection H

& @ % - %
, @ H % % -
- @ 0
! "

SelectionNotify Events

@ - 0 @ % ConvertSelection %
H & & & !
- & - XSendEvent &
@ H & @
% % & @ %
:& - % % , =

" , % % % ConvertSelection % H !
& % % ! % %
H & &! , - @ - % %

@ % ?

```
typedef struct {
     int           type;       /* SelectionNotify */
     unsigned long serial;     /* # of last request processed by server */
     Bool          send_event; /* true if this came from a SendEvent request */
     Display       *display;   /* Display the event was read from */
     Window        requestor;
     Atom          selection;
     Atom          target;
     Atom          property;   /* atom or None */
```

```
    Time           time;
} XSelectionEvent;
```

H & & & H

'

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@ % ' % !+"0) + % %

% % & % %

& " @ ! % % ,

@ % %

Chapter 11. Event Handling Functions

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& ! - % !
& @

Selecting Events

& & @ & % %%
$ & @ K 0 &
& XCreateWindow XChangeWindowAttributes &
XSelectInput

```
XSelectInput( *display,  w,  event_mask);
```

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% & &:

! - . % @

XSelectInput H 0 @ % @
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A@ % @ & & " & & @
@ ! % % - !
K K% % - %

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& &) %
@ & & & & - ?

R) % @ & & @
/ 0 @ - @ ! %

R $ H ! - H !
) % H @ ! & & @
)

R $ F H @ ! &
& @ F)

R $ * + @ ! & &
@ * +)

@ % @

XSelectInput - * &

Handling the Output Buffer

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% &
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0 @
- %

% ! XFlush

XFlush(**display*);

% 0 @

XFlush %) %%
%
XPending! XNextEvent! XWindowEvent A@ - @
H N @ H

% & H @ % !
XSync

XSync(**display, discard*);

% 0 @

% * @ & XSync
@ @ H

XSync % & H @
@ % 0 @ -
' % @ 0 ! XSync
%% N - : 11 4 8 = @ -
@ H N @ H

' ! % ' ! XSync @ H "
% ! XSync @ H ! - @
& H XSync & %%
XSync

Event Queue Management

0 @ H (& @ ! % - -
& @ H

@ @ H ! XEventsQueued

```
int XEventsQueued( *display,  mode);
```

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% . % J !
J ' ! J -

" J ! XEventsQueued @
@ H : @ % = " J ' !
XEventsQueued @ H
F " @ H ! XEventsQueued %
! % @ %% N !
" J -! XEventsQueued
@ H F " @
H ! XEventsQueued % @ %% N
& - %

XEventsQueued & & ">$ @
H XEventsQueued & J ' @
XPending XEventsQueued & J XQLength

@ % -! XPending

```
int XPending( *display);
```

% 0 @

XPending @ @ @
0 @ @ @ @ H XPending
XEventsQueued & J ' %

Manipulating the Event Queue

0 % @ % @ H
& ?

R $ @ ! ! @ H

R + @ H & @ -

R $ @ @ % %
% @

Returning the Next Event

- @ @ H ! XNextEvent

```
XNextEvent( *display,  *event_return);
```

% 0 @

! - @ H

XNextEvent % @ @ H %
0A@ @ H " @ H
% ! XNextEvent % @ @

% @ H ! XPeekEvent

XPeekEvent(*display, *event_return);

% 0 @

! - % @ N

XPeekEvent @ @ H !
@ @ H " H % ! XPeekEvent
% @ @ " % @
%% 0A@ & @ - @ H

Selecting Events Using a Predicate Procedure

A H % %
% @ & & . % %
@ & - 0 "
% @ H - !
" 0 F ! %
& % % 0
% XLockDisplay

% % - ?

Bool(*display, *event, arg);

% 0 @

! % 0A@

% - % XIfEvent!
XCheckIfEvent! XPeekIfEvent

% % @ H
- ! % % "
! '

@ H - @ ! ! @ @
H ! XIfEvent

XIfEvent(*display, *event_return, (*predicate)(), arg);

% 0 @

! - @ N

% %
@ H &
&

% %% - &
% % %

XIfEvent % & % % %
@ !& @ H XIfEvent

% & - @ XIfEvent @
- @ H % %%
0A@

@ H - @ & -! XCheck-
IfEvent

```
Bool XCheckIfEvent( *display,  *event_return,  (*predicate)(),  arg);
```

% 0 @

! - % @ N

% %
@ H &
&

% %% - &
% % %

% % ! XCheckIfEvent %
@ %% 0A@ : @
@ H =" % % ! XCheckIfEvent
' ! % & @ @
H

@ H - @ & @ - @
H ! XPeekIfEvent

```
XPeekIfEvent( *display,  *event_return,  (*predicate)(),  arg);
```

% 0 @

! - % @ N

% %
@ H &
&

% %% - &
% % %

XPeekIfEvent & % % %
@ % % ! XPeekIfEvent
% @ %% 0A@ & @
- @ H XPeekIfEvent %
& - @

Selecting Events Using a Window or Event Mask

@ & & @
% ! & - % @

@ @ & & @ ! XWin-
dowEvent

XWindowEvent(*display, w, event_mask, *event_return);

% 0 @

% & &:

! - . % @

! - @ N

XWindowEvent @ H @
% & & @ ! XWindowEvent
@ @ H % % 0A@
@ H " - @
H ! XWindowEvent % @

@ @ & & @ : =!
XCheckWindowEvent XWindowEvent %
@ * - @ &

Bool **XCheckWindowEvent**(*display, w, event_mask, *event_return);

% 0 @

% & &:

! - . % @

! - @ N

XCheckWindowEvent @ H @
@ @ @ %
& & @ " ! XCheckWindowEvent @ @ !
% % 0A@ ! @
H " @ H @ !
XCheckWindowEvent ' ! % & @

@ @ @ ! XMaskEvent

XMaskEvent(*display, event_mask, *event_return);

% 0 @

! - . % @

! - @ N

XMaskEvent @ H @ &
% ! XMaskEvent @ @
% % 0A@ @ H
" @ H H ! XMaskEvent
% @

@ @ @ : =!
XCheckMaskEvent XMaskEvent % @
* - @ &

```
Bool XCheckMaskEvent( *display,  event_mask,  *event_return);
```

% 0 @

! - . % @

! - @ N

XCheckMaskEvent @ H @ @
@ @ %
" ! XCheckMaskEvent @ @ ! % %
0A@ ! @ H
" @ H @ ! XCheckMaskEvent
' ! % & @

@ @ H @ %!
XCheckTypedEvent

```
Bool XCheckTypedEvent( *display,  event_type,  *event_return);
```

% 0 @

! - % @ % %

! - @ N

XCheckTypedEvent @ H @
@ @ @ %
% " ! XCheckTypedEvent @ @ ! %
% 0A@ ! @ H
" @ @ ! XCheckTypedEvent ' !
% & @

@ @ H @ %
& &! XCheckTypedWindowEvent

```
Bool XCheckTypedWindowEvent( *display,  w,  event_type,  *event_return);
```

% 0 @

% & &

! - % @ % %

! - @ N

XCheckTypedWindowEvent @ H
@ @ @ @ %
% & & " ! XCheckTypedWindowEvent @
@ H ! % % 0A@ !
@ H " @ @
! XCheckTypedWindowEvent ' ! % & @

Putting an Event Back into the Queue

% @ @ H ! XPutBackEvent

XPutBackEvent(**display*, **event*);

% 0 @

! % @

XPutBackEvent % @ % N
@ H % - @ H
@ & &

XPutBackEvent

Sending Events to Other Applications

@ % & &! XSendEvent
% - ' % ! & XSendE-
vent , @ H &
@ % %

Status **XSendEvent**(**display*, *w*, *propagate*, *event_mask*, **event_send*);

% 0 @

% & & @ ! +
&! "% '

% * @

! - . % @

! - % @

XSendEvent & &! &
@ % @ ! - @ -
H % @ ' @ @
! 19 I & -
& & & ?

R " & + &! & & & &
%

R " & "% ' & & % !
& & & & % O & ! &
& & &

& @ % @ ! XSendEvent
% % - - & ?

R " @ K % ! @
& & " - ! @

R " % % - ' ! @ @ -
@ % @ K -

R " % % - @ @
% @ ! % &

& % @ &
@ -& & % % % - " & &
& & & & " % ' &
- % ! @ $
& ! @ % @ -
% % @ K

@ 0A@ @
@ : * # = 0 @
& % @
& 0 @ % K @
& @ @ O
% - XSendEvent

XSendEvent F @ & %
F &

XSendEvent - * # * &

Getting Pointer Motion History

0 @ % & % %
% @ % % %
& % @
' % ! & %% ! % % - !
& @ % & % @ (& @ !
- @ %%

%% !
XDisplayMotionBufferSize

```
unsigned long( *display);
```

% 0 @

@ %
- %) , @
@

- % & & !

```
XTimeCoord *XGetMotionEvents( *display,  w,  stop,  *nevents_return);
```

% 0 @

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% @ & @
. %
%

! - @

@ &
% % ! @ ! @ &
% & & : - = % % " @
%% ! % !
! @ O ,CEE " %
! H @ % - %
& ?

```
typedef struct {
 Time time;
 short x, y;
} XTimeCoord;
```

!
% % @ - %
& & !

- * &

Handling Protocol Errors

0 % @ F

Enabling or Disabling Synchronization

-- -0 %% ! @ @ H 0 @
% & -
@ , - % I9
& & F $ +$ "0
! - @ _Xdebug ! F -
% - -- ! & @

% - & ! 0 - % H
& & &

```
int( *display,  (*procedure)());
```

% 0 @

% %

% % & % % % @

F ! XSynchronize

```
int( *display,  onoff);
```

% 0 @

% * @ &
F

XSynchronize % @ " !
XSynchronize @ " ' ! XSynchronize
@

Using the Default Error Handlers

& 0 ? %
: % ! % @ - =
% 0 @
- %% % & -
- " % ,CEE % !
& @ %
% -

! XSetErrorHandler

```
int *XSetErrorHandler( *handler);
```

% % - N %%

0 - % - N %% & @
@ " * , OpenFont! LookupColor! Alloc-
NamedColor % H * ' QueryFont %
H - % - - %
* ! %
O @ - (& @ !
: = % &
- % H & % @ % @

0A A@ ?

```
typedef struct {
 int type;
 Display *display; /* Display the event was read from */
 unsigned long serial;  /* serial number of failed request */
 unsigned char error_code; /* error code of failed request */
 unsigned char request_code; /* Major op-code of failed request */
 unsigned char minor_code; /* Minor op-code of failed request */
 XID resourceid;  /* resource id */
} XErrorEvent;
```

H ! - ! @
& & % " & @ NextRe-
quest - & H K
% H % ! <X11/Xproto.h>
& - % ?

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	-! & H H
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* #	@ - @ % H C % - % - ! - - N % % - @ % - : -=
* &	@ & & - & &

* ! * ! * ! * B & ! * ' ! * ! *
+ %! * & & - %
@

% % ! XGetErrorText

XGetErrorText(*display, code, *buffer_return, length);

% 0 @

% & &
%

- %

% F

XGetErrorText % - - %
%
"

% 0 &
-

- ! XGetErrorDatabaseText

XGetErrorDatabaseText(*display, *message, *default_string, *buffer_return, length);

% 0 @

% %%

% % -

- % -

- %

% F

XGetErrorDatabaseText - :
- = - 0
% - K - -
- ! K
- -

- - %% -
- & % - & "
- (+ A -! %
% 0 % MM %% NN %
" ! %% &

0+ A % -
- -

0) - - -

0 H ' % H ! / H %
- - '
H ! : - @
InitExtension= & % :=
H %
- " - !
K - -

% & H % ! XDisplayName

```
char *XDisplayName( *string);
```

% -

XDisplayName % XOpenDisplay
& % " ,CEE - % ! XDisplayName
@ % % XOpenDisplay &
% % % & %
% - % % & %

">$! XSetIOErrorHandler

```
int( *));
```

% % - N %%

XSetIOErrorHandler ">$ 0 % - N
%% : % !
@ & = !
" ">$! %

, % @

Chapter 12. Input Device Functions

. 0 % @ ?

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R %

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R) % -

Pointer Grabbing

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) % @ @
@ % @ %

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- & & @ @ @ "
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& % " % !
@ % - - & : XAl-
lowEvents= % F - @
@ -- - %

, - @ : %% = -
% @ @ % - F

& - ? @ % @ @ - &
- - > % % : XGrabPointer
XGrabKeyboard= % @ - & - %
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( ) ! * 1)) ! * 8)) ! * I)) !
* 7)) ! * 5)) ! *)) ! D %
) ' ! % @
?) ! E) !) !) 1) !) 8) !
) I) !) 7) !) 5)

- % ! XGrabPointer

int **XGrabPointer**(**display*, *grab_window*, *owner_events*, *event_mask*, *keyboard_mode*, *confine_to*, *cursor*, *time*);

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& % - & &
@

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XGrabPointer @ - %
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- - XGrabPointer @ @ % -
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% @

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" % F ! % - @
% " % K) ! % !
%% ! %% F ! 0 @ -
% @ - - XAllowEvents %
- % - & % F O
% H @ % -

" K) ! @ % -
@ - " K) !
! %% ! %% F ! 0 @ -
@ - - XAllowEvents
% - - &
% F O % H @ % -

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, % ! & & % & %
- K& & & & O & ! - K& &
%

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%% %% & -
%% - % H & %

XGrabPointer - A , E @ , @

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& & % & &! XGrabPointer
, # & " % @ -
! " % F @ -
! ' F " %

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" @ $ & ! % - %
: % 0 @ =

XGrabPointer - * !* # ! * &

- % ! XUngrabPointer

XUngrabPointer(*display, time);

% 0 @

% . % %

XUngrabPointer % H @
@ - % XGrabPointer! XGrabButton!
% XUngrabPointer % %
% - 0 @
" - A , E @, @ 0 @ %
UngrabPointer H @ & & K & &
@ % - @ & & & -
K & & % & &

- @ % - ! XChangeActivePointerGrab

XChangeActivePointerGrab(*display, event_mask, cursor, time);

% 0 @

! - . % & % @ %
& @ $ @
% @

% % ,

% . % %

XChangeActivePointerGrab - % %
% @ - %
% - 0 @
% @ % XGrabButton
% @ K XGrabPointer

XChangeActivePointerGrab - * * #

- % ! XGrabButton

XGrabButton(*display, button, modifiers, grab_window, owner_events, event_mask, keyboard_mode, confine_to, cursor);

% 0 @

% % :*
*

%)
& @ $ @

- % - & &

- ! % * @ &
% @ % %
& % - & &
@

! - . % & % @ %
& @ $
@ % @

- % % - % @ .
%))

. - % % - @ .
%))

- % & & %
,

% % ,

XGrabButton % @ - " ! %
@ - : XGrabPointer=! % -
& & % : * + @ =!
* + @ % & - ?

R % - ! % - % &
% - & !
- &

R - K& & %

R K & & : = @ &

R % @ - >
- K& &

% - - XGrabPointer @
- & - %
: % - =

, - @ : %% = -
% @ @ % - F

H @ % @ - >
& &) H @
- - H % : -
= " H % @
- D * H @ - H
% $ & ! H %
- %

" XGrabButton & >
& &! * -)
* ! H % ! * :
- = -- XGrabBut-
ton @ -

XGrabButton - * !* # ! * &

- % ! XUngrabButton

XUngrabButton(**display*, *button*, *modifiers*, *grab_window*);

% 0 @

% % :*
*

%)
& @ $ @

- % - & &

XUngrabButton % @ >
% & & & -) H @
- - H % ! -
* H @ -
H % XUngrabButton @ -

XUngrabButton - * # * &

Keyboard Grabbing

0 % @ - - &
& @

' ! % @
?) !E) !) !) 1) !) 8) !) I) !
) 7) !) 5)

- ! XGrabKeyboard

int **XGrabKeyboard**(**display*, *grab_window*, *owner_events*, *keyboard_mode*, *time*);

% 0 @

- % - & &

-! % * @ &
@ %

- % % - % @ .
%))

. - % % - @ .
%))

% . % %

XGrabKeyboard @ - -
' " ' $ @ ' @ %
- - XGrabKeyboard @ @ -
" & K @ ' ! - @ % & %
- K& & " & K @ - @ &
% ! % O & ! @ %
& % - K& & * D + D @ &
% ! % @

" K -) ! @ % -
" F ! % -
@ " K -) !
: %% = %% F !
0 @ - @ - -
- XAllowEvents -
- & F O % H
@ % -

" % K) ! % @ % -
@ - " % K) ! % :
%% = %% F ! 0 @ -
% @ - - - XAllowEvents
- % - & %
F O % H @ % -

" @ - ! XGrabKeyboard
" - K& & @ & !
, # & " F @ - !
' F " % -
0 @ ! " @
$ & ! - % :
% 0 @ =

XGrabKeyboard - * # * &

- ! XUngrabKeyboard

XUngrabKeyboard(**display, time*);

% 0 @

% . % %

XUngrabKeyboard H @
@ - XGrabKeyboard XGrabKey XUngrabKeyboard H @ %
- 0 @ "
- ' " ' $ @ 0 @ %

UngrabKeyboard H @ & & @ -
@ &

% @ - - ! XGrabKey

XGrabKey(*display, keycode, modifiers, grab_window, owner_events, keyboard_mode*);

% 0 @

. % D D

%)
& @ $ @

- % - & &

-! % * @ &
@ %

- % % - % @ .
%))

. - % % - @ .
%))

XGrabKey % @ - " !
@ - : XGrabKeyboard=! -
& & % : D + @ =!
D + @ % & - ?

R - % :&
= - % & % - & !
- &

R A - K& & : = & &!
- K& & & & %

R % @ -
- K& &

% - - XGrabKeyboard @
- & -
% : % - =

, - @ : %% = -
% @ @ % - F

-) H @ - H
% : - = "
H % @ - D
- D H @ - H % D
$ & ! % - % K
K %! * #

" XGrabKey &
& &! * -) D !
H % ! * : - =
- -

XGrabKey - * ! * # ! * &

- ! XUngrabKey

XUngrabKey(**display*, *keycode*, *modifiers*, *grab_window*);

% 0 @

. % D D

%)
& @ $ @

- % - & &

XUngrabKey % & &
& - " @ -
) H @ - H %
: - = - D
H @ - H %

XUngrabKey - * # * &

Resuming Event Processing

% @ - & & % - @
@ % %
- @ % -

& @ % & @ F ! XAllowEvents

XAllowEvents(**display*, *event_mode*, *time*);

% 0 @

! - % @ . % + !
+ ! D ! D ! %
+ ! % D ! * ! *

% . % %

XAllowEvents H @
@ F " % -
@ - %
0 @ B % - @ K - ! & -
?

+ " % F ! % @ % -
" % F &
& % - ! + &
+ % F
! % -

+ " % F @ - ! %
@ % - *
+ * @ %
! % - %% F (& @ ! %
@ % - ! %
F + % F
% -

% + " % @ - F
@ @ - :
@ XGrabButton % @ XAllow-
Events & + XGrabPoint-
er=! % - @ %
% ! & @ ! - % @
- @ : & = - K& &
- / H %
- % F
@

D " F ! @ %
- " F &
& % - ! D &
D
F ! -

D " F @ - !
@ % - D
+ D @ % !
- %% F (& @ ! %
@ - !
F D
F -

% D " @ - F
@ @ - :
@ XGrabKey % @ XAllowEvents
& D XGrabKeyboard=!
- @ %
% ! & @ ! - % @
- @ : & = - K& &
- / H
- F
@

* " % F ! @ %
- @ *
+ ! * ! D + ! D @
% - @ : @
% ! @ =! & @
- %% F (& @ ! % @
- ! @ F :
@ - ! H @ &
@ F *
% F " %
F & & %
- ! * & : H F

+ ! + ! % + @ % -
@ D ! D ! % D @
% - % @ " % % -
- : = @ "
@ F - ! @ % - %
@ " % - @ F - "
! F - @ -
% " @ F & - ! - XAllowEvents

XAllowEvents - * #

Moving the Pointer

- @ %
! @ % & % % -

@ % % & &! XWarpPointer

XWarpPointer(*display, dest_w, src_y, src_height, dest_y);

% 0 @

- % & & ,

- % & & ,

-

-

- #

-# # % - & &

-

- % &
& &

" K& , ! XWarpPointer @ % : K ! K =
@ % % " K& & &! XWarpPointer
@ % : K ! K = @ - K&
(& @ ! K& & &! @ % & & K&
% % - K& %

K K @ - K& " K -
F ! % & - K& K " K& F !
% & & K& K

- %
" ! & @ ! - @ /
@ % % ,
XWarpPointer @ % K & &
@ % - % & @ %
- K & &

XWarpPointer - * &

Controlling Input Focus

0 % @ - % %
! % - H
! " %
%

% ! XSetInputFocus

XSetInputFocus(*display, focus, revert_to, time);

% 0 @

% & &! + ! ,

! - % & % @ & &
@ & . % @ + !
@ + ! @ ,

% . % %

XSetInputFocus - % -
" %
- 0 @ $ & !
- % : %
0 @ = XSetInputFocus 0 @ - ' " '
$ @

B % - - ! & - ?

R " , ! @ & & &
! @ K - -

R " & &! N & & " -
@ & % & & !
@ % $ & ! @ % @
& &

R " + ! & & &
& & @ % @ " !
@ K - -

% & & @ & XSetInputFocus !
*) " & & @ & !
0 @ @ @ K - & & &
& ?

R " @ K @ + ! @ % : @ &
=! & @ K @ @ ,

R " @ K @ + @ , ! @ +
, ! % @ @ ! 0 @ - '
" ' $ @ ! -

XSetInputFocus - *) !*# ! * &

% ! XGetInputFocus

XGetInputFocus(*display, *focus_return, *revert_to_return);

% 0 @

- & &!+ ! ,

! - - : @ + !
@ + ! @ , =

XGetInputFocus & &

Manipulating the Keyboard and Pointer Settings

0 % @ - !
% ! % ! - !
% %% -! @

% % ! !%
@ ! @ % @ %
, % & %

XChangeKeyboardControl - %
0D ?

```
/* Mask bits for ChangeKeyboardControl */


#define     KBBellPercent           (1L<<0)
#define     KBBellPitch             (1L<<1)
#define     KBBellDuration          (1L<<2)
#define     KBLed                   (1L<<3)
#define     KBLedMode               (1L<<4)
#define     KBKey                   (1L<<5)
#define     KBAutoRepeatMode        (1L<<6)


/* Values */

typedef struct {
int key_click_percent;
int bell_percent;
int bell_pitch;
int bell_duration;
int led;
int led_mode;               /* LedModeOn, LedModeOff */
int key;
int auto_repeat_mode;       /* AutoRepeatModeOff, AutoRepeatModeOn,
```

```
                                        AutoRepeatModeDefault */
} XKeyboardControl;
```

K K% @ & 9 : =
199 : = @ ! % - 1 $ - @
@ - * #

K% @ & 9 : = 199 : =
@ ! % - 1 $ - @ @ -
* # K% % : % (F=
! % - 1 $ - @ @ -
* # K %
! % - 1 $ - @ @
- * #

" K % ! EAB
- ! % K E) $ E)
$ " K % ! EAB - ! %
I8 EAB %% , %
EAB " % & K ! *)

" K % K % ! K % K
- : - %) $! %) $!
%) B =! % " K % K % !
- K % K - ! % !
% - " % & K % K !
*) A @ &
% - " ! -
& % -
- %) $! @
% - %) $!
% % - - - D + D
@ !
% ! - % -

- &
& % & @
@ % " - !
@

XChangeKeyboardControl(**display*, *value_mask*, **values*);

% 0 @

! - . % & -
& @ $ @

! % @ 1

XChangeKeyboardControl
0D @ K - % &
@ -

XChangeKeyboardControl - *) * #

@ ! XGetKeyboardControl

XGetKeyboardControl(*display, *values_return);

% 0 @

! - %
0D

XGetKeyboardControl @
0D

```
typedef struct {
 int key_click_percent;
 int bell_percent;
 unsigned int bell_pitch, bell_duration;
 unsigned long led_mask;
 int global_auto_repeat;
 char auto_repeats[32];
} XKeyboardState;
```

' EAB ! - K % EAB !
1 K EAB - K K %
%) $ %) $ K %
@ A 1 %
% - @ % I8 * , : 9=
4, 4, [2 & - % -
4,

% ! XAutoRepeatOn

XAutoRepeatOn(*display);

% 0 @

XAutoRepeatOn % %
%

% ! XAutoRepeatOff

XAutoRepeatOff(*display);

% 0 @

XAutoRepeatOff % %
%

- ! XBell

XBell(*display, percent);

% 0 @

% @ ! & -
199 199 @

XBell - % % ! %
% @ @ @ "
@ % - - 199 199 @ ! * #
@ & - & % -
- @ ?

R S: V % = > 199T [%

@ & - & % - - @ ?

R [S: V % = > 199T

- @ ! XChangeKeyboardControl

XBell - * #

@ ! XQueryKeymap

XQueryKeymap(**display*, *keys_return[32]*);

% 0 @

. - &
% & A %

XQueryKeymap @ - !
& 1 % - %
& @ % I8 * , : 9=
4, 4, [2 & - % - 4,

, - @ : %% = -
% @ @ % - F

%% - % ! XSetPointerMapping

int **XSetPointerMapping**(**display*, *map[]*, *nmap*);

% 0 @

% %% -

% %% -

XSetPointerMapping %% - % " !
0 @ -) %% -, @ ! XSetPointerMapping
) %% - A %S T - %
[1 - XGetPointerMapping &
! * # F !
@ % (& @ ! &
@ F @ ! * # "
- & ! XSetPointerMapping
) %% -* ! %% - -

XSetPointerMapping - * #

- % %% -! XGetPointerMapping

int **XGetPointerMapping**(**display*, *map_return[]*, *nmap*);

% 0 @

- %% -

% %% -

XGetPointerMapping %% - %
+ - XGetPointerMapping
% % %% -
% %S T] [1 % - % - &
% %% - ! %
%K

% N @ ! XChangePointerControl

XChangePointerControl(**display*, *do_threshold*, *accel_denominator*, *threshold*);

% 0 @

- % * @ &
@ K K

-# # % * @ &
@

- %
%

- %
%

%

XChangePointerControl & % - @ @
! % ! % @ ' % !
% - I>1 % @
0 @
% @ % %%
@ - - @ 1
@ K K -
% @ ! % - , - @ @ :
1= - * # ! F @ K
-

XChangePointerControl - * #

- % % ! XGetPointerControl

XGetPointerControl(**display*, **accel_denominator_return*, **threshold_return*);

% 0 @

- - %

- -
%

-

XGetPointerControl % N
%

Manipulating the Keyboard Encoding

D % % : - = D @ -
S4!855T D @ ! - @ %
% - : % ! =
% @ % %% -
& D -

D - % D
" $ E :1 7=! D ! ! ! !
! % !+ -! +E! (&! ! D
: ! (%! ! = % !
@ " & !
@ B - AH % %
<X11/keysymdef.h> C ! %
% @ " D
E 1 7! ! ! @
) %% <X11/keysym.h>!
& " $ E 1 7! !

D & D @
% - " : - - - ,
= - D MM *7* NN! & MM *7*
, *7* , NN " : - - - , = %
D MM *7& 76* NN! & MM *7& 76 7& 76* NN
" : - - - , = % D MM *7& 76 78* NN!
& MM *7& 76 78* , NN %
MM@ NN ! @ #

% & - % D % 1
D O % 8 D
- %! - % , ! - %
& !
% & % D MM *7* NN & &
%% " ! - %
& & MM *7* NN &
%% MM *7* NN

- D D + @
% 1 % 8 D O % D
- @ - % & -
& - % D)$BA " (! -

D D - D
) 1 -) 5 ' D !
% 1 & - % ! % 8 & - %

E % % E & D
0DK % KE D D
E E % E & D
0DK KE D D
E " E % % E
E ! % E %

% % D 0DK, KE !
- D D - D
) 1 -) 5 .
D & % MM0DKD+KNN %
D O D & @ - 9 "49
9 "*B @ " ! @ % D -
9 11999999 9 1199"" % D

- %! D %% -
& - ?

R D % D "
! ! E %
E ! D ! & D

R E " ! D

R ! E % %
E " ! D ! D &
% ! % - %% D

R ! E % %
E " ! D ! D &
% ! % - %% D

R ! E % E !
" ! D

, % -
D ! - - - @ % 0
@ %% - & D D !
- & -

- D % ! XDisplayKeycodes

XDisplayKeycodes(**display*, **max_keycodes_return*);

% 0 @

-. - D

-. - D

XDisplayKeycodes %
% % % D @

4! D @ -
855 , D - H @ % -

% D ! XGetKeyboardMapping

```
KeySym *XGetKeyboardMapping( *display,  first_keycode,  keycode_count,
*keysyms_per_keycode_return);
```

% 0 @

-. % D :D

. - % D

. - -. - D % D

XGetKeyboardMapping %
D - & K @ % K
- H K XDisplayKeycodes!
* # " ! & - %
H K XDisplayKeycodes?

```
first_keycode + keycode_count - 1
```

" ! * #
D ?

```
keycode_count * keysyms_per_keycode_return
```

D ,! - F ! D D & -
! - F ?

```
(K - first_code) * keysyms_per_code_return + N
```

0 @ K% K K @ -
- % H % D @ ,
@ D -
XGetKeyboardMapping!

XGetKeyboardMapping - * #

- %% -! XChangeKeyboardMapping

```
XChangeKeyboardMapping( *display,  first_keycode,  keysyms_per_keycode,
*keysyms,  num_codes);
```

% 0 @

-. % D :D

. - -. % D % D

. % D

- % D
-

XChangeKeyboardMapping %
D -& K D
- - ?

```
num_codes * keysyms_per_keycode
```

% K - H K
XDisplayKeycodes! * # " ! & -
% H K XDisplayKey-
codes! * # ?

```
first_keycode + num_codes - 1
```

D ,! - F ! D D & -
! - F ?

```
(K - first_keycode) * keysyms_per_keycode + N
```

% K% K
- - % D @ ,
@ D " -
, %% - % @ D
XChangeKeyboardMapping -) %% -, @

H 0 @ % %% - "
- & -

XChangeKeyboardMapping - * * #

0) D % ! &
?

```
typedef struct {
 int max_keypermod; /* This server's max number of keys per modifier */
 KeyCode *modifiermap; /* An 8 by max_keypermod array of the modifiers */
} XModifierKeymap;
```

0) D % ! XNewModifiermap

```
XModifierKeymap *XNewModifiermap( max_keys_per_mod);
```

-. - - % D %
%

XNewModifiermap % 0) D %

& 0) D % ! XInsertModifiermapEntry

XModifierKeymap ***XInsertModifiermapEntry**(**modmap*, *keycode_entry*, *modifier*);

% 0) D %

. - % D

%

XInsertModifiermapEntry % D
% - 0) D %
: % =

0) D % ! XDeleteModifiermapEntry

XModifierKeymap ***XDeleteModifiermapEntry**(**modmap*, *keycode_entry*, *modifier*);

% 0) D %

. - % D

%

XDeleteModifiermapEntry % D
% % - 0)
D %

0) D % ! XFreeModifiermap

XFreeModifiermap(**modmap*);

% 0) D %

XFreeModifiermap % 0) D %

D ! XSetModifierMapping

int **XSetModifierMapping**(**display*, **modmap*);

% 0 @

% 0) D %

XSetModifierMapping % D : =
" ! 0 @ -) %% -,
@ ! XSetModifierMapping) %% - 0 %
4 " 4 % 0) D % !
* E -

% 0) D % 4
K % D ! ! E ! !
) 1!) 8!) I!) 7!) 5 $ F D @ -

! F D - " ! F D
- % K K B %
! * #

0 @ % & - ! % !
- % & ! %
! % %% "
@ ! %) %% -' !
- " & D %
: &= -
& ! XSetModifierMapping) %% -* !
-

XSetModifierMapping - * * #

D ! XGetModifierMapping

```
XModifierKeymap *XGetModifierMapping( *display);
```

% 0 @

XGetModifierMapping % & 0)
D % -
- XFreeModifiermap " F @ %%
!

Chapter 13. Locales and Internationalized Text Functions

F %% % H
@ - - ! ! - - %
% - % % @ - - ! ! -
- F - F % F
& % - %

F ! 0 % @ 0 " %) :0")=
F % 0 $ %) :0$)=
F %

" F 0 %
F @ % - E 0 ?

R A - % - %

R A - @

R A - - - -

R A - -

R A - - @
- - % % - - B
- - @ - ! @ -
- -

% %% F - - %
% 0
% @ : V= & & :& K =
%% - - @
& H @ % -

0 F % @ %%
- %% : - % - - & - % =!
% % %% & &
- - %

% ?

R 0 -

R E %

R # -

R $ %

R " %

R -

X Locale Management

0 %% @ $ %
, " !
setlocale - %
0 % 0 - @ E K .+A - O
% % % @ %
% - setlocale

$ % , " !
0 % %

& % 0 %
% %

0 H %% %%
%% 0! XSupportsLocale

* 0 %% E :=

XSupportsLocale 0 % %
- " ' ! 0 %
& 0E , %% & 0E
, %% $ 0 % & % MM NN

% - 0 %
@ @ N @
) - % 0 % - 0 %
- @ & - - ?
- ! XSupportsLocale! XSetLocaleModifiers

- 0 F %
- -) % %
% - % %
- @ %

- 0 ! XSetLocaleModifiers

```
char *XSetLocaleModifiers( *modifier_list);
```

- %

XSetLocaleModifiers 0
- K - -
MMc‘] ! eNN! ! @ - F
MM‘] ! NN ! & - !
:% % = - - @
- +$ "0 + '

0 : +$ "0 % !
0)$B""A @ @ = %% K % @
@ " - @ - %%
! - " - @ -
! - % %
% @ - % % %
%

" ! % -
- H & - : = &
- " K ,CEE % ! XSetLo-
caleModifiers % -!
-

" @ @ - @ - %%
! ,CEE % ! -

% - %! %
@ - !
%
& XSetLocaleModifiers & ,CEE K -
% 0

- MM NN! &
% @ % F -
% % ! & - %
% % %
) % % % - @ -
% %

- & 0
" 0
- C ! & 0

% F -
% & - %
F ?

R %

R

R % - :UU=

, &
% ! -
% ! @ - - % -
@

Locale and Modifier Dependencies

F 0 % -
@ 0 XSetLocaleModifiers
- / %% &
' % ! & -
: = % ?

& '		
& ( ) ! *		
setlocale	XSupportsLocale	E H
	XSetLocaleModifiers	E
+ *		
setlocale	XrmGetFileDatabase	E 0 B

&	'	
	XrmGetStringDatabase	
0 B	XrmPutFileDatabase	E 0 B
	XrmLocaleOfDatabase	
% ! % ,	*	
setlocale	XmbSetWMProperties	A - % % > :)K % % @ =
setlocale	XmbTextPropertyToTextList	A - % % >
	XwcTextPropertyToTextList	
	XmbTextListToTextProperty	
	XwcTextListToTextProperty	
"- *		
setlocale	XOpenIM	0") %
	XRegisterIMInstantiateCallback	0")
	XUnregisterIMInstantiateCallback	0")
0")	XCreateIC	0" % -
	XLocaleOfIM!	J
0"	XmbLookupString	D
	XwcLookupString	A -
"- . !*		
setlocale	XOpenOM	0$) %
	XCreateFontSet	0'
0$)	XCreateOC	0$ % -
	XLocaleOfOM!	J
0'	XmbDrawText!	E %%
	XwcDrawText!	E %%
	XExtentsOfFontSet!	E %
	XmbTextExtents!	
	XwcTextExtents!	
/ *		
setlocale	XGetErrorDatabaseText!	E -

& '
XGetErrorText!

- 0
% ! @ @ ! &

- % F 0 -
- ! - %

0 @ - 0
- : - XSetLocaleModifiers &
,CEE - ! @
= ! 0 % ,"
- & ," mblen! mbtowc!
wctomb! strtok

Variable Argument Lists

% @ - ," @
- - @ A & -
MM NN @ - @ % !&
- @ % 0+ - ,CEE

@ - - " 0,#,
E % % - ! & - @
% 0#, E @ % @ -
- % ,CEE

@ - ! XVaCreateNestedList

```
XVaNestedList XVaCreateNestedList( dummy);
```

% - : H ," =

% @ - - :

XVaCreateNestedList % -
- % !& @ - H -
@ % % B % % O
@
- & -

Output Methods

% @ & - 0 $ %) :0$)= % ?

R $ % @ @ &

R $ %

R $ % @

R $ %

R $ % @

R - -

R $ -

R B & - -

Output Method Overview

E % % ! &
H - " - - !
% - @ & - ! % -
% - % % &
- -

& - % ! % & -
H O % ! & H & ! &
% % ! & & %
' ! & & ! %
- @ % &

0 $ %) % @ @
& % $ % % @
& - % ?

R - H & %

R B & - % & & -
& %

R $ - % % %

R B - % & - H %
& %

& % %

& % % H
% 0$) % % -
% % 0 %
% 0$! & % & 0'
! ! - F

Output Method Functions

% % ! XOpenOM

```
XOM XOpenOM( *display,  db,  *res_name,  *res_class);
```

% 0 @

% %

- % %%

- % %%

XOpenOM % % -
% %
& XOpenOM & %
-

% % & &
XOpenOM & %
% - -
XSetLocaleModifiers %

- %
- % % @ % "
% @ $ @ %
" ,CEE! % %

K K - %
%% % % &
- % %
%
0 + % %
K K ,CEE

K K -
XOpenOM %
%

XOpenOM ,CEE % %

% ! XCloseOM

```
Status XCloseOM( om);
```

% %

XCloseOM % %

% ! XSetOMValues

```
char *XSetOMValues( om);
```

% %

% @ - - :

XSetOMValues % @ - % - -
- % % % %
,CEE O & ! -

, - 0

H % ! XGetOMValues

```
char *XGetOMValues( om);
```

% %

% @ - - :

XGetOMValues % @ - % - -
H - % % % %
,CEE O & !

% & % ! XDisplayOfOM

```
Display *XDisplayOfOM( om);
```

% %

XDisplayOfOM % & % %

- & % ! XLocaleOfOM

```
char *XLocaleOfOM( om);
```

% %

XLocaleOfOM & % %

X Output Method Values

& - & 0$) @ % %
0$) @ &
0$) @ % %

& - %%

0 **-**
@ - XGetOMValues

/ # **0**
0, H
0,J $
0,B B % B & -
0, B & -

Required Char Set

0, H - H
- @ - %
% 0$) E

0$) E & ?

```
typedef struct {
     int    charset_count;
     char   **charset_list;
} XOMCharSetList;
```

K !
K

H & 0
" & XCloseOM & 0$) C !
& 0

Query Orientation

0,J $ - - &
& $ XOMOrientation_LTR_TTB! %%
% @ - % % 0$
)$ % - 0$)$
- O

```
typedef struct {
     int          num_orientation;
     XOrientation *orientation;     /* Input Text description */
} XOMOrientation;

typedef enum {
     XOMOrientation_LTR_TTB,
     XOMOrientation_RTL_TTB,
     XOMOrientation_TTB_LTR,
     XOMOrientation_TTB_RTL,
     XOMOrientation_Context
} XOrientation;
```

% @ 0$?

R XOMOrientation_LTR_TTB - ! % -

R XOMOrientation_RTL_TTB - ! % -

R XOMOrientation_TTB_LTR % ! - -

R XOMOrientation_TTB_RTL % ! - -

R XOMOrientation_Context -

Directional Dependent Drawing

0,B B % B & - - &
- % % - " @ !

% & - %
& - " @ ' ! %
% -!
-

- - ! -
% & & - -

$) @ % XDirectionalDependentDrawing

Context Dependent Drawing

0, B & - - & -
% % % & - " @ !
% & - % % %
-! - - % % -
% - % %

$) @ % XContextualDrawing

Output Context Functions

% H %
H % %
% % % - - -!
-! - % @ -
- 0$ @ "
% 0$ @ & 0$ @ !
- & 0 0$ &
0' ! @ @ O 0' %
& % @ % % %
! - F ! %% - %
- % ! - & % &
% (& @ ! 0' & @ ! 0$
%& % % 0'

% ! XCreateOC

```
XOC XCreateOC( om);
```

% %

% @ - - :

XCreateOC % & % %

- ! %
& % @ % @

XCreateOC ,CEE % ,CEE
& - ?

R H - &

R - &

R - - F

R % % % %

XCreateOC - *

% ! XDestroyOC

void **XDestroyOC**(*oc*);

% %

XDestroyOC % %

- % & % ! XOMOfOC

XOM **XOMOfOC**(*oc*);

% %

XOMOfOC % & %
%

0 % @ & - - % @ ! %
@ ! XSetOCValues XGetOCValues * @ @ -
- " - ! 0$ @ N &
- - 0 +

0$ @ ! XSetOCValues

char *__XSetOCValues__(*oc*);

% %

% @ - - :

XSetOCValues ,CEE O & !
- - -
& - ?

R -

R - - F

R % %

A @ %% % ! - % %
-

XSetOCValues - *

0$ @ ! XGetOCValues

```
char *XGetOCValues( oc);
```

% %

% @ - - :

XGetOCValues ,CEE O & !
- - -
& - ?

R - - F

R % %

A - @ & - % & @

Output Context Values

& - & 0$ @ % %
0$ @ @
% @ % & % @
& 0$ @

& - %%

0 -		
	@ &	XCreateOC
B	@ -	XCreateOC " !
	% @	
	@ -	XGetOCValues
	@ -	XSetOCValues

/	0
* ' ,	XCreateFontSet
) -	XCreateFontSet
B -	XCreateFontSet
$	B
,	
' "	XFontsOfFontSet
$)	

Base Font Name

0,* ' , - 0
%

- (+
A -O & ! % % %
% - -

C 0E'B % 0 @
- % -
& @

0E'B %
& % & H !
-

" 0E'B ! 0 & % 0E'B
% % " 0 ! XGetOCValues
& 0E'B %%

- - "
H ! 0 H
% ! XCreateOC
,CEE

H - 0,* ' , 0$ @ ! XGetOCValues
- - 0
- & 0
- & XDestroyOC &
0$ C ! - & 0

Missing CharSet

0,) - - H
- @ - % %
0$) E

" H ! K
,CEE K F "
H ! K
& ! K -
H -
& 0 %
H

- & 0
" & XDestroyOC & 0$ C !
& 0

Default String

& - - & 0$ -
! & & 0,B -
- % - % - % &
& 0$ & @ - %
H & - @
& &

! & - % -
- - - & & 0$

" 0,B - - % - :UU=! - %
& % F - "
& 0 " &
XDestroyOC & 0$ C ! &
0

Orientation

0,$ - % & &
@ - @ XGetOMValues
& 0,J $ - % 0$
@ - % 0$ 0,$ H !
@ % 0,$! @

XOMOrientation_Context !
- % : % !" $ 6783
H =! % 0
XOMOrientation_LTR_TTB

0,$ @ - % & - 0 &
-

Resource Name and Class

0, , 0, - - %
%
% @ % &
- % @ - % " @
! & %

" @ 0$) @

H - 0, , 0, 0$ @ ! XGetOC-
Values - - & 0
- & XDestroyOC
& 0$ & @ - @ XSetOCValues
C ! - & 0

Font Info

0,' " - % 0'
& - - @ % @
- % % 0$)' "

```
typedef struct {
     int          num_font;
     XFontStruct **font_struct_list;
```

```
    char        **font_name_list;
} XOMFontInfo;
```

% 0' K K
% ! % -
% K K K K %
K K 0'
K

* - - @ & - - -
- % ! % @ %% - -
% % ! "B!
0' @

0 - @
0$ 0 ! - &
% ! % K
0' 0' !
% % 0' ", -

0$)' " O & &
0$

OM Automatic

0,$) - & % &
XCreateFontSet * XFreeFontSet
% % %
& ! XFreeFontSet & % XCreate-
FontSet (& @ ! % & & %
& * % ! H &
0,$) & XFreeFontSet XDestroyOC
%

Creating and Freeing a Font Set

0 & - - !
' -
%% H 0'
% H % % - % % H @
% 0$

XCreateFontSet @ - %
- @ 0' %
0$) 0$) $) @ 0,$)
% & & XCreateOC XCreate-
FontSet

```
XFontSet    XCreateFontSet(    *display,        *base_font_name_list,
***missing_charset_list_return,        *missing_charset_count_return,
**def_string_return);
```

% 0 @

- - - %

-# - - -

-# - - -

- - - & -

XCreateFontSet % %
& XCreateFontSet
H -

K K K - 0
%
- (+
A -O & ! % % %
% - -

C 0E'B % 0 @
- % -
& @

0E'B %
& % & H !
-

" 0E'B ! 0 & % 0E'B
% % " -
0E'B ! XBaseFontNameListOfFontSet & 0E'B
%%

0 & - - & %
& 0'

' H !
%% & -
@ ?

R 0E'B - % H
% H *CharSetRegistry* *CharSetEncoding*
% & %
% H ! % ! " $4453 1 ""

R 0E'B - %
%% %% H 0
% - F @ %% - H
' % ! "
"" & % @ O 0
" $4453 1 %% "
@

R 0E'B - 0E'B &
0E'B ! & H : % -
CharSetRegistry *CharSetEncoding* 0E'B =

1! % % H

R %% % %
%% - -

' % ! H ?

```
ISO8859-1
JISX0208.1983
JISX0201.1976
GB2312-1980.0
```

%% K K K % % !
- % ' % ?

```
"-JIS-Fixed-Medium-R-Normal--26-180-100-100-C-240-JISX0208.1983-0,\\
-JIS-Fixed-Medium-R-Normal--26-180-100-100-C-120-JISX0201.1976-0,\\
-GB-Fixed-Medium-R-Normal--26-180-100-100-C-240-GB2312-1980.0,\\
-Adobe-Courier-Bold-R-Normal--25-180-75-75-M-150-ISO8859-1"
```

@ ! %% K K K !
-0 H ' % ?

```
"-JIS-Fixed-Medium-R-Normal--26-180-100-100-C-240,\\
-JIS-Fixed-Medium-R-Normal--26-180-100-100-C-120,\\
-GB-Fixed-Medium-R-Normal--26-180-100-100-C-240,\\
-Adobe-Courier-Bold-R-Normal--25-180-100-100-M-150"
```

@ ! % %% - & 0
@ 0E'B % % H
' % ?

```
"-*-*-*-R-Normal--*-180-100-100-*-*"
```

" XCreateFontSet !
%% ! XCreateFontSet ,CEE! -K K K ,CEE!
-K K K F "
H ! XCreateFontSet @ 0' !
-K K K ,CEE! -K K K
F

" H ! XCreateFontSet
-K K K
& -K K K
- H
- & 0 %
H

" H
0 H %

! XCreateFontSet ,CEE $ & ! XCreateFontSet
@ 0' K

0 >& & - - & 0'
- ! & & "
K -K ,CEE! XCreateFontSet % -
% - % & & 0' &
@ - % H & %
- @
& & ! &
- % - - - - &
& 0'

" - K -K % - :UU=! - %
& ! % F - "
& 0 " &
XFreeFontSet & 0' C ! &
0

% - - -
- %

0' - & XFreeFontSet
XFreeStringList! % @ %% K K K
- XCreateFontSet

0' - @ 0' !
XFontsOfFontSet

int **XFontsOfFontSet**(*font_set*, ***font_struct_list_return*, ***font_name_list_return*);

- %

- - -

- - -

XFontsOfFontSet 0'
0 0& - @
% 0' K K K
% ! % -
K K K K K %
K K 0'
@

* - - @ & - - -
- % ! % @ %% - -
% % ! "B!
0' @

0 - @
0' 0 ! - &
% ! % K

0' 0' !
% % 0' ", -

0' & 0
& XFreeFontSet &
0' C ! & 0

- @ 0' !
XBaseFontNameListOfFontSet

```
char *XBaseFontNameListOfFontSet( font_set);
```

- %

XBaseFontNameListOfFontSet -
%% & 0' & -
- % @
% %% % -

" XCreateFontSet 0E'B % %
% 0E'B ! XBaseFontNameListOfFontSet
& 0E'B 0E'B

& 0
" & XFreeFontSet & 0' C
! & 0

- @ 0' ! XLocaleOfFontSet

```
char *XLocaleOfFontSet( font_set);
```

- %

XLocaleOfFontSet %
0' ! -

- & 0
" XFreeFontSet &
0' C ! & 0

XFreeFontSet @ - %
XFreeFontSet 0$) % &
XCreateFontSet

```
void XFreeFontSet( *display,  font_set);
```

% 0 @

- %

XFreeFontSet %
! ! 0' ! 0' A ! !

Obtaining Font Set Metrics

) F & -
% & ! & & -

@ - - 0
%% - % & & - -
% % & - & &
& - & - - % % &
% % -
% - - - %

& - & % % !
@ - & - % &
% % -

- - ! -
% & & - - %
- & XmbTextPerCharExtents Xwc-
TextPerCharExtents

& - & % % -!
& - % & - % - %
% @ - & & &
XmbDrawString & & & &
% XmbDrawString " %%
% @ & -! & /
% % -

% -! XDirectionalDependent-
Drawing

Bool **XDirectionalDependentDrawing**(*font_set*);

- %

XDirectionalDependentDrawing & -
% % O & ! '

% -! XContextualDrawing

Bool **XContextualDrawing**(*font_set*);

- %

XContextualDrawing & & -
% & -O & ! '

% % -! XCon-
textDependentDrawing

Bool **XContextDependentDrawing**(*font_set*);

- %

XContextDependentDrawing & -
% % & & K -
% & -O & ! '

& - % & ! !
@ & % - % & %

% " N % %

& -
0' A ?

```
typedef struct {
     XRectangle max_ink_extent;     /* over all drawable characters */
     XRectangle max_logical_extent; /* over all drawable characters */
} XFontSetExtents;
```

0 - 0
- & ! - @ - %% ! & -
& % @

K K - @ ! @ &
! - - % - &
- ! @ - XmbTextExtents XwcTextEx-
tents

K - K - @ ! @ &
! - % % - - % !
@ - $ - % & !
% ! - ! -
K - K % % -
& & - @

B % -! %% - - @ -
- -N N @

- - @ - XmbTextPer-
CharExtents XwcTextPerCharExtents

- @ 0' ! XExtentsOf-
FontSet

```
XFontSetExtents *XExtentsOfFontSet( font_set);
```

- %

XExtentsOfFontSet 0' A
0 0& - @

0' A & 0
" & XFreeFontSet & 0'
C ! & 0

% % % @ ! XmbTex-
tEscapement XwcTextEscapement

```
int XmbTextEscapement( font_set,  *string,  num_bytes);
```

```
int XwcTextEscapement( font_set,  *string,  num_wchars);
```

- %

% -

- % - -

- # % - -

XmbTextEscapement XwcTextEscapement %
% % - @ ! - %
% % % &
& - - - & ! -
- % %% -

- - ! % & % @

@ K K @ K - K - ! @
- -N - ! - - ! XmbTextExtents
XwcTextExtents

```
int XmbTextExtents( font_set, *string, num_bytes,
*overall_ink_return, *overall_logical_return);
```

```
int XwcTextExtents( font_set, *string, num_wchars,
*overall_ink_return, *overall_logical_return);
```

- %

% -

- % - -

- # % -
-

! - .- @

! - - @ -

XmbTextExtents XwcTextExtents % %
@ K K @ K - K - @
- -N - - - % - % % !
% @ @ XmbTextEscapement XwcTex-
tEscapement @ & - - -! -
%

" @ K K - ,CEE! -
-N @ K K -!
F & E @ @ O
! @ K K - \] @ K K @ K K
! - ! - O !
@ K K ^] 9 - - % -
& @ K K] 9!] 9! &] 1! -] 1

" @ K - K - ,CEE! -
% @ % - - % - $
- % ! % ! - !
-

0' - ! @
- XCreateFontSet
% & & @ @ %

@ & - - & -!
XmbTextPerCharExtents -!
! @ -
& % / & ! %
-! &
- -

% -! XmbTextPerCharExtents
XwcTextPerCharExtents

Status **XmbTextPerCharExtents**(*font_set*, **string*, *num_bytes*, **ink_array_return*, **logical_array_return*, *array_size*, **num_chars_return*, **overall_ink_return*, **overall_logical_return*);

Status **XwcTextPerCharExtents**(*font_set*, **string*, *num_wchars*, **ink_array_return*, **logical_array_return*, *array_size*, **num_chars_return*, **overall_ink_return*, **overall_logical_return*);

- %

% -

- % - -

- # % -
-

.- -

- - -

- 9 % F K K
- K K %
F

-# -

! - .- @

! - - @ -

XmbTextPerCharExtents XwcTextPerCharExtents
% ! -
% A @ K K
- K K @ N & ! @
& - - - - %%

- K K - K K
@ K K

A K K - % -
N & - A - K K
- % @ % - - %
% - $ - %
- K K -

, 0 - % @ & -
! - - % &
& & " % %
- - % ! 0 -

0' - ! @
- XCreateFontSet
% & & @ @ %

" K F %% !
F K K -
H $ & ! F @

" @ K K @ K - K - ,CEE! Xmb-
TextPerCharExtents XwcTextPerCharExtents
-N @ K K @ K - K !
XmbTextExtents XwcTextExtents

Drawing Text Using Font Sets

& % &
XDrawText! XDrawString! XDrawImageString
% & & - %
- -
4 6 % : =
% % " * ' - ! %
- @ &

& - % O
- , @
& %

XmbDrawText XwcDrawText & - ?

```
typedef struct {
     char     *chars;     /* pointer to string */
     int      nchars;     /* number of bytes */
     int      delta;      /* pixel delta between strings */
     XFontSet font_set;   /* fonts, None means don't change */
} XmbTextItem;
```

```
typedef struct {
     wchar_t *chars;     /* pointer to wide char string */
     int nchars;     /* number of wide characters */
     int delta;     /* pixel delta between strings */
     XFontSet font_set;     /* fonts, None means don't change */
} XwcTextItem;
```

& - % - @ & ! XmbDrawText XwcDrawText

```
void XmbDrawText( *display, d, gc, y, *items, nitems);

void XwcDrawText( *display, d, gc, y, *items, nitems);
```

% 0 @

% &

%

% :0

%

%

XmbDrawText XwcDrawText & % % -
& - A % ! & -
@ % & %
% @ % %
& - - % & K
, H
K E - & K , &
&

XmbDrawText XwcDrawText % % -
& - % & - % -
- XmbTextExtents XwcTextExtents XmbTextPerCharExtents
XwcTextPerCharExtents 0' - !
@ & & - XCreateFontSet
@ @ %

& - - - @ & ! XmbDrawString
XwcDrawString

```
void XmbDrawString( *display, d, font_set, gc, y, *string,
num_bytes);

void XwcDrawString( *display, d, font_set, gc, y, *string,
num_wchars);
```

% 0 @

% &

- %

%

% :0

% -

- % - -

- # % - -

XmbDrawString XwcDrawString & % &
- % 0' - ! @
& & - XCreateFontSet @
@ %

& - - - - @ & ! XmbDrawI-
mageString XwcDrawImageString

```
void XmbDrawImageString( *display, d, font_set, gc, y, *string,
num_bytes);

void XwcDrawImageString( *display, d, font_set, gc, y, *string,
num_wchars);
```

% 0 @

% &

- %

%

% :0

% -

- % - -

- # % - -

XmbDrawImageString XwcDrawImageString
- & - % %
& - % - -
@ K - K XmbTextExtents XwcTextExtents
0'

0' - ! @ & &
- XCreateFontSet @ @
%

Input Methods

% @ & - 0 " %) :0")= % ?

R " % @ @ &

R " % -

R " %

R " % @

R " %

R " % @

R " %

R A@ -

R - %

R " % @

Input Method Overview

% @ % F
% @ @ & % @
0

- - - & % -
: = & % %
- - ! & %
- % ! & % - -
-) % & % E %
- - @ A -

- @ @ % - &
A % % ! % % ! %

% % - - & % ! &
% % & % % ?
D (- " - ! D & -
- ! (- & - @ % & @ ! &
D A 74

D % ! (- A 87 %
:17 19 @ & = % %
% & % ? ! @ & ! %
(- ! &
% - ' % ! % & %

D @
% % % &
% - % ' % !
& % ! %
- % F E & !& % !
& % - % F

, - - % % - - !
- % D ! % - % & - "
- % ! - -
& & ! & H : !
! @ = @ - ? %%
59!999 @ (F ! - %

& / % - % % & % ' !
% % ! ! D -
4!999 !& & @ & 15!999 I9!999
% !
@ % @ - @ - - N
- % ! H -
& %
% ! - %
% %

" % ! D - % D / " D ! (-
- % (/ , & -
- % % ! D ! ! &

" % ! D A - % -
: = @ D / @ D /
@ % % " & - !
% %% % "
% ! %
E @ D D / !
/ @

" D ! % % D (- !
% % & (/ - & (/ (-
- (- (/ ! - @ &
%

+ & % % & - %
D ! % % - - %
D @ A - %
- @ ! & & &

% +
% ! - @
% % :+ =! - %
% & ! & @ %
16 & ! &

! & - % ? : -
& = % @ - ! + % N %
% - % - %

- C % ! & @
@ @ @ @ &! - !
% % %

Input Method Architecture

& % @ ! %
! @ - & - - ! !
% % % % -
: = % % -
" H % - -
@ @ - %

" % H & &
! % % - ! !
% & ?

R - EAB %
" & & % %

%

R % - -
% - % -

R % % % F - -
H % % %
- % %
% - ! &
%

@ % - %%
0 & ?

R ' # % ! % - & %
%% & & %% @ & % %%
%

R +! # % - % % & &
% @ %

R + # % - % & & %%
& & % $! % & & %
%% & &

R (% - % % & &
RootWindow

" & H % - % %%
% - - & @ ! - 0
- & %% & % %
% % % ! @ &
%% % @ & %%
%! ! - - -
% "

' - @ - - ! ! !
% : % - @ =

C - % @ % @ ! %%
- & - " % %
- % @

% . "
! & % 0 @ ? -
0 @ % @
- % -
% - H F
& & @ @ -

" ! - 0 @ % -
- %% % %
' ! (% & % % "
& % % % : ! @ =!
% % & % @

F -
:' ! (%! =
% @ %
& - " % :0 @ ! % @ ! = -
- & ! & % &
!

& % % H
% 0") %
XOpenIM ! & % % - @ % H
% % &
% 0 & -
- - % - %

- % @ - - ! %% -
- * - % & &
: - = & 0") /

Input Contexts

0 % @ - %
- % & & ! & & & % !
% & - - % -
% % 0 %
% 0"

% - ! % % !
& % %
% ! % - - -
! & &! ! @
%% % % & %
- % - % %

$ % - % B %
& % ! % & & &

0" & XCreateIC ! % @ - 0") -
- % % %
& XCloseIM! %
: % - % =

- % & & & % ! %
% % - ! % ! % & ?

R % ! & -
% %

R - % @ & & %% "
& & @ ! @
! -

- %% - -
% % ! - %%

Getting Keyboard Input

% ! XmbLookupString XwcLookupString & % %
* % % & % !
% % - XmbLookupString XwcLookupString &

Focus Management

' & XmbLookupString XwcLookupString
! & %

%% @ ! %%
% % & %
- XSetICFocus & %% % %

! & %% @ ! %%
% - XUnsetICFocus
% F ! XSetICFocus @ & %
! - &

% ! %%
@ - - % 0
@ -

" - % - % % !
& & & % & @
& & - : 1I 5 6 I =

Geometry Management

" % : % - % =!
% & % % & % @ @
! @ % &
! % % 0 % @

%% & F % % % @
% %% - -
%

% & - - % &
& % % @ % & : =
% @ % & ?

R % - % & &

R % % % & &

% -- F ! --
% % -- F "
F ! % F - @

* % @ - - % !
- - %
- - - 0")+ 0")
0") @ XGetIMValues &
% @ - - % !
- 0," % @ 0"

& % & -
- ! - - & % -
- & - % ?

R -- % - 0, ,
@ " % !
& -- & & - F $ & ! &
@

R & - 0" @ 0, , % &
-- F @ % %
--

R 0" @ 0, % -
& & - H %
% % -

- - - & - 0" @
- % ' % ! 0,'
0,E % - - %

0" @ : 1I 5 6 = @
- - & " %
- - % & & &

" ! - - % @ & %
- -

Event Filtering

- % @ & % % 0 @
% " % : = - XmbLookupString

XwcLookupString & % @ % -
@ %
%

" & ! @ @
% % - % & - % @ &
% @ ?

R A % @ % & &

R A@ % & % @
% @ % @ @ %
&

R D @
0 " % @

% - 0" @ 0,' A@ - @
& & & @ F

Callbacks

% % % !
% % % -
@ ! - % &
% -

! XmbLookupString XwcLookupString % ! % !
% * - -
% ! % - -
& " % !
! % & (!
& %% ! & - ! % -
! ! %
! % -

& % -
A & & "
% % ! % ! &

% @
- H %

Visible Position Feedback Masks

" % % ! % & % - & %
- - @ % $ % !
& % % - @ %
0") % @ % & - % %
% % - ' % !
% @ % % - - % - &
% %

Preedit String Management

- - ! % % @ % -! &
%% % % % % % " ! %
% - H @ - - @
XmbLookupString XwcLookupString % @ %

" % - @ ! - & % @
- @ @ % - &
& ! % @ - 0"
@ % - @ & %
% N % % - %

- @ - - % %
& - % - @ ?

R @ % @ - - % @ &
% " D % ! & @ (- -
(/ - & % -! % -!
: % ! -= @ -- &
% (- (/ H :& % % =
& @ @ - % -
- ! - @ %%
! % % - @ @
& H @ %
@ @ - - !
% ! D D / @ %
@ -- H
& - % %

R @ % @ - - %%
% @ ' % !
% & % - " ! % %
@ % H H MM @ NN %
-! % @ %
& % - @
% - & @ @ -
-- @ - % ! @
%

R @ @ H - - %
@ % : %
= N & % - %
% - : % - % =
' % ! - - % ! H @
% & & @
& " % % - @
- % % &
C @ ! @ % H
" % % @ @ @
H ! - %
@ N &
@ - - ' ! %
%% - % @ & XmbResetIC XwcResetIC! & -

@ @ / % N ! &
@ % N & & @ @
. @ ! @
% -! XmbLookupString XwcLookupString

- @ %% % @ 0, - @
0, - @ 0" @ * %
%% - @ ! @ H @ - @
% - %% 0" @ - XGetIMValues
& 0,J " # E ") @

& & @ & @ @
% 0, - @ 0" @
H - @ % %
- & @ -- - @ &
- @ % % @
% O % - @
- 0, - @ & &
@ O ! @

0, - @ 0" @ %
& % H % - @ "
@ ! % N % & @
-- - @ @ ! %
%% % @ - @
N % & % -
% @ & 0") - @
% & % %

' ! % N 0, - @ %
% - %
@ - N % &
% % : = @ N
% F * @ - % F
H ! % @

Input Method Management

% - %% % - %
:XOpenIM= - % : XCloseIM= (& @ ! %
H % & % @ :") @ =! % ?

R " 0 @ ! ") @ ! 0 !
% ") @ % !
! & & ") @

" % & & ") @ @
: % ! & ! ") @ =

R % & - ") @ &
F & -

%% - % ! & -
% @ ?

XRegisterIMInstantiateCallback & -
% &
0 ") @ %
@

XOpenIM
% -

XSetIMValues! XSetICValues 0") 0"
@ ! 0,B ! &
- %
& 0
") @ & &
% % - @
" !
& ") @
% %%
") @ & - ")
@ % % O
% & &
- ") @

XUnregisterIMInstantiateCallback @ %
-

" % %% & - ") @ ?

R % & & ") @ %% %
- % & %
(& @ ! %% %

R - H % @ %
& ") @

Hot Keys

- & % %
! - % O % ! % (%
@ % (D &
% % % (& @ ! % - &
% ! @ H %%
- %% 0" @ - XGetIMValues & 0,
J " # E ") @ % &
- % ! % @ -
%

Preedit State Operation

% @ @ ! % - %
(& @ ! % %
& % % - % - % 0
% @ %% - % % -
& % @ @ - % %
$ H - XGetICValues & 0,+

0" @ @ & @ %
- @ ! %% -
- XSetICValues & 0,+ , 0" @ "
- % % - ! %% XSetIC-
Values & 0,+

@ % % % %
% @ @ % -
! @ H @ % % -
%% 0" @ - XGetIMValues & 0,J " #
E ") @

Input Method Functions

% ! XOpenIM

```
XIM XOpenIM( *display,  db,  *res_name,  *res_class);
```

% 0 @

% %

- % %%

- % %%

XOpenIM % % ! -
% %
% - & % -
% - XmbLookupString Xw-
cLookupString! % & - @ % ! &
% %

% % & &
XOpenIM & % % -
- XSetLocaleModifiers
%

- %
- % % @ % "
% @ " @ %
" ,CEE! % %

K K - %
%% % % &
- % %
%
0 + % %
K K ,CEE

K K -
XOpenIM %
%

XOpenIM ,CEE % %

! XCloseIM

```
Status XCloseIM( im);
```

% %

XCloseIM % %

% ! XSetIMValues

```
char *XSetIMValues( im);
```

% %

% @ - - :

XSetIMValues % @ - % - -
- % % " ,CEE
O & ! -
0 % - %% &
- O - % - - @

H % ! XGetIMValues

```
char *XGetIMValues( im);
```

% %

% @ - - :

XGetIMValues % @ - % - -
H -% % % %
,CEE O & ! -

A 0") @ - : & - = % &
0") @ ! 0") @ % ! -
% V " % % ! XGetIMValues
! % - -
& %

% & % ! XDisplayOfIM

```
Display *XDisplayOfIM( im);
```

% %

XDisplayOfIM % & % %

- & % ! XLocaleOfIM

```
char *XLocaleOfIM( im);
```

% %

XLocaleOfIM & % %

- % ! XRegisterIMInstantiate-
Callback

```
Bool XRegisterIMInstantiateCallback( *display, db, *res_name,
*res_class, callback, *client_data);
```

% 0 @

% %

- % %%

- % %%

. % % %

- %

XRegisterIMInstantiateCallback - @
& @ & % @ % %

O & ! '

- % % & ?

```
void IMInstantiateCallback( *display, client_data, call_data);
```

% 0 @

- %

- , & % ,CEE

- % ! XUnregisterIMInstan-
tiateCallback

```
Bool XUnregisterIMInstantiateCallback( *display, db, *res_name,
*res_class, callback, *client_data);
```

% 0 @

% %

- % %%

- % %%

. % % %

- %

XUnregisterIMInstantiateCallback @ %
% @ - O
& ! '

Input Method Values

& - & 0") @ % %
0") @ &
0") @ %

& - %%

0	-	
B	@ - % @	XSetIMValues " !
	@ -	XSetIMValues
	@ -	XGetIMValues

/ #	0
0,J " %	
0, ,	B
0,	B
0,B	B
0,J ")# E	
0,J " # E	
0,# +	
0, 6+	B

0, 6+ :
1I 5 7 6 =

Query Input Style

& H % & %
%% % % %% -

" % %% ! - &
% - : ! % !
=

- @ % & @ &
@ % % 0")
% - 0") !

0") & ?

```
typedef unsigned long XIMStyle;


#define     XIMPreeditArea              0x0001L
#define     XIMPreeditCallbacks         0x0002L
#define     XIMPreeditPosition          0x0004L
#define     XIMPreeditNothing           0x0008L
#define     XIMPreeditNone              0x0010L

#define     XIMStatusArea               0x0100L
#define     XIMStatusCallbacks          0x0200L
```

```
#define     XIMStatusNothing            0x0400L
#define     XIMStatusNone               0x0800L

typedef struct {
      unsigned short count_styles;
      XIMStyle * supported_styles;
} XIMStyles;
```

0") % %%
K F %% K

%% ! &
%% A
@
% %% $
%% %

% - & % %% % @ %
%

0")+ " ! % & H
% @ @ % -
0" @ 0, 0, ,

0")+ + " ! % & H
% @ % @ 0" @
0, % E 0,' &

0")+ " ! % & H
% 0" @
0,+ ! 0,+ B !
0,+ B & ! 0,+

0")+ , - " ! % &
% @

0")+ , % % @ %
% @ -
@ & %

- & % %% % @ %

0") % H % @
@
0, 0, ,

0") % H
! 0, ! 0,
B ! 0, B &

0") , - % & @

0") , % % @
" ! @ -
@ &

Resource Name and Class

0, , 0, - - %
% @
% & - % @
- % " @ ! &
%

" @ 0") @

Destroy Callback

0,B - % % 0")
0,B -- & % % @
@ ! %
% : = 0 ! XCloseIM
XDestroyIC

- % % & ?

```
void DestroyCallback( im,  client_data,  call_data);
```

% %

- %

- , & % ,CEE

B & & ,CEE K -

Query IM/IC Values List

0,J ")# E 0,J " # E H 0")
0" @ %% %

- @ % & @ &
@ % % 0")# E
% - 0")# E !

0")# E & ?

```
typedef struct {
     unsigned short count_values;
     char **supported_values;
} XIMValuesList;
```

Visible Position

0,# + - & @ %
0")' 0") @

- @ % & @ &
@ % * " @ ! %
@ % 0")' 0") O & !
%

* 0") @ % ! XGetIMValues & -
0,J ")# E - - " 0,# +
") @ 0,J ")# E ! @ %
0")' 0") @ %

Preedit Callback Behavior

0, 6+ - - 011 6 %
% a: - B - 011 6 % ! @
6 + B & & - - -
5 E - % @ - 5 6 @ !
- 0, 6+ C ! - &
@ 6 % & %

0, 6+ - & @ %
- - 0")+ B & @ & 5
6

@ % * H - 0, 6+ !
@ ! % 6 @ O & !
5 @ @ ' " 6 !
@ 0, 6+

* 0") @ % ! XGetIMValues & -
0,J ")# E - - " 0, 6+
") @ 0,J ")# E ! +
@ 5

Input Context Functions

% H :
= % H %
% % % % - -
-! -! - % @ -
- 0" @ "
% 0" @ & 0" @ !
- & 0

% ! XCreateIC

```
XIC XCreateIC( im);
```

% %

% @ - - :

XCreateIC & % %

- ! % &
- % @ -
% : % H
= % @

XCreateIC ,CEE @ % ,CEE @
& - ?

R H - &

R - & : % !0,' A@ =

R - - F

R % % % %

XCreateIC - * !* !* + %! * &

% ! XDestroyIC

```
void XDestroyIC( ic);
```

% %

XDestroyIC % %

F & % -
! XSetICFocus XUnsetICFocus

```
void XSetICFocus( ic);
```

% %

XSetICFocus & %
& & % % @
% % @ %% % %
% %

- XSetICFocus & & @

```
void XUnsetICFocus( ic);
```

% %

XUnsetICFocus & % %
% % %
& & % %
% @ %% % % %
%

- XUnsetICFocus & & @ O
@ @ % & &

% ! XmbResetIC XwcReSetIC

```
char *XmbResetIC( ic);
```

```
wchar_t *XwcResetIC( ic);
```

% %

0, 0")" ! XmbResetIC XwcResetIC
% O & 0, 0")+ @ !
% % @ " ! % % -
% H % !
! % - - XmbResetIC XwcResetIC
-

@ XmbResetIC % - - "
% & @ ! %
,CEE - " @ % ! %
% % & % ,CEE -
,CEE

- -

- % & % ! XIMOfIC

```
XIM XIMOfIC( ic);
```

% %

XIMOfIC % & % %

0 % @ & - -0" @ ! % @ ! XSetIC-
Values XGetICValues * @ @ - - "
- ! 0" @ N & -
- 0 +

0" @ ! XSetICValues

```
char *XSetICValues( ic);
```

% %

% @ - - :

XSetICValues ,CEE O & !
- - -
& - ?

R - : % ! 0,' A@ =

R - - F

R % %

A @ %% % ! - % %
-

XSetICValues - * ! * ! * ! * + %! *
&

0" @ ! XGetICValues

```
char *XGetICValues( ic);
```

% %

% @ - - :

XGetICValues ,CEE O & !
- -
& - ?

R - - F

R % % %

A " @ - : & - = % &
" @ ! " @ % ! -
% V " % % ! XGetICValues
! % - - &
% % " @ % 0#, E
: % = " ! - %
0#, E ! - - % V -
%%

Input Context Values

& - & 0" @ % %
% - %

0" @ & @
@ @ -! - -! - - %
& & %
%% A & 0" @
%

& - %%

0	-
	@ & XCreateIC
B	@ - XCreateIC ^ " !^ % @
	@ - XGetICValues
,	@ - - & @ XCreateIC XSetICValues
	@ & % % & , @ -
	@ & - % & &
$	@ "
	@ & XSetICValues
"-	@ - % - @ %

/	# !	, $	, ,	% ,	, ' !	,
" %	i					
	i	$	$	$	$	"-
&						
'	,	B	B	B	B	"-
&						
	i	"-	B	B	B	"-
,						
	i	"-	B	B	B	"-
	i	"-	"-	B	"-	"-
'	i					"-
A@						
B	i	B	B	B	B	B
-	i					
@						
-	i	B	B	B	B	B
@						
	i	B	B	B	B	"-
(D	i					"-
(D	i	B	B	B	B	"-
Preedit						
		"-	B	B	"-	"-
	,	"-	"-		"-	"-
,						
% E	i	"-	B	"-	"-	"-
%	i	"-	B	B	B	"-
'	i	"-	B	B	B	"-
-						
*	i	"-	B	B	B	"-
-						
*	i	"-	B	B	B	"-
-						
+ %						

/	# !	, $	, ,	% ,	, ' !	,
'	,	"-	B	B	B	"-
E % -	,	"-	B	B	B	"-
	i	"-	B	B	B	"-
+	i	B	B	B	B	"-
+ ,	i					"-
+	i		"-	"-	"-	"-

/	# !	% $	%	% ' !	%
" %	i				
&	i	$	$	$	"-
' &	,	B	B	B	"-
,	i	"-	B	B	"-
	i	"-	B	B	"-
	i	"-	B	"-	"-
' A@	i				
		"-	B	"-	"-
,	,	"-		"-	"-
%	i	"-	B	B	"-
' -	i	"-	B	B	"-
* -	i	"-	B	B	"-
* - + %	i	"-	B	B	"-
'	,	"-	B	B	"-
E % -	,	"-	B	B	"-
	i	"-	B	B	"-

/	%	%	%	%
# !	$		' !	
i		"-	"-	"-

Input Style

0," % - % % @
- @ XGetIMValues &
0,J " % - % %% K

, - -

Client Window

0, & - % % & &
& % % & & @
% - @ & % & & B -
& & %% -
% - % " ! %
%

" % @ & XSetICValues! -
0, & & XSetICValues! & & &
-

" & & @ & & "B % %
! * & - & @ %

Focus Window

0,' & - % & & % % %
0,' & & & & @ @
& % % " ! % %
& & & ?

R @

R @

R) % %

R & & &

@ % & " & & @
& & "B % % ! * &
- & @ %

0" @ % ! % & & &
& &

Resource Name and Class

0, , 0, - - %
&

& @ % & - %
@ - % " @ !
& %

" @ 0" @

Geometry Callback

0, - % 0") :
1I 5 6 1I 18 =

0, - % -
H % %
" & % % %
H - % N & & %
- & @
-

Filter Events

0,' A@ - @ %
@ % - & @
& & &

- ! % ! @
-

% - - - - @ &

Destroy Callback

0,B - % % 0")
: 1I 5 6 1I 18 = -- & % %
@ O % !& ") @
! % %
! XDestroyIC XCloseIM

String Conversion Callback

0, - @ - % 0") :
1I 5 6 1I 18 =

0, - @ - % - @
H % %
" %% - @ H
% % - @ &
@ @

* 0" @ % ! XGetIMValues & -
0,J " # E - -

String Conversion

0, - @ - % 0") - @

0, - @ - % - @ %
- H % %

- @ % % % - "
% % % -
@ @ ! @ ! @

* 0" @ % ! XGetIMValues & -
0,J "# E - -

0") - @ & ?

```
typedef struct _XIMStringConversionText {
     unsigned short               length;
     XIMStringConversionFeedback *feedback;
     Bool                         encoding_is_wchar;
     union {
          char     *mbs;
          wchar_t  *wcs;
     } string;
} XIMStringConversionText;

typedef unsigned long XIMStringConversionFeedback;
```

@ @
- - - % @
- % F % !
,CEE

Reset State

0, - % % &
- XmbResetIC XwcResetIC

0" ! % 0,+ @
& XCreateIC & ! % @

@ 0") & ?

```
typedef unsigned long XIMResetState;

#define XIMInitialState  (1L)
#define XIMPreserveState (1L<<1)
```

" 0")" ! XmbResetIC XwcResetIC &
0,+ 0"

" 0")+ @ ! XmbResetIC XwcResetIC & % @
0"

" 0, % ! 0")"

0") @ % @ & 0")"

* 0" @ % ! XGetIMValues & -
0,J "# E - -

Hot Keys

0,(D - % 0"
% % 0")(D -- !& % @
@ & % % '
& - F ! 0,(D
0")(D $,

* 0" @ % ! XGetIMValues & -
0,J "# E -

@ - % % 0")(D --

" @ ! % & @
@ & %

```
typedef struct {
     KeySym keysym;
     unsigned int modifier;
     unsigned int modifier_mask;
} XIMHotKeyTrigger;

typedef struct {
     int num_hot_key;
     XIMHotKeyTrigger *key;
} XIMHotKeyTriggers;
```

K %
? !
! MM N NN K
9! - & @ - &

# 1	# $ 1	# !
9	1	
1	1	
>	9	B

Hot Key State

0,(D - % %
& % & %
% % -

@ - % % 0")(D

```
typedef unsigned long XIMHotKeyState;

#define XIMHotKeyStateON             (0x0001L)
#define XIMHotKeyStateOFF            (0x0002L)
```

" % ! 0")(D $"

Preedit and Status Attributes

0,+ 0, - % %
% !
% XSetICValues XGetICValues @ -
& -

Area

@ 0, - % % 0
- % 0, - % %

" % 0")+ + ! 0, % %% -
- & & % - & % " & & !
@ & & $ & !
@ & & " !

" 0, % ! ,CEE! @ ! % &
%% - - - 0,' & " %
,CEE @ !

" % 0")+ 0") ! 0, % -
% @ % %
% ! % % - -
% & & & & &
0, @ & & "
& & ! % @ @ %%
& & & " 0, % ! ,CEE!
@ !

Area Needed

! 0, , - % - --
:% = @ & -
% % 0 - , ! @
F @ & -
& % %

! 0, , - % % -
%

- @ % 0")+ 0")
" - - & %
% : 1I 5 1 5 =

Spot Location

0, % E - % %
% % - & 0," % 0")+
+ % % 0")+ + !
0" @ -

% % & &
%
& & @ & &!
O & ! @ & & " & &
& & !

@ - % % 0+

Colormap

& - & % %
! % "B! %

0, % - % % "B - @
% % @ - - * &
%

0, % -
% & % - @
@ - XGetRGBColormaps @ -
- * & %

" % % ! & & %

Foreground and Background

0,' - 0,* - - % -
- % ! % @ - @ % - - "
@ % % %

" @ % ! %

Background Pixmap

0,* - + % - % - % %
- & & @ % + % @ -
- * + % & %

" @ % ! %

Font Set

0,' - % % &
- @ % 0'

" @ % ! %

Line Spacing

0,E % - % % & % -
% & & -
%

" @ % ! %

Cursor

0, - % % &
% & & - %

@ - - * &
% " @ % ! %

Preedit State

0,+ - % % % - %
" % % -

@ 0,+ & ?

```
typedef unsigned long XIMPreeditState;

#define XIMPreeditUnknown    0L
#define XIMPreeditEnable     1L
#define XIMPreeditDisable    (1L<<1)
```

" @ 0")+ A ! % % - %

" @ 0")+ B ! % % -
%

" 0,+ % ! & % %

0, 0")" ! 0,+ @ %
& XmbResetIC XwcReSetIC

* 0" @ % ! XGetIMValues & -
0,J " # E - -

Preedit State Notify Callback

% -- % & %
- - @ 0,+ , -
% % 0") - % % & ?

```
void PreeditStateNotifyCallback( ic,  client_data,  *call_data);
```

% %

- %

- % %

0")+ , & ?

```
typedef struct _XIMPreeditStateNotifyCallbackStruct {
     XIMPreeditState state;
} XIMPreeditStateNotifyCallbackStruct;
```

* 0" @ % ! XGetIMValues & -
0,J "# E - -

Preedit and Status Callbacks

& %% % 0")+ % @
% % %
& ?

0,+	&	% %
0,+ B	&	% % %
0,+ B &	&	%
0,+	@	% &
	% -	

& %% % 0")	% @	
%	& ?	

0,	&	% F
0, B	&	% -
0, B &	&	% -
	H	

@ % - % % 0")

```
typedef void (*XIMProc)();

typedef struct {
     XPointer client_data;
```

```
    XIMProc callback;
} XIMCallback;
```

A % & %
@ % %
- % -

- @ & - % %

Input Method Callback Semantics

0") % & - % -
% & @) &
- % - ! ! &
! & -- ! &
- 0 %

% @ : - % - = %
% % - & & & " ! %
F & %
- % & & &
& F % ! % & %
-! @ % - % ! % ! %

% & - % % ?

```
void CallbackPrototype( ic,  client_data,  call_data);
```

% %

- %

- % %

K - % -
@ O ! % %% %
" & ! K -
,CEE K - %
& % - % " @ ! % !
%%

& - % - % % - - %
&

Geometry Callback

- -- % &
- - - % % & ?

```
void GeometryCallback( ic,  client_data,  call_data);
```

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- %

- , & % ,CEE

& ,CEE K -

Destroy Callback

-- % & % @
@ ! % & 0
- % % & ?

```
void DestroyCallback( ic,  client_data,  call_data);
```

% %

- %

- , & % ,CEE

& ,CEE K -

String Conversion Callback

- @ -- % H
- @ -
& -! & - - %
% % & ?

```
void StringConversionCallback( ic,  client_data,  *call_data);
```

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- %

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1I 5 6 3 =
% % -
0") - @ & - %
%
! @
! ,CEE % @
- F %

0") - @ & ?

```
typedef struct _XIMStringConversionCallbackStruct {
    XIMStringConversionPosition position;
    XIMCaretDirection direction;
    short factor;
    XIMStringConversionOperation operation;
    XIMStringConversionText *text;
} XIMStringConversionCallbackStruct;
```

```
typedef short XIMStringConversionPosition;

typedef unsigned short XIMStringConversionOperation;

#define XIMStringConversionSubstitution        (0x0001)
#define XIMStringConversionRetrieval           (0x0001)
```

0") - @ + % - % -
0") - @ @ % !
! @ N % N

- %
% ! % @ - %
0") B 0") - @
% 0") B % %% '
% ! % XIMLineEnd 1!
- % % "
% XIMForwardChar XIMBackwardChar! %
@ % ! ! - %

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: = % : @ = N
0") - @ $% 0") - @ !
- @ & 0") -
@ $% 0") - @ @ !
- @ % %
@ @ ! & @ % %
@ @

Preedit State Callbacks

% % - ! *PreeditStartCallback* *PreeditDoneCallback* -- %
% % -

```
int PreeditStartCallback( ic,  client_data,  call_data);
```

% %

- %

- , & % ,CEE

% % % ! &
,CEE K - *PreeditStartCallback* & F
% - % @
& % -! @ 1

```
void PreeditDoneCallback( ic,  client_data,  call_data);
```

% %

- %

- , & % ,CEE

% % % % ! &
,CEE K - *PreeditStartCallback*

PreeditStartCallback F %% % % - % - *PreeditDrawCallback* $ *PreeditStartCallback* ! & - *PreeditDoneCallback*

Preedit Draw Callback

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% - % @ % %
D ! @ % D / !
- & -! & -
% % % & ?

```
void PreeditDrawCallback( ic,  client_data,  *call_data);
```

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- %

- % % & -

% 0")+ B & K
- &
- & ! @ %

0")+ B & & ?

```
typedef struct _XIMPreeditDrawCallbackStruct {
     int caret;      /* Cursor offset within preedit string */
     int chg_first;      /* Starting change position */
     int chg_length;      /* Length of the change in character count */
     XIMText *text;
} XIMPreeditDrawCallbackStruct;
```

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- K @ % -
- % ! & ?

R ! K % ,CEE
% -K
: - F = - -K -

R ,CEE! %

R -K - %
% @ -K -
-K - ! - -K !
% ! & - % 0")

R -K - @ F - %
% -K @ F -K %

R -K - -K H
% O - - -K ! % -K -
& %% 0") ' % ! %% %
- U * BAU

R

```
Text:      A B C D E
           ^ ^ ^ ^ ^ ^
CharPos:   0 1 2 3 4 5
```

+ - & % @

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I - - % 1 & - 0")
(! * B & % @

R - -K - -K - - & @ @
- @ @

R % &
% % % '
% ! F ! - - "
! &

```
typedef struct _XIMText {
     unsigned short length;
     XIMFeedback * feedback;
     Bool encoding_is_wchar;
     union {
          char * multi_byte;
          wchar_t * wide_char;
     } string;
} XIMText;
```

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R - -

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% & - - ! 0") &
,CEE @ - ! : @
-K = & - ! & %
0")'

A % @ %
0")' @ & ?

```
typedef unsigned long XIMFeedback;

#define     XIMReverse                      1L
#define     XIMUnderline                    (1L<<1)
#define     XIMHighlight                    (1L<<2)
```

```
#define     XIMPrimary                      (1L<<5)*
#define     XIMSecondary                    (1L<<6)*
#define     XIMTertiary                     (1L<<7)*
#define     XIMVisibleToForward             (1L<<8)
#define     XIMVisibleToBackward            (1L<<9)
#define     XIMVisibleToCenter                (1L<<10)

*† The values for XIMPrimary, XIMSecondary, and XIMTertiary were incorrectly defin
the R5 specification. The X Consortium's X11R5 implementation correctly
implemented the values for these highlights. The value of these highlights has
been corrected in this specification to agree with the values in the
Consortium's X11R5 and X11R6 implementations.
```

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- - & H
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0") & 5 % 0 N
011 5 % % @ - -
@ - - % - &
@ N 011 5 011 6 %

Preedit Caret Callback

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% % : % ! @ & & =
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% " +

```
void PreeditCaretCallback( ic,  client_data,  *call_data);
```

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- % %

% & -- + @ %
- % K - % 0")+
! & & @
@ % & ! %
! & @ %

0")+ & ?

```
typedef struct _XIMPreeditCaretCallbackStruct {
     int position;     /* Caret offset within preedit string */
     XIMCaretDirection direction;     /* Caret moves direction */
     XIMCaretStyle style;     /* Feedback of the caret */
} XIMPreeditCaretCallbackStruct;
```

0") & ?

```
typedef enum {
     XIMIsInvisible,     /* Disable caret feedback */
     XIMIsPrimary,     /* UI defined caret feedback */
     XIMIsSecondary,     /* UI defined caret feedback */
} XIMCaretStyle;
```

0") B & ?

```
typedef enum {
     XIMForwardChar, XIMBackwardChar,
     XIMForwardWord, XIMBackwardWord,
     XIMCaretUp, XIMCaretDown,
     XIMNextLine, XIMPreviousLine,
     XIMLineStart, XIMLineEnd,
     XIMAbsolutePosition,
     XIMDontChange,
 } XIMCaretDirection;
```

@ & ?

XIMForwardChar) @ & %

XIMBackwardChar) @ & %

XIMForwardWord) @ & &

XIMBackwardWord) @ & &

XIMCaretUp) @ % % -
F

XIMCaretDown) @ & % -
F

XIMPreviousLine) @ - - % @

XIMNextLine) @ - -

XIMLineStart) @ - -
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XIMLineEnd) @ %

XIMAbsolutePosition @ %
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XIMDontChange % -

Status Callbacks

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void ***StatusStartCallback***(*ic*, *client_data*, *call_data*);

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B

void ***StatusDoneCallback***(*ic*, *client_data*, *call_data*);

% %

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- , & % ,CEE

StatusStart

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void ***StatusDrawCallback***(*ic*, *client_data*, **call_data*);

% %

- %

- % & -

% & - - - -
%

0") B % 0") B &
& ?

typedef enum {

```
    XIMTextType,
    XIMBitmapType,
} XIMStatusDataType;

typedef struct _XIMStatusDrawCallbackStruct {
    XIMStatusDataType type;
    union {
        XIMText *text;
        Pixmap  bitmap;
    } data;
} XIMStatusDrawCallbackStruct;
```

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@ & %% 0")'
0")

Event Filtering

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tEvent 0") XFilterEvent &
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N % % @
& % @ - : % ! - =

& & ! ! &
& @ XFilterEvent
@

@ ! XFilterEvent

```
Bool XFilterEvent( *event,  w);
```

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% & &:

" & & - , ! XFilterEvent %% & &
% 0A@ & & - % @
@ 0 @ & & & @

" XFilterEvent ! % @ !
@ " XFilterEvent ' !
% - @

" - XFilterEvent !
-

Getting Keyboard Input

- % % % ! XmbLookupString Xw-
cLookupString

```
int XmbLookupString( ic, *event, *buffer_return, bytes_buffer,
*keysym_return, *status_return);

int XwcLookupString( ic, *event, *buffer_return, wchars_buffer,
*keysym_return, *status_return);
```

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! % :A@

- - & -
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XmbLookupString XwcLookupString -
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XmbLookupString - - ! XwcLookupString
- - * XmbLookupString Xw-
cLookupString - %
% %

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& % D @

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- % @ ?

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bLookupString O XwcLookupString
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K K
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! F

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% K - ! -
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K
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F

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" % @ % & %
! % H XmbLookupString
XwcLookupString @ - @

Input Method Conventions

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& % F & %
% @

Client Conventions

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- =! - &
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Synchronization Conventions

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% % % XmbLookupString
XwcLookupString , D + @ & D F

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?

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@ H

R D + @ & D @ %

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% @ =

String Constants

& - - <X11/Xlib.h> -
& & % ! %
! - ! & - % @
- O H & @ %
H -

```
#define XNVaNestedList                  "XNVaNestedList"
#define XNSeparatorofNestedList         "separatorofNestedList"
#define XNQueryInputStyle               "queryInputStyle"
#define XNClientWindow                  "clientWindow"
#define XNInputStyle                    "inputStyle"
#define XNFocusWindow                   "focusWindow"
#define XNResourceName                  "resourceName"
#define XNResourceClass                 "resourceClass"
#define XNGeometryCallback              "geometryCallback"
#define XNDestroyCallback               "destroyCallback"
#define XNFilterEvents                  "filterEvents"
#define XNPreeditStartCallback          "preeditStartCallback"
#define XNPreeditDoneCallback           "preeditDoneCallback"
#define XNPreeditDrawCallback           "preeditDrawCallback"
#define XNPreeditCaretCallback          "preeditCaretCallback"
#define XNPreeditStateNotifyCallback    "preeditStateNotifyCallback"
#define XNPreeditAttributes             "preeditAttributes"
#define XNStatusStartCallback           "statusStartCallback"
#define XNStatusDoneCallback            "statusDoneCallback"
#define XNStatusDrawCallback            "statusDrawCallback"
#define XNStatusAttributes              "statusAttributes"
#define XNArea                          "area"
#define XNAreaNeeded                    "areaNeeded"
#define XNSpotLocation                  "spotLocation"
#define XNColormap                      "colorMap"
#define XNStdColormap                   "stdColorMap"
#define XNForeground                    "foreground"
#define XNBackground                    "background"
#define XNBackgroundPixmap              "backgroundPixmap"
#define XNFontSet                       "fontSet"
#define XNLineSpace                     "lineSpace"
#define XNCursor                        "cursor"
#define XNQueryIMValuesList             "queryIMValuesList"
#define XNQueryICValuesList             "queryICValuesList"
#define XNStringConversionCallback      "stringConversionCallback"
#define XNStringConversion              "stringConversion"
```

```
#define XNResetState                        "resetState"
#define XNHotKey                            "hotkey"
#define XNHotKeyState                       "hotkeyState"
#define XNPreeditState                      "preeditState"
#define XNVisiblePosition                   "visiblePosition"
#define XNR6PreeditCallbackBehavior         "r6PreeditCallback"
#define XNRequiredCharSet                   "requiredCharSet"
#define XNQueryOrientation                  "queryOrientation"
#define XNDirectionalDependentDrawing       "directionalDependentDrawing"
#define XNContextualDrawing                 "contextualDrawing"
#define XNBaseFontName                      "baseFontName"
#define XNMissingCharSet                    "missingCharSet"
#define XNDefaultString                     "defaultString"
#define XNOrientation                       "orientation"
#define XNFontInfo                          "fontInfo"
#define XNOMAutomatic                       "omAutomatic"
```

Chapter 14. Inter-Client Communication Functions

"

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)K,)A	A0	i	%%
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Client to Window Manager Communication

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Manipulating Top-Level Windows

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H % @ & & ! XIconifyWindow

```
Status XIconifyWindow( *display,  w,  screen_number);
```

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H % @ & & & & ! XWithdrawWindow

Status **XWithdrawWindow**(**display*, *w*, *screen_number*);

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- @ - H -
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XWithdrawWindow - * &

H % @ & & - ! XReconfigureWMWindow

Status **XReconfigureWMWindow**(**display*, *w*, *screen_number*, *value_mask*, **values*);

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! % 0 & -

XReconfigureWMWindow ConfigureWindow H
% % @ & & " - - H
& *) ! %% 0 ConfigureRequestEvent - - %
% & & & - @ @

H - & & " F
H @ O & ! F

XReconfigureWMWindow - * # * &

Converting String Lists

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% % % -! 0 + %
-! % ! - &
@ 0 + % ?

```
typedef struct {
 unsigned char *value; /* property data */
 Atom encoding; /* type of property */
 int format; /* 8, 16, or 32 */
 unsigned long nitems; /* number of items in value */
} XTextProperty;
```

0 % @ @ F - %%
@ " ! %
@ @ - & % - % %
", -

F - -
F ! % - @ ! % @
@

```
#define #XNoMemory           -1
#define #XLocaleNotSupported -2
#define #XConverterNotFound  -3

typedef enum {
 XStringStyle,  /* STRING */
 XCompoundTextStyle, /* COMPOUND_TEXT */
 XTextStyle,  /* text in owner's encoding (current locale) */
 XStdICCTextStyle /* STRING, else COMPOUND_TEXT */
} XICCEncodingStyle;
```

@ - 0 + % ! XmbTextListTo-
TextProperty XwcTextListToTextProperty

int **XmbTextListToTextProperty**(*display, **list, count, style, *text_prop_return);

int **XwcTextListToTextProperty**(*display, **list, count, style, *text_prop_return);

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XmbTextListToTextProperty XwcTextListToTextProperty

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! - - " XStdICCTex-

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XSupportsLocale

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& ! , @ %

XStringStyle -

- @ !

- 0 + % ! XmbTextProp-

ertyToTextList XwcTextPropertyToTextList

int **XmbTextPropertyToTextList**(**display*, **text_prop*, ****list_return*, **count_return*);

int **XwcTextPropertyToTextList**(**display*, **text_prop*, ****list_return*, **count_return*);

% 0 @

- % 0 + %

- -

- :

XmbTextPropertyToTextList XwcTextPropertyToTextList
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% 0 + % K% %
4

) % % % : % ! - /
= % % % H
O - K% %

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ToTextList XwcTextPropertyToTextList 0,) "
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! 0 @ , ' ' %% !
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- XSupportsLocale :
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@

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K

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@ @ - %
@ -! XDefaultString $ & !
XmbTextPropertyToTextList XwcTextPropertyToTextList

- XmbTextPropertyTo-
TextList! XFreeStringList -
XwcTextPropertyToTextList! XwcFreeStringList

& % & - !
XwcFreeStringList

void **XwcFreeStringList**(**list);

% -

XwcFreeStringList XwcTextPropertyTo-
TextList

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XDefaultString - 0 @
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& -O XCreateFontSet - 0'

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! XStringListToTextProperty

Status **XStringListToTextProperty**(**list, count, *text_prop_return);

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XStringListToTextProperty % 0 + %
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% - :&
= @ K% %K
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@ & @ -! XStringListToTextProperty
0 + % F
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- % 0 + % ",
-! XTextPropertyToStringList

Status **XTextPropertyToStringList**(*text_prop, ***list_return, *count_return);

- % 0 + %

- -

- :

XTextPropertyToStringList - % -
% % 0 + %
K% % % ", 4) % % %
: % ! - / = % ,CEE :
- 9= % % "
@ ! XTextPropertyToStringList
@ F $ & ! F
- ! XFreeStringList

& % - !
XFreeStringList

void **XFreeStringList**(**list);

% -

XFreeStringList XmbTextPropertyTo-
TextList XTextPropertyToStringList -
XCreateFontSet

Setting and Reading Text Properties

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- @ & & .
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)K E"A, K) (",A= " !0 % @ % @
% % '
@ ! 17 1 7 ! 17 1 5 ! 17 8 1 ! 17 8 8 ! % @

& &N % % ! XSetTextProperty

```
void XSetTextProperty( *display,  w,  *text_prop,  property);
```

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XSetTextProperty % - % % %
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TextProperty % & &

XSetTextProperty - * ! * ! * # ! * &

& &N % % ! XGetTextProperty

```
Status XGetTextProperty( *display,  w,  *text_prop_return,  property);
```

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XGetTextProperty % % % & &
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@ K% %K % % % % N
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TextProperty F O & ! F

XGetTextProperty - * * &

Setting and Reading the WM_NAME Property

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% % - @ & &

& &N)K,)A % % & %% @ !
XSetWMName

void **XSetWMName**(*display, w, *text_prop);

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- % 0 + %

XSetWMName @ XSetTextProperty
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& &N)K,)A % % & %% @ !
XGetWMName

Status **XGetWMName**(*display, w, *text_prop_return);

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XGetWMName @ XGetTextProperty
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F

& - & @ % XSetWMName XGetWMName!
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- & &! XStoreName

XStoreName(*display, w, *window_name);

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XStoreName - * * &

- & &! XFetchName

```
Status XFetchName( *display,  w,  **window_name_return);
```

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Name & &K K ,CEE " @
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A - $ & ! % %
& ! & & - -

XFetchName - * &

Setting and Reading the WM_ICON_NAME Property

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)K" $,K,)A % % - @ & &

& &N)K" $,K,)A % % ! XSetWMIconName

```
void XSetWMIconName( *display,  w,  *text_prop);
```

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% & &

- % 0 + %

XSetWMIconName @ XSetTextProperty
)K" $,K,)A % %

& &N)K" $,K,)A % % ! XGetWMIconName

```
Status XGetWMIconName( *display,  w,  *text_prop_return);
```

% 0 @

% & &

- - 0 + %

XGetWMIconName @ XGetTextProperty
)K" $,K,)A % % " F O & !
F

& @ % XSetWMIconName XGetWMIcon-
Name! % @ . @ & &
", % %

% & &N ! XSetIconName

```
XSetIconName( *display,  w,  *icon_name);
```

% 0 @

% & &

- % ! &
-

" - (+ A -! %
% XSetIconName - * * &

- & & & % ! XGetIconName

```
Status XGetIconName( *display,  w,  **icon_name_return);
```

% 0 @

% & &

- - & &N ! &
-

XGetIconName % %
& &N " ! F O & !
& &! F " @ -
& &! XGetIconName K K ,CEE "
@ E + A -! -
(+ A - $ & ! %
% & ! - -

XGetIconName - * &

Setting and Reading the WM_HINTS Property

0 % @)K(", % %
- @ & & - 0)(!

```
<X11/Xutil.h>
```

0)(! XAllocWMHints

0)(V0)(:=

XAllocWMHints % 0)(
, 0)(F "
@ ! XAllocWMHints ,CEE
!

0)(?

```
/* Window manager hints mask bits */

#define         InputHint               (1L<<0)
```

```
#define         StateHint               (1L<<1)
#define         IconPixmapHint          (1L<<2)
#define         IconWindowHint          (1L<<3)
#define         IconPositionHint        (1L<<4)
#define         IconMaskHint            (1L<<5)
#define         WindowGroupHint         (1L<<6)
#define         UrgencyHint             (1L<<8)
#define         AllHints                (InputHint|StateHint|IconPixmapHint|
                                         IconWIndowHint|IconPositionHint|
                                         IconMaskHint|WindowGroupHint)


/* Values */

typedef struct {
 long flags;         /* marks which fields in this structure are defined */
 Bool input;         /* does this application rely on the window manager to
              get keyboard input? */
 int initial_state; /* see below */
 Pixmap icon_pixmap; /* pixmap to be used as icon */
 Window icon_window; /* window to be used as icon */
 int icon_x, icon_y; /* initial position of icon */
 Pixmap icon_mask; /* pixmap to be used as mask for icon_pixmap */
 XID window_group; /* id of related window group */
 /* this structure may be extended in the future */
} XWMHints;
```

% & & - %
%% %% % % @ %
& & : ! % - =!
0 # 19 %% @ !
! %% % & &
& - @ % @ & & & & -
%% - & % %
- & & & @ & % :
! % - = ' %%
@ % % '

+ & & - % % %%
- % - % % @ & & %% & %
+ & & - %
%% - % + &
%% % : % ! & @ %% & % '
% & & =

K - ?

```
#define      WithdrawnState 0
#define      NormalState    1   /* most applications start this way */
#define      IconicState    2   /* application wants to start as an icon */
```

K % & % K% %
& - * K% % K

% K& & %% % @ & &
& & - %% & &K- % %
& & - - % & & ' % ! - %
% % % % @ & & ! & % @ -
& & - & & /
& &

C - (-! - !
& & - ! H - % & &
- & & N & & &
- % @ &
- - : - - & &
- - = & & & &

& &N)K(", % % ! XSetWMHints

XSetWMHints(*display, w, *wmhints);

% 0 @

% & &

% 0)(

XSetWMHints & & -
! & &! & %%
& & - - %

XSetWMHints - * * &

& &N)K(", % % ! XGetWMHints

XWMHints ***XGetWMHints**(*display, w);

% 0 @

% & &

XGetWMHints & & - ,CEE
)K(", % % & & & % 0)(
& ! %
-

XGetWMHints - * &

Setting and Reading the WM_NORMAL_HINTS Property

0 % @)K,$) EK(",
% % - @ & & - 0 F (
! <X11/Xutil.h>

F 0 F (- & ! & %
%% & ") + -
0 % & -
- !

0 F(! XAllocSizeHints

0 F(V0 F(:=

XAllocSizeHints % 0 F(
, 0 F(F
" @ ! XAllocSizeHints ,CEE
!

0 F(?

```
/* Size hints mask bits */

#define           USPosition          (1L<<0)  /* user specified x,y */
#define           USSize              (1L<<1)  /* user specified width,height */
#define           PPosition           (1L<<2)  /* program specified posistion */
#define           PSize               (1L<<3)  /* program specified size */
#define           PMinSize            (1L<<4)  /* program specified minimum size */
#define           PMaxSize            (1L<<5)  /* program specified maximum size */
#define           PResizeInc          (1L<<5)  /* program specified resize incremen
#define           PAspect             (1L<<6)  /* program specified min and max asp
#define           PBaseSize           (1L<<8)
#define           PWinGravity         (1L<<9)
#define           PAllHints           (PPosition|Psize|
                                       PMinSize|PMaxSize|
                                       PResizeInc|PAspect)


/* Values */

typedef struct {
 long flags;          /* marks which fields in this structure are defined */
 int x, y;          /* Obsolete */
 int width, height; /* Obsolete */
 int min_width, min_height;
 int max_width, max_height;
 int width_inc, height_inc;
 struct {
        int x;          /* numerator */
        int y;          /* denominator */
 } min_aspect, max_aspect;
 int base_width, base_height;
 int win_gravity;
 /* this structure may be extended in the future */
} XSizeHints;
```

!!& ! - & %
K& K - % &
& F & %% K& K -
% & & F & K - K
% - F : = & &
& % F K % K % %
! & %% % - %
% K& K - F

& & & & - & % % & &
& % % - @ & &
% & K- @ - & &
%% & & - " & !
& & - % & & & ! %
% & &N & K- @ & % &
& & & @ % & & -

, + (- -

& &N)K,$) EK(", % % ! XSetWMNormalHints

void **XSetWMNormalHints**(**display*, *w*, **hints*);

% 0 @

% & &

% F & &

XSetWMNormalHints % F
)K,$) EK(", % % % & & " % %
! XSetWMNormalHints F)K,$) EK(",
% % % & & % % & %
)K "LAK(", I8

XSetWMNormalHints - * * &

& &N)K,$) EK(", % % ! XGetWMNormalHints

Status **XGetWMNormalHints**(**display*, *w*, **hints_return*, **supplied_return*);

% 0 @

% & &

- F & &

- & %%

XGetWMNormalHints F
)K,$) EK(", % % % & & " % % %
)K "LAK(", ! I8! - - :%
")= & F ! XGetWMNormalHints @
0 F (! %% K -
& %% :& @ =!
F $ & ! F

" XGetWMNormalHints % ") F % %
! %% K - & & - ?

(USPosition|USSize|PPosition|PSize|PMinSize|
PMaxSize|PResizeInc|PAspect)

" % % - - F & & - @
& ! %% K - & & - ?

PBaseSize|PWinGravity

XGetWMNormalHints - * &

& &N)K "LAK(", % % ! XSetWMSizeHints

void **XSetWMSizeHints**(**display*, *w*, **hints*, *property*);

% 0 @

% & &

% 0 F (

% % %

XSetWMSizeHints % F % % %
& & " % % % ! XSetWMSize-
Hints F % % % & & % %
& %)K "LAK(", I8 & &N
F ! XSetWMNormalHints

XSetWMSizeHints - * ! * ! * &

& &N)K "LAK(", % % ! XGetWMSizeHints

Status **XGetWMSizeHints**(**display*, *w*, **hints_return*, **supplied_return*, *property*);

% 0 @

% & &

- 0 F (

- & %%

% % %

XGetWMSizeHints F % % %
& & " % % %)K "LAK(", !
I8! - - :% ")= & F
! XGetWMSizeHints @ 0 F (!
%% K - & %%
:& @ =! F $
& ! F - & &N F !
XGetWMNormalHints

" XGetWMSizeHints % ") F % %
! %% K - & & - ?

```
(USPosition|USSize|PPosition|PSize|PMinSize|
 PMaxSize|PResizeInc|PAspect)
```

" % % - - F & & - @
& ! %% K - & & - ?

```
PBaseSize|PWinGravity
```

XGetWMSizeHints - * * &

Setting and Reading the WM_CLASS Property

0 % @ -)K E % %
- @ & & 0 (! &

```
<X11/Xutil.h>
```

0 (! XAllocClassHint

0 (V0 (:=

XAllocClassHint % 0 (
, % 0 (
,CEE " @ ! XAllocClassHint ,CEE
!

0 (?

```
typedef struct {
 char *res_name;
 char *res_class;
} XClassHint;
```

K %% ! K
%% , % %
)K,)A !)K,)A % &
% ! ! % :
% ! N = $!
% %)K E %%
& @ - %% N

& &N)K E % % ! XSetClassHint

XSetClassHint(*display*, *w*, *class_hints*);

% 0 @

% & &

-# % 0 (

XSetClassHint % & & "
- (+ A -! %
%

XSetClassHint - * * &

& &N)K E % % ! XGetClassHint

```
Status XGetClassHint( *display,  w,  *class_hints_return);
```

% 0 @

% & &

-# - 0 (

XGetClassHint % & &
%% " @ E
+ A -! - (+
A - $ & ! % % "
F O & ! F K
K & & - ! @

XGetClassHint - * &

Setting and Reading the WM_TRANSIENT_FOR Property

0 % @)K , "A, K'$
% % - @ & &

& &N)K , "A, K'$ % % ! XSetTransientForHint

```
XSetTransientForHint( *display,  w,  prop_window);
```

% 0 @

% & &

- % & &)K , "A, K'$
% %

XSetTransientForHint)K , "A, K'$ % %
% & & % % %K& &

XSetTransientForHint - * * &

& &N)K , "A, K'$ % % ! XGetTransientForHint

```
Status XGetTransientForHint( *display,  w,  *prop_window_return);
```

% 0 @

% & &

- -)K , "A, K'$ % %
% & &

XGetTransientForHint)K , "A, K'$ % %
% & & " F O & !
F

XGetTransientForHint - * &

Setting and Reading the WM_PROTOCOLS Property

0 % @)K+ $ $ $E % %
- @ & &

& &N)K+ $ $ $E % % ! XSetWMProtocols

```
Status XSetWMProtocols( *display,  w,  *protocols,  count);
```

% 0 @

% & &

% %

% :

XSetWMProtocols %)K+ $ $ $E % %
% & & & % % - "
% % ! XSetWMProtocols)K+ $ $ $E % %
% & & % % -
% % & % $) I8 "
)K+ $ $ $E ! XSetWMProtocols F $
& ! F

XSetWMProtocols - * * &

& &N)K+ $ $ $E % % ! XGetWMProtocols

```
Status  XGetWMProtocols(  *display,  w,  **protocols_return,
*count_return);
```

% 0 @

% & &

- %

- :

XGetWMProtocols
)K+ $ $ $E % % % & & & &
- % & & & & & - % % "
% % ! % $)! I8!)K+ $ $ $E
! XGetWMProtocols % K -
! K - !
F $ & ! -
F !

XGetWMProtocols - * &

Setting and Reading the WM_COLORMAP_WINDOWS Property

0 % @
)K E) +K ",B$ % % - @ & &

& &N)K E) +K ",B$ % % ! XSetWMColormapWindows

```
Status XSetWMColormapWindows( *display, w, *colormap_windows, count);
```

% 0 @

% & &

- % & &

% :

XSetWMColormapWindows %)K E) +K ",B$
% % % & & & & & %
%K& & - " % % ! XSetWMColormapWindows)K E) +K ",B$ % % % &
& & & & % %K& & - % %
& % ",B$ I8 "
)K E) +K ",B$! XSetWMColormapWindows F
$ & ! F

XSetWMColormapWindows - * * &

& &N)K E) +K ",B$ % % ! XGetWMColormapWindows

```
Status XGetWMColormapWindows( *display, w, **colormap_windows_return, *count_return);
```

% 0 @

% & &

- - & &

- :

XGetWMColormapWindows & &
)K E) +K ",B$ % % % & &
% & & -
& & " % % ! % ",B$! I8!
)K E) +K ",B$! XGetWMColormapWindows
& & K - & & ! K
- ! F $
& ! - F
& & !

XGetWMColormapWindows - * &

Setting and Reading the WM_ICON_SIZE Property

0 % @)K" $,K "LA % %
- @ & & 0" F ! &
<X11/Xutil.h>

0" F ! XAllocIconSize

0" F V0 " F :=

XAllocIconSize % 0" F
, 0" F F "
@ ! XAllocIconSize ,CEE
!

0" F ?

```
typedef struct {
 int min_width, min_height;
 int max_width, max_height;
 int width_inc, height_inc;
} XIconSize;
```

& K - K % - F
: = % %% F

& &N)K" $,K "LA % % ! XSetIconSizes

XSetIconSizes(**display*, *w*, **size_list*, *count*);

% 0 @

% & &

9 - % F

% F

XSetIconSizes & & - %%
F

XSetIconSizes - * * &

& &N)K" $,K "LA % % ! XGetIconSizes

Status **XGetIconSizes**(**display*, *w*, ***size_list_return*, **count_return*);

% 0 @

% & &

9 - - F

- F

XGetIconSizes F & & - F O & ! F XGetIconSizes %% & & & F & %% & & - & %% - %% XSetWMHints %% & & - & % % & & %% F F K K !

XGetIconSizes - * &

Using Window Manager Convenience Functions

XmbSetWMProperties & & - % % ! & % % - F & & - % % - @ & &)K,)A!)K" $,K,)A!)K(", !)K,$) EK(", !)K E !)K $)) ,B!)K E"A, K) (",A!)KE$ EAK,)A

void **XmbSetWMProperties**(**display*, *w*, **window_name*, **icon_name*, **argv[]*, *argc*, **normal_hints*, **wm_hints*, **class_hints*);

% 0 @

% & &

- % & & ! & -

- % ! & -

! % %% N -

% -

% F & &

-# % 0)(

-# % 0 (

XmbSetWMProperties @ % @ % % - - - & & % % - & :% & & - =

" & &K - ,CEE! XmbSetWMProperties)K,)A % % " K - ,CEE! XmbSetWMProperties)K" $,K,)A % % & &K K - - - " - @ ", -! % % & % MM ", NNO & ! - @ % ! % % & % MM $)+$C,BK A0 NN

" K - ,CEE! XmbSetWMProperties XSetWMNormalHints! &)K,$) EK(", % % : 17 1 2 = "

& K - ,CEE! XmbSetWMProperties XSetWMHints! &
)K(", % % : 17 1 6 =

" -@ - ,CEE! XmbSetWMProperties)K $)) ,B
% % -@ - - F F -

- XSetWMClientMachine :
17 8 8 =

" K - ,CEE! XmbSetWMProperties)K E
% % " K 0 (,CEE
% A $C AK,)A @ @ ! @
@ @ K " K ,CEE!
@ @ ! -@ -@S9T ! @
-@S9T! %% % ! K

" %% K K -@!
A $C AK,)A @ @ !
- E K .+A - : +$ "0 %
! E K .+A! E , @ @ = % -
)K E !)K $)) ,B!)K E"A, K) (",A % % %
- , - @ %
% - % %

' % % % ! XmbSetWMProperties
)KE$ EAK,)A % %
(+ A - @
", - % %

XmbSetWMProperties - * * &

& &N & & - % % & -
% - ! XSetWMProperties & &
- % % - @ & &)K,)A!)K" $,K,)A!
)K(", !)K,$) EK(", !)K E !)K $)) ,B!
)K E"A, K) (",A

void **XSetWMProperties**(**display*, *w*, **window_name*, **icon_name*, ***argv*, *argc*, **normal_hints*, **wm_hints*, **class_hints*);

% 0 @

% & &

- % & & ! &
-

- % ! &
-

! % %% N -

% -

-# % F & &

-# % 0)(

-# % 0 (

XSetWMProperties @ % @ - % - -
- & & % % -
& :% & & - =

" & &K - ,CEE! XSetWMProperties XSetWMName!
& ! !)K,)A % % : 17 1 7 = " K
- ,CEE! XSetWMProperties XSetWMIconName! &
)K" $,K,)A % % : 17 1 5 = " -@ - ,CEE!
XSetWMProperties XSetCommand! &)K $)) ,B % %
: 17 8 1 = , - F & F -
, - XSetWM-
ClientMachine : 17 8 8 =

" K - ,CEE! XSetWMProperties XSetWMNormal-
Hints! &)K,$) EK(", % % : 17 1 2 = "
& K - ,CEE! XSetWMProperties XSetWMHints! &
)K(", % % : 17 1 6 =

" K - ,CEE! XSetWMProperties XSetClassHint!
&)K E % % : 17 1 4 = " K
0 (,CEE % A $C AK,)A
@ @ ! @ @ @
K " K ,CEE! @ @
! -@ -@S9T ! @ -@S9T! %%
% ! K

XSetWMProperties - * * &

Client to Session Manager Communication

& ?

R)K $)) ,B % %

R)K E"A, K) (",A % %

Setting and Reading the WM_COMMAND Property

0 % @)K $)) ,B % %
- @ & &

& &N)K $)) ,B % % ! XSetCommand

XSetCommand(**display*, *w*, ***argv*, *argc*);

% 0 @

% & &

! % %% N -

% -

XSetCommand - @ %
% : % ! -@ -@ % - = " -
(+ A -! %
%

XSetCommand - * * &

& &N)K $)) ,B % % ! XGetCommand

```
Status XGetCommand( *display,  w,  ***argv_return,  *argc_return);
```

% 0 @

% & &

!- %% N -

- -

XGetCommand)K $)) ,B % % %
& & - ")K $)) ,B % % ! %
", 4 " -
! XGetCommand -@K - K -
F $ & ! F "
@ E + A -! -
(+ A - $ & ! %
% - ! XFreeStringList

Setting and Reading the WM_CLIENT_MACHINE Property

0 % @)K E"A, K) (",A
% % - @ & &

& &N)K E"A, K) (",A % % ! XSetWMClientMachine

```
void XSetWMClientMachine( *display,  w,  *text_prop);
```

% 0 @

% & &

- % 0 + %

XSetWMClientMachine @ XSetTextProperty
)K E"A, K) (",A % %

& &N)K E"A, K) (",A % % ! XGetWMClientMachine

```
Status XGetWMClientMachine( *display,  w,  *text_prop_return);
```

% 0 @

% & &

- - 0 + %

XGetWMClientMachine @ % XGetTextProperty
)K E"A, K) (",A % % " F O
& ! F

Standard Colormaps

%% & % ! & - ! - F -
- " ! %% H
%% - % % @ % %% %

% ! % % - & &
% % - % ! % -
% - @ &
% % ! - ! : *= -
9 9 1 9 & % ! % - % % @ -
- % -
% - @ * % % @ @ H ! & -
% H @

$ & ! % 856 & %%
! @
- @ %
$ % 0 % ! %% @) &
@ & % ! %% %
- @ %% - %
% ! %% - % &

% ! & - - % - % -
% - % - % - %
% & 4 ! 4 - ! 7 ! 856 *
%! - % - % -
& %

- @ - %
% - % % - %
& - ! - - ! ! / - % - %
- ! & %

* % ! %
% & @ - % - % - @ @ !
& @ % % - @ ! - %
@ % % -
% %% &
%

- % - % - % % -
% @ & % & %
@ % - & @ ! & %

% % % % %%
% @ %
% @

% & %%
& %% % ! @
& %% %

@ % C ! & &
- % %% %

0 % ! XAllocStandardColormap

0 % V0 %:=

XAllocStandardColormap % 0
% , 0 %
F " @ ! XAllocStandardCol-
ormap ,CEE !

0 % ?

```
/* Hints */

#define       ReeaseByFreeingColormap  ((XID)1L)

/* Values */

typedef struct {
 Colormap colormap;
 unsigned long red_max;
 unsigned long red_mult;
 unsigned long green_max;
 unsigned long green_mult;
 unsigned long blue_max;
 unsigned long blue_mult;
 unsigned long base_pixel;
 VisualID visualid;
 XID killid;
} XStandardColormap;
```

% % XCreateColormap
K ! - K ! K - @ ! - !
@ ! % @ A - F !
@ ' % ! % I>I>8 :I % ! I
% - ! 8 % = % & @ K] 2!
- K] 2! K] I 816
K] 5! - K] 5! K] 5

K ! - K ! K - @
% % @ : K%
= ' I>I>8 ! K - I8! - K - 7!
K - 1 ' 6 ! K - I6!
- K - 6! K - 1

K% - @ % @ % % @
C ! K% XAllocColorPlanes

@ - !- ! %% % - !
% % - % @ - & - % ?

```
(r * red_mult + g * green_mult + b * blue_mult + base_pixel) & 0xFFFFFFFF
```

' % ! %! K ! K ! K%
- %
% @ ! & - % ?

```
(gray * red_mult + base_pixel) & 0xFFFFFFFF
```

, - @ % % @ - 8N % %
% - - - %
% % K % - 9 """" @ @
- % @ % - @ - % & %
! % - F -
% %

@ - @ "B @ & %
& - @ "B &
% - % "B
- XKillClient :,
- - % =

% % - 0 % @ %
*K E K) +

% % %
& & % %

Standard Colormap Properties and Atoms

@ % @ A %
% % ! % % & -
% & <X11/Xatom.h>
& - ! &
% & 0 K

*KBA' CE K) + % % @ % %
0 %
A *
% # %
@ K

%% & *

% &
% @
%% % &

% *KBA' CE K) +
4 % % 6 ! 6 - ! 6
- @ 816 :6
I6 = @ 79
856 % @ % % %
! !

*K*A K) + % % @ % %
0 %

% % * % @
:$! / @
@ =) - % -
%% @
% % %
% @
% - @ @
! & -

' 4 % + @ ! *K*A K) +
I>I>8 ' 87 % B
@ ! *K*A K) + 4>4>4

*K ABK) +! *K AA,K) +! *K*ECAK) + % % @
% % 0 %

% % ! - !
% ! % @ % %
% & % -
' % ! - -
- 4 % % - -
: & - !
& - ! & = %
% - -

*K .K) + % % @ % %
0 %

% % %
@ % @ !
%! K ! K ! K%
0 %
%

Setting and Obtaining Standard Colormaps

0 % @ 0 %

0 % ! XSetRGBColormaps

```
void XSetRGBColormaps( *display, w, *std_colormap, count, property);
```

% 0 @

% & &

- % 0 %

% :

% % %

XSetRGBColormaps % * % %
% % & & " % % ! XSetRGB-
Colormaps * % % % %
& & % % & % *K E K) + I8
, N % ")
*KBA' CE K) +

XSetRGBColormaps & &
- %! & % ?

R $% & @

R @

R % % % % & &

R " % % % ?

R % : - % =

R B @

R % : & =

R XStoreColors %% % @ %

R ' % @ 0 %

R % % & &

R C %

R C - @

XSetRGBColormaps - * ! * ! * &

0 % & % % % !
XGetRGBColormaps

```
Status XGetRGBColormaps( *display, w, **std_colormap_return,
*count_return, property);
```

% 0 @

% & &

- - 0 %

- :

% % %

XGetRGBColormaps * %
% % % & & " % % ! %
*K E K) +! I8! - - %
! XGetRGBColormaps % %
F " @ % ! XGetRGBColormaps
@ & & & O
% ! , ! &
$ & ! ! XGetRGBColormaps F
, N % ")
*KBA' CE K) +

XGetRGBColormaps - * * &

Chapter 15. Resource Manager Functions

% - @ % 0 @ : % ! !
! ! = % - %
& & & F % % -
@ & F -
- % @ % % %
@ % %

- - & & "
! % H - % % ! -
- ! & @ ! & % - @
& % % ! H & % %
! - - @ %%
& & % ! ! "
- & 0 % U
) - !U - - &

' % ! %% & % & &
@ - - & & @
- & - %% !
- & %

% & - & ! - %%
- % & &
& & @ ! &
& & / & - "
! / % /
- ' H @
% ! H &
% H -
%% % / ! - & %
%

' % ! % - U U U) U
% - * @ ! % % F !
% & A
: % ! U - U U U= " & & % %
- ! % %
%%

% @ ! %% - % & & : ! &
& @ @ = U U $ % % & &
& & U U & $
% & U
% U & & H ! U % U!
H ! U0 + * U " H
% ! U U! & ! U % U "
% ! U0 + * U! & % ! U
U H N %%
/ N H ! H %%
/ N

% - & - ? -!' !'
- @ ! * - @ ! '
- @ ! * - @ A
! !
' % ! - @ -
U @ ' - U! - U' - U

%% % : % ! =! %
% % %
- % % % - % %
! !
% - @

- <X11/Xresource.h>

Resource File Syntax

H &
@ ?

```
ResourceLine     =     Comment | IncludeFile | ResourceSpec | <empty line>
Comment     =     "!" {<any character except null or newline>}
IncludeFile     =     "#" WhiteSpace "include" WhiteSpace FileName WhiteSpace
FileName     =     <valid filename for operating system>
ResourceSpec     =     WhiteSpace ResourceName WhiteSpace ":" WhiteSpace Value
ResourceName     =     [Binding] {Component Binding} ComponentName
Binding     =     "." | "*"
WhiteSpace     =     {<space> | <horizontal tab>}
Component     =     "?" | ComponentName
ComponentName     =     NameChar {NameChar}
NameChar     =     "a"-"z" | "A"-"Z" | "0"-"9" | "_" | "-"
Value     =     {<any character except null or unescaped newline>}
```

A % @ :d= @ :c e=
F % H :S T=
% J :U U=

" ' % % - & %
& U U & %
@ & : % !
@ % =

" , - H & * -
! H & % & - U U H
U U O & ! H & % & -
UVU

@ - @ ,
" % & , !

& % %
- & # - & & % ! & H Ua
a U : & % = - F % %
! & H Uaa U : & F =
- F % F & #
& ! & H Uaa U - F
% & & # %
! & H Uaa U : &
& = - F @ @ & #
! H Uaa U! &
- - U9U U2U! - F % & -
@ % H ' ! &
H Ua & U - F % & -

% H ! & - @
- ? ! ! UFU! & ?

```
magic.values: \\000\
z\n
```

Resource Manager Matching Rules

- - & - @
H - H %
: UVU U_U % =
%% % 199 %
& % % ! - %
- :V= - %
@ - % ! - % : = - -
% / % H :_=
- %
-O % :& U_U=
% % -
: % = - H
! %
/

- : - @
& =! % @ ! % -
% > - - ! -
% - % - % A
%% @ @ - @ !
- @ ! % ! ?

R - % :& ! !
U_U= % @ @ : !
@ -=

R & - % @ &
- - U_U & -
% @ - U_U

R % - - % @ %
-

! & - ?

```
xmh*Paned*activeForeground:     red     (entry A)
*incorporate.Foreground:     blue     (entry B)
xmh.toc*Command*activeForeground:     green     (entry C)
xmh.toc*?.Foreground:     white     (entry D)
xmh.toc*Command.activeForeground:     black     (entry E)
```

H ?

```
xmh.toc.messagefunctions.incorporate.activeForeground     (name)
Xmh.Paned.Box.Command.Foreground     (class)
```

@ : ! 0 =! 1 * @ : !
+ =! 8 @ : - ! * =!
@ : % ! =! 8
B @ : @ ' - !' - =! I

Quarks

) - @ @ - ! ! %
% - (& @ ! & - -
- &! @ @
% ! - % -
- % % % -
% - H % 0
J $! & H -
H @

H - & - @ !
%%

& H ! XrmUniqueQuark

0 J 0 C H J :=

XrmUniqueQuark H - %
- & -

A ! ! % % % N 0 J

```
typedef int XrmQuark, *XrmQuarkList;
typedef XrmQuark XrmName;
typedef XrmQuark XrmClass;
typedef XrmQuark XrmRepresentation;
#define NULLQUARK ((XrmQuark) 0)
```

E % H F
- - %

```
typedef XrmQuarkList XrmNameList;
typedef XrmQuarkList XrmClassList;
```

@ - H ! XrmStringToQuark XrmPermStringToQuark

```
#define XrmStringToName(string) XrmStringToQuark(string)
#define XrmStringToClass(string) XrmStringToQuark(string)
#define XrmStringToRepresentation(string) XrmStringToQuark(string)
```

```
XrmQuark XrmStringToQuark( *string);
```

% - & H :J

@ - H % "
- (+ A -! @ %
% - - XrmStringToQuark %
- XrmPermStringToQuark / XrmStringToQuark!
% 0 % - - % !
! ! @ XrmQuarkToString

' - @ H ! XrmStringToQuark ,CEE @ !
& @ : =

@ H -! XrmQuarkToString

```
#define XrmNameToString(name)  XrmQuarkToString(name)
#define XrmClassToString(class)  XrmQuarkToString(name)
#define XrmRepresentationToString(type)  XrmQuarkToString(type)
```

```
char *XrmQuarkToString( quark);
```

0 . % H & H @ -

@ H % -
- % @
- H - - % -
H " - H ! XrmQuarkToString ,CEE
' - @ H ! XrmQuarkToString ,CEE @ !
& @ : =

@ - & % H ! XrmString-ToQuarkList

```
#define XrmStringToNameList(str,name)  XrmStringToQuarkList((str), (name))
#define XrmStringToClassList(str,class)  XrmStringToQuarkList((str), (class))
```

```
void XrmStringToQuarkList( *string,  quarks_return);
```

% - & H :J

0 .- H
% H - XrmStringToQuarkList

XrmStringToQuarkList @ -:-
H = H , - @
, : 15 1 = " - (+
A -! @ % %

- % 0 * -E %
- : ! & -
% % =

```
typedef enum {XrmBindTightly, XrmBindLoosely} XrmBinding, *XrmBindingList;
```

XrmBindTightly % % % ! XrmBind-
Loosely % %

@ - & % - H !
XrmStringToBindingQuarkList

XrmStringToBindingQuarkList(**string*, *bindings_return*,
quarks_return);

% - & H :J

- -
% - - XrmStringToBindingQuarkList

0 .- H
% H - XrmStringToBindingQuarkList

% % %
- @ , : 15 1 = "
- & % ! - - '
% ! - MMV V NN ?

```
quarks:      a        b        c
bindings:    loose    tight    loose
```

Creating and Storing Databases

% H % !0 B A @
0 # F ! ! %
% F % % % & --
%% % : % ! -
MM NN MM NN= " - & % &
0 # ?

```
typedef struct {
     unsigned int size;
     XPointer addr;
} XrmValue, *XrmValuePtr;
```

F - ! XrmInitialize

```
void XrmInitialize( XrmInitialize(\|));
```

@ ! XrmGetFileDatabase

```
XrmDatabase XrmGetFileDatabase( *filename);
```

%

XrmGetFileDatabase % % ! &
! & % %
% H @ E :
15 1 =O - &
% % % !
" % % ! XrmGet-
FileDatabase ,CEE

% ! XrmPutFileDatabase

```
void XrmPutFileDatabase( database,  *stored_db);
```

%

- %

XrmPutFileDatabase % %
% & H @ E
: 15 1 = & A
- (+ A -
- @ - ! &
% % & &
% % A & % % MM -NN
-

% % % ! XResource-
ManagerString

```
char *XResourceManagerString( *display);
```

% 0 @

XResourceManagerString A $C AK) , A % %
@ N & & F ! & & &
& % - XOpenDisplay % % @ %
", @ %

XmbTextPropertyToTextList - ", % %
- & 0 % % @
% XrmGetStringDatabase " % %
! ,CEE

% % ! XScreenResourceString

```
char *XScreenResourceString( *screen);
```

%

XScreenResourceString AA,K A $C A % %
& & % % % @ %
", @ % Xmb-
TextPropertyToTextList - ", % % % % @
% XrmGetStringDatabase " % %
! ,CEE % - -
-

-! XrmGetStringDatabase

```
XrmDatabase XrmGetStringDatabase( *data);
```

% - -

XrmGetStringDatabase &
% % - XrmGetStringDatabase
XrmGetFileDatabase % -
- H @
E : 15 1 = O
- - & % %
- % !

! XrmLocaleOfDatabase

```
char *XrmLocaleOfDatabase( database);
```

%

XrmLocaleOfDatabase
% ! - -
& 0 0 %
- C - ! &
0

! XrmDestroyDatabase

```
void XrmDestroyDatabase( database);
```

%

" ,CEE! XrmDestroyDatabase

& % ! XrmSetDatabase

```
void XrmSetDatabase( *display,  database);
```

% 0 @

%

XrmSetDatabase % : ,CEE=
& % % % @ & % :
= @
-

- & % ! XrmGetDatabase

```
XrmDatabase XrmGetDatabase( *display);
```

% 0 @

XrmGetDatabase & %
% " ,CEE

Merging Resource Databases

- ! XrmCombineFileDatabase

```
Status XrmCombineFileDatabase( *filename,  *target_db,  override);
```

%

- % &
-

! % & @ -

XrmCombineFileDatabase -
" %
! & % @
O & ! %
" ! F O & ! F
" - K ,CEE! XrmCombineFileDatabase
& $ & ! % - K
- - & - -
@ % ! - -

- ! XrmCombineDatabase

```
void XrmCombineDatabase( *target_db,  override);
```

- % -
-

- % &
-

! % & @ -

XrmCombineDatabase -
" % !
K & % - K @ O & !
K " - K ,CEE! XrmCombineDatabase
% K $ & ! K -!
% - K
- & - - @ % ! -
-

- & @
! XrmMergeDatabases

void **XrmMergeDatabases**(*target_db);

- % -
-

- % &
-

- XrmMergeDatabases H @ - XrmCombine-Database & @ -

Looking Up Resources

@ ! XrmGetResource! XrmQGetRe-source! XrmQGetSearchResource

Bool **XrmGetResource**(*database, *str_name, *str_class, **str_type_return, *value_return);

%

- % H @ -
@ : -=

- % H @ -
@ : -=

- - % %
: -=

! - @

Bool **XrmQGetResource**(*database, *quark_name, *quark_class, *quark_type_return, *value_return);

%

0 .- % H @ -
@ : H =

0 .- % H @ -
@ : H =

0 .- - % %
: H =

! - @

XrmGetResource XrmQGetResource @
% * H > % !
% ! @ : F > % = @
% % O !

@ & XrmPutResource! XrmQPutResource! XrmMergeDatabases - & @
- - - %
" & ! XrmGetResource XrmQGetResource O & ! '

) %% %
0 % H
F 1 89 % & > -
% XrmGetResource & 8 - ! &
- > % @ % %%
% - % - @ - %
>

@ ! XrmQGetSearchList

Bool **XrmQGetSearchResource**(*database*, *names*, *classes*, *list_return*, *list_length*);

%

%

%

-
% - XrmQGetSearchList

- # % : F =
K

XrmQGetSearchList
@ & - &
- XrmGetResource -%
" K & - - ! XrmQGetSearchList O
& ! '

F % %
@ & %
& - I ! & %

- XrmQGetSearchList & % % &
% ! % %
XrmQGetSearchList

@ - @ ! XrmQGetSearchResource

Bool **XrmQGetSearchResource**(*list*, *name*, *class*, **type_return*, **value_return*);

% XrmQGetSearchList

%

%

- % %

! - @

XrmQGetSearchResource % @
%
% & XrmQGetSearchResource
& O & ! '

XrmQGetSearchList & -
% & XrmQGetSearchResource &
% XrmGetResource XrmQGetResource & H

Storing into a Resource Database

! XrmPutResource XrmQPutResource
* % % ! % % !
@ @ % %

void **XrmPutResource**(**database*, **specifier*, **type*, **value*);

%

% % % %

% %

! % @ !& %
-

" ,CEE! XrmPutResource &
% XrmPutResource @ XrmStringToBindingQuarkList & ?

XrmQPutResource(database, bindings, quarks, XrmStringToQuark(type), value)

" % % (+ A -!
% % @ &

```
void XrmQPutResource( *database,  bindings,  quarks,  type,  *value);
```

%

% -

0 . % % %

% %

! % @ ! & %
-

" ,CEE! XrmQPutResource &
% " & - H
! % @ % @ % & %
% @ @ &

% -! XrmPutStringResource

```
void XrmPutStringResource( *database,  *specifier,  *value);
```

%

% % % %

! % @ ! & %
-

" ,CEE! XrmPutStringResource &
% XrmPutStringResource & % @
% XrmPutStringResource @
XrmStringToBindingQuarkList % XrmQPu-
tResource! - MM -NN % % " % (
+ A -! % % @
&

- - H % ! XrmQPutStringRe-
source

```
void XrmQPutStringResource( *database,  bindings,  quarks,  *value);
```

%

% -

0 . % % %

! % @ ! & %
-

" ,CEE! XrmQPutStringResource &
% XrmQPutStringResource @
0 # @ - : - strlen % F =

XrmQPutResource! - MM -NN % % @
&

- % -
@ ! XrmPutLineResource

```
void XrmPutLineResource( *database,  *line);
```

%

% @ % -
-

" ,CEE! XrmPutLineResource &
% XrmPutLineResource - %
@ E : 15 1 =
& O -
- & % % - %
" *ResourceName* (+
A -! % % ,

Enumerating Database Entries

! XrmEnumerateDatabase

```
#define       XrmEnumAllLevels       0
#define       XrmEnumOneLevel        0

Bool XrmEnumerateDatabase( database,  name_prefix,  class_prefix,  mode,
(*proc)(),  arg);
```

%

- % %

- % %

% @

% %
-

% %% - &
% %

XrmEnumerateDatabase % %
& % - @ >
% & % % "
0 A $ E @ ! - @ > %
& / - %% " 0 A E @ !
- @ > % &
%% " % !
" % & ' ! -
'

% & & - - ?

```
(*proc)(database, bindings, quarks, type, value, arg)
     XrmDatabase *database;
     XrmBindingList bindings;
     XrmQuarkList quarks;
     XrmRepresentation *type;
     XrmValue *value;
     XPointer arg;
```

- H ,CEEJC D , %
% % ! @

% " 0 F !
% &
% 0 -

Parsing Command Line Options

XrmParseCommand % -
% - &

```
typedef enum {
     XrmoptionNoArg,     /* Value is specified in XrmOptionDescRec.value */
     XrmoptionIsArg,     /* Value is the option string itself */
     XrmoptionStickyArg,     /* Value is characters immediately following option *
     XrmoptionSepArg,     /* Value is next argument in argv */
     XrmoptionResArg,     /* Resource and value in next argument in argv */
     XrmoptionSkipArg,     /* Ignore this option and the next argument in argv */
     XrmoptionSkipLine,     /* Ignore this option and the rest of argv */
     XrmoptionSkipNArgs     /* Ignore this option and the next
          \ \ \ XrmOptionDescRec.value arguments in argv */
} XrmOptionKind;
```

, XrmoptionSkipArg H @ XrmoptionSkipNArgs &
0 $% B *value* - @ , @
F XrmoptionSkipNArgs % %%

```
typedef struct {
     char *option;     /* Option specification string in argv              */
     char *specifier;     /* Binding and resource name (sans application name)
```

```
    XrmOptionKind argKind;      /* Which style of option it is          */
    XPointer value;     /* Value to provide if XrmoptionNoArg or
         \ \ \ XrmoptionSkipNArgs    */
} XrmOptionDescRec, *XrmOptionDescList;
```

! XrmParseCommand

```
void XrmParseCommand( *database,    table,    table_count,    *name,
*argc_in_out,  **argv_in_out);
```

%

% -
%

- %

% %%

- - % -
- -

!- - % -
- -

XrmParseCommand % : - ! -@= % - %
% ! - F % % & %
MM -!NN : - ! -@= % @ - F % "
,CEE! XrmParseCommand &
% $ & ! % "
!

% % - F %
@ -@! %
-@
% -! % ! % ! @ % @
% XrmoptionNoArg % %
- -@! % @ - @
&
- MM -NN % % - - %
- -@ -
- & % -
%% - - %
, % -
- - % ! @ % ,
% -: -= ! %
:= :V= , %
% H ! ,
% % " - ,
(+ A -! % %

& - % @ % % ?

```
static XrmOptionDescRec opTable[] = {
{"-background",     "*background",                  XrmoptionSepArg,    (XPointer)
{"-bd",             "*borderColor",                 XrmoptionSepArg,    (XPointer)
{"-bg",             "*background",                  XrmoptionSepArg,    (XPointer)
{"-borderwidth",    "*TopLevelShell.borderWidth",   XrmoptionSepArg,    (XPointer)
{"-bordercolor",    "*borderColor",                 XrmoptionSepArg,    (XPointer)
{"-bw",             "*TopLevelShell.borderWidth",   XrmoptionSepArg,    (XPointer)
{"-display",        ".display",                     XrmoptionSepArg,    (XPointer)
{"-fg",             "*foreground",                  XrmoptionSepArg,    (XPointer)
{"-fn",             "*font",                        XrmoptionSepArg,    (XPointer)
{"-font",           "*font",                        XrmoptionSepArg,    (XPointer)
{"-foreground",     "*foreground",                  XrmoptionSepArg,    (XPointer)
{"-geometry",       ".TopLevelShell.geometry",      XrmoptionSepArg,    (XPointer)
{"-iconic",         ".TopLevelShell.iconic",        XrmoptionNoArg,     (XPointer)
{"-name",           ".name",                        XrmoptionSepArg,    (XPointer)
{"-reverse",        "*reverseVideo",                XrmoptionNoArg,     (XPointer)
{"-rv",             "*reverseVideo",                XrmoptionNoArg,     (XPointer)
{"-synchronous",    "*synchronous",                 XrmoptionNoArg,     (XPointer)
{"-title",          ".TopLevelShell.title",         XrmoptionSepArg,    (XPointer)
{"-xrm",            NULL,                           XrmoptionResArg,    (XPointer)
};
```

```
"      !      -   :   -= %            -      !
          %                    -    "
   &    %       !           %      %%
&              %E @     :    !      &   & !     - % %
 % &   & = "        %              &   &   !       %
 %%     &   &     @

   %   -         !     H     -      @         %
                              %    ,      %%
   &
```

Chapter 16. Application Utility Functions

$ @ F 0 ! 0 ?

R C

R C E 1 @

R % -

R + & & -

R) % -

R C

R B %% % @ %

R) % -

R) % %

R C -

- %! % % @
H %) -
% H @

Using Keyboard Utility Functions

%% - & D D ! -
D ! %% - & D -
% % @ %% -
D D - - @
18 2 D !
18 2

D D @ ! XLookupKeysym

```
KeySym XLookupKeysym( *key_event,  index);
```

. -! % D + D @

% D @ N
D

XLookupKeysym - @ @ %
D % D
0D + A@ 0D A@ " D
D @ ! XLookupKeysym ,

D % D ! XKeycodeToKeysym

```
KeySym XKeycodeToKeysym( *display,  keycode,  index);
```

% 0 @

. % D

% D @

XKeycodeToKeysym 0 D
% D D @ "
! XKeycodeToKeysym ,

D @ - % D ! XKeysymToKeycode

```
KeyCode XKeysymToKeycode( *display,  keysym);
```

% 0 @

. % D

" % D D ! XKeysymToKeycode
F

%% - & D D 0
- @ ! 0
% ! XRefreshKeyboardMapping

```
XRefreshKeyboardMapping( *event_map);
```

! - % %% - @

XRefreshKeyboardMapping %
. &) %% -, @ &
H) %% -D) %% -)
% 0 N & -

%% & D ! XConvertCase

```
void XConvertCase( keysym,  *lower_return,  *upper_return);
```

. % D :'

- & !

- %% !

XConvertCase %% & %
D ! D / @ O & ! %
D & K %% K %% @
E D % %

D @ - & @
D D ! XStringToKeysym

```
KeySym XStringToKeysym( *string);
```

% D @

D <X11/keysymdef.h> @ -
0DK % D % 0
& D @
& 0 % %

" D (+ A -!
% % " % - @ D !
XStringToKeysym ,

@ D D ! XKeysymToString

```
char *XKeysymToString( keysym);
```

. % D :'

- -
(+ A - " % D !
XKeysymToString ,CEE

KeySym Classification Macros

. & D ! % ! %
. D % & -

" D : . =

. % D

% D

"' D : . =

. % D

% D

"D % D : . =

. % D :'

% D %

"+ @ D % D : . =

. % D :'

% D @ % @ %

") ' D : . =

. % D :'

% D

") D : . =

. % D

% D

" +'D : . =

. % D

% D +'

Using Latin-1 Keyboard Event Functions

% 1I F % !
% & %% & E 1 ""
! 0 % @ % % % XLookupString
18 2
% % 1I
%

% @ " $ E 1 -! XLookupString

```
int XLookupString( *event_struct, *buffer_return, bytes_buffer,
*keysym_return, *status_in_out);
```

! - % @ .
% 0D + A@ 0D A@

-

- % - ,
K

. - D % @
- ,CEE

- - % 0 %
,CEE

XLookupString @ D -
D - % ! E ! - %!
0 + % " D
: XRebindKeysym=! - &
$ & ! D %% ! % ! " $ E 1 :
= "" !
XLookupString

" % : ,CEE=! 0 % ! &
% @ 0 ! % @ XLookupString %
% % - 0 % %
% O % % - % ,CEE -

XLookupString % %
@ ! XRefreshKeyboardMapping %
%

- D XLookupString! XRebindKeysym

```
XRebindKeysym( *display, keysym, list[], mod_count, *string,
num_bytes);
```

% 0 @

. % D :'

% D

- %

% - % &
XLookupString

- % - -

XRebindKeysym - D
" 0 @ % @ &
- - XLookupString -&
%% % % & D & @
, @ % O %
%% - %% % - , D

Allocating Permanent Storage

& @ -@ ! Xpermalloc

```
char *Xpermalloc( size);
```

Xpermalloc - @
% - & - %
% @ % % @ - @ % -

Parsing the Window Geometry

% & &- -! XParseGeometry

```
int XParseGeometry( *parsestring,  *y_return,  *height_return);
```

% - & %

-

-

#-

#- & -

* @ ! 0 %% - & & F
% XParseGeometry
& % & &- % !
% - ?

```
[=][<width>{xX}<height>][{+-}<xoffset>{+-}<yoffset>]
```

% - & :"
\ ^ - ! S T % ! c e MM
NN , %% - = " -
(+ A -! % %

XParseGeometry &
@ :& ! - ! ! = & -
& @ - @ * @ ! g9 H [9!
MM% & & @ -
- NN' @ ! % - - % '
@ ! - - %
0# !.# ! # !(- # !0, - @ ! ., - @
<X11/Xutil.h> & & @ @
-

" 0# .# -! % & &
H %

& &N - ! XWMGeometry

int **XWMGeometry**(*display, screen, *user_geom, *def_geom, bwidth, *hints, *y_return, *width_return, *height_return, *gravity_return);

% 0 @

%

- % % - ,CEE

- % %% N -
,CEE

% &

% F & &

-

-

#-

#- & -

! - & & - @

XWMGeometry - :- @
XParseGeometry= % - % - &
F :)K,$) EK(", =
% ! F ! - @ :, @ ! , A @ ! A @ !
@ = & & " F
0 F (! F $ & ! F F
" F ! F
: XParseGeometry= & @
% & % @

- - , & @
K K @

, @ - % & - F
% & K- @
- @ K %

Manipulating Regions

- % 0 % @ %
- - % H % - <X11/Xutil.h> 0 % @
% - & ?

R ! %! -

R) @ -

R % & -

R B - % H

R E % - -

Creating, Copying, or Destroying Regions

& % - ! XCreateRegion

- 0 - :=

- - % - ! XPolygonRegion

```
Region XPolygonRegion( points[], n, fill_rule);
```

% %

% % % -

- % & %
. % A@ $ -

XPolygonRegion - % - %
' % K ! XCreateGC

% - ! XSetRegion

```
XSetRegion( *display, gc, r);
```

% 0 @

%

% -

XSetRegion % % -
- % @ & N - - % -
% % $! -

- & % - ! XDestroyRegion

```
XDestroyRegion( r);
```

% -

Moving or Shrinking Regions

@ - % ! XOffsetRegion

```
XOffsetRegion( r, dy);
```

% -

% ! &
& :B % -

- % ! XShrinkRegion

```
XShrinkRegion( r, dy);
```

% -

% ! &
& :B % -

+ @ @ F - ! - @ @ % -

Computing with Regions

- - - - ! XClipBox

```
XClipBox( r, *rect_return);
```

% -

- - -

XClipBox - - %
-

% & - ! XIntersectRegion

```
XIntersectRegion( dr_return);
```

% & - & & & %
%

- %

% & - ! XUnionRegion

XUnionRegion(*dr_return*);

% & - & & & %
%

- %

- - ! XUnionRectWithRegion

XUnionRectWithRegion(*rectangle, src_region, dest_region_return*);

% -

- % -

- - -

XUnionRectWithRegion % -
% - % -

& - ! XSubtractRegion

XSubtractRegion(*dr_return*);

% & - & & & %
%

- %

XSubtractRegion
K

& & - !
XXorRegion

XXorRegion(*dr_return*);

% & - & & & %
%

- %

Determining if Regions Are Empty or Equal

% - % ! XEmptyRegion

Bool **XEmptyRegion**(*r*);

% -

XEmptyRegion - %

& - @ ! F! %! XEqualRegion

```
Bool XEqualRegion( r2);
```

&

6 % & -

XEqualRegion & - @ !
F! %

Locating a Point or a Rectangle in a Region

% % % - ! XPointInRegion

```
Bool XPointInRegion( r,  y);
```

% -

% :0

XPointInRegion % :! =
-

% - - ! XRectInRegion

```
int XRectInRegion( r,  y,  height);
```

% -

% :0

#

% & - :

XRectInRegion - " -
% - ! - $ - % - !
- + - % % -

Using Cut Buffers

0 % @ % ! @ %
% % &
- - & : 75 = -

% % % & & %
! ", - -
- 0 & - - A - % @
- % : 9 - 2=

9! XStoreBytes

```
XStoreBytes( *display,  *bytes,  nbytes);
```

% 0 @

% !& ""

%

@
N @ - XFetchBytes

XStoreBytes - *

% ! XStoreBuffer

```
XStoreBuffer( *display,  *bytes,  nbytes,  buffer);
```

% 0 @

% !& ""

%

% :'

" @ % ! @

XStoreBuffer - *

9! XFetchBytes

```
char *XFetchBytes( *display,  *nbytes_return);
```

% 0 @

-

XFetchBytes K -
! $ & ! ,CEE
9 %% % - %
- & & -

% ! XFetchBuffer

```
char *XFetchBuffer( *display,  *nbytes_return,  buffer);
```

% 0 @

-

% :'

XFetchBuffer F K -
@ %

! XRotateBuffers

XRotateBuffers(**display*, *rotate*);

% 0 @

% &

XRotateBuffers ! 9
! 1 [1 4! -
- % , XRotateBuffers - *)
- @

Determining the Appropriate Visual Type

- % %% % A @ @
@ % %% % .
& @ %%

@ 0# "
!& <X11/Xutil.h> ?

```
/* Visual information mask bits */


#define   VisualNoMask                0x0
#define   VisualIDMask                0x1
#define   VisualScreenMask            0x2
#define   VisualDepthMask             0x4
#define   VisualClassMask             0x8
#define   VisualRedMaskMask           0x10
#define   VisualGreenMaskMask         0x20
#define   VisualBlueMaskMask          0x40
#define   VisualColormapSizeMask      0x80
#define   VisualBitsPerRGBMask        0x100
#define   VisualAllMask               0x1FF




/* Values */

typedef struct {
     Visual *visual;
     VisualID visualid;
     int screen;
     unsigned int depth;
     int class;
     unsigned long red_mask;
     unsigned long green_mask;
     unsigned long blue_mask;
```

```
    int colormap_size;
    int bits_per_rgb;
} XVisualInfo;
```

@ % % !
XGetVisualInfo

```
XVisualInfo *XGetVisualInfo( *display,  vinfo_mask,  *vinfo_template,
*nitems_return);
```

% 0 @

! - . % @ @

! - % @
- @

- - @

XGetVisualInfo @ @
H % @ K % " @
% - % @ K ! XGetVisualInfo ,CEE
!

@ % %
! XMatchVisualInfo

```
Status  XMatchVisualInfo(  *display,  screen,  depth,  class,
*vinfo_return);
```

% 0 @

%

% %

%

! - @

XMatchVisualInfo @ @
% % * % @
% % ! @
" @ ! XMatchVisualInfo F
@ @ K $ & ! & @ ! XMatchVisualInfo
F

Manipulating Images

0 % @ @ % % - %
- - 0" - ! <X11/Xlib.h>
* % - @ - !
- - % % %%

- % -)
% @ @ % H

&
- - % - ! % @
- % - - % - -
XGetImage XPutImage

, @ ! ! & -

0" - - N
H - ! & !
- & - @ , K% K
& - $:
% ! ! %K ! = -
@ " & - @ ! XPutImage
%% % @ %
: [: V - V K% K == ' %
0" - ! 4 2

0" - F & - @
% ! XCreateImage

XImage *XCreateImage(*display, *visual, depth, format, offset, *data, width, height, bitmap_pad, bytes_per_line);

% 0 @

! % #

% % -

% - . % 0.
* %! 0.+ %! L+ %

% % - -
-

% -

% & - ! %

% - - ! %

- % H :4! 16! I8= "
& ! %

- %

- - % -
&

XCreateImage 0" -
% % % - !
F ! ! % @
% % 0" - ! - !
@ L - @ #

% $ @ % % % %
- - & H - % "
% F @ K% K !0 -
@ K% K

, & - - XCreateImage!XGetImage! XSubImage!
% XDestroyImage -
% -

- % ! % ! -!
@ - - /
@ - /
<X11/Xutil.h>

% @ -! XGetPixel

unsigned long **XGetPixel**(**ximage*, *x*, *y*);

% -

%

XGetPixel % % - %
@ F : ! -
- - % = -

% @ -! XPutPixel

XPutPixel(**ximage*, *x*, *y*, *pixel*);

% -

%

% & % @

XPutPixel @ & % - & %
% @ % % @ F : !
- - - % = -

-! XSubImage

XImage ***XSubImage**(**ximage*, *x*, *y*, *subimage_width*, *subimage_height*);

% -

%

- # % & & -! %

-# # % - & -! %

XSubImage & - -
" & 0" -
% & - % -! -
- ! ! - K& ! - K -

% - @ ! XAddPixel

XAddPixel(*ximage, value);

% -

! % @

XAddPixel @ @ % - "
& @ % @ -
% -

% @ XCreateImage! XDestroyImage

XDestroyImage(*ximage*);

% -

XDestroyImage & 0" -

, & - - XCreateImage!XGetImage! XSubImage!
% -
% -

Manipulating Bitmaps

0 % @ % ! @ %
! %
% N ! & -
: % ! %
@ =

0 @ 11 % ?

```
#define name_width width
#define name_height height
#define name_x_hot x
#define name_y_hot y
static unsigned char name_bits[] = { 0xNN,... }
```

@ - & K K K K %
% % %
@ H & MM - NN % O !
% K MM NN MM - NN K
- - F % % 4

% % %! XReadBitmapFile

int **XReadBitmapFile**(*display, d, *filename, *height_return, *bitmap_return, *y_hot_return);

% 0 @

% & :B

%
% - %

#-

#- & - @
%

- %

-# -

-# - %

XReadBitmapFile - % %
-
% % " % ! XReadBitmapFile
* %$% ' " % @ %
! * %' " @ " & - - !
* %,) " @ ! * %

XReadBitmapFile %N - & ! !
& K - K " % % %% % F !
% % %! - % %
N @ % % - XFreePixmap &
" K K K K ! XReadBitmapFile
K K K K O & ! g1!g1

XReadBitmapFile - * !* B & ! *

% ! XReadBitmapFileData

int **XReadBitmapFileData**(*filename, *height_return, *data_return, *y_hot_return);

%
% - %

#-

#- & - @
%

- %

-# -

-# - %

XReadBitmapFileData - %!
XReadBitmapFile! -
% % @ % K O
- & & - @
XReadBitmapFile

& % % % ! XWriteBitmapFile

int **XWriteBitmapFile**(**display*, **filename*, *bitmap*, *height*, *y_hot*);

% 0 @

%
% - %

% %

#

% & -

-#

-# % & % % : g1!g1
% =

XWriteBitmapFile & % 0 # 11
% @ -
% & - "
% & -! * %$% ' "
! XWriteBitmapFile * %,) O & ! !
* % " K K g1! g1! XWriteBitmapFile
& % %

XWriteBitmapFile - * B & *)

% % % ! XCre-
atePixmapFromBitmapData

Pixmap **XCreatePixmapFromBitmapData**(**display*, *d*, **data*, *height*, *bg*, *depth*);

% 0 @

% & :B

% %

#

% & -

% - - % @

% % % %

XCreatePixmapFromBitmapData % % - @ %
% XPutImage %
%% % & ! *)

XCreatePixmapFromBitmapData - * !* B & !* !
* #

% & XWriteBitmapFile % - !
%% - @ ! XCreateBitmapFromData

```
Pixmap XCreateBitmapFromData( *display,  d,  *data,  height);
```

% 0 @

% & :B

% %

#

% & -

XCreateBitmapFromData & % - :
- #include= % & & XWriteBitmapFile :0 @
11 = & - % & - %
- %?

```
#include "gray.bitmap"

Pixmap bitmap;
bitmap = XCreateBitmapFromData(display, window, gray_bits, gray_width, gray_height
```

" & - - & ! XCreateBitmapFromData
, " % % - XFreePixmap &

XCreateBitmapFromData - * *

Using the Context Manager

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: % & &= % - , % - O
@ % %
% & "B! %
% & - H & -
"B % @

A ! - @ & & ! % ?
% 0 "B %
A % 0 % @
- & & @ @ !- @ !
! H % <X11/Xutil.h>

@ @ % "B % ! XSave-
Context

```
int XSaveContext( *display,  rid,  context,  data);
```

% 0 @

% "B & &

% % & -

% & & &
%

" & % "B % ! XSaveContext
@ & % XSaveContext F
F & + 0
,$)A) : =

- & "B % ! XFindContext

```
int XFindContext( *display,  rid,  context,  *data_return);
```

% 0 @

% "B & &

% % & -

-

* @ ! % XFindContext
F F & +
0 ,$A, : =

- @ "B % ! XDeleteContext

```
int XDeleteContext( *display,  rid,  context);
```

% 0 @

% "B & &

% % & -

XDeleteContext - @ "B % XFindCon-
text & - XDeleteContext
& & @

H % H XSaveCon-
text XFindContext! XUniqueContext

0 0 H :=

Appendix A. Xlib Functions and Protocol Requests

%% % @ & 0 0 %
& - 0 : % =
% - % H -

" 6 2326, 4 ' /

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XActivateScreenSaver	ForceScreenSaver
XAddHost	ChangeHosts
XAddHosts	ChangeHosts
XAddToSaveSet	ChangeSaveSet
XAllocColor	AllocColor
XAllocColorCells	AllocColorCells
XAllocColorPlanes	AllocColorPlanes
XAllocNamedColor	AllocNamedColor
XAllowEvents	AllowEvents
XAutoRepeatOff	ChangeKeyboardControl
XAutoRepeatOn	ChangeKeyboardControl
XBell	Bell
XChangeActivePointerGrab	ChangeActivePointerGrab
XChangeGC	ChangeGC
XChangeKeyboardControl	ChangeKeyboardControl
XChangeKeyboardMapping	ChangeKeyboardMapping
XChangePointerControl	ChangePointerControl
XChangeProperty	ChangeProperty
XChangeSaveSet	ChangeSaveSet
XChangeWindowAttributes	ChangeWindowAttributes
XCirculateSubwindows	CirculateWindow
XCirculateSubwindowsDown	CirculateWindow
XCirculateSubwindowsUp	CirculateWindow
XClearArea	ClearArea
XClearWindow	ClearArea
XConfigureWindow	ConfigureWindow
XConvertSelection	ConvertSelection
XCopyArea	CopyArea
XCopyColormapAndFree	CopyColormapAndFree
XCopyGC	CopyGC
XCopyPlane	CopyPlane

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XCreateBitmapFromData	CreateGC
	CreatePixmap
	FreeGC
	PutImage
XCreateColormap	CreateColormap
XCreateFontCursor	CreateGlyphCursor
XCreateGC	CreateGC
XCreateGlyphCursor	CreateGlyphCursor
XCreatePixmap	CreatePixmap
XCreatePixmapCursor	CreateCursor
XCreatePixmapFromData	CreateGC
	CreatePixmap
	FreeGC
	PutImage
XCreateSimpleWindow	CreateWindow
XCreateWindow	CreateWindow
XDefineCursor	ChangeWindowAttributes
XDeleteProperty	DeleteProperty
XDestroySubwindows	DestroySubwindows
XDestroyWindow	DestroyWindow
XDisableAccessControl	SetAccessControl
XDrawArc	PolyArc
XDrawArcs	PolyArc
XDrawImageString	ImageText8
XDrawImageString16	ImageText16
XDrawLine	PolySegment
XDrawLines	PolyLine
XDrawPoint	PolyPoint
XDrawPoints	PolyPoint
XDrawRectangle	PolyRectangle
XDrawRectangles	PolyRectangle
XDrawSegments	PolySegment
XDrawString	PolyText8
XDrawString16	PolyText16
XDrawText	PolyText8
XDrawText16	PolyText16
XEnableAccessControl	SetAccessControl
XFetchBytes	GetProperty
XFetchName	GetProperty

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XFillArc	PolyFillArc
XFillArcs	PolyFillArc
XFillPolygon	FillPoly
XFillRectangle	PolyFillRectangle
XFillRectangles	PolyFillRectangle
XForceScreenSaver	ForceScreenSaver
XFreeColormap	FreeColormap
XFreeColors	FreeColors
XFreeCursor	FreeCursor
XFreeFont	CloseFont
XFreeGC	FreeGC
XFreePixmap	FreePixmap
XGetAtomName	GetAtomName
XGetClassHint	GetProperty
XGetFontPath	GetFontPath
XGetGeometry	GetGeometry
XGetIconName	GetProperty
XGetIconSizes	GetProperty
XGetImage	GetImage
XGetInputFocus	GetInputFocus
XGetKeyboardControl	GetKeyboardControl
XGetKeyboardMapping	GetKeyboardMapping
XGetModifierMapping	GetModifierMapping
	GetMotionEvents
XGetNormalHints	GetProperty
XGetPointerControl	GetPointerControl
XGetPointerMapping	GetPointerMapping
XGetRGBColormaps	GetProperty
XGetScreenSaver	GetScreenSaver
XGetSelectionOwner	GetSelectionOwner
XGetSizeHints	GetProperty
XGetTextProperty	GetProperty
XGetTransientForHint	GetProperty
XGetWMClientMachine	GetProperty
XGetWMColormapWindows	GetProperty
	InternAtom
XGetWMHints	GetProperty
XGetWMIconName	GetProperty
XGetWMName	GetProperty

/	, +4
XGetWMNormalHints	GetProperty
XGetWMProtocols	GetProperty
	InternAtom
XGetWMSizeHints	GetProperty
XGetWindowAttributes	GetWindowAttributes
	GetGeometry
XGetWindowProperty	GetProperty
XGetZoomHints	GetProperty
XGrabButton	GrabButton
XGrabKey	GrabKey
XGrabKeyboard	GrabKeyboard
XGrabPointer	GrabPointer
XGrabServer	GrabServer
XIconifyWindow	InternAtom
	SendEvent
XInitExtension	QueryExtension
XInstallColormap	InstallColormap
XInternAtom	InternAtom
XKillClient	KillClient
XListExtensions	ListExtensions
XListFonts	ListFonts
XListFontsWithInfo	ListFontsWithInfo
XListHosts	ListHosts
XListInstalledColormaps	ListInstalledColormaps
XListProperties	ListProperties
XLoadFont	OpenFont
XLoadQueryFont	OpenFont
	QueryFont
XLookupColor	LookupColor
XLowerWindow	ConfigureWindow
XMapRaised	ConfigureWindow
	MapWindow
XMapSubwindows	MapSubwindows
XMapWindow	MapWindow
XMoveResizeWindow	ConfigureWindow
XMoveWindow	ConfigureWindow
XNoOp	NoOperation
XOpenDisplay	CreateGC
XParseColor	LookupColor

/	, +4
XPutImage	PutImage
XQueryBestCursor	QueryBestSize
XQueryBestSize	QueryBestSize
XQueryBestStipple	QueryBestSize
XQueryBestTile	QueryBestSize
XQueryColor	QueryColors
XQueryColors	QueryColors
XQueryExtension	QueryExtension
XQueryFont	QueryFont
XQueryKeymap	QueryKeymap
XQueryPointer	QueryPointer
XQueryTextExtents	QueryTextExtents
XQueryTextExtents16	QueryTextExtents
XQueryTree	QueryTree
XRaiseWindow	ConfigureWindow
XReadBitmapFile	CreateGC
	CreatePixmap
	FreeGC
	PutImage
XRecolorCursor	RecolorCursor
XReconfigureWMWindow	ConfigureWindow
	SendEvent
XRemoveFromSaveSet	ChangeSaveSet
XRemoveHost	ChangeHosts
XRemoveHosts	ChangeHosts
XReparentWindow	ReparentWindow
XResetScreenSaver	ForceScreenSaver
XResizeWindow	ConfigureWindow
XRestackWindows	ConfigureWindow
XRotateBuffers	RotateProperties
XRotateWindowProperties	RotateProperties
XSelectInput	ChangeWindowAttributes
XSendEvent	SendEvent
XSetAccessControl	SetAccessControl
XSetArcMode	ChangeGC
XSetBackground	ChangeGC
XSetClassHint	ChangeProperty
XSetClipMask	ChangeGC
XSetClipOrigin	ChangeGC

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XSetClipRectangles	SetClipRectangles
	SetCloseDownMode
XSetCommand	ChangeProperty
XSetDashes	SetDashes
XSetFillRule	ChangeGC
XSetFillStyle	ChangeGC
XSetFont	ChangeGC
XSetFontPath	SetFontPath
XSetForeground	ChangeGC
XSetFunction	ChangeGC
XSetGraphicsExposures	ChangeGC
XSetIconName	ChangeProperty
XSetIconSizes	ChangeProperty
XSetInputFocus	SetInputFocus
XSetLineAttributes	ChangeGC
XSetModifierMapping	SetModifierMapping
XSetNormalHints	ChangeProperty
XSetPlaneMask	ChangeGC
XSetPointerMapping	SetPointerMapping
XSetRGBColormaps	ChangeProperty
XSetScreenSaver	SetScreenSaver
XSetSelectionOwner	SetSelectionOwner
XSetSizeHints	ChangeProperty
XSetStandardProperties	ChangeProperty
XSetState	ChangeGC
XSetStipple	ChangeGC
XSetSubwindowMode	ChangeGC
XSetTextProperty	ChangeProperty
XSetTile	ChangeGC
XSetTransientForHint	ChangeProperty
XSetTSOrigin	ChangeGC
XSetWMClientMachine	ChangeProperty
XSetWMColormapWindows	ChangeProperty
	InternAtom
XSetWMHints	ChangeProperty
XSetWMIconName	ChangeProperty
XSetWMName	ChangeProperty
XSetWMNormalHints	ChangeProperty
XSetWMProperties	ChangeProperty

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XSetWMProtocols	ChangeProperty
	InternAtom
XSetWMSizeHints	ChangeProperty
XSetWindowBackground	ChangeWindowAttributes
XSetWindowBackgroundPixmap	ChangeWindowAttributes
XSetWindowBorder	ChangeWindowAttributes
XSetWindowBorderPixmap	ChangeWindowAttributes
XSetWindowBorderWidth	ConfigureWindow
XSetWindowColormap	ChangeWindowAttributes
XSetZoomHints	ChangeProperty
XStoreBuffer	ChangeProperty
XStoreBytes	ChangeProperty
XStoreColor	StoreColors
XStoreColors	StoreColors
XStoreName	ChangeProperty
XStoreNamedColor	StoreNamedColor
XSync	GetInputFocus
XSynchronize	GetInputFocus
XTranslateCoordinates	TranslateCoordinates
XUndefineCursor	ChangeWindowAttributes
XUngrabButton	UngrabButton
XUngrabKey	UngrabKey
XUngrabKeyboard	UngrabKeyboard
XUngrabPointer	UngrabPointer
XUngrabServer	UngrabServer
XUninstallColormap	UninstallColormap
XUnloadFont	CloseFont
XUnmapSubwindows	UnmapSubwindows
XUnmapWindow	UnmapWindow
XWarpPointer	WarpPointer
XWithdrawWindow	SendEvent
	UnmapWindow

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" 6 2526/ .' ' ', +4

, +4	/
AllocColor	XAllocColor
AllocColorCells	XAllocColorCells

, +4	/
AllocColorPlanes	XAllocColorPlanes
AllocNamedColor	XAllocNamedColor
AllowEvents	XAllowEvents
Bell	XBell
ChangeActivePointerGrab	XChangeActivePointerGrab
ChangeGC	XChangeGC
	XSetArcMode
	XSetBackground
	XSetClipMask
	XSetClipOrigin
	XSetFillRule
	XSetFillStyle
	XSetFont
	XSetForeground
	XSetFunction
	XSetGraphicsExposures
	XSetLineAttributes
	XSetPlaneMask
	XSetState
	XSetStipple
	XSetSubwindowMode
	XSetTile
	XSetTSOrigin
ChangeHosts	XAddHost
	XAddHosts
	XRemoveHost
	XRemoveHosts
ChangeKeyboardControl	XAutoRepeatOff
	XAutoRepeatOn
	XChangeKeyboardControl
ChangeKeyboardMapping	XChangeKeyboardMapping
ChangePointerControl	XChangePointerControl
ChangeProperty	XChangeProperty
	XSetClassHint
	XSetCommand
	XSetIconName
	XSetIconSizes
	XSetNormalHints
	XSetRGBColormaps

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	XSetSizeHints
	XSetStandardProperties
	XSetTextProperty
	XSetTransientForHint
	XSetWMClientMachine
	XSetWMColormapWindows
	XSetWMHints
	XSetWMIconName
	XSetWMName
	XSetWMNormalHints
	XSetWMProperties
	XSetWMProtocols
	XSetWMSizeHints
	XSetZoomHints
	XStoreBuffer
	XStoreBytes
	XStoreName
ChangeSaveSet	XAddToSaveSet
	XChangeSaveSet
	XRemoveFromSaveSet
ChangeWindowAttributes	XChangeWindowAttributes
	XDefineCursor
	XSelectInput
	XSetWindowBackground
	XSetWindowBackgroundPixmap
	XSetWindowBorder
	XSetWindowBorderPixmap
	XSetWindowColormap
	XUndefineCursor
CirculateWindow	XCirculateSubwindowsDown
	XCirculateSubwindowsUp
	XCirculateSubwindows
ClearArea	XClearArea
	XClearWindow
CloseFont	XFreeFont
	XUnloadFont
ConfigureWindow	XConfigureWindow
	XLowerWindow
	XMapRaised

, + 4	/
	XMoveResizeWindow
	XMoveWindow
	XRaiseWindow
	XReconfigureWMWindow
	XResizeWindow
	XRestackWindows
	XSetWindowBorderWidth
ConvertSelection	XConvertSelection
CopyArea	XCopyArea
CopyColormapAndFree	XCopyColormapAndFree
CopyGC	XCopyGC
CopyPlane	XCopyPlane
CreateColormap	XCreateColormap
CreateCursor	XCreatePixmapCursor
CreateGC	XCreateGC
	XCreateBitmapFromData
	XCreatePixmapFromData
	XOpenDisplay
	XReadBitmapFile
CreateGlyphCursor	XCreateFontCursor
	XCreateGlyphCursor
CreatePixmap	XCreatePixmap
	XCreateBitmapFromData
	XCreatePixmapFromData
	XReadBitmapFile
CreateWindow	XCreateSimpleWindow
	XCreateWindow
DeleteProperty	XDeleteProperty
DestroySubwindows	XDestroySubwindows
DestroyWindow	XDestroyWindow
FillPoly	XFillPolygon
ForceScreenSaver	XActivateScreenSaver
	XForceScreenSaver
	XResetScreenSaver
FreeColormap	XFreeColormap
FreeColors	XFreeColors
FreeCursor	XFreeCursor
FreeGC	XFreeGC
	XCreateBitmapFromData

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	XCreatePixmapFromData
	XReadBitmapFile
FreePixmap	XFreePixmap
GetAtomName	XGetAtomName
GetFontPath	XGetFontPath
GetGeometry	XGetGeometry
	XGetWindowAttributes
GetImage	XGetImage
GetInputFocus	XGetInputFocus
	XSync
	XSynchronize
GetKeyboardControl	XGetKeyboardControl
GetKeyboardMapping	XGetKeyboardMapping
GetModifierMapping	XGetModifierMapping
GetMotionEvents	
GetPointerControl	XGetPointerControl
GetPointerMapping	XGetPointerMapping
GetProperty	XFetchBytes
	XFetchName
	XGetClassHint
	XGetIconName
	XGetIconSizes
	XGetNormalHints
	XGetRGBColormaps
	XGetSizeHints
	XGetTextProperty
	XGetTransientForHint
	XGetWMClientMachine
	XGetWMColormapWindows
	XGetWMHints
	XGetWMIconName
	XGetWMName
	XGetWMNormalHints
	XGetWMProtocols
	XGetWMSizeHints
	XGetWindowProperty
	XGetZoomHints
GetSelectionOwner	XGetSelectionOwner
GetWindowAttributes	XGetWindowAttributes

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GrabButton	XGrabButton
GrabKey	XGrabKey
GrabKeyboard	XGrabKeyboard
GrabPointer	XGrabPointer
GrabServer	XGrabServer
ImageText8	XDrawImageString
ImageText16	XDrawImageString16
InstallColormap	XInstallColormap
InternAtom	XGetWMColormapWindows
	XGetWMProtocols
	XIconifyWindow
	XInternAtom
	XSetWMColormapWindows
	XSetWMProtocols
KillClient	XKillClient
ListExtensions	XListExtensions
ListFonts	XListFonts
ListFontsWithInfo	XListFontsWithInfo
ListHosts	XListHosts
ListInstalledColormaps	XListInstalledColormaps
ListProperties	XListProperties
LookupColor	XLookupColor
	XParseColor
MapSubwindows	XMapSubwindows
MapWindow	XMapRaised
	XMapWindow
NoOperation	XNoOp
OpenFont	XLoadFont
	XLoadQueryFont
PolyArc	XDrawArc
	XDrawArcs
PolyFillArc	XFillArc
	XFillArcs
PolyFillRectangle	XFillRectangle
	XFillRectangles
PolyLine	XDrawLines
PolyPoint	XDrawPoint
	XDrawPoints
PolyRectangle	XDrawRectangle

, +4	/
	XDrawRectangles
PolySegment	XDrawLine
	XDrawSegments
PolyText8	XDrawString
	XDrawText
PolyText16	XDrawString16
	XDrawText16
PutImage	XPutImage
	XCreateBitmapFromData
	XCreatePixmapFromData
	XReadBitmapFile
QueryBestSize	XQueryBestCursor
	XQueryBestSize
	XQueryBestStipple
	XQueryBestTile
QueryColors	XQueryColor
	XQueryColors
QueryExtension	XInitExtension
	XQueryExtension
QueryFont	XLoadQueryFont
	XQueryFont
QueryKeymap	XQueryKeymap
QueryPointer	XQueryPointer
QueryTextExtents	XQueryTextExtents
	XQueryTextExtents16
QueryTree	XQueryTree
RecolorCursor	XRecolorCursor
ReparentWindow	XReparentWindow
RotateProperties	XRotateBuffers
	XRotateWindowProperties
SendEvent	XIconifyWindow
	XReconfigureWMWindow
	XSendEvent
	XWithdrawWindow
SetAccessControl	XDisableAccessControl
	XEnableAccessControl
	XSetAccessControl
SetClipRectangles	XSetClipRectangles
SetCloseDownMode	

, +4	/
SetDashes	XSetDashes
SetFontPath	XSetFontPath
SetInputFocus	XSetInputFocus
SetModifierMapping	XSetModifierMapping
SetPointerMapping	XSetPointerMapping
SetScreenSaver	XGetScreenSaver
	XSetScreenSaver
SetSelectionOwner	XSetSelectionOwner
StoreColors	XStoreColor
	XStoreColors
StoreNamedColor	XStoreNamedColor
TranslateCoordinates	XTranslateCoordinates
UngrabButton	XUngrabButton
UngrabKey	XUngrabKey
UngrabKeyboard	XUngrabKeyboard
UngrabPointer	XUngrabPointer
UngrabServer	XUngrabServer
UninstallColormap	XUninstallColormap
UnmapSubwindows	XUnmapSubWindows
UnmapWindow	XUnmapWindow
	XWithdrawWindow
WarpPointer	XWarpPointer

Appendix B. X Font Cursors

& - @ & XCreateFontCursor

```
#define XC_X_cursor 0
#define XC_arrow 2
#define XC_based_arrow_down 4
#define XC_based_arrow_up 6
#define XC_boat 8
#define XC_bogosity 10
#define XC_bottom_left_corner 12
#define XC_bottom_right_corner 14
#define XC_bottom_side 16
#define XC_bottom_tee 18
#define XC_box_spiral 20
#define XC_center_ptr 22
#define XC_circle 24
#define XC_clock 26
#define XC_coffee_mug 28
#define XC_cross 30
#define XC_cross_reverse 32
#define XC_crosshair 34
#define XC_diamond_cross 36
#define XC_dot 38
#define XC_dot_box_mask 40
#define XC_double_arrow 42
#define XC_draft_large 44
#define XC_draft_small 46
#define XC_draped_box 48
#define XC_exchange 50
#define XC_fleur 52
#define XC_gobbler 54
#define XC_gumby 56
#define XC_hand1 58
#define XC_hand2 60
#define XC_heart 62
#define XC_icon 64
#define XC_iron_cross 66
#define XC_left_ptr 68
#define XC_left_side 70
#define XC_left_tee 72
#define XC_leftbutton 74
#define XC_ll_angle 76
#define XC_lr_angle 78
#define XC_man 80
#define XC_middlebutton 82
#define XC_mouse 84
#define XC_pencil 86
#define XC_pirate 88
#define XC_plus 90
#define XC_question_arrow 92
#define XC_right_ptr 94
#define XC_right_side 96
#define XC_right_tee 98
#define XC_rightbutton 100
#define XC_rtl_logo 102
#define XC_sailboat 104
#define XC_sb_down_arrow 106
#define XC_sb_h_double_arrow 108
#define XC_sb_left_arrow 110
#define XC_sb_right_arrow 112
#define XC_sb_up_arrow 114
#define XC_sb_v_double_arrow 116
#define XC_shuttle 118
#define XC_sizing 120
#define XC_spider 122
#define XC_spraycan 124
#define XC_star 126
#define XC_target 128
#define XC_tcross 130
#define XC_top_left_arrow 132
#define XC_top_left_corner 134
#define XC_top_right_corner 136
#define XC_top_side 138
#define XC_top_tee 140
#define XC_trek 142
#define XC_ul_angle 144
#define XC_umbrella 146
#define XC_ur_angle 148
#define XC_watch 150
#define XC_xterm 152
```

Appendix C. Extensions

* 0 @ @ % ! %
% @ F % ! @
% % 0

! -
% @ @ - F % %%
% - ! % % F @ !
F - @ &

%% H & - 0 &
% % H

" % - @ 0 % H B
- 19 & 19 % % !
% - - %
- H

& - 0 <X11/Xlibint.h>

Basic Protocol Support Routines

% H XQueryExtension XListExtensions

Bool **XQueryExtension**(*display, *name, *major_opcode_return, *first_event_return, *first_error_return);

% % 0 @

%

/ K % K / %

K @ K @ !

K K !

XQueryExtension % "
% ! XQueryExtension ' O & !
" % ! XQueryExtension / %
/ K % K O & ! F %
H % "
@ @ @ % ! XQueryExtension @ %
K @ K O & ! F @ %
" @ @ ! XQueryExtension
K K O & ! F
%

" (+ A -
% % C%% & O - MM -NN!
MM -NN! MM NN

```
char **XListExtensions( *display,  *nextensions_return);
```

% 0 @

-

XListExtensions %% @
" @ E + A -!
- (+ A - $ & !
% %

```
XFreeExtensionList( **list);
```

%

XFreeExtensionList XListExtensions

Hooking into Xlib

&
%% % - % % & 0 %
0 ! & - % H
0! %

" ! @ F @
" @ ! XInitExtension %
F @

" >
& @ % ! &
& @

0A XInitExtension
<X11/Xlib.h>?

```
typedef struct _XExtCodes { /* public to extension, cannot be changed */
 int extension;  /* extension number */
 int major_opcode; /* major op-code assigned by server */
 int first_event; /* first event number for the extension */
 int first_error; /* first error number for the extension */
} XExtCodes;
```

```
XExtCodes *XInitExtension( *display,  *name);
```

% 0 @

%

XInitExtension !
- -
! !
% & "
! XInitExtension ,CEE

" (+ A -!
% % C%% & O - MM -NN!
MM -NN! MM NN

0A
& H -

```
XExtCodes *XAddExtension( *display);
```

% 0 @

' 0 ! XAddExtension 0A
! % !
: % 0 & H - @ =

Hooks into the Library

& % & @
% &
! % - ! - ! - - !
@ @ & !
-

% @ %

```
int XESetCloseDisplay( *display,  extension,  (*proc)());
```

% 0 @

%

% % & %

XESetCloseDisplay % & @
XCloseDisplay " % @ % ! ,CEE

XCloseDisplay ! % & - ?

```
int (*proc)(display, codes);
```

```
int *XESetCreateGC( *display,  extension,  (*proc)());
```

% 0 @

%

% % &

XESetCreateGC % & @ &
" % @ % ! ,CEE

! % & - ?

```
int (*proc)(display, gc, codes);
```

```
int *XESetCopyGC( *display, extension, (*proc)());
```

% 0 @

%

% % & %
%

XESetCopyGC % & @ %
" % @ % ! ,CEE

% ! % & - ?

```
int (*proc)(display, gc, codes);
```

```
int *XESetFreeGC( *display, extension, (*proc)());
```

% 0 @

%

% % &

XESetFreeGC % & @
" % @ % ! ,CEE

! % & - ?

```
int (*proc)(display, gc, codes);
```

```
int *XESetCreateFont( *display, extension, (*proc)());
```

% 0 @

%

% % &

XESetCreateFont % & @ XLoad-
QueryFont XQueryFont " % @ % !
,CEE

XLoadQueryFont XQueryFont ! % &
- ?

```
int (*proc)(display, fs, codes);
```

```
int *XESetFreeFont( *display,  extension,  (*proc)());
```

% 0 @

%

% % &

XESetFreeFont % & @ XFreeFont
" % @ % ! ,CEE

XFreeFont ! % & - ?

```
int (*proc)(display, fs, codes);
```

XESetWireToEvent XESetEventToWire & &
@ 0A@ & % : % =
% H & @
% & : % - -= H
% @ % & * : % * =
-& @ SendEvent % H
% & % % @ & %
& "B ! & &!
% % & !
@ @ @ O @
% % % ! F F %
@ F -- F
0A@ & - 87
36 & % &

```
int *XESetWireToEvent( *display,  event_number,  (*proc)());
```

% 0 @

! - % @

% % & @ -
@

XESetWireToEvent % & @
@ & : A@ = :0A@ = @
& % @ @ %
XESetWireToEvent % @ % . %
@ @ & & ! -
- " & ! & @ ! & % @
-% H & 0 @ @
& ! % & - ?

```
int (*proc)(display, re, event);
```

. % @
- % & @ !
@ - I8 & @ " 0A@
-! @ H @ .

```
          %      &      %  %          A@
.      %                A@        :&      =
0A@        :      = .    @    %
 @        %       H    '            %       H

     F            %       @  !                          _XSetLastRequestRead
&     @            @

unsigned long_XSetLastRequestRead( *display,   *rep);

                        %              0   @

                        %      &   @

    _XSetLastRequestRead      %           %
      %              @

Status *XESetEventToWire( *display,   event_number,   (*proc)());

                              %              0   @

! -                           %       @

                              %       %          &     @   -
                              @

    XESetEventToWire          %            &     @
       @            :0A@  =  &      : A@  =
 @          &   %     @              @    %
         XESetEventToWire       % @         %      "
F        @          F    &   .    %       @
@         &          & !   -           -  " &  !
 & @ !   &        %      @              -
         0         @     @            &      !
   %          &      -   ?

int (*proc)(display, re, event);

    -      %              @  !     @    -
%      &     I8    &   @                .
    % &      %      0A@
   %                A@

Bool *XESetWireToError( *display,   error_number,   (*proc)());

                              %              0   @

  -                           %

                              %       %          &
                               @

    XESetWireToError          %           &
          @      &
   &   %                  @    %                                XESetWire-
ToError       % @        %
```

C @
0 ! & % & -
0 ! & % 0 &

0 @ & ! %
& - ?

```
int (*proc)(display, he, we);
```

- % &
% - - 0A@
% - 0A A@ @ "
% - 0 : % ! @ %
& 0 =!
' O & !

```
int *XESetError( *display, extension, (*proc)());
```

% 0 @

%

% % & @

" 0 ! & %% -
- & &
- : - H
% ! ! % % - =

0 % _XReply! % &
- ?

```
int (*proc)(display, err, codes, ret_code);
```

- % I8 & -
% K -
& _XReply

" % F @ ! %% ! N
:' ! 1148 =" %
F ! %% ! _XReply @
K

```
char *XESetErrorString( *display, extension, *(*proc)());
```

% 0 @

%

% % -

XGetErrorText - XESetErrorString & % %
- & - %

```
int (*proc)(display, code, codes, buffer, nbytes);

. %          &            @          .
 %                 -    -       -

void *XESetPrintErrorValues( *display,  extension,  (*proc)());

                          %              0  @

                          %

                          %      %        &        %

    XESetPrintErrorValues          %            &
        %   !  %        @    C
                @              0    "
  % @        %

  0       %       !  %          &      -   ?

void (*proc)(display, ev, fp);

      %        @  -          -    0A@
           %  -     0A  A@            @
     -      XESetWireToError       - %     %  -
 %   O   +$ "0  %      ! %          % '"EAV

int *XESetFlushGC( *display,  extension,  *(*proc)());

                          %              0  @

                          %

                          %      %        &

  %                    XESetFlushGC                  %
                XESetCopyGC    !        &
  %        @

int *XESetCopyGC( *display,  extension,  *(*proc)());

                          %              0  @

                          %

                          %      %        &

    XESetBeforeFlush         %          &
        @                !  %
      &      -   ?

void (*proc)(display, codes, data, len);

     -   %     %        - -     !     -
     %          -   .  %
                  %     H          %
```

Hooks onto Xlib Data Structures

```
#    0            @  %  @            %
     %%                          !#   !    !
'   !B  %  !   0'      *         %       &
          !    -      %                %


     & -
<X11/Xlib.h>



typedef struct _XExtData {
 int number; /* number returned by XInitExtension */
 struct _XExtData *next; /* next item on list of data for structure */
 int (*free_private)(); /* if defined,  called to free private */
 XPointer private_data; /* data private to this extension. */
} XExtData;

                    @       !        &   !
    N     %      :    =        "       ,CEE!
      %          %  @   K


union { Display *display;
 GC gc;
 Visual *visual;
 Screen *screen;
 ScreenFormat *pixmap_format;
 XFontStruct *font } XEDataObject;


XExtData **XEHeadOfExtensionList( object);

 5                    %       /

    XEHeadOfExtensionList         %
           %      /   "      &                        XAddToExtensionList! XE-
HeadOfExtensionList   &
       %         0AB  $ /

XAddToExtensionList( **structure,   *ext_data);

                          %

 -                        %

       -     %                        @
.        F   K   ^    &                  -


XExtData *XFindOnExtensionList( **structure,   number);

                          %
```

% XInitExtension

XFindOnExtensionList
" % &
- N
&

XAllocID !& "B! <X11/Xlib.h>

XAllocID(**display*);

% 0 @

- B % "B
" "B & - &

XAllocIDs "B

XAllocIDs(**display*, **ids_return*, *count*);

% 0 @

- "B

% "B H

- B % "B
" "B %%
"B ! XAllocIDs & H - %
"B - - % H

GC Caching

& - - % - H
- % H % &
% & @ %
@ %

FlushGC N
_XFlushGCCache @ - FlushGC
& ?

FlushGC(**display*, *gc*);

% 0 @

%

, "B % !
- H
- ! @
& - % H ! -
- . _XFlushGCCache %
_XFlushGCCache % & ?

_XFlushGCCache(*display, gc);

% 0 @

%

Graphics Batching

" 0 % - % % @ ! @
- & -
% H % @ % % -
& -% H % H! K H
% ! H -% * - H
%! & !-! % &
- % ! / % @ - %
H - - H %% -
% @ % @ @ % - '
% ! XDrawPoint : -
=

```
#include <X11/Xlibint.h>

/* precompute the maximum size of batching request allowed */

static int size = sizeof(xPolyPointReq) + EPERBATCH * sizeof(xPoint);

XDrawPoint(dpy, d, gc, x, y)
    register Display *dpy;
    Drawable d;
    GC gc;
    int x, y; /* INT16 */
{
    xPoint *point;
    LockDisplay(dpy);
    FlushGC(dpy, gc);
    {
    register xPolyPointReq *req = (xPolyPointReq *) dpy->last_req;
    /* if same as previous request, with same drawable, batch requests */
    if (
           (req->reqType == X_PolyPoint)
       && (req->drawable == d)
       && (req->gc == gc->gid)
       && (req->coordMode == CoordModeOrigin)
       && ((dpy->bufptr + sizeof (xPoint)) <= dpy->bufmax)
       && (((char *)dpy->bufptr - (char *)req) < size) ) {
         point = (xPoint *) dpy->bufptr;
         req->length += sizeof (xPoint) >> 2;
         dpy->bufptr += sizeof (xPoint);
         }

    else {
        GetReqExtra(PolyPoint, 4, req); /* 1 point = 4 bytes */
```

```
        req->drawable = d;
        req->gc = gc->gid;
        req->coordMode = CoordModeOrigin;
        point = (xPoint *) (req + 1);
        }
    point->x = x;
    point->y = y;
    }
    UnlockDisplay(dpy);
    SyncHandle();
}
```

% - -@ - H % F @ !
<X11/Xlibint.h> A+A * (
H) % & -
H , FlushGC % - % @ K H!

Writing Extension Stubs

0 H & - H ! % 16 H
I8 - H 856D
- @ %% - H - @
% ^ K H K F - @
% ' !

Requests, Replies, and Xproto.h

<X11/Xproto.h>
% ? H ! H ! %

. - H @ <X11/Xproto.h>
% A %
<X11/Xlibint.h>

& ! H
0KB -! H B - H! %
B - % H ! <X11/Xlibint.h>!
@ - -

' 0 H ! <X11/Xproto.h> ?

```
#define X_DoSomething   42
```

" ! & % ! / %

Request Format

A@ H 4 / % 16 - %
7 A@ H 7 : - /
% ! - ! = & F
- - H ! -

- H H - H
H " % - - H - !
@ - * E - C H
H F A - & - %
H % % H ! %
H F @ % - H F
7936 :16I47 =

) / % 184 - 855 @ A
% H ! H % @
% H ! %
% % &
H % A@ H % -
H : - & = % ! ! @

% % % ! *16 *I8
@ %
' % ! ! 16 I8
H ! &

) % H @ % - % <X11/Xproto.h>!
& ?

```
typedef struct _DoSomethingReq {
 CARD8 reqType;  /* X_DoSomething */
 CARD8 someDatum; /* used differently in different requests */
 CARD16 length B16; /* total # of bytes in request, divided by 4 */
 ...
 /* request-specific data */
 ...
} xDoSomethingReq;
```

" % H - I8 - !
H " ! H
H <X11/Xproto.h> H
& - - &! + %! B & ! ! ' ! !
%! ! # "B

```
typedef struct _ResourceReq {
 CARD8 reqType; /* the request type, e.g. X_DoSomething */
 BYTE pad; /* not used */
 CARD16 length B16; /* 2 (= total # of bytes in request, divided by 4) */
 CARD32 id B32; /* the Window, Drawable, Font, GContext, etc. */
} xResourceReq;
```

" @ ! -

" ! H % % H :
% !0K) % & 0K + %= - & -

H 7 -& - H
@ - ! - ! & H
H F ! H %
% -

& % H - " ! H
<X11/Xproto.h>! & H % - : %
=

" % H H % ! <X11/Xproto.h> %
% ?

```
typedef struct _DoSomethingReply {
 BYTE type; /* always X_Reply */
 BYTE someDatum; /* used differently in different requests */
 CARD16 sequenceNumber B16; /* # of requests sent so far */
 CARD32 length B32; /* # of additional bytes, divided by 4 */
 ...
 /* request-specific data */
 ...
} xDoSomethingReply;
```

) % I8 - " %
@ ! % - % I8
- H I8! @
7 - & F ?

R % & @ - ! -

R % - I8

$ GetWindowAttributesl! QueryFont! QueryKeymap! GetKeyboardControl
@ % - I8 %

& % H % <X11/Xproto.h>
% " ! % !
& % ! - ! H : % -
I8 -=

Starting to Write a Stub Procedure

0 % ?

```
#include "<X11/Xlibint.h>

XDoSomething (arguments, ... )
/* argument declarations */
{

register XDoSomethingReq *req;
...
```

" % H % ! @
% H & - % ?

```
xDoSomethingReply rep;
```

Locking Data Structures

% & %%
- % ! &
! % / %% % H
- @ %
- % % & !&
- % ! @ % @

```
LockDisplay( *display);
```

```
UnlockDisplay( *display);
```

% 0 @

Sending the Protocol Request and Arguments

@ ! %
<X11/Xlibint.h>?GetReq!GetReqExtra!GetResReq! GetEmptyReq
! - ! % H
<X11/Xproto.h> % & 0K @ A B %
% ! %! % H ! H!&
%% % % %% H
% ! % - ! H %

" % H - : ! 0K @ =!
GetEmptyReq

```
GetEmptyReq (DoSomething, req);
```

" % H - I8 - : + %! &!
B & ! ! =! GetResReq -
I8 / 0K) % & - %

```
GetResReq (DoSomething, rid, req);
```

- + %! &! "B

" % H - ! GetReq
GetReq! H !
- %

```
GetReq (DoSomething, req);
/* fill in arguments here */
```

```
req->arg1 = arg1;
req->arg2 = arg2;
...
```

```
rid = req->rid = XAllocID();
...
return (rid);
```

Variable Length Arguments

```
req->length += (nbytes+3)>>2;
```

```
Data( display,  *);
```

Replies

" % H % ! _XReply @ -
& - @ - - _XReply %
& % % @ " @ @ !
_XReply % H

```
Status _XReply( *display,  *rep,  extra,  discard);
```

% 0 @

% %

% I8 & %
%

% %
-

_XReply & % % % %
% _XReply @ % %
@ _XReply - ?

R B % V

R % % :& % V=

R I8 & : sizeof(xReply=]I8 =
%

R * & _XReply
&

* % I8 -! - 9
% % % GetWindowAttributesl!QueryFont!
QueryKeymap! GetKeyboardControl!& @ - %

- ' % &
@ - : -= "
@ - - % @ %& %
& % % & % @
@ % ' % !
@ GetWindowAttributesl - - ! % !
& % _XReply
@ % ' @

' H & % & @ - ! &
- ?

```
_XReply(display, (xReply *)&rep, 0, True);
*ret1 = rep.ret1;
*ret2 = rep.ret2;
*ret3 = rep.ret3;
...
UnlockDisplay(dpy);
```

```
SyncHandle();
return (rep.ret4);
}
```

" @ - % ! - ' !
%% % _XRead @ -

_XRead(**display*, **data_return*, *nbytes*);

% 0 @

- %

% H

_XRead % K

_XRead16(**display*, **data_return*, *nbytes*);

% 0 @

- %

% H

_XRead16 % ! % - 16
H ! %

_XRead32(**display*, **data_return*, *nbytes*);

% 0 @

- %

% H

_XRead32 % ! % - I8
H ! % -

_XRead16Pad(**display*, **data_return*, *nbytes*);

% 0 @

- %

% H

_XRead16Pad % ! % -
16 H ! % "
% ! _XRead16Pad % & %

_XReadPad(**display*, **data_return*, *nbytes*);

% 0 @

- %

% H

_XReadPad % K "
% ! _XReadPad %
%

A % H ' ! 0
%

Synchronous Calling

A % @ ! / - !
SyncHandle " : XSynchronize=! H
! & @ !& %
- @

Allocating and Deallocating Memory

%% % % ! @ @
@ & - - ! &
- & & F &
@ : % ! =
% - -
& - - ">$ @ ?

% &

" - : % ! %
% & % =! -
% @ :% % ! & %
= & - &
?

```
char *_XAllocScratch( *display,  nbytes);
```

% 0 @

% H

-
% @ - %
0 ' % ! % @
GetReq Data ! _XReply!
_XSend _XRead

& - ?

```
char *_XAllocTemp( *display,  nbytes);
```

% 0 @

% H

- - %
0 - % 0 & -
- ?

```
void _XFreeTemp( *display,  *buf,  nbytes);
```

% 0 @

%

% F

. % % F & _XAllocTemp

Portability Considerations

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% & % @ - ! -
- * @
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% % - O ! 16 16
H I8 I8 H
% I8 - % @ -
. % I8 + @
F & % @ %
H ' - % @ & @
% %

& 16 ! - - ! @
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B16 % ! - : !
! %% * =

! - - @ BI8 %
! - - - -
@ @ - 16 -

4 ! 16 ! 16
I8 ! - I8 PackData %
& % I8 (& @ ! &
& % %

Deriving the Correct Extension Opcode

- % & %
% % % % / %
- ! % &

R B % ! K,'"EA - : <stdio.h>
% %% = % 0A
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,CEE! - % %
F % % % %

R $ F % ! XInitExtensionO !
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& F B & @ F
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! & & & %

R - F % ! &
! / % 0A

Appendix D. Compatibility Functions

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@ % & 0 # 11 !
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X Version 11 Compatibility Functions

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R - & & F -

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R 0 @

Setting Standard Properties

% % % - % %% !
XSetStandardProperties % XSetWMProperties %)K,)A!)K" $,K,)A!)K(", !
)K $)) ,B!)K,$) EK(", % %

XSetStandardProperties(**display*, *w*, **window_name*, **icon_name*, *icon_pixmap*, ***argv*, *argc*, **hints*);

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-

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- % %
,

! % %% N -

% -

% % F & &

XSetStandardProperties % @ & % %%
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- @ & & - % - N
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-@ % - = " - (+
A -! % %

XSetStandardProperties - * * &

Setting and Getting Window Sizing Hints

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- 0 F(!
<X11/Xutil.h>)K,$) EK(", % %

F - @ & & ! XSetNormalHints
% XSetWMNormalHints

XSetNormalHints(*display, w, *hints);

% 0 @

% & &

% % F & &

XSetNormalHints F % &
& %% XSetNormalHints & & - F
% & & " ! %% & @
F XSetNormalHints % &
F & - 0 @ F &
& - - - H ! %
% % -

F ! %% - @ %% %
-
& % & XSetNor-
malHints - ! - &
@ - @

XSetNormalHints - * * &

F & & ! XGetNormalHints
% XGetWMNormalHints

Status **XGetNormalHints**(*display, w, *hints_return);

% 0 @

% & &

- F & &

XGetNormalHints F & &
" F F %% %
F & &

XGetNormalHints - * &

&)KL$$)K(", % %

F & &! XSetZoomHints -
%% ! "

XSetZoomHints(**display*, *w*, **zhints*);

% 0 @

% & &

9# % % F

) & & - & & ? ! !
F XSetZoomHints % @ & & - &
& & F

XSetZoomHints - * * &

F & &! XGetZoomHints -
%% ! "

Status **XGetZoomHints**(**display*, *w*, **zhints_return*);

% 0 @

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9# - F

XGetZoomHints F & & F
" F F %% % F
F & &

XGetZoomHints - * &

@ % % %)K "LAK(", ! XSetSizeHints
% XSetWMSizeHints

XSetSizeHints(**display*, *w*, **hints*, *property*);

% 0 @

% & &

% % F

% % %

XSetSizeHints 0 F (% %
% & & XSetNormalHints XSetZoomHints
@ % % %)K "LAK(", !
% % % -

XSetSizeHints - * ! * ! * &

@ % % %)K "LAK(", ! XGetSizeHints
% XGetWMSizeHints

```
Status XGetSizeHints( *display,  w,  *hints_return,  property);
```

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% & &

- F

% % %

XGetSizeHints 0 F(% %
% & & XGetNormalHints XGetZoomHints
" @ @ % % %)K "LAK(",
! % % % - XGetSizeHints
F F & F &

XGetSizeHints - * * &

Getting and Setting an XStandardColormap Structure

- 0 % &
! XGetStandardColormap % XGetRG-
BColormaps

```
Status XGetStandardColormap( *display,  w,  *colormap_return,  proper-
ty);
```

% 0 @

% & &

- % & %

% % %

XGetStandardColormap %
& %% % % - XGetStandardColormap
F F & ' % !
% % ! XGetStandardColormap & &
- ?

```
XGetStandardColormap(dpy, DefaultRootWindow(dpy), &cmap, XA_RGB_GRAY_MAP);
```

17 I %

XGetStandardColormap - * * &

%! XSetStandardColormap
% XSetRGBColormaps

```
XSetStandardColormap( *display,  w,  *colormap,  property);
```

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XSetStandardColormap & &
-

XSetStandardColormap - * ! * ! * B & ! *
&

Parsing Window Geometry

% & & - - @ % % % !
XGeometry % XWMGeometry

int **XGeometry**(*display, screen, *default_position, bwidth, fheight, yadder, *y_return, *height_return);

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XGeometry % & & - - %
% XParseGeometry & &
@ H - % % -
% ! XParseGeometry @ @
XParseGeometry ! - % -

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& ! & - ! % - %
! - & & - -
%

Getting the X Environment Defaults

XGetDefault % @ % @ -
% 15 " @ % %%

```
char *XGetDefault( *display, *program, *option);
```

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% " 0A,#" $,)A,
! XGetDefault U $HOME/.Xdefaults-*name*U ! & *name* %
& %% -

X Version 10 Compatibility Functions

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R B & % - @

R & @

Drawing and Filling Polygons and Curves

0 % @ & % - @
% @ % & 0 # 19 @
@ %% ! 0 ! @

! / @ - &! - XDrawLines XDrawSegments

% @ 0 # 19
XDraw! XDrawFilled! XDrawPatterned! XDrawDashed! XDrawTiled
% % - @ 0 # 11N & & - $
- ! & @ ! VertexDrawLastPoint - %% !
%% & & 0 # 19 :
0 # 11 = XAppendVertex XClearVertexFlag
0 # 19 %%

& - % % & -
! E % % /
- - : XDrawLines= :
F = % # # &
# & # & # A

@ 0 # 19 XDraw! XDrawDashed! XDrawPat-
terned! XDraw

X \011>019 ^

Status **XDraw**(**display*, *d*, *gc*, **vlist*, *vcount*);

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%

! % % @ &
&

! % & @ @

XDraw & % - @ - &
% @ :@ = % %
- @

A # ! <X11/X10.h>! & & - ?

```
typedef struct _Vertex {
 short x,y;
 unsigned short flags;
} Vertex;
```

@ @
%% & : # @ F = % @
@ : # @ =

-! <X11/X10.h>! & ?

```
VertexRelative      0x0001      /* else absolute */
VertexDontDraw      0x0002      /* else draw */
VertexCurved        0x0004      /* else straight */
```

```
VertexStartClosed  0x0008      /* else not */
VertexEndClosed    0x0010      /* else not */
```

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& N - = @ @

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@ 0# 19 XDrawTiled XDrawFilled! XDraw-
Filled

X \011>019 ^

```
Status XDrawFilled( *display, d, gc, *vlist, vcount);
```

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Associating User Data with a Value

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"B 0 % @ XAssocTable
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- F XAssocTable &
& % F :
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% & XAssocTable! XCreateAssocTable

```
XAssocTable *XCreateAssocTable( size);
```

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socTable

F - % XAs-
socTable ' % & &
F -- - ? I8 % 199 / !
/ % 4 " -
XAssocTable ! ,CEE %

- @ XAssocTable! XMakeAssoc

```
XMakeAssoc( *display,  *table,  x_id,  *data);
```

% 0 @

%

- % 0 "B

% & 0 "B

XMakeAssoc XAssocTable 0"B B
- H
& 0"B - 0"B

- @ XAssocTable! XLookUpAssoc

```
char *XLookUpAssoc( *display,  *table,  x_id);
```

% 0 @

%

- % 0 "B

XLookUpAssoc @ XAssocTable 0"B
" %% % - 0"B ! XLookUpAssoc
& " K ! ,CEE

- @ XAssocTable! XDeleteAssoc

```
XDeleteAssoc( *display,  *table,  x_id);
```

% 0 @

%

- % 0 "B

XDeleteAssoc XAssocTable
0"B : 0"B = - B -
& % % XAssocTable

& - @ XAssocTable! XDestroyAssocTable

```
XDestroyAssocTable( *table);
```

%

Glossary

References

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Index

Symbols

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K0 -! 88I
K0' ! 716
K0' %! 785
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A

! 121 ! 7I2
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& -! 1I3
-! 17I

-! 1I8
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* %! 8 ! 7I4
* %* $! 16
* %+ ! 16
* %C ! 16
* + ! 3
* + $! 12
* ! 7
* ! 7I4
*
- -! 8I8 ! 7I4
- -! 8I7
* + ! 14I
* ! 14I
*
! 7I4

C

+ % ! I94
! 22
! 3I
! 22 ! 39 ! 31 ! 31
-! 37
%! 22 ! 39 ! 39 ! 39
$! 12
- -
% - ! 8I8
! 7I4
- % ! 7I4
! 7I4
! 7I4
& &! 8
&! 51
! 7I3
! 195 ! 196 ! 196
! 195 ! 196 ! 196
"A - ! 191 ! 198 ! 198 ! 19I ! 19I ! 197 ! 197 ! 195
! 198 ! 198 ! 197 ! 197
! 19I ! 195
, ! 134
H ! 896
! 7I3
-
! 1I8
& & ! 1II
! 7I3
+ ! 22
@ ! 38

) - ! 893
+ $! 38
%% - - ! 7I3
! 7I3
! 7I3
% ! 7I3
! 21
! 41 ! 41 ! 41 ! 48 ! 48 ! 4I ! 47
@ ! 37
! 45
-! 23 ! 23 ! 49 ! 48 ! 48 ! 42
H -! 44 ! 44 ! 43 ! 43
-! 45 ! 46 ! 46 ! 42 ! 42
F B ! 11I
@ ! 37
@ ! 22
! 22 ! 39 ! 3I
! 22 ! 39 ! 31 ! 31
-! 37
%! 22 ! 39 ! 39 ! 39
%! 21 ! 41
%! 7I3
! 39 ! 39
%, ! 894
%
! I59
- , ! 134
- H ! 896
! 7I3
, ! 19
! 7I3
! 779
% -
! 1II
% ! 1I7
, ! 899
! 149 ! 883
! 779
" ! I6
! 64
* ! I49

D

B -- -
@ ! 887
! 887
- - ! 886
! 885
! 88I
B + ! 121
B %! 19
B %$! 12
B B % ! 19
B B % $! 14
B ! 11
B $! 14
B &! 11
B ! 11
B $ B % ! 11
B # ! 18
B # $! 14
B % ! 779
B ! 116
B ! 83I ! I93
B , ! 899
B @ ! 779
B @ F ! 111
B @ % ! 22 ! 11I
B ! 779
B % ! 4 ! 779
! 3
! 779 ! 776
B % ' ! 116
B % ! 18
B % (- ! 16
B % (-))! 16
B % $! 31
B % $! 14
B % + ! 18
B % -! 18
B % ! 16
B %))! 12
B * - ! 14
B @ C ! 14
B & ! 8 ! 779
B & -
! 1I3
- ! 152
! 1I2
% ! 1I6
% - ! 1I2
- ! 1I4
- ! 152
! 155

E

A -! 779
A , ! 142
A @
B" +E .! 2
A
! 885
! 887
-! I
A % ! 771
A@ ! I ! 126 ! 771

- ! 126
A % ! 771
! 771
% % - ! 817 ! 771
! 771
F ! 771
% ! 126
A@ ! 123
A@) $! 13
A@
* + ! 14I
* ! 14I
, ! 134
H ! 896
) - ! 893
%, ! 894
- , ! 134
- H ! 896
, ! 899
B , ! 899
A , ! 142
A % ! 135
' " ! 139
' $! 139
% A % ! 136
@ , ! 891
D %, ! 137
D + ! 14I
D ! 14I
E @ , ! 142
) %, ! 898
) %% -, ! 898
) % H ! 892
) , ! 14I
, A % ! 136
+ % , ! 819
% , ! 89I
F H ! 894
! 811
, ! 818
H ! 811
C %, ! 897
, ! 897
A % ! 135
A ! 771

F

' ! 7
'
Y($)A> 0 ! 7I8
> >0_ ! 121
\011> ^!
\011> ^! ! 876
\011> ^! ! 876 ! I2I
\011>0 ^! 8 ! ! 116 ! 126 ! 123
\011>019 ^! ! 7II ! 7II
\011>0 ^! ! 56 ! 173 ! I59
\011>0 ^! ! 29
\011>0 ^! ! 4 ! 29 ! 122 ! I4I
\011>0 ^!
\011>0% ^! ! 132
\011>0% ^!
\011>0 ^! ! I55
\011>0 ^! ! III ! II5 ! II3 ! I7I !
I26 ! I22 ! I48 ! I45 ! I43 ! 784
' -
! 17I
% - ! 178
- ! 171
' ! 715
' " ! 139
' $! 139
' ! 177 ! 771
' - % ! 771
'
- ! 174
- - ! 174
-! 174
' -
! 45
! 84 ! 74 ! 73
' F @ ! 771
' ! 111
E",A K *! 111

G

% ! 22
! 38
% ! 38
- @ ! 38
-! 22
H -! 33
! 778
! I94
% ! 778
% - ! 778
! 778
-
! 8I8
! 8I7
! 8I6
% ! 8I9
@ ! 164
% ! 778
F -! 181
% A % ! 136

@ ! 778
@ , ! 891
! 778

H

(E %! 7I5
(! I
\011> ^!
\011> ^! ! 876
\011> ^! ! 876 ! I2I
\011>0 ^! 8 ! ! 116 ! 126 ! 123
\011>019 ^! ! 7II ! 7II
\011>0 ^! ! 56 ! 173 ! I59
\011>0 ^! ! 29
\011>0 ^! ! 4 ! 29 ! 122 ! I4I
\011>0 ^!
\011>0% ^! ! 132
\011>0% ^!
\011>0 ^! ! I55
\011>0 ^! ! III ! II5 ! II3 ! I7I !
I26 ! I22 ! I48 ! I45 ! I43 ! 784
(-))$! 13
(- $! 13
(+ A -! 778
(% ! 778

I

" ! 778
" -
& -! 152
" - * $! 15
")" ! 839
" ! 778
" %
! 778
- ! 77I
" % ! 126
" F ! 77I
" D ! I2I
" ' D ! I2I
" D % D ! I2I
") ' D ! I2I
") D ! I2I
" $8988! 77I
" +'D ! I27
" + @ D % D ! I2I

K

D
- -! 8I6 ! 77I
- -! 8I2
D
@ ! 871
@ ! 871
- -! 8I7 ! 77I
@ ! 871
- -! 8I5
D %, ! 137
D + ! 14I
D ! 14I
D ! 77I

L

E D & H + ! 1I
E + A -! 77I
E 1! 77I
E @ , ! 142
E
& -! 1I2
E ! 77I
E ! 777
E F ! 777
E B % ! 789

M

) %, ! 898
) %% & &! 777
) %% -, ! 898
) % H ! 892
) % $! 13
) ! 164
) % $! 89
) ! 777
) ! 777
) , ! 14I
)
% - -! 871
) ! 777

N

, H ! 1I
, A % ! 136
, ! 7

O

$! 777
$! 777
$ % ! 126

P

+ -! 777
+ &! 8 ! 51
+ @ - ! 883 ! 777
+ @ ! 112 ! 777
+ %! 8 ! 775
+ ! 775

% -! 1I7
! 112 ! 775
+ $! 89
+ ! 775
- -! 8I9 ! 8I8 ! 775
- -! 8I8
+ - @ ! 775
+
& -! 1I6
+ -
& -! 1I2
-! 178
+$ "0! 775
+$ "0 + ' ! 775
+$ "0
! 18
+ ! I17
+ B ! I19
+ B & ! I11
+ ! I19
+ , ! I96
+ % ! 775
%% -! 61
- -! 61
-! 68
! 61
- -! 53
-! 61
% % -! 61
% -! 61
% ! 61
+ % ! 775
+ % , ! 819
+
BA ! 4
+! 4
+ @ ! 17
+ # ! 1I
+ ! 775
+ ! 191 ! 198 ! 19I ! 197
! 191 ! 198 ! 19I ! 197
+ (- ! 191 ! 198 ! 198 ! 19I ! 19I ! 197 ! 197 ! 195

Q

JE - ! 17

R

% ! 41
-! 41 ! 41 ! 48 ! 48
% ! 41
>& % ! 41
-! 4I
>& % %
-! 47
- ! 775
-! 171
-
& -! 1I4
- ! 776
% , ! 89I
% ! 776
H ! 776
F H ! 894
! 776
"B ! 8 ! 81 ! 7I5
%! 8
! 8
' ! 8
-! 84 ! 74 ! 73
! 8
+ %! 8
&! 8
* @ ! 776
! 776
&! 17
&$! 89

S

@ ! 776
@ C ! II
! 776
! 776
! 1 ! 4 ! 776
! 776
+ ! 33
! 17
, $! 31
$ B % ! 11
+ $! 31
! 6I ! 772
@ -! 67
- - & ! 67
- & ! 6I
! 811
, ! 818
H ! 811
, ! 887
@ ! 772
- -! 164 ! 772
@ # ! 17
H ! 772
-! 772
! 116
- ! 8 ! 772
% ! I59

% -! 772
% -! 772
! 772
! 774
! I ! 774
B ! I16
B & ! I16
! I16
%% ! 774
- AH @ ! 774
- @ ! I93
-
& -! 152

T

& -! 155
! 8 ! 774
! 84
% % ! 84
! 883
%! 774
! 7
! 774
% ! 774

U

C - -
! 8I7
! 8I5
! 8I2
% ! 8I8
C B % ! 789
C %, ! 897
C %, A@ ! 79 ! 79

V

! 195 ! 196 ! 196 ! 192
! 195 ! 196 ! 196
! 192
! 17
! 7II
@ ! 7II
B B &! 7II
A ! 7II
@ ! 7II
! 7II
& ! 774
, ! 897
! 773
! 86
#
! 86
+ ! 86
! 86 ! 86
! 86
! 86
% ! 86
$! 31

W

% ! 22
% / ! 22
! 38
% ! 38
- @ ! 38
+ ! 19
+ $! 12
% ! 773
))$! 13
$! 13
&! 8 ! 82
! 82
- ! 74
-! 1II
- ! 59
- ! I25 ! 7I1
- @ ! 773
! III
"B ! 7I5
" % $! I5 ! 77I
" % $ % ! 77I
- ! 773
- ! 164
%% -! 84
! II1
% ! 777
! 776
&! 17
- ! 59
0 &! 17

X

0 + ! 773
019 %
0B &! 7II ! 7II
0B &B ! 7II ! 7II
0B &' ! 7II ! 7I7
0B &+ ! 7II ! 7II
0B & ! 7II ! 7I7
011> ! I
011> ! 7 ! 876
011> ! I ! 876 ! I2I
011>0 ! 8 ! I ! 116 ! 126 ! 123
011>019 ! 7 ! 7II ! 7II
011>0 ! I ! 56 ! 173 ! I59

011>0 ! I ! 29
011>0 ! I ! 4 ! 29 ! 122 ! I4I
011>0 ! 7
011>0% ! 7 ! 132
011>0% ! 7
011>0 ! I ! I55
011>0 ! I ! III ! II5 ! II3 ! I7I ! I26 ! I22 ! I48 ! I45 ! I43 ! 784
0 @ @ ! 129
0 A ! 794
0 (! 128
0 (! 12I
0 + ! I46
0 A E ! 717
0 @ ! 165
0 (! II3
0 ! 41 ! 45
0 ! 4I ! 45
0 + ! 47 ! 45
0 "B! 715
0 "B ! 715
0 , ! 48 ! 45
0 &A@ ! 8I2
0 + ! 3
0 A@ ! 122
0 ! 1I6
0 % $! 87I
0 % $! 87I
0* ' , E $ ' ! 829
0* ! 87I
0* %* $! 16
0* %+ ! 16
0* %C ! 16
0* + ! 3
0* + $! 12
0 $! 12
0 - @ + ! 8I8
0 - ! 188
0 - D ! 878
0 - D) %% -! 874
0 - + ! 875
0 - + % ! 61
0 - @ ! 165
0 - & ! 72
0 8 ! 175
0 ! 175
0 " A@ ! 814
0) A@ ! 813
0 % A@ ! 889
0 % &A@ ! 889
0 &A@ ! 813 ! 813
0 A@ ! 134
0 H A@ ! 896
0 & & ! 75
0 & & B & ! 76
0 & & C%! 76
0 (! II3
0 ! 1I8
0 &! 1II
0) - A@ ! 819
0 %* ! I24
0 B % ! 89 ! 81
0 ")! 844
0 $)! 854
0 % ! 194
0 ' ! 111
0 ! 41
0 , ! 48
0 $ %! 39
0 "AE ! 2I
0 "AE J) ! 198
0 "AE J) E! 198
0 "AE J) E ! 198
0 "AE J) E! 19I
0 "AE @! 27
0 "AE @J) ! 19I
0 "AE @J) E! 197
0 "AE @J) E ! 197
0 "AE @J) E! 195
0 "A @.! 2I
0 "A .! 2I
0 "A0.L! 2I
0 + $! 38
0 ! 21
0 % + ! 35
0 @ ! 37
0 ! 3I
0 B ! 31
0 B % $! 31
0 ' $ + ! 194
0 ' ! 37
0 E % ! 49
0 + ! 27
0 + -+ ! 119
0 + $ ' ! 194
0 J * ! 199
0 J * ! 199
0 J ! 43
0 J ! 43
0 J ! 199
0 J ! 191
0 J ! 191
0 *! 28
0 * ! 2I
0 " + ! 118
0 , $! 31
0 + $! 31
0 $ %! 39

0 % + ! 38
0 / + ! 38
0 + ! 38
0 ! 46
0 ! 42
0 (#! 27
0 (#J) ! 195
0 (#J) #. 195
0 (#J) #! 196
0 (#J) # % ! 196
0 (#J) #. 192
0 # $! 31
0 / + ! 32
0 ! 21
0 %A@ ! 893
0 - A@ ! 133
0 - H A@ ! 892
0 - &! 78
0 , ! 19
0 B % B & -! 821
0 B & -! 821
0 @ ! I28
0 @ ! 67
0 % ! 1II
0 % % ' ! 24
0 % ! 181
0 % + ! 1I7
0 ! 7I5
0 * %' B ! I43
0 %! 22
0 ' ! 66
0 ' ! 866
0 ! 181
0 % ! 66
0 "! 837
0 " -! I47
0 $! 861
0 + %! 65
0 + % ! 62
0 + %' * %B ! I44
0 % &! I6
0 &! I5
0 &A@ ! 899
0 -A@ ! 142
0B %! 19
0B %$! 12
0B B % ! 19
0B B % $! 14
0B ! 11
0B $! 14
0B &! 11
0B ! 11
0B $B % ! 11
0B # ! 18
0B # $! 14
0B ! I6 ! 59
0B ! 7I6
0B ! I39
0B) %A ! 859
0B + % ! 68
0B ! 7I6
0B "! 835
0B " -! I46
0B $! 868
0B - ! I24
0B & &! I4
0B &! I2
0B &A@ ! 891
0B B % B & -! 821
0B ! 127
0B % ! 18
0B % (-! 16
0B % (-))! 16
0B % D ! 872
0B %) * F! 888
0B % , ! 882
0B % $")! 843
0B % $$)! 853
0B % $! 14
0B % + ! 18
0B % -! 18
0B % ! 16
0B %))! 12
0B * - ! 14
0B @C ! 14
B - %! 713
B - H! 714
0B & ! 1I3 ! 1I3
0B & ! 1I3 ! 179
0B &" - -! 152 ! 154
0B &" - -16! 152 ! 154
0B &E ! 1I2 ! 1I2
0B &E ! 1I2 ! 1I2 ! 7II
0B &+ ! 1I6 ! 1I6
0B &+ ! 1I6 ! 1I6
0B & - ! 1I4 ! 1I4
0B & - ! 1I4 ! 1I3
0B & - ! 1I2 ! 1I2 ! 7II
0B & -! 152
0B & -16! 152
0B & ! 155
0B & 16! 156
0A($A E ! 717
0A % - ! I23
0A ! 127
0A &A@ ! 142
0AH - ! I49
0A A@ ! 887

0A * ' ! 71I
0A B % ! 794
0A % ! 793
0A ' ! 793
0A ! 794
0A A ! 718
0A A -! 718
0A A@ ! 711
0A ' ! 71I
0A ' ' ! 719
0A + A # ! 71I
0A A ! 711
0A A@ ! 719
0A@ ! 124
0A@) $! 13
0A@ J ! 815
0A % A@ ! 135
0A ! 792
0A B ! 717
0A) H F ! 18
0A $ ' ! 828
0' * ! I41
0' * ! I41
0' , ! II8
0' ! 17I ! 17I
0' ! 177
0' + - ! 178
0' - ! 171 ! 171
0' - ! 171 ! 178
0' A@ ! I12
0' ! I39
0' $ A E ! 717
0' ! 815
0' ! 18I
0' - A@ ! 139
0' " A@ ! 139
0' $ A@ ! 139
0' + %! 175
0' A ! 828
0' $ ' ! 863
0' ! 175
0' @ ! 129
0' ! 89
0' %! 23
0' ! 45
0' ! 64
0' A E ! 792
0' ' ! 173
0' ' " ! 151
0' ' , ! 159
0' ' + ! 164
0' ' ! 829
0' ! 18I
0') %! 859
0' + %! 65
0' -E ! I83
0 ' ! 18I
0 ! 7I1
0 , ! 54
0 , ! 54
0 (! I79
0 ! I72
0 B ! 7I8
0 A B ! 886
0 A ! 886
0 ' + ! 164
0 ' + % ! 173
0 # ! 188
0 ! 5I
0 " , ! III
0 " F ! I7I
0 " # ! 836
0 " - ! 161
0 ")# ! 843
0 " % ' ! 871
0 D ! 87I ! 87I
0 D) %% -! 874
0)) %% -! 851
0) A@ ! 888
0 , (! 784
0 $ # ! 86I
0 $)# ! 854
0 + ! I45
0 + ! 875
0 +) %% -! 875
0 * % ! I58
0 @ ! 121
0 $& ! 67
0 F (! 7I9
0 %! 7I9
0 " - ! 168
0 + % ! II9
0 ' (! I79
0 # " ! I4I
0 & ! 58
0 &+ % ! 53
0)) ! I72
0) % & ! I78
0)(! II5
0)" , ! II8
0), ! II1
0), (! II2
0)+ ! I71
0) F (! II4
0 L (! 783
0 * ! 8I8
0 D ! 8I6
0 D ! 8I7

0 + ! 8I9
0 @ ! 164
0 % A % A@ ! 136
0 @ A@ ! 891
0(-))$! 13
0(- $! 13
0(! 128
0" &! I87
0" F ! I7I ! I7I
0"B! 7
0" A@ ! 812
0") + ! I16
0" - ! 153
0" - * $! 15
0")* & ! I15
0")* & ! I15
0") ! I92
0") B ! I15
0") B & ! I15
0") ! I15
0") C%! I15
0")B - ! I16
0")' & ! I15
0")' & ! I15
0")(- - ! I1I
0")" ! I98
0")E A ! I16
0")E ! I16
0"), E ! I16
0")$ " ! 836
0")+ ! 831 ! 838
0")+ ! 831 ! 838
0")+ ! I17
0")+ B ! I96
0")+ B & ! I11
0")+ A ! I96
0")+ , ! 831 ! 838
0")+ , -! 831 ! 838
0")+ + ! 831 ! 838
0")+ , ! I92
0")+ C & ! I96
0")+ @ E ! I16
0")+ ! I1I
0")+ ! I92
0") @ ! I1I
0") ! I1I
0") ! 831 ! 838
0") ! 831 ! 838
0") B % ! I16
0") B & ! I16
0") , ! 831 ! 838
0") , -! 831 ! 838
0") - @ ! I93
0") ! 831
0") ! 831
0") ! I1I
0") ! I18
0")C ! I1I
0")# * & ! I1I
0")# ! I1I
0")# ' & ! I1I
0" A ! 792
0" " - ! 169
0" ! 88
0",+ @ ! I98
0") %A ! 859
0" %! 166
0" , ! 87
0" ! 52
0" ! 54
0" - ! I24
0D ! 87I
0D D ! I21
0D %A@ ! 137
0D D ! I28
0D -! I2I
0D ! 163
0E D & H + ! 1I
0E @ &A@ ! 142
0E'B! 773
0 % !
0E B % ! 19
0E A ! 792
0E ' ! 159
0E ' " ! 151
0E (! 12I
0E " % ! 162
0E + %' ! 15
0E + % ! 61
0E ' ! 174
0E J ' ! 173
0E $ ' ! 829
0E $ ")! 843
0E $ $)! 853
0E B % ! 8I
0E C% ! 7I6
0E % ! 23
0E %D ! I21
0E % -! I27
0E & &! 75
0) ! 7I5
0) %A@ ! 898
0) %% -A@ ! 898
0) % ! I3
0) % H A@ ! 894
0) % & & ! I3 ! I3
0) % &! 84 ! I4 ! I3
0) A@ ! 813

0) # " ! I4I
0) % $! 13
0) H F ! 1I
0 B &" - -! 822
0 B & -! 826
0 B & ! 826
0 E % -! I14
0 " ! 835
0)+ % ! I77
0 A % ! 828
0 A ! 82I
0 " ! 825
0 E + % ! I86
0 + A ! 827
0 + % E ! I82
0) % $! 89
0) D %! 873
0) @ F &! 77
0) @ &! 7I
0, ! I97
0, , ! I97
0,* - ! I95
0, &! I99
0, %! I95
0, ! I96
0, &) %! 873
0, A@ ! 815 ! 816
0, H ! 1I
0,' A@ ! I91
0,' &! I99
0,' ! I95
0,' - ! I95
0, ! I91
0, A % A@ ! 132
0, $%! 89
0,+ ! I97
0,+ ! I92
0,+ B ! I92
0,+ B & ! I92
0,+ ! I92
0, ! I99
0, , ! I99
0, % E ! I95
0, ! I97
0, B ! I92
0, B & ! I92
0, ! I92
0, %! I95
0$ - ! I24
0$) E ! 853
0$)$ $! 868
0$% B % ! 2
0$% ")! 844
0$% $)! 852
0+ ! 23
0+ ! I25
0+ A@ ! 812
0+ " A@ ! 814
0+ -! 815 ! 816
0% ! I25
0+ $! 89
0+ ! 1I5
0+ ! 7
0+ " - ! I49
0+ - - ! I22
0+ " ! 87
0+ % A@ ! 819
0+ @ ! 17
0+ # ! 1I
0+ * A@ ! 881
0+ " - ! 169
0+ + ! I45
0JE - ! 17
0J * ! 66 ! 64
0J * F ! 182
0J * %% ! 184
0J * ! 182
0J ! 44
0J ! 44
0J A ! 796
0J ' ! 174
0J D %! 877
0J + ! 55
0J A ! 15I
0J A 16! 157
0J ! 51
0 &! 75
0 * %' ! I42
0 * %' B ! I42
0 D ! I27
0 ! 64
0 -) &! I85
0 - ! 1I5
0 " - ! I49
0 D) %% -! I28
0 - ")" ! 843
0 @ ! 87
0 @ ' @ ! 166
0 @ (! 12I
0 @ (! 127
0 % A@ ! 89I
0 % &! 167
0 @ ! 129
0 F H A@ ! 894
0 F &! 7I
0) - -! I69
H! 714
0 & ! 76

0 B ! I68
0 ' B ! I68
0 B ! I53
0 B B ! I61
0 A B ! I62
0 B ! I68
0 ' B ! I69
0 ! I6I
0 -B ! I61
0 " F ! I69
0 E $ B ! I61
0) - B ! I6I
0 $% B ! I64
0 $% D ! I64
0 + ! I63
0 + - J ! I54
0 + ' B ! I69
0 + E ! I62
0 + ! I65
0 + - ! I66
0 J ! I6I
0 J E ! I67
0 J ! I65
0 J+ ! I65
0 J+ - ! I66
0 J -! I54
0 B ! I68
0 - * -J E ! I53
0 - J ! I54
0 - J E ! I54
0 C H J ! I52
0 # ! I69
0 &! 17
0 &$! 89
0 * ! I48
0 &+ % ! 68
0 @ ! I39
0 ! 17
0 , $! 14
0 $ B % ! 11
0 -! I61
0 - ! 1I5
0 " % ! 817
0 A@ ! 811
0 A@ ! 818
0 H A@ ! 811
0 A@ ! 881 ! 881
0 @ " % ! 128
0 @ # ! 17
0 ! 127
0 ' ! 88I
0) ! 1I1
0 * - ! 187
0 (! II3
0 %) ! 1I9
0 %$ - ! 183
0 % - ! 1I9
0 B &) ! 81
0 ! I76
0 B ! 185
0 A (! 887
0 ' ! 186
0 ' ! 186
0 ' ! 183
0 ' + ! 162
0 ' - ! 187
0 ' ! 187
0 % A % ! 1I1
0 " ' ! 835
0 " , ! III
0 " F ! I7I
0 " # ! 836
0 ")# ! 843
0 " % ' ! 879
0 "$A (! 882
0 E ! 185
0 E) ! 85I
0)) %% -! 859
0 , (! 784
0 $ # ! 868
0 $)# ! 854
0 +) ! 185
0 +) %% -! 877
0 - ! I22
0 * % ! I51
0 @ ! 163
0 $& ! 6I
0 F (! 783
0 %! 7I9
0 + % ! 782
0 ! 187
0 %% ! 184
0 & &) ! 1I1
0 + % ! II9
0 ! 184
0 ' (! I79
0 $ - ! 183
0 & ! 83
0 &* - ! 74
0 &* - + %! 74
0 &* ! 73
0 &* + %! 73
0 &* ! 77
0 & %! 73
0)) ! I72
0) % & ! I78
0)(! II5
0)" , ! II8

0), ! II1
0), (! II2
0)+ % ! I75
0)+ ! I71
0) F (! II4
0 L (! 783
0 - ! I24
0 * ! I41
0 * ! I41
0 ! 45
0 ! 46
0 , ! II1
0 , ! 42
0 -E + % ! I83
0 - D ! I28
0 " - ! I45
0 - ! I23
0 ! 8 ! I ! 815
0 F ! 88I
0 A ! 158
0 A 16! 158
0 " ! 155
0 " 16! 155
0 + % ! I86
0 + % -E ! I83
0 ! 151 ! 158
0 16! 151 ! 158
0 ! 88I
0 ! 57
0C ! 59
0C - * ! 8I7
0C - D ! 8I2
0C - D ! 8I5
0C - + ! 8I8
0C - @ ! 164
0C %! 162
0C - ! I23
0C - ! I24
0C ' ! 159
0C B % ! 8I
0C %A@ ! 897
0C % & & ! 79
0C % &! 79 ! 79
0C - ")" ! 839
0C " ' ! 835
0# , E ! 856
0# ! 17
0# A@ ! 895
0# "B' # ! 82
0 %+ ! 8I3
0& B &" - -! 822
0& B & -! 826
0& B & ! 826
0& ' -E ! I84
0& E % -! I14
0& " ! 835
0& A % ! 828
0& A ! 82I
0& " ! 826
0& E + % ! I86
0& + A ! 827
0& + % E ! I82
0 + ! 19
0 + $! 12
0))$! 13
0 $! 13
0 & ! 58
0 & - ! 71
0 &A@ ! 815 ! 813
0 & &! I85
0) ! I26
0 * %' ! I44 ! I43
00 - ! I23
0. ! 773

Z

L ! 773