# PARALLEL PROGRAMMING ABOUT XLIB API

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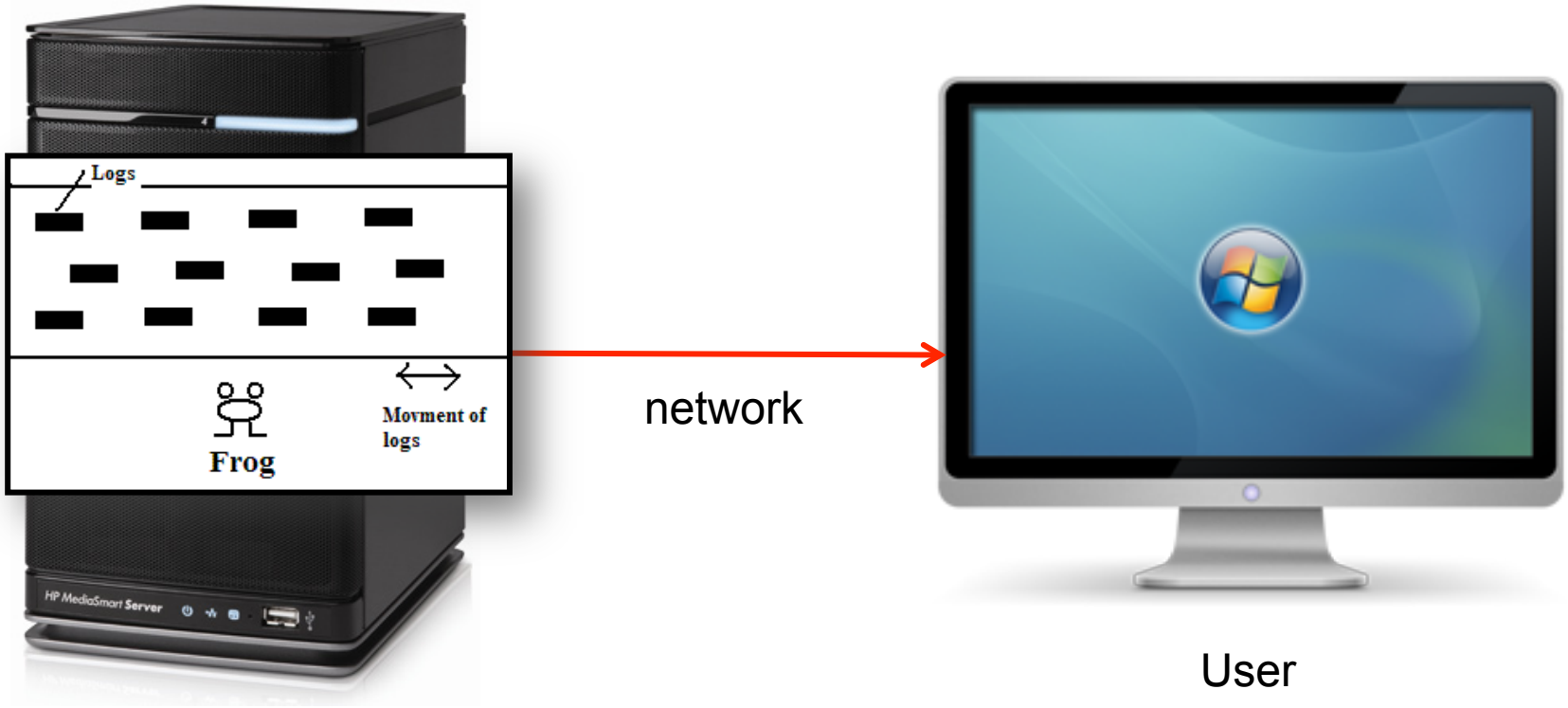
# X WINDOW SYSTEM

**Introduction :**

**The X window system (commonly X or X11) is a computer software system and network protocol that provides a basis for graphical user interfaces (GUIs) and rich input device capability for networked computers. It creates a hardware abstraction layer where software is written to use a generalized set of commands, allowing for device independence and reuse of programs on any computer that implements X.**

# X WINDOW SYSTEM



# XLIB

**Xlib is an X Window System protocol client library written in the C programming language. It contains functions for interacting with an X server. These functions allow programmers to write programs without knowing the details of the protocol.**

# XLIB

Include xlib header file :

```
#include <X11/Xlib.h>          // basic X routine
#include <X11/keysym.h>        // keyboard event
```

Compile :

Seq: gcc -o foo foo.c -lX11

Pthread: gcc -o foo foo.c –lpthread -lX11

Run :

./foo

# XLIB – BASIC DATATYPE

**Basic datatypes**

- **Display – specify the connection to the X server**
- **Window – specify the window**
- **GC – graphic context**

# XLIB – BASIC API

**Basic API :**

- **XOpenDisplay - connect to X server**
- **XCreateSimpleWindow - create simple windows**
- **XMapWindow – map windows**
- **XCreateGC - create graphics contexts**
- **XSetBackground – set the background color**
- **XFlush - output buffer or event queue**
- **XDrawString - draw text characters**
- **XDrawPoint - draw points**
- **XFillRectangle - fill rectangles**
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# XLIB – XOPENDISPLAY

**Connect to X server :**

**Display *XOpenDisplay(char *display_name);**

**display_name – IP address of X server**

**Return value – handle of this display to X server**

**e.g. Display *display = XOpenDisplay(NULL);**

**// just NULL if you follow the front the set up the x server**

# XLIB – BASIC API

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# XLIB - XCREATESIMPLEWINDOW

**Create a window :**

**Window XCreateSimpleWindow(Display *display, Window parent, int x, int y, unsigned int width, unsigned int height, unsigned int border_width, unsigned long border, unsigned long background);**

**parent - Specifies the parent window.**
**x, y – coordinate of top-left corner of window**
**width, height – width and height of window**

**e.g.**

**Window win = XCreateSimpleWindow(display, DefaultRootWindow(display), 0, 0, 300, 200, 1, BlackPixel(display, screen_num), WhitePixel(display, screen_num))**

# XLIB – BASIC API

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# XLIB - XMAPWINDOW

**Map a window (make the window viewable)**

**Window XMapWindow( Display *display, Window w );**

**display – specify the connection to X server**

**w – specify the window**

**e.g.**

```
XMapWindow(display, win);
```

# XLIB – BASIC API

**Basic API :**

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# XLIB - XFLUSH

**Output the buffer and event queue**

**int XFlush( Display *display );**

**When you change the state of the window or trigger an event, use XFlush() to update the screen**

**e.g.**

```
XFlush( display );
```

# EXAMPLE – CREATE A SIMPLE WINDOW

```
#include <X11/Xlib.h>
#include <unistd.h>

int main(int argc, char **argv)
{
    Display *display = XOpenDisplay ( NULL );      // create X connection
    Window win;
    int whiteColor = WhitePixel( display, DefaultScreen( display ) );
//  int blackColor = BlackPixel( display, DefaultScreen( display ) );

    win = XCreateSimpleWindow( display, DefaultRootWindow( display ), 0, 0,
                300, 200, 0, whiteColor, whiteColor );  // create a window

    XMapWindow( display, win );
    XFlush( display );
    sleep( 10 );
    return 0;
}
```

# XLIB – BASIC API

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# XLIB - XCREATEGC

**Create graphics contexts (create the basic structure to describe the graphics)**

**GC XCreateGC(Display *display, Drawable d, unsigned long valuemask, XGCValues *values );**

**Drawable d – usually specify the window**

**e.g.**

```
GC gc = XCreateGC( display, win, 0, 0 );
```

# XLIB

**Set the foreground/background color**

**int XSetForeground( Display *display, GC gc, unsigned long foreground );**

**int XSetBackground( Display *display, GC gc, unsigned long background );**

**e.g.**

```
ret = XSetForeground( display, gc, 0xFFFFFF );
ret = XSetBackground( display, gc, 0x000000 );
```

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# XLIB - XDRAWSTRING

**Draw text characters :**

**int XDrawString( Display *display, Drawable d, GC gc, int x, int y, char *string, int length );**

**x, y – coordinate of first character of string**

**length – string length**
**Drawable d – usually specify the window**

**e.g.**

```
//You Win
    XDrawString( display, win, gc, 30, 30, “You Win”, 7 );
//You Lost
    XDrawString( display, win, gc, 100, 100, “You Lost”, 5);
```

# XLIB - XDRAWPOINT

**Draw graphics**

**Draw points :**
**XDrawPoint(Display *display, Drawable d, GC gc, int x, int y);**

**fill rectangles :**
**XFillRectangle(Display *display, Drawable d, GC gc, int x, int y, unsigned int width, unsigned int height );**

**Fill arcs :**
**XFillArc( Display *display, Drawable d, GC gc, int x, int y, unsigned int width, unsigned int height, int angle1, int angle2);**

# XLIB - XDRAWPOINT

**e.g.**

**Draw a rectangle of color 0xAABBCC**

```
XSetForeground( display, gc, 0xAABBCC );
XFillRectangle( display, win, gc, 0, 0, 300, 300 );
```

**Draw a point of color 0xDDEEFF**

```
XSetForeground( display, gc, 0xDDEEFF );
XDrawPoint( display, win, gc, 10, 10 );
```

# EXAMPLE – DRAW A LINE

```
int main(int argc, char **argv) {
    Display *display = XOpenDisplay ( NULL );      // create X connection
    Window win;
    int whiteColor = WhitePixel( display, DefaultScreen( display ) );
    int blackColor = BlackPixel( display, DefaultScreen( display ) );

    win = XCreateSimpleWindow( display, DefaultRootWindow( display ), 0, 0,
                300, 200, 0, blackColor, blackColor );  // create a window
    XMapWindow( display, win );

    GC gc = XCreateGC( display, win, 0, 0 );           // Create a "Graphics Context"

    XSetForeground( display, gc, whiteColor );         // Tell the GC we draw using the white color
    XDrawLine( display, win, gc, 10, 60, 180, 20 );   // Draw the line

    XFlush( display );                                 // Send the "DrawLine" request to X server
    sleep( 10 );
    return 0;
}
```

# EXAMPLE OF KEYBORARD EVENT

```
deal_with_keys(XEvent *event;)
{
int count;
int buffer_size = 80;
char buffer[80];
KeySym keysym;
count = XLookupString(event,buffer,buffer_size, &keysym);
if ((keysym >= XK_Left) && (keysym <= XK_Down)){
      printf("Arrow Key:-");
      switch(keysym){
      case XK_Left: printf("Left\n");break;
      case XK_Up: printf("Up\n");break;
      case XK_Right: printf("Right\n");break;
      case XK_Down: printf("Down\n");break;
      }
}
```