LGE Protocol Specification

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Interface Version 5.0
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This document describes Version 5.0 of the protocol for the LG Extension to Xorg (LGE).
The exact details and encoding of this protocol is specified in
`xc/include/extensions/lgewire.h.` (See the appendix at the end of this document).

1 Changes since Interface Version 5.0

Added *sendEventDirect* argument to LgeRegisterClient.

2 LG Display Server Use of LGE Requests

The LGE requests are intended to be used only by the LG Display Server (or other 3D window system servers which are compatible with the LGE protocol). In this document the LG Display Server as referred to as the DS.

The DS invokes these requests in the following order:

1. LgeQueryVersion
   Frequency: Once.
   Purpose: To query the LGE interface version.

2. LgeRegisterClient
   Frequency: Once for each DS X11 client connection.
   Purpose: To inform LGE of each DS client connection and to identify certain special connections. (The DS opens one X11 connection per thread which talks to the X server).

3. LgeRegisterScreen
   Frequency: Once for each screen managed by the DS.
   Purpose: To inform LGE of which screens will be running a 3D desktop and, therefore, which should receive special event and window processing.

4. LgeControlLgMode
   Frequency: Once.
   Purpose: To enable LG mode or all registered screens.

5. LgeSendEvent
   Frequency: Once per raw device event that the DS receives.
   Purpose: When the DS has finished performing a pick operation on the raw device

event, it sends the modified event back to the X server using this request.

3 LgeQueryVersion

LgeQueryVersion
==>
majorVersion: CARD32
minorVersion: CARD32
implementation: CARD32

Used by the LG DS to determine the interface version which is supported by the LGE extension in the X server. The major number is incremented for changes which are not backward compatible. The minor number is incremented for changes which are backward compatible. Also, a number which identifies a specific LGE implementation is returned in implementation field.

4 LgeRegisterClient

LgeRegisterClient
clientType: CARD8
sendEventDirect: BOOL

Used by the LG DS to identify its client connections to LGE. LGE needs to know which connections belong to the DS so that it can disable LG mode whenever any of these connections is closed (for proper clean up on DS death).

In addition, there are certain special clients which LGE needs to know about, specifically the *Picker*, to which LGE sends raw device events for picking, and the *Event Deliverer*, to which LGE sends processed 3D events. The DS Picker client should invoke this request with *clientType* equals LGE_CLIENT_PICKER. The DS Event Deliverer client should invoke this request with *clientType* equals LGE_CLIENT_EVENT_DELIVERER. All other DS clients should use *clientType* LGE_CLIENT_GENERIC. The Picker and Event Deliverer clients may only be registered once (they may be registered again only after LG mode has been disabled).

Note: When one or more DS client connections are closed, LG mode is disabled by LGE.

The argument *sendEventDirect* is new to version 5.0 of the interface. This argument is ignored unless *clientType* == LGE_CLIENT_PICKER. When the Picker sends this request to the X server it should set *sendEventDirect* to TRUE if the Picker is operating in session mode. It should set the argument to FALSE if it is operating in app mode.

Errors:

BadAccess   Returned if *clientType* == LGE_CLIENT_PICKER and the Picker client has already been registered or *clientType* == LGE_CLIENT_EVENT_DELIVERER and the Event Deliverer client has already been registered.

`BadAlloc` Returned if LGE is unable to create an X resource for the client.

5 LgeRegisterScreen

LgeRegisterScreen
prw: WINDOW

Used by the DS to register with LGE each of the screens it is managing. The DS can be configured to manage a subset of the physical screens attached to the X server and to render a 3D desktop environment on these screens. *prw* is the XID of the pseudo-root window of the screen to be registered.

Only the DS Picker client may invoke this request.

Errors:

`BadAccess` Returned if the client making the request is not the DS Picker client.

`BadAlloc` Returned if the maximum number of screens is exceeded (currently the maximum is 16, which is the same as the X server's maximum number of screens). This error may also be returned if attempts to allocate internal memory (such as cursors, etc.) fail.

`BadMatch` Returned if *prw* does not reference a valid resource.

6 LgeControlLgMode

LgeControlLgMode
enable: BOOL

Used by the DS to make the Xorg server start or stop operating in *LG mod*e. If enable is TRUE, LG mode is enabled, otherwise it is disabled.

Only the DS Picker client may invoke this request.

While LG mode is enabled, the following client-visible Xorg semantics are altered:

1. The XVideo, XVideo-MotionCompensation and XINPUT extensions are not supported. (See section 8 of [1]).

2. The clip shapes of top-level windows are not subtracted from the clip shapes of their parent windows. (See section 4.1 of [1]).

3. The window manager is not asked for permission to map (i.e. make visible) top-level override

redirect windows; they are always automatically mapped, and they are mapped onto the screen before before the `MapWindow` request completes. In addition, top-level override redirect windows are always automatically composite-redirected. (See section 5 of [1]).

4. QueryTree will indicate that the parent of a top-level window is the root window, even though it may be some other window. This is a work around for an emacs bug. (See section 9.2 of [1]).

While LG mode is enabled, the following (potentially) user-visible Xorg semantics are altered:

1. OpenGL programs will not function properly (they will flash and draw to the wrong location).

2. The Display ID (DID) buffer pixels for top-level windows are not rendered with the window's DID. (See section 4.2 of [1]).

3. The rendering of the X cursor is disabled; the X cursor is no longer visible on the screen. (See section 6 of [1]).

Errors:

`BadAccess`	Returned if the client making the request is not the DS Picker client.

7 LgeSendEvent

LgeSendEvent
event: XEVENT

Used by the DS to send back to the X server an event which has had pick processing performed on it. Refer to section 9 of [2] for more information on how this request is used.

Only the DS Picker client may invoke this request.

8 Bibliography

[1] *LG Modifications to Xorg* by Deron Johnson, Sun MicroSystems.
This document is located in `xc/doc/specs/LG/lg_xorg_mods.pdf`. This document is currently located in the `lg3d-dev-0-7-1` branch of the Xorg CVS.

[2] *A Trip Up the Looking Glass Event Pipeline* by Deron Johnson, Sun Microsystems.
This document is located in `xc/doc/specs/LG/lg_event_trip.pdf`. This document is currently located in the `lg3d-dev-0-7-1` branch of the Xorg CVS.

9 Appendix: lgewire.h

This include file defines the specifics of the LGE protocol. It also defines the protocol encoding. This file is currently located in the lg3d-dev branch of the Xorg CVS.

```
/************************************************************

$RCSfile: lgewire.h,v $

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```

```
/*
 * lge.h - Looking Glass Extension Definitions
 */

#ifndef _LGEWIRE_H
#define _LGEWIRE_H

#include "X11/Xfuncproto.h"

#define LGE_NAME "LGE"

/* Current interface version numbers */
#define LGE_MAJOR_VERSION   5
#define LGE_MINOR_VERSION   0

/* Display Server is alive */
#define  X_LgeQueryVersion          0
#define  X_LgeRegisterClient        1
#define  X_LgeRegisterScreen        2
#define  X_LgeControlLgMode         3
#define  X_LgeSendEvent             4

/* Arguments to XLgeRegisterClient */
#define LGE_CLIENT_GENERIC          0
#define LGE_CLIENT_PICKER           1
#define LGE_CLIENT_EVENT_DELIVERER  2

typedef struct {
    CARD8       reqType;
    CARD8       lgeReqType;
    CARD16      length B16;
} xLgeQueryVersionReq;

#define sz_xLgeQueryVersionReq  sizeof(xLgeQueryVersionReq)

typedef struct {
    /* Always X_Reply */
    BYTE        type;
    CARD8       unused;
    CARD16      sequenceNumber B16;
    CARD32      length B32;
    CARD32      majorVersion B32;
    CARD32      minorVersion B32;
    CARD32      implementation B32;
    CARD32      pad3 B32;
    CARD32      pad4 B32;
    CARD32      pad5 B32;
} xLgeQueryVersionReply;

#define sz_xLgeQueryVersionReply sizeof(xLgeQueryVersionReply)

typedef struct {
    CARD8  reqType;
    CARD8  lgeReqType;
    CARD16 length B16;
    CARD8  clientType;
    BOOL   sendEventDirect;
    CARD16 pad2 B16;
} xLgeRegisterClientReq;

#define sz_xLgeRegisterClientReq sizeof(xLgeRegisterClientReq)

typedef struct {
    CARD8  reqType;
    CARD8  lgeReqType;
    CARD16 length B16;
    /* The pseudo-root window of the screen */
    Window prw;
} xLgeRegisterScreenReq;

#define sz_xLgeRegisterScreenReq sizeof(xLgeRegisterScreenReq)

typedef struct {
    CARD8     reqType;
    CARD8     lgeReqType;
    CARD16    length B16;
    BOOL      enable;
    CARD8     pad1;
    CARD16    pad2 B16;
} xLgeControlLgModeReq;

#define sz_xLgeControlLgModeReq sizeof(xLgeControlLgModeReq)

typedef struct {
    CARD8     reqType;
    CARD8     lgeReqType;
    CARD16    length B16;
    xEvent    event;
} xLgeSendEventReq;

#define sz_xLgeSendEventReq sizeof(xLgeSendEventReq)
```

```
#endif /* LGEWIRE_H */
```