Welcome to Wayland

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Agenda

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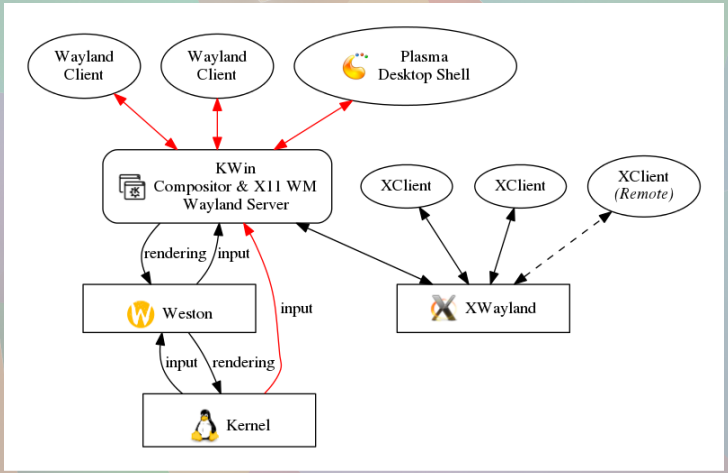
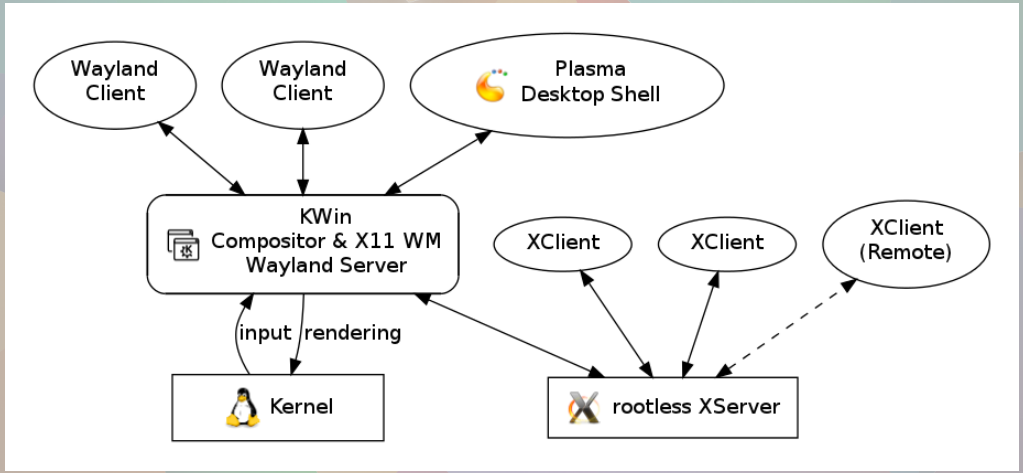
Architecture as presented last year



Current architecture



Backend plugins for different platforms

KWin internal Platform Abstraction

- Create OpenGL context and surface
- QPainter fallback for no OpenGL
- Output information
- Input event handling

Libinput

If backend doesn't provide input, libinput library is used.

Available backend plugins

Windowed/Nested Platforms

- X11 (supports OpenGL, QPainter)
- Wayland (supports OpenGL, QPainter)

Full Platforms

- DRM (supports OpenGL through GBM, QPainter)
- fbdev (supports QPainter)
- Android hwcomposer/libhybris (supports OpenGL, input)

This Presentation runs on the DRM platform!

Architecture summary

- KWin is a Wayland server
- KWin supports wl_shell clients both OpenGL and SHM
- KWin supports Xwayland based clients
- KWin can render on top of DRM/KMS
- KWin support input through libinput
- Nested KWin Wayland servers on X11/Wayland for easy testing

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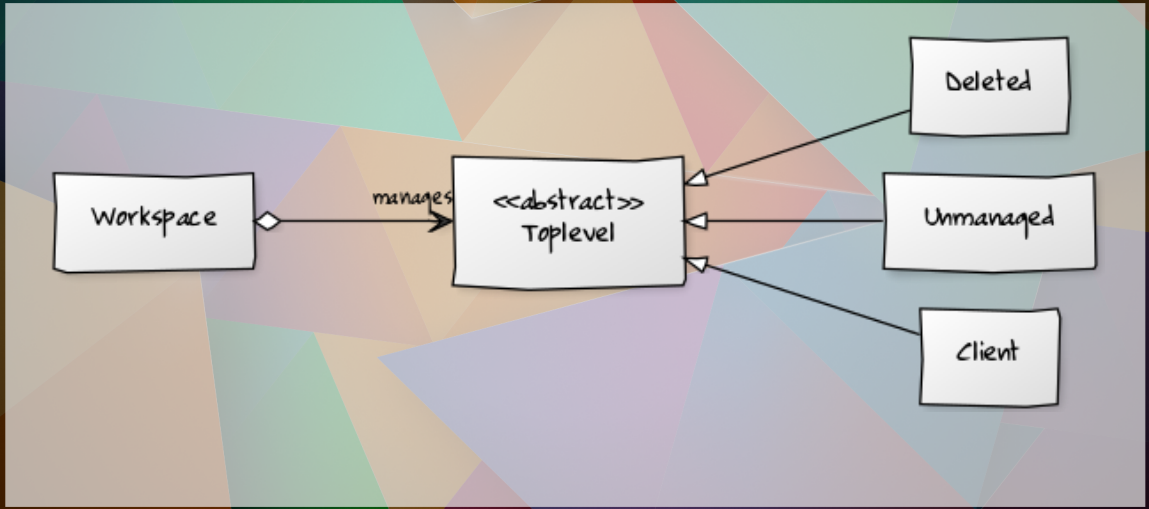
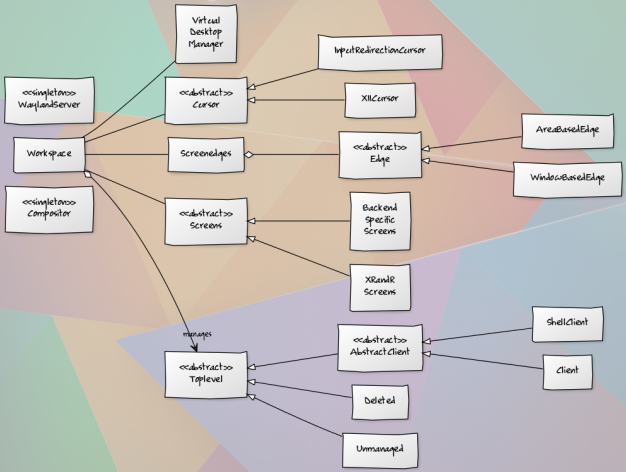
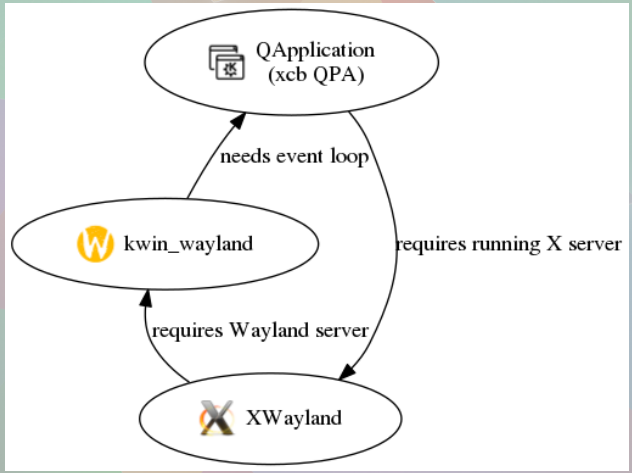
Simplified KWin (Core) architecture before Wayland



Simplified KWin (Core) architecture as of today



How to start KWin



Starting KWin as X11 application

How to start X?

- KWin's startup is highly X11 dependent
- Qt's XCB plugin requires X11 in QApplication ctor
- Starting Xwayland before KWin requires a running Wayland server
- Wayland server requires event loop
- Event loop requires QApplication
- Xwayland requires wl_drm

KWin needs to move away from xcb QPA

Is QtWayland any better?

New Startup

- First start Wayland server
- Create QApplication
- Startup Compositor/Scene
- Startup Xwayland
- Wait for Xwayland being started
- Continue with X specific startup code

Similar problems as xcb QPA

Roundtrips are evil

- Requires Wayland server at QApplication startup
- Does roundtrip to server in startup (blocks gui thread)
- Cannot create a QThread before creating QApplication
- QtWayland dispatches events while waiting for the roundtrip

Still many workarounds needed

Blocking OpenGL context creation

```
// HACK: create a QWindow in a thread to force QtWayland to create the
// client buffer integration.
// this performs an eglInitialize which would block as it does a roundtrip
// to the Wayland server in the main thread.
// By moving into a thread we get the initialize without hitting the problem
// This needs to be done before creating the Workspace as from inside
// Workspace the dangerous code gets hit in the main thread
QFutureWatcher<void> *eglInitWatcher = new QFutureWatcher<void>(this);
eglInitWatcher->setFuture(QtConcurrent::run([] {
    QWindow w;
    w.setSurfaceType(QSurface::RasterGLSurface);
    w.create();
}));
```

More workarounds

BypassWindowManagerHint needed for each Window on X11

```
bool ApplicationWayland::notify(QObject *o, QEvent *e)
{
  if (QWindow *w = qobject_cast< QWindow* >(o)) {
    if (e->type() == QEvent::Show) {
      // on QtWayland windows with X11BypassWindowManagerHint are not shown,
      // thus we need to remove it. As the flag is interpreted only before
      // the PlatformWindow is created we need to destroy the window first
      if (w->flags() & Qt::X11BypassWindowManagerHint) {
          w->setFlags(w->flags() & ~Qt::X11BypassWindowManagerHint);
          w->destroy();
          w->show();
          return false;
      }
    }
  }
  return Application::notify(o, e);
}
```

Do we need our own QPA plugin?

Further issues

- Cannot share composited OpenGL context with QtQuick
- Cannot use threaded QtQuick render loop
- QtQuick on hwcomposer aborts
- Intercept all input inside KWin anyway
- Have code to create X11 and Wayland windows
- Have code to create OpenGL context
- Have code to do low level event processing

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I propose to rename kwin to kwind because it swallows all features *(Kai-Uwe Broulik)*

Fixing the X11 security issues

Generic issues on X11

- KGlobalAccel is a global key logger
- Screen lockers are not secure (see Blog post “Why screen lockers on X11 cannot be secure”)
- All windows can edit all attributes of windows of foreign processes
- Windows can place themselves
- Windows can bypass Window Managers
- Clients can warp pointer
- Clients can grab foreign window content

KWin needs more knowledge about the windows

More control to the compositor

- KGlobalAccel moved into KWin
- Screen Locking needs to move into KWin
- Needs to know which windows belong to virtual keyboard
- Needs to know which process is desktop shell
- Needs to know which process is screen shot application
- Needs to know which process handles power management
- Needs to know the session splash screen
- Needs to authorize processes to access special interfaces

Suggestions for the problems appreciated!

It's tricky

- Don't duplicate code
- Don't hard depend on specific technology
- Everything should be flexible
- How to handle e.g. a shell process crash
- Don't harm user experience (no UAC)
- What about kded?

Agenda

XDG_Shell

So far only wl_shell support

- wl_shell is rather limited
- We make it useable with a Qt extension
- No support for Weston-demo clients
- No support for GTK+ clients

XDG_Shell under heavy development

- Unstable protocol mechanism
- GTK, Qt, Weston on real systems out of sync
- Need to get our (Qt, Plasma) needs into the protocol

Window Decorations

Issues with Qt deco

- Minimize button does nothing
- No visible distinction between active/inactive state
- Cannot configure button order
- Cannot add our own buttons
- It's not a good client-side deco solution, models server side

Possible Solution 1

Implement a better plugin based on KDecoration

Maybe better Solution?

- Disable Qt deco at runtime
- Read Qt::FramelessWindowHint in Extended surface
- Create server deco for all Qt Windows

Improvements in KWin

Lot's of features still missing

- Geometry handling missing
- Window types mostly missing
- Interaction with Plasma needs improvements
- Lots of small bugs here and there
- Window Rules missing

Please help us!

Plasma on Wayland on todo.kde.org

KWindowSystem

Modeled around X11

- Everywhere global Window Id
- Mixes API for own and foreign windows
- Platform abstraction is not a solution to support Wayland

Idea

Create a new API exposing a QAbstractItemModel which can be used by Task Managers.

Polish, polish, polish

Please Help!

- Starting KWin: kwin_wayland –xwayland
- Starting Plasma: startplasmacompositor

Tuesday is Wayland Day

Lab 0.5w

- 10:30 Wayland and Powerdevil and KScreen
- 11:30 Wayland and Plasma
- 15:00 Wayland and Applications

What is KWayland Client?

Qt style convenient library for Wayland

- Allow to use Wayland APIs in a Qt way
- Not a complete wrapper of Wayland yet
- Can integrate with QtWayland QPA
- Additional KWin/Plasma specific Wayland interfaces

Doesn't that duplicate QtWayland?

- QtWayland is a QPA plugin
- KWayland is an API which could be used to write a Wayland QPA plugin
- KWayland is to QtWayland, what KWindowSystem is to xcb QPA plugin

Additional Interfaces provided by KWayland

Already implemented

- org_kde_kwin_shadow (e.g. Plasma panel shadow)
- org_kde_kwin_idle (KF5IdleTime)
- org_kde_kwin_fake_input (kdeconnect)
- org_kde_plasma_shell
- org_kde_plasma_window_management

More to come, e.g.

- Blur and Background contrast effect
- Highlight Windows
- Present Windows
- Slide Windows

New Repository: kwayland-integration

New in Plasma 5.4

- Plugin for KWindowSystem
- Plugin for KIdleTime
- Place for any framework plugin which needs to depend on KWayland

What is KWayland Server?

The other side

- Qt-style API to implement a Wayland server
- Wrapper for the core Wayland protocols
- Wrapper for the KWin/Plasma specific interfaces
- No rendering!
- Implements lots of generic Wayland server functionality

Building a Wayland Server with KWayland

```
auto display = new KWayland::Server::Display(this);
display->start();
auto compositor = display->createCompositor(display);
compositor->create();
auto shell = display->createShell(display);
shell->create();
display->createShm();
auto seat = display->createSeat(display);
seat->create();
display->createDataDeviceManager(display)->create();
display->createIdle(display)->create();
auto plasmaShell = display->createPlasmaShell(display);
plasmaShell->create();
auto qtExtendedSurface = display->createQtSurfaceExtension(display);
qtExtendedSurface->create();
auto windowManagement = display->createPlasmaWindowManagement(display);
windowManagement->create();
auto shadowManager = display->createShadowManager(display);
shadowManager->create();
```

Interacting with the server

Example for a created object

```
connect(m_plasmaShell, &PlasmaShellInterface::surfaceCreated,
    [this] (PlasmaShellSurfaceInterface *surface) {
        if (ShellClient *client = findClient(surface->surface())) {
            client->installPlasmaShellSurface(surface);
        }
    }
);
```

Interacting with the server

Example for updating information in the server

```
void InputRedirection::processPointerMotion(const QPointF &pos, uint32_t time)
{
    // KWin internal handling for pointer motion removed for readability
#if HAVE_WAYLAND
    if (auto seat = findSeat()) {
        seat->setTimestamp(time);
        seat->setPointerPos(pos);
    }
#endif
}
```

Why not QtCompositor?

Comparable to Client vs QPA

- Our own interfaces are no fit for integration into Qt
- QtCompositor has not seen a release yet
- Focus on QtQuick useless for our needs
- Lot's of things which just doesn't fit our usecases