Pimp your Pi

with Eclipse RCP for your Home TV

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Who’s Talking?

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Obligatory Disclaimer

- We’re here because we love Eclipse.
- Yes, we could plug Genuitec, and our awesome products like MyEclipse and Secure Delivery Center…
- But this talk is all about the fun you can have with Pi and open source!

- *MyEclipse is your fully loaded IDE, ready to go. Built on Eclipse and optimized for a broad array of development tasks including rich Java EE.*
- *Secure Delivery Center lets you eliminate engineering overhead by simply packaging up Eclipse with add-ons and configuration, and delivering it to a team, or your end-users.*

Agenda

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- Introducing PiPlug
- Building your first PiPlug application
- Understanding performance on the Raspberry Pi
- PiPlug architecture and rapid deployment cycles
- Where to start on your own apps
- What’s next

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Pi Meets Eclipse

Raspberry Pi® + eclipse

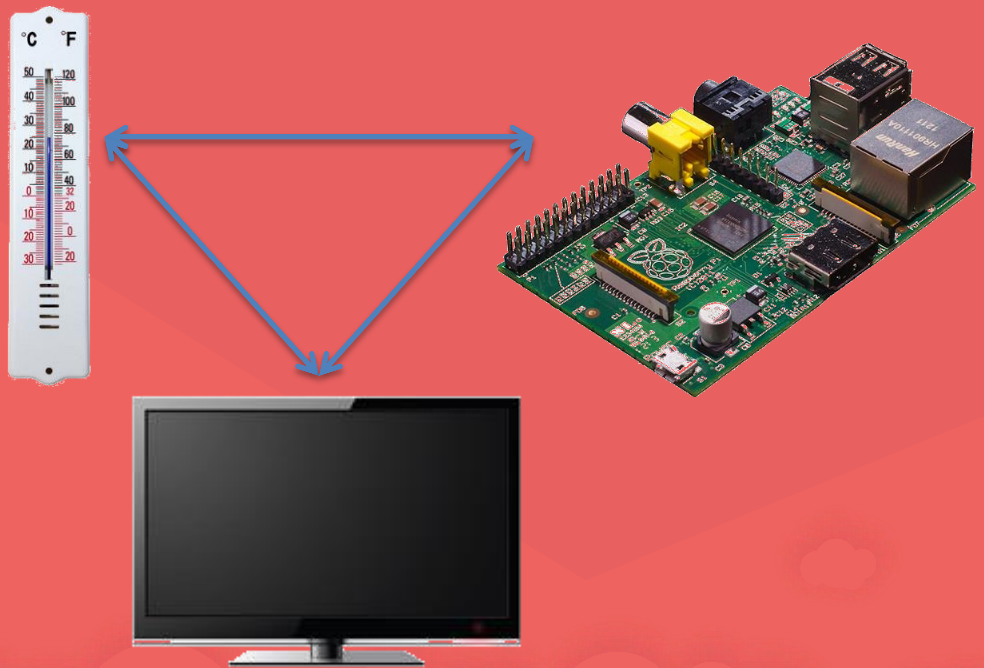
- Platform for tinkering
- Exemplifies opportunities of the "Internet of Things" (IoT)
- Based on ARM architecture
- Lower-powered but flexible

- Rich foundation of components for devices to servers
- Flexible deployment models
- Simple extensibility
- Vibrant community

= An ideal pairing of technologies

Pi Setup Example

How do we solve this problem?



Introducing PiPlug

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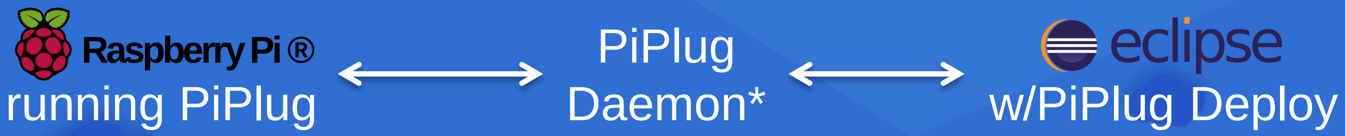
- PiPlug brings the ease and extensibility of Eclipse to the Raspberry Pi
- Runs using a simple RCP front-end with app plug-ins
- Optimized for low overhead and responsive UI
- Remote deployment of apps from Eclipse to Pi



* Daemon can be automatically self-hosted inside Eclipse

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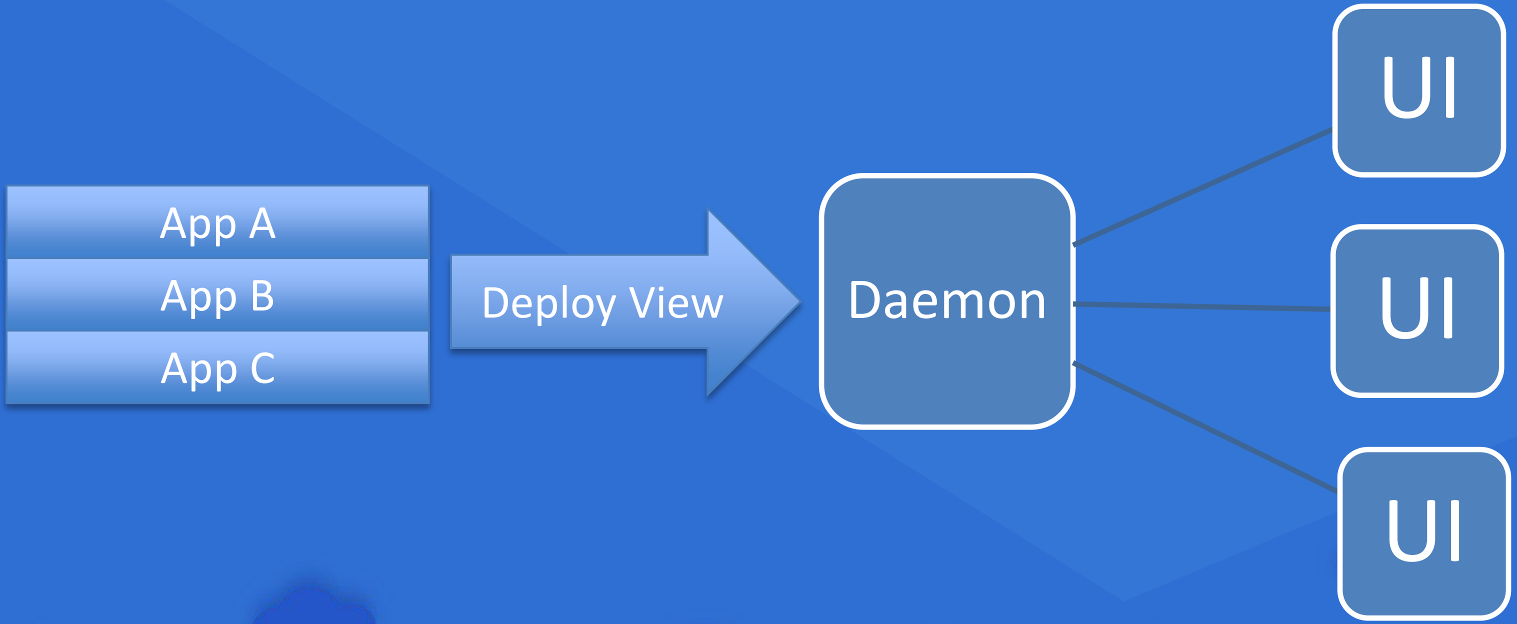
What’s Possible?

- What works well with PiPlug
  - Apps using standard SWT and JFace
  - Apps using Java bindings to Pi services and add-on modules
  - Apps using custom canvases for dynamic rendering
  - Apps using remote network resources (off UI thread!)
- What’s not intended for the PiPlug
  - Non-UI services (though not strictly prohibited)
  - Very heavy weight apps that won’t perform well on the Pi (example, full Eclipse IDE takes ~10 minutes to start up!)

Architecture of PiPlug



Demonstration

Seeing PiPlug in Action

Running your first application

App Plug-ins in PiPlug

- Each application…
  - is in an OSGi bundle (plug-in)
  - implements a PiPlug API extension point
  - defines a lifecycle class
  - contributes UI controls for the application display
- Additional service bundles can be deployed
  - Provides services outside of core framework
- Already available to PiPlug apps:
  - JFace, SWT, Jobs, Registry, and other base Eclipse bundles

Implement App Lifecycle

```
public class YourFirstApp implements IPiPlugApplication {

    public void installed(IPiPlugServices services) {
        // called upon installation of the plug-in
    }

    public Composite prepare(IPiPlugServices services, Composite parent) {
        // called to initialize the UI on first access or upgrade
    }

    public void resume(IPiPlugServices services) {
        // called as app will be placed in the foreground
    }

    public void suspend(IPiPlugServices services) {
        // called when app is no longer in the foreground
    }

    public void shutdown(IPiPlugServices services) {
        // called to allow cleanup for upgrade or shutdown
    }

}
```

installed(…)

public void installed(IPiPlugServices services) { … }

- Prepares services needed for the bundle off UI thread
- Called once per invocation of VM or when upgraded to a new app version
- Should wait until prepare/resume is called for anything heavy

```
@Override
public void installed(IPiPlugServices services) {
    // nothing needed at installation time
}
```

prepare(…)

public Composite prepare(
    IPiPlugServices services, Composite parent) { … }

- Initializes the user interface controls for the application
- Called once per invocation of VM or when upgraded to a new app version

```
@Override
public Composite prepare(IPiPlugServices services, Composite parentStack) {
    composite = new ClockComposite(services, parentStack);
    return composite;
}
```

resume(...)

public void resume(IPiPlugServices services) { … }

- Populates the UI with current information
- Starts background workers or services
- Called each time application will be in the foreground
- Resumes previous operations that were otherwise suspended

```
@Override
public void resume(IPiPlugServices services) {
    job = new ClockJob(composite);
    job.schedule(100);
}
```

suspend(…)

public void suspend(IPiPlugServices services) { … }

- Saves off any application state
- Suspends background jobs or threads
- Called once the application is in the background
- Should stop any CPU utilization from the application

```
@Override
public void suspend(IPiPlugServices services) {
    if (null != job) {
        job.stop();
        job = null;
    }
}
```

shutdown(…)

public void shutdown(IPiPlugServices services) { … }

- Frees handles to classes in the runtime
  - Make sure to null out references, and clean up services
- Called just before PiPlug front-end shuts down or bundle is uninstalled before upgrade

```
@Override
public void shutdown(IPiPlugServices services) {
    // nothing needed during shutdown
}
```

Guidelines for Apps

- Optimize for responsive UI
  - Minimize UI created in prepare(…)
  - Depend on SWT, or at most JFace
  - Minimize # of dependent bundles
- Build for OSGi bundle reloading
  - Cleanly dispose and cleanup services in shutdown(…)
  - Cleanly track Images and other heavy resources
  - If using background threads, respond to shutdown & suspend

Demonstration

Seeing PiPlug in Action

Working with your applications

Performance on the Pi

- Starting Java is slow
  - Java 8 ARM is better!
  - Stay in the same VM
- Your app runs in a shared JVM/OSGi runtime
  - Startup is ~10 seconds
  - You don’t pay for your own JVM/OSGi/SWT Display
  - Follow good UI responsiveness rules (instant feedback)
- Overclocking makes a difference (are you a hardware guy?)
  - A good power supply matters, as do heat sinks!

Idiosyncrasies of RCP on Pi

- No SWT fragment
  - ARM LE is not officially supported
  - This makes building products difficult
  - PDE export works if you put in your arch as arm
- Xlib: RANDR missing on display :1.0
  - Can be ignored

Demonstration

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Seeing PiPlug in Action

Rapid development with PiPlug

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Time to Start Plugging!

- It’s all on Github!
  - http://genuitec.github.io/piplug
- In your Eclipse
  - Install the PiPlug Deployment View
  - Create your app or copy an example
- On your Pi
  - Install the PiPlug Frontend (& dependencies)
  - Run it!

Back to the IoT

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- Lifecycle of software rollout
- How to get IoT devices out in volume with applications
- How to manage many IoT devices
- How to handle versions of applications
- What security constraints apply to the IoT

- *We've done this for Eclipse & Eclipse Plugins with* ***Secure Delivery Center*** *but what's right for the IoT?*

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Thank You!

- **Get started with PiPlug at** http://genuitec.github.io/piplug/
- Learn about Genuitec products at http://www.genuitec.com