



# BUG: A Customizable Hardware and Software Platform Using Linux, Java and OSGi



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# What's a BUG?!

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- A mobile Linux computer with OSGi built-in.
- A Modular hardware and software platform for user-created gadgets.
- A tool for prototyping and building custom hardware.
- The real world expressed as services.
  - Native Linux
  - OSGi
  - RESTful-style web services



# What's a BUG?!

- Eclipse-based SDK and virtual BUG.
- Application Sharing Website: BUGnet
  - Makes it drag-and-drop simple to share creations with others.
- Community Focus: BUGCommunity.com
  - Hardware schematics are open source.
  - Anyone can build BUG devices and modules.
  - Fully Free and Open Source Software.
    - BUG: GPL, BSD
    - SDK: EPL, BSD



# BUG Hardware Summary



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# BMI: BUG Module Interface

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- Hardware:
  - 40 Pin Samtec Connector
  - GPIOs and Interrupts
  - Peripheral I/O interfaces
    - LCD, Camera, SSI, UARTs, etc...
- The Software:
  - Hooks into the Linux Kernel's bus subsystem.
  - Makes hot plug-in possible.
  - Notifies device drivers and OSGi when hardware is present.



# Linux Device Driver Interface

- Standardized file based interface for non network devices.
  - `open()/close()`
  - `lseek()`
  - `ioctl()`
- Allows reuse of JNI code for multiple devices
  - `CharDevice`
  - `CharDeviceInputStream`



# Java Native Interface

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- Provides Java(tm) programs access to the operating system.
- Each BUG module has one or more JNI bridges to Linux device driver(s).



# JVM: PhoneME Advanced

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- Sun's GPL mobile CDC JVM
- Personal Profile: Almost complete J2SE 1.4.
- Just-in-time compiler for native level performance.
- Excellent performance.
- Great documentation.
- Active community with helpful forums.
- <https://phoneme.dev.java.net/>





# Concierge – OSGi R3 Framework

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- Small and Fast OSGi implementation.
- File footprint is about 80 Kb.
- CPU utilization on BUG typically under 1%.
- Optimized for small devices and mobile Java.
- Clean, simple code base.
- <http://concierge.sourceforge.net>



# OSGi/Java BUGisms

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- Modlet
  - Similar to a bundle, but for a hardware module.
  - One to one relationship with module.
    - On current BUG, maximum of 4 modules can be loaded.
  - Initializes JNI code and manages OSGi and web services.
  - Is the bundlespace representation of a hardware device.



# OSGi/Java BUGisms

- Web Services
  - HTTP bundle provides servlet container.
  - IPublicWSAdmin
    - Simple, discoverable web services.
- OSGi console
- Configuration Manager
- SDK interface entirely WS
  - URL is entity
  - HTTP method is operation



# Ongoing challenges

- Security/Identity
  - WS uses MS-DOS security (there is none)
- The network
  - pervasiveness
  - addressability
- Embedded Linux
  - Most moms and dads won't get cross compiling.
  - Embedded Linux is still emerging. Many competing visions.
- User Interfaces



# Vision in Use Cases

- Activist consumer
- Chinese restaurant blogger
- Time-shifted racing
- Rapid HW prototyping
- Stephenson's Gargoyles

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# BUG Tour



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# Questions and Comments

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