



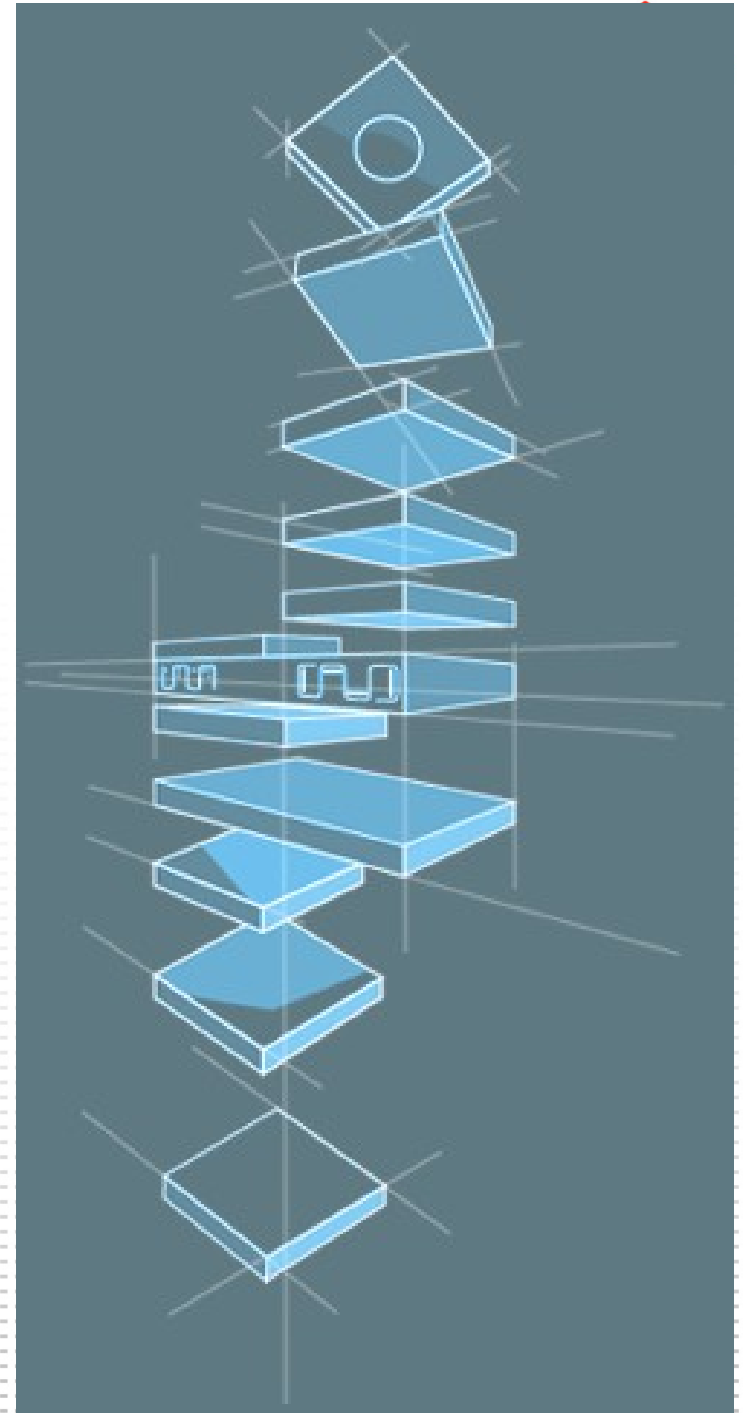
bug labs

An Introduction to BUG

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BUG in a nutshell

- BUG is a mobile, general purpose computer with hardware attachments for creating gadgets and platforms that are not addressed by traditional computer or consumer electronics companies.
- BUG bridges the gap between embedded systems and commodity computing.
- BUG allows new types of people to play with unusual hardware combinations.





Huh?

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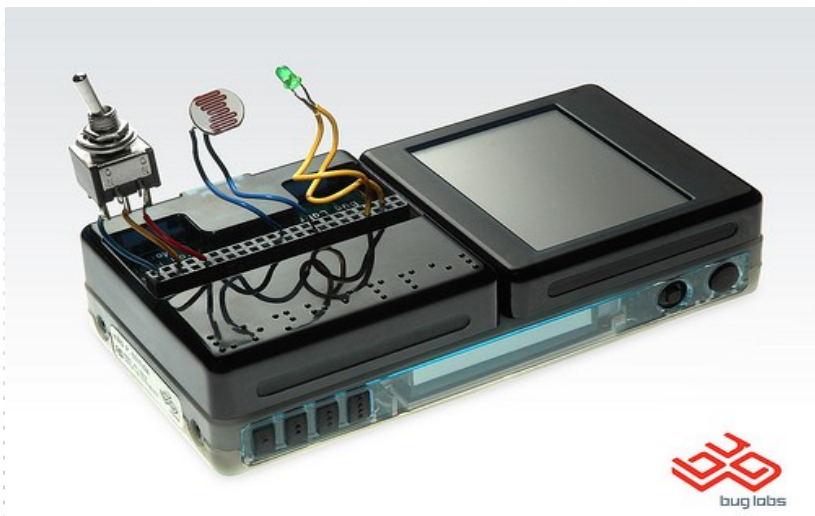
- BUG provides users with electronic building blocks to build personalized hardware devices.
- Examples ~
 - GPS alarm clock, stereo camera system, online radar map, open source telemetry system
- A 100% open source platform.
- Use well known technologies (Linux, Java, OSGi)
- User is in control, kernel, rootfs, JVM and app layer changeable and upgradable with binary packages.



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What is BUG srsly?



- The BUG is:
 - BUGbase ~ Mobile Linux computer
 - BUGmodules ~ Audio, Video, GPS, Wifi, General IO, sensors, GSM, 802.15.4, Breakout Module, Touchscreen LCD
 - Eclipse-based SDK
 - Community App Repository ~ BUGnet
- 100% Open source software **and** hardware ((L)GPL, BSD, EPL)



BUGbase

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- Mobile Linux computer
 - 532 MHz ARM CPU, 128 Mb RAM, 32 Mb Flash, Ethernet, 2Gb SD storage, USB 2.0 OTG
 - Simple integrated LCD menu system, navigation, buttons, LEDs
 - Internal battery
- BUG Module Interface (BMI) connects modules to base.



BMI Interface

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BMI Interface - BUG Wiki - Mozilla Firefox

http://bugcommunity.com/wiki/index.php/BMI_Interface

Log in / create account

BMI Interface

SIGNAL	NETNAME	PIN
Ext Battery Power to Base	BAT_EXT_P1	01
Ext Battery Power to Base	BAT_EXT_P3	03
Module Present	MOD_PRSNT_N*	05
LCD: Serial Link MD0	MPL_MD0	07
LCD: Serial Link MD1	MPL_MD1	09
LCD: Serial Link Clock	MPL_MC	11
	GND	13
Serial Port: Receive Data	RxD	15
Serial Port: Transmit Data	TxD	17
Serial Port: Clear to Send	CTS	19
Serial Port: Ready to Send	RTS	21
GPIO Bit 0 (LSB)	GPIO0	23
I2S Clock	SCK	25
I2S Frame	SFS	27
I2S Transmit Data	STxD	29
I2S Receive Data	SRxD	31
	GND	33
USB: Data +	USBDP	35
USB: Data -	USBDN*	37
5V Power to Module	V5_P39	39

PIN	NETNAME	SIGNAL
02	V5_P2	5V Power to Module
04	SPL_MISO	SPI: Master-In Slave-Out Data
06	SPL_MOSI	SPI: Master-Out Slave-In Data
08	SPL_SS	SPI: Select
10	SPL_CLK	SPI: Clock
12	SPL_RDY	SPI: Ready
14	GND	
16	I2C_SCL	I2C: Clock
18	I2C_SDA	I2C: Data
20	GPIO3	GPIO Bit 3 (MSB)
22	MOD_INT_N*	Module Interrupt, active LOW
24	GPIO2	GPIO Bit 2
26	LCD_VSYNC	LCD Frame Signal
28	GPIO1	GPIO Bit 1
30	GND	
32	CSI_MCLK	Camera: Clock
34	GND	

Image:QTE BUG pins.jpg

http://bugcommunity.com/wiki/index.php/Image:QTE_BUG_pins.jpg



BUG Camera Module

- 2 Megapixels
- Flash LED
- 3 Hardware buttons
- Take a picture, display on LCD:



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include

```
Frame frame = display.getFrame();
Image img =
Toolkit.getDefaultToolkit().createImage(camera.getImage()).getScaledInstance(320, 200, Image.SCALE_FAST);
frame.setTitle("ImageTest: Reloads picture on hotkey2");
ic = new ImageCanvas(img);
frame.add(ic, BorderLayout.CENTER);
frame.setSize(320, 280);
frame.setVisible(true);
this.loadImage();
```



BUG LCD Module

- QVGA Resolution
- Resistive touchscreen
- Built-in accelerometer
- To create a window:



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include

```
frame = display.getFrame();  
frame.setTitle("Hello BUG!");  
frame.setBackground(Color.WHITE);  
label = new Label("Hello BUG! ", Label.CENTER);  
frame.setLayout(new BorderLayout());  
frame.add(label, BorderLayout.CENTER);  
frame.show();
```



BUG GPS Module

- Serial-based GPS device
- Internal or external antenna
- To get current position:



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include

```
IPositionProvider positionProvider =  
(IpositionProvider)getService(IPositionProvider.class);  
LatLon latitudeLongitude =  
positionProvider.getLatitudeLongitude();  
System.out.println("GPS latitude: " +  
latitudeLongitude.latitude);  
System.out.println("GPS longitude: " +  
latitudeLongitude.longitude);
```



Motion and Accelerometer Module

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- Passive IR Motion Detector
- 3-axis Accelerometer
- Built-in microcontroller for real-time like performance
- Get the X, Y, Z acceleration vector:



```
IAccelerometerSampleFeed isp = (IAccelerometerSampleFeed)
serviceProvider.getService(IAccelerometerSampleFeed.class);
AccelerometerSample s =
isp.getSampleInputStream().readSample();
s.getAccelerationX();
s.getAccelerationY();
s.getAccelerationZ();
```



Audio Module

- Audio in and out
- Mic, Headphone, Line-in, Line-out
- Two hardware buttons
- To play audio from a stream:



```
IAudioPlayer audioPlayer = (IAudioPlayer)
serviceTracker.getService(IAudioPlayer.class);
InputStream sampleStream = new
SampleStream(serviceTracker.getBundleContext());
audioPlayer.play(sampleStream);
```

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Von Hippel Module

- Named for MIT professor Dr. Eric von Hippel
- Breakout module exposes all hardware interfaces
- Allows for integration with sensors, embedded devices
- Flash a LED:



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```
IVonHippelModuleControl vhControl = (IVonHippelModuleControl)
serviceProv.getService(IVonHippelModuleControl.class);
vhControl.makeGPIOOut(1);
vhControl.setGPIO(1);
vhControl.clearGPIO(1);
```



BUG modules yet to be born

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- Bar code scanner (1d, 2d), RFID
- GSM/CDMA, Geiger counter, Servo controller
- Health Monitor, FPGA, Software Radio
- Battery, Solar Cell, Fuel Cell
- Speaker, LED bank, keyboard
- MIDI, Audio, Video, PICO projector
-? (Users can create custom modules)



BUG Software Platform

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- RedBoot
- Linux 2.6.27
- Poky Linux-based distro
 - Busybox, dropbear, etc.
 - Matchbox, Gnome Mobile, etc.
- PhoneME (or JamVM, CACAO, OpenJDK) JVM
- Concierge OSGi

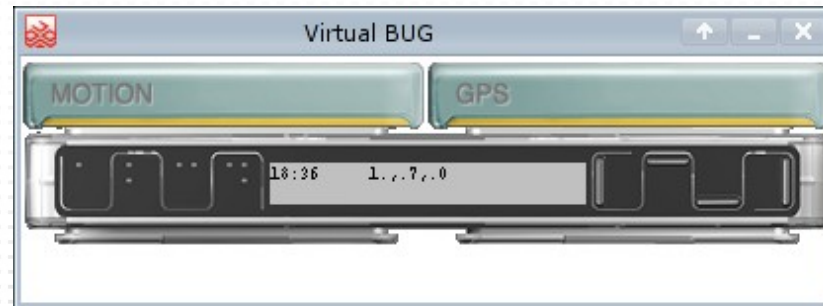


Dragonfly, BUG SDK

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include

- Software development kit to build BUG apps
- Eclipse-based plug-ins, open source
- Virtual BUG emulator to create and test applications without hardware

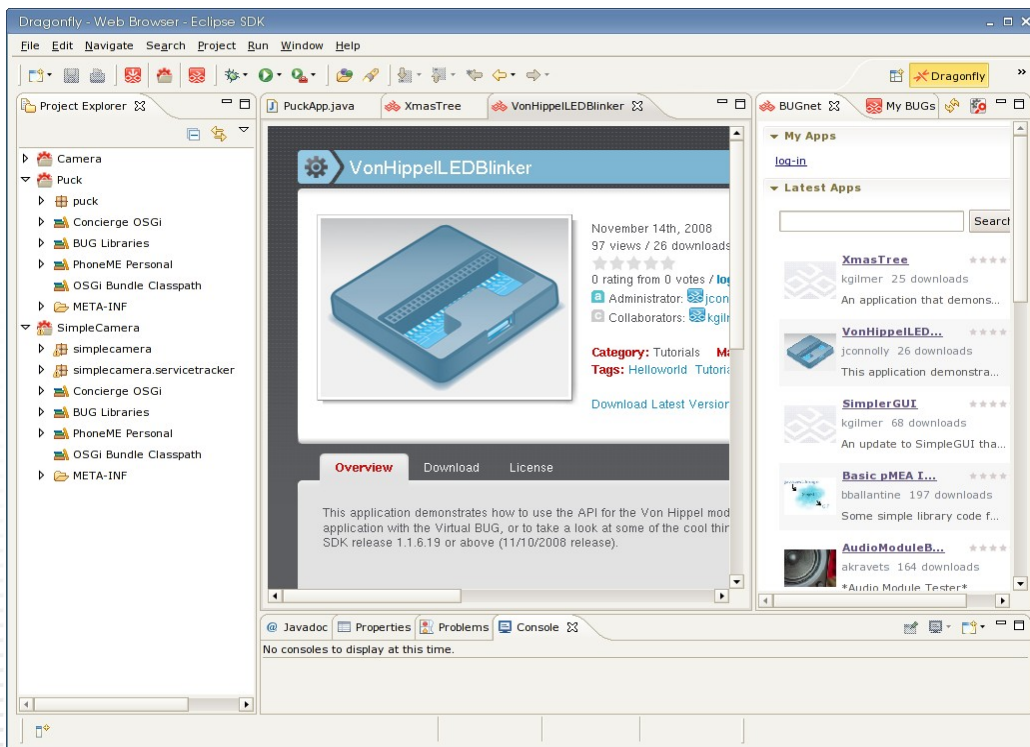




Easy Collaboration and Deployment

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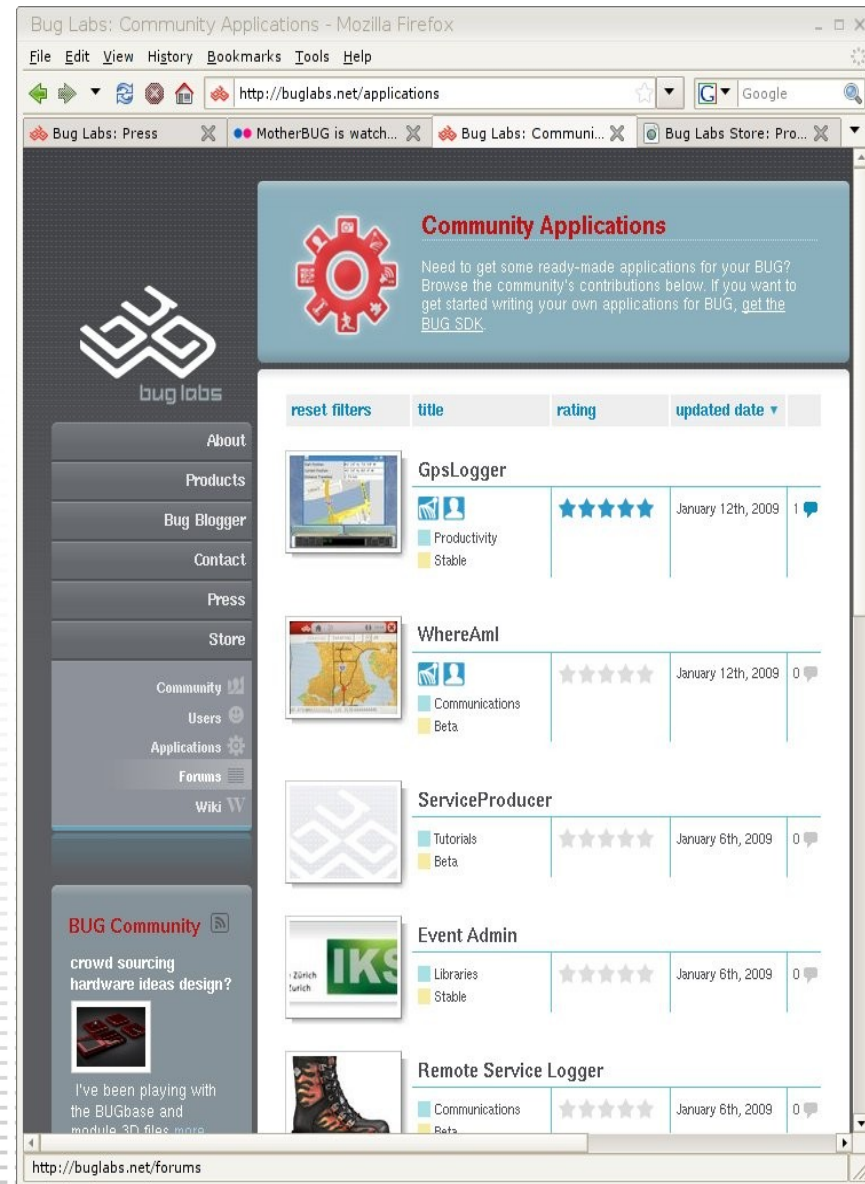


- One click to download community apps
- One click to install app on BUG



BUGnet

- Online community to upload and share BUG applications
 - Rate and comment on apps, and contribute to projects
 - Allow others to contribute to your application
- Accessible via Dragonfly SDK as well as web
 - Drag and drop applications to BUG
 - Publish new applications with one click
- A place for exploring new device and application ideas



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Thanks!

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community.buglabs.net

