

OPEN
Compute Project



OpenBMC

9/25/2017





BMC Development

	Outsourced	Home Grown	Open
Control of features	X	✓	✓
Fast bug fixes	X	✓	✓
Control of security updates	X	✓	✓
Cheaper to develop	✓	X	✓
Open Source Community Code Reviews	X	X	✓
Simple infrastructure support	✓	X	✓
Unique look	X	✓	✓

What is the OpenBMC Project

Free open source software management Linux
distribution designed for the embedded environment

...

Reduce the cost of development

Views of Success

- ▶□ Core enables industry
- ▶□ Feature advances come faster
- ▶□ Hardware manufacturers support OpenBMC
- ▶□ Software supports OpenBMC
- ▶□ Diverse architectures are managed similarly in the datacenter



Strong Community

- ▶□ Code Contributions
 - ▶□ IBM, Google, Rackspace, Yadro, Inventec, Mellanox, and more
- ▶□ 145 emails address' from 51 different domain names
- ▶□ Average 65 users on IRC (freenode #openbmc)
- ▶□ 8 sponsor users for UI
- ▶□ Hardware donations for build and code reviews
- ▶□ <https://lists.ozlabs.org/pipermail/openbmc/>

Active code base

Aug 9, 2015 – Sep 24, 2017

Contributions: **Commits** ▾

Contributions to master, excluding merge commits



Contribution Distribution



Welcome Yadro, Nuvoton, Inventec

Contributions

- ▶ Machine configuration
- ▶ Business logic
- ▶ Core contributions



What is the OpenBMC Project

Contributions to upstream communities

- ▶ □ U-Boot and Kernel
- ▶ □ Supported: ASPEED AST2400 and AST2500
Nuvoton Poleg BMC

Staying up to date

- ▶ □ U-Boot 2016
- ▶ □ Linux 4.4 → 4.7 → 4.10 ... 4.13
- ▶ □ Yocto 1.7 → 1.8 → 2.1

Tag 2.0 is almost here

- ▶□ /org will be removed
- ▶□ Webui preview
- ▶□ Enhanced Code Update support
- ▶□ Security
 - ▶□ Password changing via REST
 - ▶□ Closed BIOS writes to flash
- ▶□ Error logs
 - ▶□ Mark resolved, Associations
- ▶□ Network
 - ▶□ Vlan, ipmi support
- ▶□ Boot
 - ▶□ Added one time boot

User Interface - Login



OpenBMC

API version	1.00.102
Hostname	IBM Power Witherspoon 2
Server model	S822LC
Server power	✓ On
Server message	--

USERNAME

PASSWORD

Log in

User Interface – Systems Overview

- ▶ ☐ Client Rendered
- ▶ ☐ HTML5
- ▶ ☐ No java

OpenBMC 1.00.102

IBM Power Witherspoon 2
BMC IP address: 9.3.111.222

Server status **Good** Server power **On** Data last refreshed 3:18:00 5/22/2017 CDT Refresh

Server overview

Server health

Server control

Server configuration

Users

All servers

IBM Power Witherspoon 2 [Edit](#)

Server information	MODEL	8335-GTC	MANUFACTURER	IBM
	FIRMWARE VERSION	2.3.104497	SERIAL NUMBER	123456ABCD

BMC information	HOSTNAME	IBM Power Witherspoon 2		
	BMC IP ADDRESS	9.3.111.222	FIRMWARE VERSION	2.104001
	MAC ADDRESS	70:E2:84:14:05:2F		

Power information	POWER CONSUMPTION	000 W	POWER CAP	000 W
-------------------	-------------------	-------	-----------	-------

[View 3 recent high priority events](#)

BMC time 3:20:12 5/22/2017 UTC

Turn server LED on ☐

Launch Serial Over Lan [Launch](#)

[Edit network settings](#)

High priority events (3) [View all event logs](#)

#00997	HIGH - EMERGENCY	03/07/2017 21:00:26 UTC	>
org.open_power.Error.Host.Event.Event.Cras.amet dapibus.Lorem ipsum dolor sit amet, consectetur adipiscing...			
#00982	HIGH - EMERGENCY	03/07/2017 20:48:11 UTC	>
org.open_power.Error.Host.Event.Event.Cras.amet dapibus.Lorem ipsum dolor sit amet, consectetur adipiscing...			
#00971	HIGH - EMERGENCY	03/07/2017 20:42:35 UTC	>
org.open_power.Error.Host.Event.Event.Cras.amet dapibus.Lorem ipsum dolor sit amet, consectetur adipiscing...			

Two flash architectures

- ▶ □ UBI file system
 - ▶ □ Brick Protection
 - ▶ □ Faster Flashing
 - ▶ □ Multiple BMC image
- ▶ □ Flash File System
 - ▶ □ Current default

Quick Test Drive?



QEMU == No Hardware Required

AST2400 and AST2500
supported

```
QEMU
Phosphor OpenBMC (Phosphor OpenBMC Project Reference Distro) 0.1.0 qemuarm tty1
qemuarm login: Starting Network Service...
[ OK ] Started Phosphor OpenBMC host IPMI to DBUS example implementation.
[ OK ] Started Serial Getty on ttyAMA0.
[ OK ] Started Phosphor OpenBMC QEMU application example.
[ OK ] Started Phosphor OpenBMC fan management.
Starting SSH Key Generation...
[ OK ] Started Serial Getty on ttyAMA1.
[ OK ] Reached target Login Prompts.
Starting Login Service...

Phosphor OpenBMC (Phosphor OpenBMC Project Reference Distro) 0.1.0 qemuarm tty1
qemuarm login:
```

```
causten@fiji: ~/workspace
causten@fiji:~/workspace$ curl -b cjar -k https://localhost:2443/xyz/openbmc_project/
{
  "data": [
    "/xyz/openbmc_project/sensors",
    "/xyz/openbmc_project/inventory",
    "/xyz/openbmc_project/ObjectMapper",
    "/xyz/openbmc_project/software",
    "/xyz/openbmc_project/logging"
  ],
  "message": "200 OK",
  "status": "ok"
}
causten@fiji:~/workspace$
causten@fiji:~/workspace$ ssh -p 2222 root@localhost
root@localhost's password:
root@palmetto:~#
```



Automated Build Verification

OpenPower continuous integration setup

S	W	Name ↓	Last Success	Last Failure	Last Duration
✓	☁	Intramfs Build - buildroot	9 days 0 hr - #12-3fc77e5f81906d	13 days - #11-3fc77e5f81906d	9 min 35 sec ▶
	☁	Intramfs Builds	N/A	N/A	N/A
✓	☀	Linux Build - aspeed	15 days - #4-35d2cfb27392c7	N/A	7 min 21 sec ▶
✓	☀	Linux Build - master branch	8 hr 26 min - #155-e46b4e2b46e173	N/A	6 min 53 sec ▶
✓	☁	OpenBMC Build	3 days 11 hr - #77-2fe86d90044af2	17 days - #74-b182f7b07220bc	1 hr 41 min ▶
✓	☀	OpenBMC Build - Pull Request	16 hr - #134-c9c000e1555fe3	13 days - #125-331da0441b1cb8	1 hr 3 min ▶
✓	☀	OpenBMC Test - QEMU Boot	15 hr - #183-	10 days - #174-	1 min 18 sec ▶


- Dedicated Test Development Team
- Every commit... tested


Prebuilt images


 **Jenkins**


[Jenkins](#) > [OpenBMC Build](#)

[Back to Dashboard](#)
[Status](#)
[Changes](#)
[Git Polling Log](#)
[GitHub](#)
[Embeddable Build Status](#)

 **Build History** [trend](#)

 [#1014-561798c89ea04f](#)
Sep 21, 2017 9:14 PM



















 [#1013-319ec4177fa86b](#)
Sep 19, 2017 9:14 PM

 [#1012-a0ff17f96a7fe8](#)
Sep 18, 2017 3:14 PM

[RSS for all](#) [RSS for failures](#)

Project OpenBMC Build

Project name: openbmc-build
Builds of OpenBMC that land in master, should be triggered by a hook on GitHub.

Configuration Matrix	fedora	ubuntu
barreleye		
palmetto		
qemu		
witherspoon		
evb-ast2500		
firestone		
garrison		
zaius		
romulus		

Subprojects

Code Reviews

https://gerrit.openbmc-project.xyz/#/q/status:open 90% temperature

All Projects Documentation
Open Merged Abandoned

status:open Search Sign-in with GitHub

Search for status:open

Subject	Status	Owner	Project	Branch	Updated	Size	CR	OTT	V
Remove "File System Read Only" test		George Keishing	openbmc/openbmc-test-automation	master	Sep 23		+1		
Use sha512 to calculate the versionID for images.		Saqib Khan	openbmc/phosphor-bmc-code-mgmt	master (2323)	Sep 23		-1	✓	✓
Use sha512 to calculate the versionID for images.		Saqib Khan	openbmc/openpower-pnor-code-mgmt	master (2323)	Sep 23		-1	✓	✓
Add in support for power supply over-temperature		Brandon J. Wyman	openbmc/witherspoon-pfault-analysis	master (openbmc/openbmc#1732)	Sep 23			✓	✓
Add STATUS_WORD to metadata for VIN_UV_FAULT		Brandon J. Wyman	openbmc/witherspoon-pfault-analysis	master (openbmc/openbmc#1731)	Sep 23		+1	✓	✓
Create set request speed base action function		Matthew Barth	openbmc/phosphor-fan-presence	master	Sep 23		+1	✓	✓
Replace 'Trigger Warm Reset' with 'obmc reboot (off)' as it is in org.		Sweta Potthuri	openbmc/openbmc-test-automation	master	Sep 23				
Remove all the org from data/variable.py.		Sweta Potthuri	openbmc/openbmc-test-automation	master	Sep 23				
Fix eSEL parsing from logging entry "AdditionalData"		George Keishing	openbmc/openbmc-test-automation	master	Sep 23				
Software activation association test		George Keishing	openbmc/openbmc-test-automation	master	Sep 23				
Update error log and association test for log deletion		George Keishing	openbmc/openbmc-test-automation	master	Sep 23				
Update BMC dump delete use cases		George Keishing	openbmc/openbmc-test-automation	master	Sep 23				
Reducing the restart of systemd-networkd by implementing timers		Ratan Gupta	openbmc/phosphor-networkd	master	Sep 23			✓	✓
Implement delete all interface.		Ratan Gupta	openbmc/phosphor-networkd	master	Sep 23			✓	✓
Don't return zeroconfig address if other IP address is present		Nagaraju Goruganti	openbmc/phosphor-host-ipmid	master (2265)	Sep 23		-1	✓	✓

Core Infrastructure of the OpenBMC Project

Control the Functions in your OpenBMC...

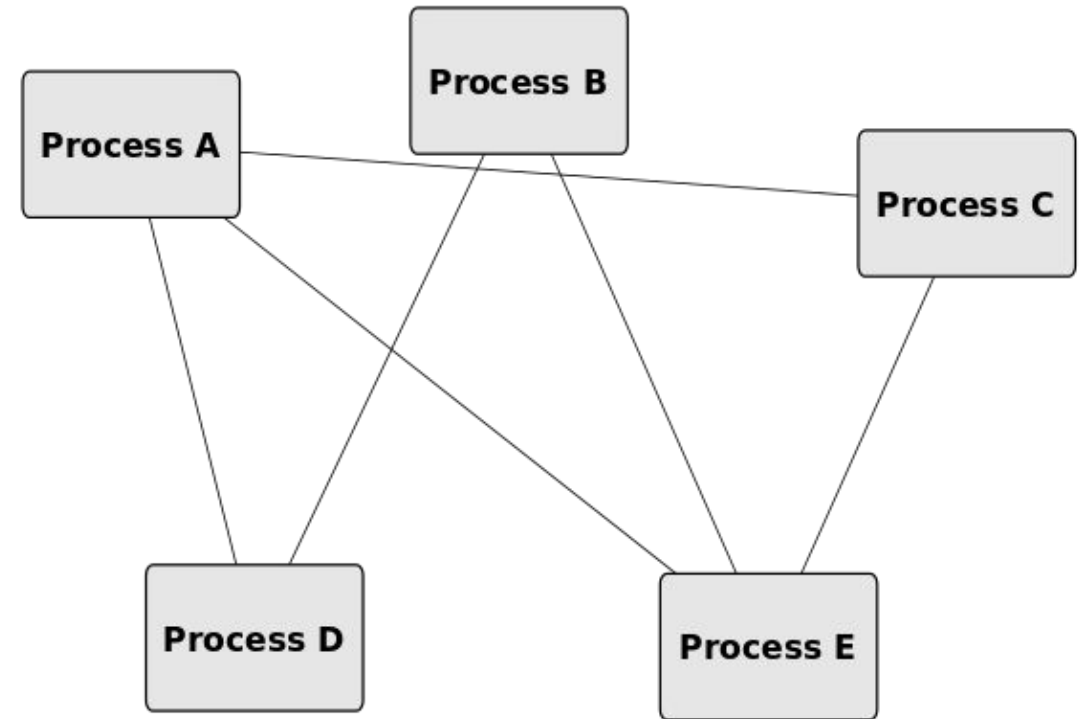
- ▶ □ Built on Yocto-Linux

Simple infrastructure for you

- ▶ □ Process management Systemd
- ▶ □ IPC via D-Bus
- ▶ □ Interfaces via REST and IPMI
- ▶ □ Automatic REST API from D-Bus introspection

Without D-Bus

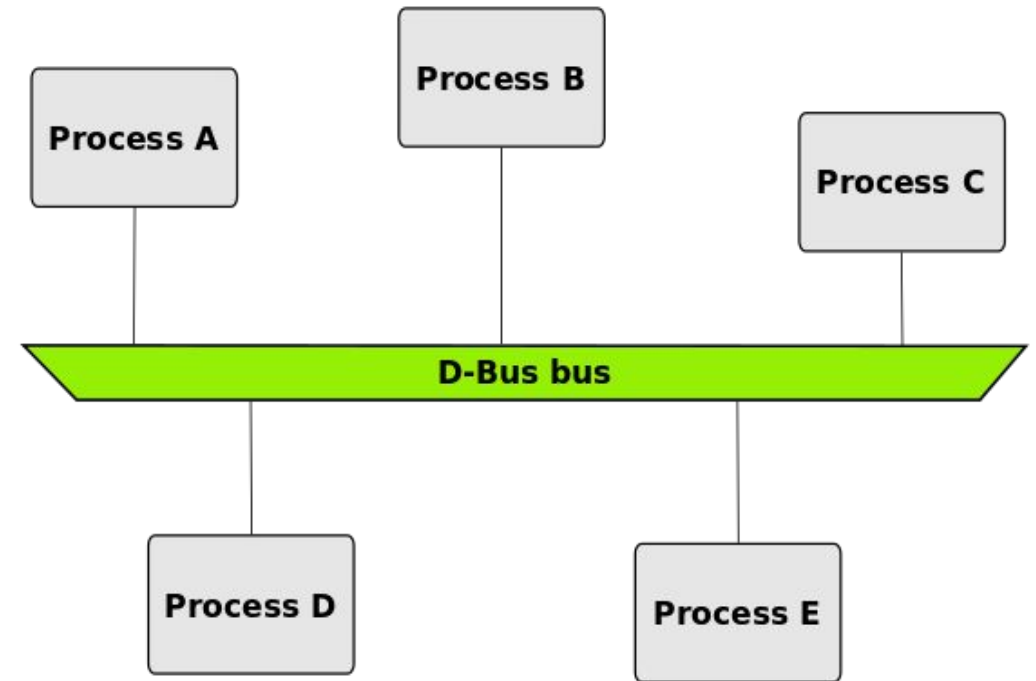
- ▶□ Code all IPC yourself
- ▶□ Startup / Recover logic
- ▶□ Multi-company collaboration?



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With D-Bus

- ▶ □ Rapid community collaboration
- ▶ □ Rapid Prototyping
 - ▶ □ Bindings for C/C++, Python, etc
- ▶ □ Compete IPC integration with systemd



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With D-Bus example

HWMon

i2c@1e78a000/i2c-bus@c0/tmp423@4c

D-Bus

CompanyX
Thermal
Manager

OpenBMC Dbus Interface Examples

Attach an interface, get the benefits in Dbus and REST

xyz.openbmc_project.Sensor.Threshold.Warning

- ▶□ Broadcast notification when value trips
- ▶□ “Min”, “Max”

xyz.openbmc_project.Inventory.Item

- ▶□ VPD Properties
- ▶□ “Present”

Making ODM development easier

In 2 Ways...

XML Integration

- ▶□ Manifest for your hardware
- ▶□ Define wiring
- ▶□ Define environmental limits
- ▶□ IPMI entity IDs

XML Integration

```
<targetInstance>
  <id>MAX31785.hwmon2</id>
  <type>unit-hwmon-feature</type>
  ...
  <attribute>
    <id>HWMON_FEATURE</id>
    <default>
      <field><id>HWMON_NAME</id><value>fan1</value></field>
      <field><id>DESCRIPTIVE_NAME</id><value>fan0</value></field>
      <field><id>WARN_LOW</id><value>1000</value></field>
      <field><id>WARN_HIGH</id><value>80000</value></field>
      <field><id>CRIT_LOW</id><value></value></field>
      <field><id>CRIT_HIGH</id><value></value></field>
    </default>
  </attribute>
</targetInstance>
```

Making ODM development easier

In 2 Ways...

XML Integration

- ▶□ Manifest for your hardware
- ▶□ Define wiring
- ▶□ Define environmental limits
- ▶□ IPMI entity IDs

YAML definitions for REST

- ▶□ Human readable properties
- ▶□ Documentation driven code

YAML, Code and Schema Documented

`description: >`

Implement to provide event/error entry attributes.

This interface should be instantiated for the `phosphor::logging` namespace.

This interface is a collection of objects, therefore it is required to implement `org.freedesktop.DBus.ObjectManager` on the logging namespace root. Optionally, implement `org.openbmc.Object.Delete` to allow the deletion of individual entries.

`properties:`

- `name: Id`

`type: uint32`

`description: >`

The error event entry id number.

- `name: Timestamp`

`type: uint64`

`description: >`

Commit timestamp of the error event entry in milliseconds since 1970.

Defined REST Schema

- ▶□ /
- ▶□ /list
- ▶□ /enumerate
- ▶□ /attr/<property>
- ▶□ /action/<method>
- ▶□ /schema

Lets see an example

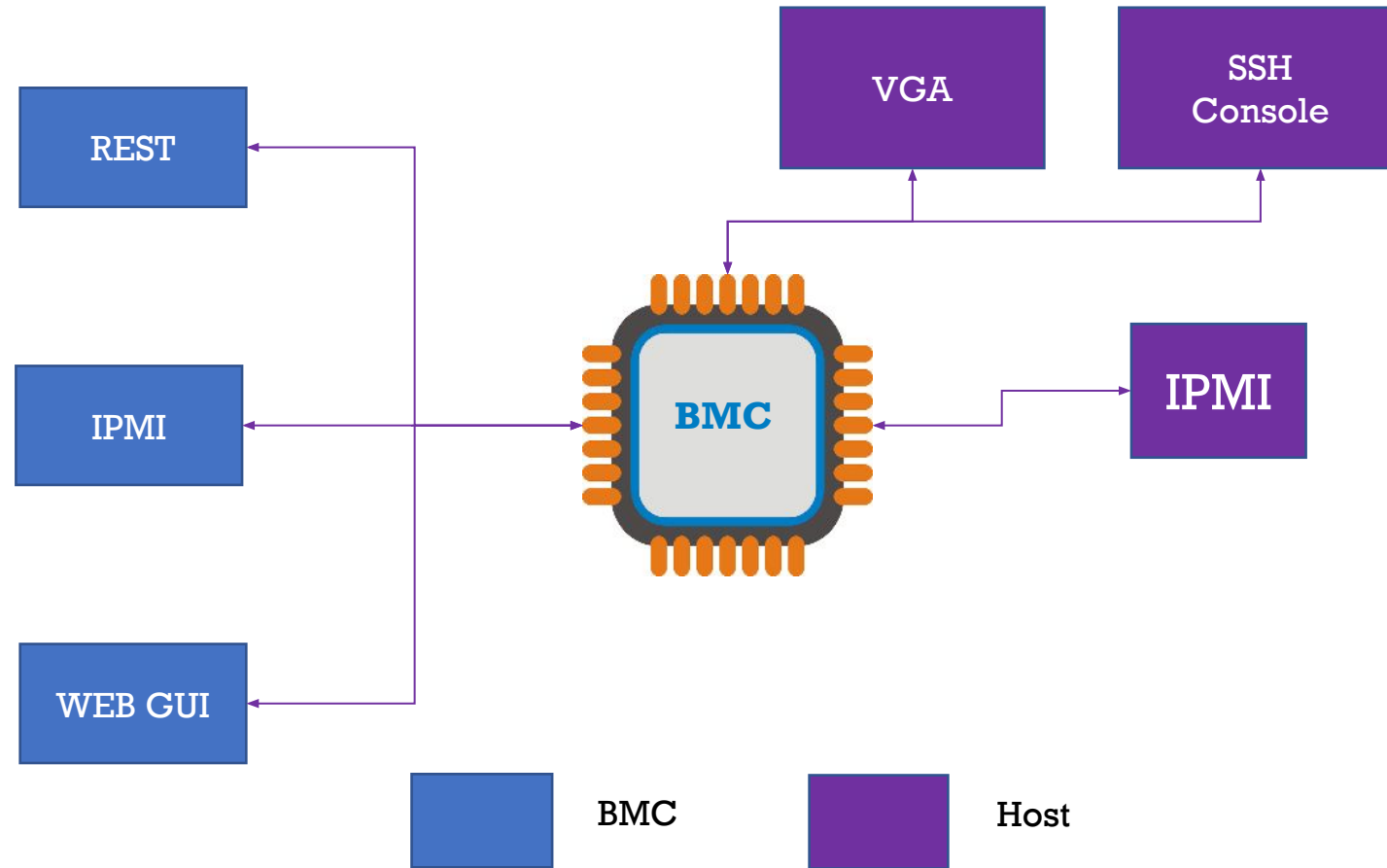
```
curl -b cjar -k https://bmc/xyz/openbmc_project/inventory/  
  
{  
  "data": [  
    "/xyz/openbmc_project/inventory/system"  
  ],  
  "message": "200 OK",  
  "status": "ok"  
}
```

Lets see an example

```
curl -b cjar -k
https://bmc/xyz/openbmc_project/Inventory/system/chassis/motherboard/cpu0

{
  "BuildDate": "",
  "Manufacturer": "IBM",
  "Model": "",
  "PartNumber": "01HL322",
  "Present": 0,
  "PrettyName": "PROCESSOR MODULE",
  "SerialNumber": "YA3933741577",
  "Version": "EC:10"
}
```

Covered Interfaces -- 2017



Features Provided

- Zeroconf discoverable
- Power Control
- Remote Console
- Power and Cooling Management
- Event Logs
- IPMI
- Sensors
- LED Management
- Host Watchdog
- VPD Inventory
- Simulation

Features in development

- ▶□ Telemetry
- ▶□ GPU inventory
- ▶□ Full IPMI 2.0 Compliance with DCMI IPMI
- ▶□ Verified Boot

Learn through code

openbmc-tutorials

A series of simple lessons on working with the OpenBMC Project. The lessons are laid out assuming you only have access to github. Some are dependant on previous lessons, when this occurs I have placed links.

Lessons

1. [Build the Simulator](#)
2. [Hello World with the SDK](#)
3. [Watch the bus](#)
4. [Hop on the bus](#)
5. [Get in the flash](#)
6. [Test with Robot](#)

<https://github.com/causten/openbmc-tutorials/blob/master/lessons101.md>

Features of the future...

- ▶□ OpenCompute Redfish Compliance
- ▶□ Remote KVM
- ▶□ Remote USB
- ▶□ Additional Board Support
- ▶□ OpenStack Ironic Integration
- ▶□ QEMU enhancements

Our World

Code:

- ▶ <https://github.com/openbmc>

Continuous Testing

- ▶ <https://openpower.xyz>

Code Reviews

- ▶ <http://gerrit.openbmc-project.xyz>

Contact

- ▶ Mail: openbmc@lists.ozlabs.org
IRC: #openbmc on freenode.net
- ▶ Riot: [#openbmc:matrix.org](https://openbmc:matrix.org)