Linux firmware for new iRMC S5 BMC controller on Fujitsu Primergy servers

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Fujitsu Primergy Servers

Lineage of x86-based servers:
Blade (BX), Rack (RX), Tower (TX) and Cloud (CX).

iRMC S5 in the wild

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iRMC - integrated Remote Management Controller

ARM-based SoC

(new) Aspeed Pilot 4 iBMC ASIC
Integrated BMC
Super I/O
Graphics controller

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Pilot 4 chip (S5)

KVMS: Remote Keyboard, Video, Mouse and Storage
CPU: Dual ARM Cortex A9 500MHz
RAM: 512MB (was 256MB)

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Own Operation System

Very typical Embedded Linux.

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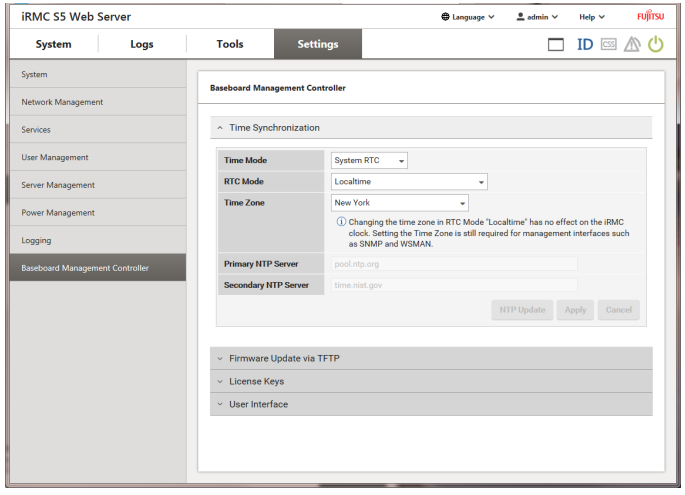
iRMC basic features

- (new) WebUI
- (new) Redfish - RESTful API for servers
- Security (SSL and SSH included)
- ServerView suite Integration
- Power management
- SNMPv1/v2c/v3 support
- Text console redirection
- “Headless” system operation
- CLP - command line interface



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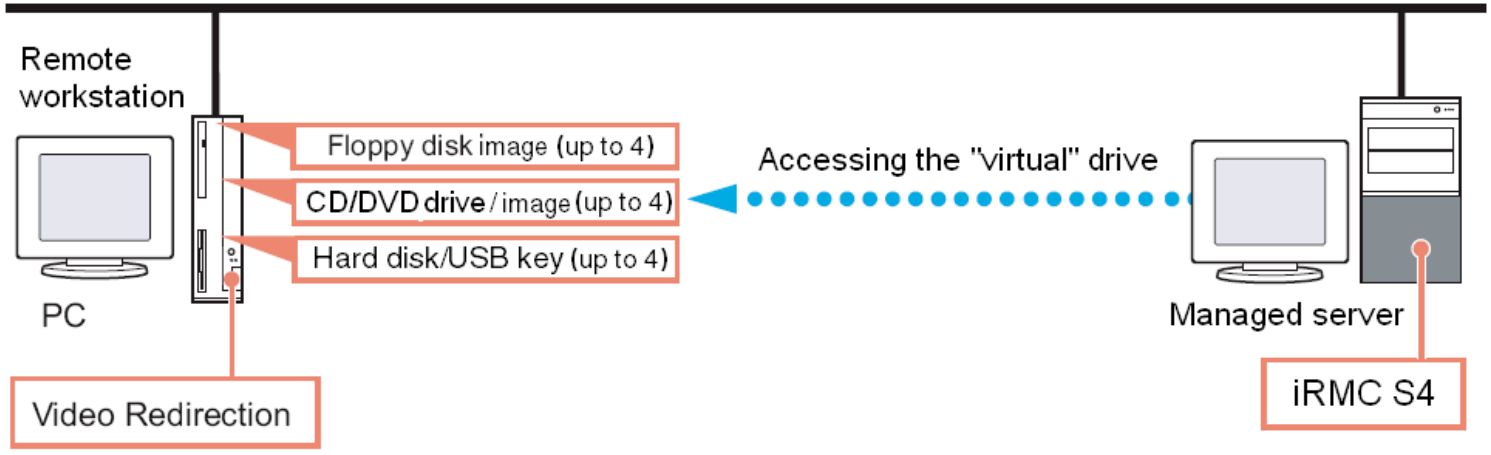
iRMC advanced features

- Advanced Video Redirection (AVR)
- Virtual Media
- Embedded Lifecycle Management (eLCM)



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Intelligent Platform Management Interface

IPMI - standardized, abstract, message-based interface between BMC and intelligent hardware for platform management. Key component of system.

OpenSSL
Cryptography and SSL/TLS Toolkit

Net-SNMP

ANGULARJS
by Google

DMTF

Redfish

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Popular protocol for network management.

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Security: SSH and SSL

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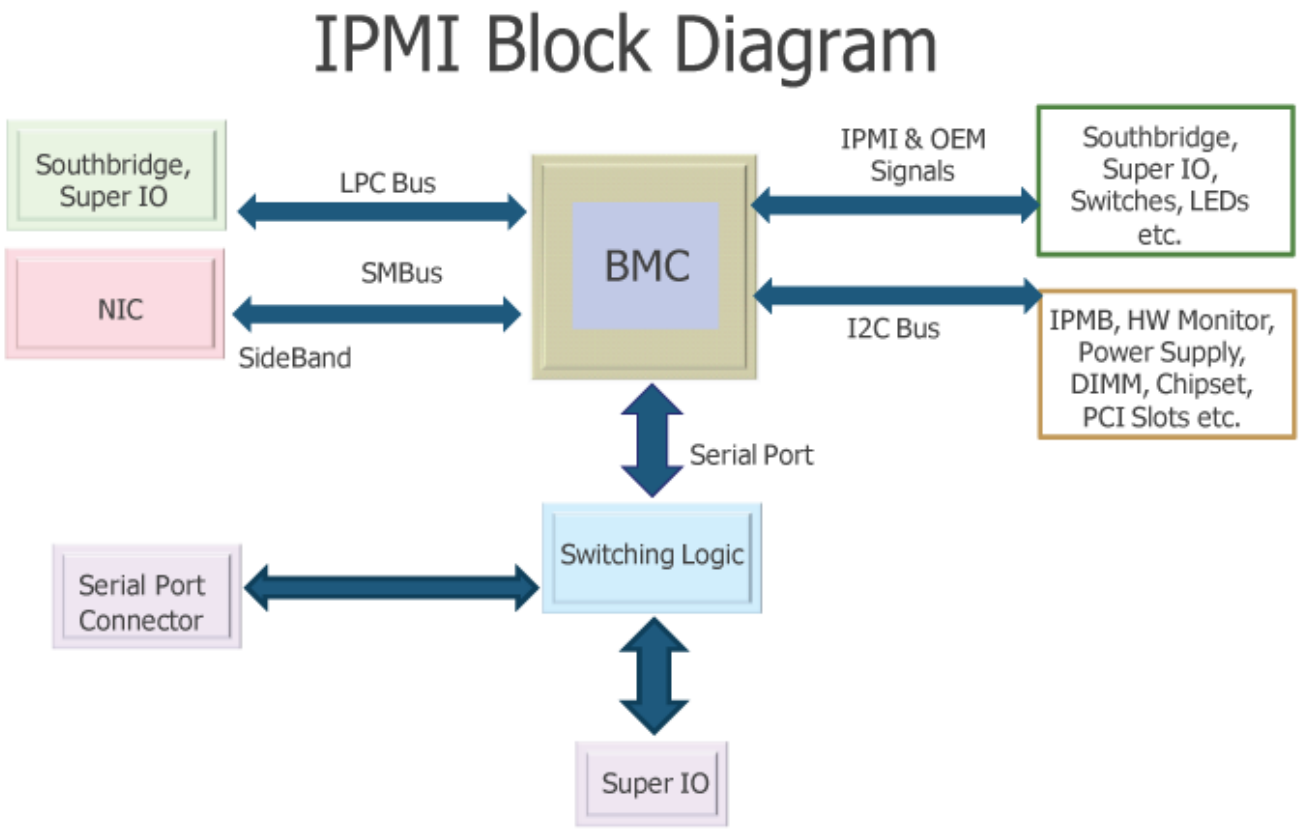
IPMI - key interface of a system



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Demo 1

Web interface: AVR, VirtualMedia, remote boot

Scenario 1: AVR, show boot settings

AVR: show Windows, Start LCM Custom Image, AVR: Show Linux

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Web interface: AVR, VirtualMedia, remote boot

Scenario 1: AVR, show boot settings

AVR: show Windows, Start LCM Custom Image, AVR: Show Linux

Scenario 2: IPMI - via ipmitool

$ ipmitool -U admin -P admin -H 192.168.1.1 -I lanplus [command line]

command line variants:

- chassis status
- lan print
- user list
- sensor

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Pro

- Advanced Real-Time Operation System
- Small footprint
- Fast performance

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iRMC S1 - S2/S3 OS

Pro

- Advanced Real-Time Operation System
- Small footprint
- Fast performance

Contra

- Lack of available developers
- Lack of 3rd party ready components
- High cost of support
- Long features time-to-market
- Environment compatible only with themselves

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Why Linux

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Why Linux

Cost of development and support

- More developers available
- Huge amount of 3rd party ready components
- Faster development
- HW platform fast enough to run it

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Backward compatibility

- Same interfaces (UI, protocols)
- Binary firmware upgrades

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Main challenges

Backward compatibility

- Same interfaces (UI, protocols)
- Binary firmware upgrades

Code re-use

- OS API are different
- OS layout completely different
- HW-related stuff to rewrite from scratch

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Whats new on iRMC S5?

Harware

- More CPU (Now Dual Cortex A9 500mhz, was - old single core ARM926TEJ 400mhz)
- 2x RAM (256MB -> 512MB)
- 2x space for firmware (32mb -> 64mb)

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Whats new on iRMC S5?

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Software

- Modern UI on Angular (rewritten from scratch)
- Refish (RESTful API for servers) API
- Unified Life Cycle Management support
- thousands of bugfixes (many backported to S4 also)
- heavily updated base system (Debian inside, supplied by AMI)

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Demo 2: OpenSSH + RemoteManager

Interface ~~bug to bug~~ byte to byte identical to ThreadX.

```
*****************************************************
*    Welcome to PRIMERGY Remote Manager             *
*    Firmware Revision 98.10a (1.00)                *
*    SDR 3.16  ID 0401 TX1320M1                     *
*    Firmware built  Nov  5 2015 16:35:12 CET       *
*****************************************************

System Type  : PRIMERGY TX1320 M1
System ID    : YLXLXXXX36
System Name  : SUT-PW
System OS    : Windows Server 2016 Technical Preview 3 Standard
System Status: OK (Identify LED is OFF)
Power Status : Off
Asset Tag    : System Asset Tag

    Main Menu

(1) System Information...
(2) Power Management...
(3) Enclosure Information...
(4) Service Processor...

(c) Change password
(*) Console Redirection (EMS/SAC)
(s) Start a Command Line shell...
(l) Console Logging

Enter selection or (0) to quit:
```

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iRMC Firmware components

Free and Open Source Software

- Linux Kernel
- U-Boot bootloader
- Busybox
- GNU Glibc
- Net-SNMP
- OpenSSH

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Closed source

- IPMI full stack powered by AMI MegaRAC
- WebServer
- SNMP agents
- Redfish implementation

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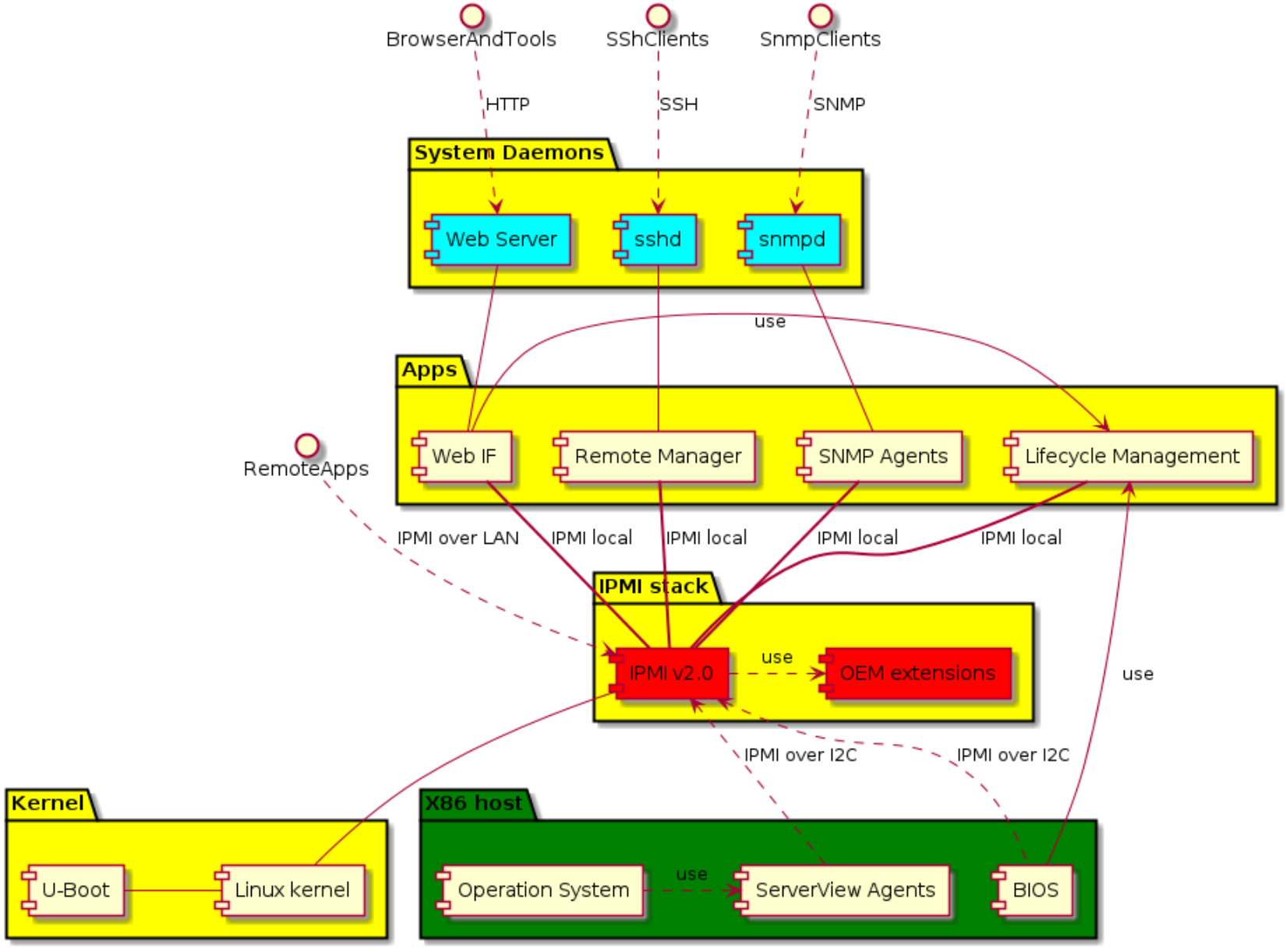
iRMC firmware internals



Development environment

LXC containers + X2go for developers

The same environment for all to build and debug.
Read-only root filesystem on container.
Debian GNU/Linux based.

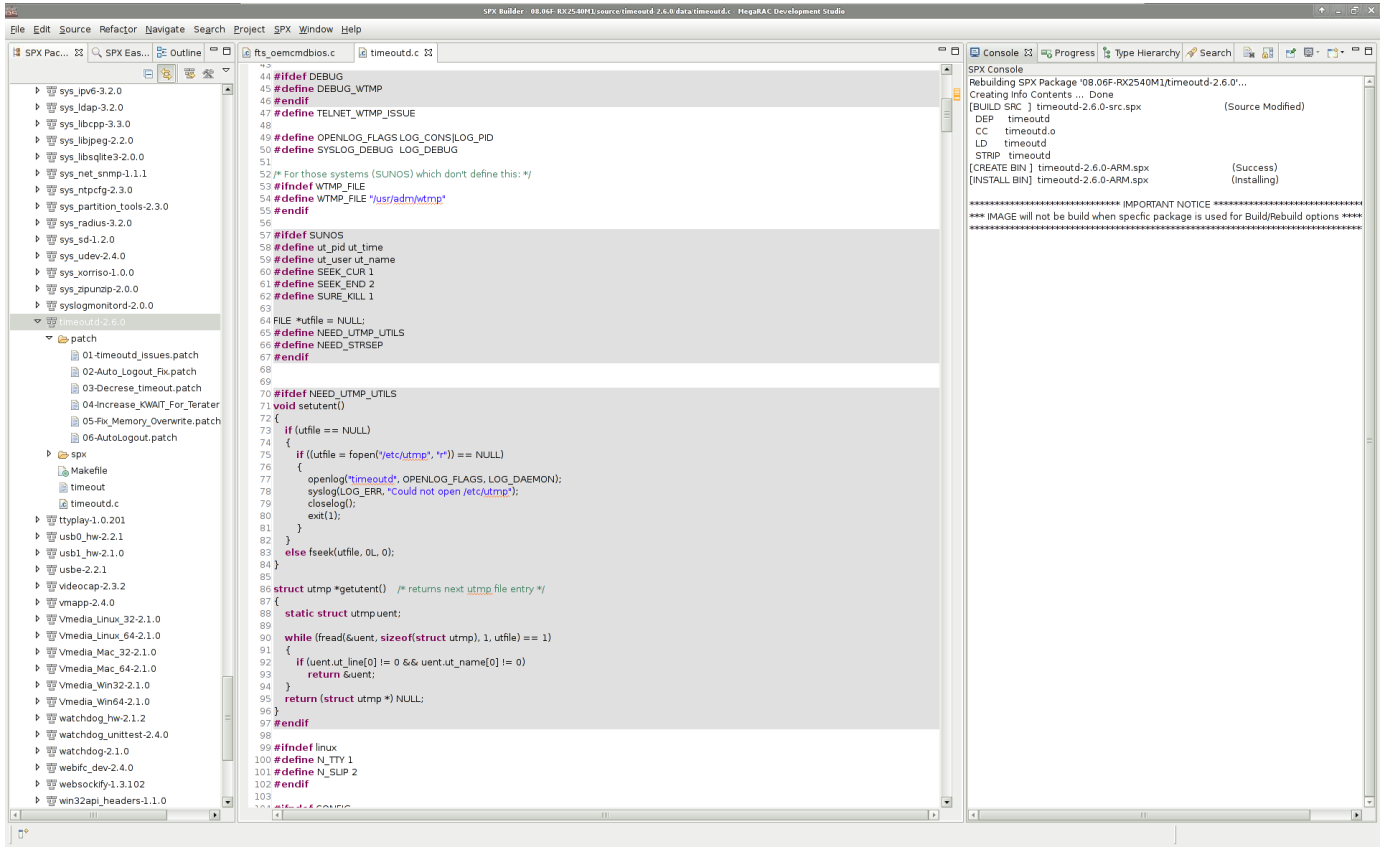
Custom package system by AMI MegaRAC technology

Used only in development and build process.
Not used for updates.
Package format similar to DEB, but not the same.

Eclipse-based IDE + AMI MegaRAC extensions

Rich IDE + version control + packaging system integration


IDE: Eclipse + AMI MegaRAC extensions



BUILT ON eclipse

MEGARAC® DS DEVELOPMENT STUDIO

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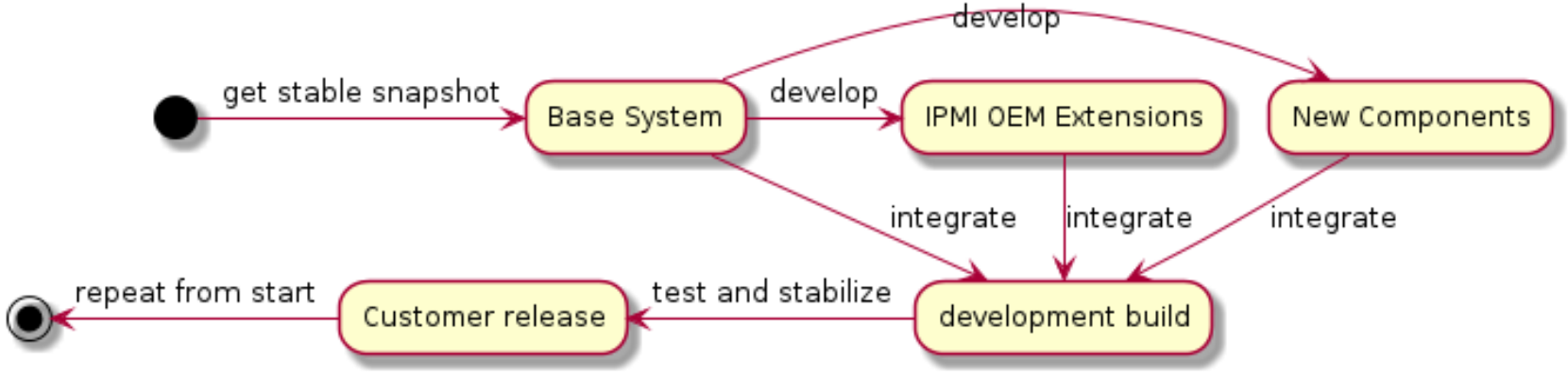
Development cycle



Very typical Embedded Linux development cycle (simplified view):

1. Get base system snapshot and freeze it
2. Develop new components and IPMI OEM extensions
3. Bug fix and stabilization
4. Test it hard
5. Release firmware to customers
6. Repeat once again from step (1).

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FOSS legal questions

- Following the FOSS licenses
- Special policy for FOSS components using
- Consolidation of components legal status
- Rare upstream communication [1]
- FOSS component sources - by demand from support

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[1] no significant changes in upstream

Demo 3

Development login via SSH.
Show typical Embedded Linux system.

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Questions? Remarks?

shaping tomorrow with you

- Fujitsu Primergy servers: http://www.fujitsu.com/fts/products/computing/servers/primergy/
- iRMC S5 manual: http://manuals.ts.fujitsu.com/file/13280/irmc-s5-configuration-en.pdf
- Aspeed Pilot 4 iBMC specs: https://www.aspeedtech.com/products.php?fPath=20&rId=527
- AMI MegaRAC technology by American Megatrends Inc: http://ami.com/products/remote-management/
- ThreadX RTOS: http://rtos.com/products/threadx
- Fujitsu Technology Solutions: http://www.fujitsu.com/fts

contact: Vladimir.Shakhov at ts.fujitsu.com

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