ENHANCE FUEGO TEST EFFICIENCY BY APPLYING ADDITIONAL SOFTWARE AND HARDWARE SOLUTIONS

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AGENDA

- Self introduction
- Fuego as a test automation solution
  - Why Fuego
  - Known efforts of applying Fuego
- A FUNCTIONAL automation test solution based on Fuego
- Feedback to Fuego upstream
- Future work

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SELF INTRODUCTION
ABOUT RENESAS AND RENESAS DESIGN VIETNAM

- Renesas Design Vietnam Co., Ltd. (RVC) was founded in October 2004, as one of the main design centers in Renesas group.
- Business line: Design of semiconductor for both hardware and software.
WHO AM I?

- **Name**: Khiem Trong. Nguyen (KHIEM Nguyen - キム グエン)
- **Company**: Renesas Design Vietnam

- **Career**: 09 years experiences in embedded software development
  - Development and verification for Mobile software platform
  - Development and verification for In-vehicle software platform
  - Development for test automation solutions of In-vehicle software platform

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FUEGO

AS A TEST AUTOMATION SOLUTION
There have been **3 important milestones** so far.

And there are more expectations on upcoming releases as Fuego gets more attentions from community.
ABOUT FUEGO [2/2]

2014
- LTSI Test project (JTA)
- 1st release by May 2014
- Adopted by AGL and community
- Run on Docker from 2015

2016
- Fuego v1.0 release
- Released by Nov. 2016
- More engagement from community
- Function enhancement from community
- Wiki, Mailing list discussion

2017
- Fuego v1.1 “Blaze” release
- Released by April 2017
- Upgraded to Jenkins 2.32.1
- New Fuego directories layout
- New Fuego script system
- New transport for board communication

- LAVA integration
- etc
PITFALLS OF SOFTWARE TEST ACTIVITIES

1. Unstable test results among testers
2. Much human effort due to manual tests & repetitive test cycle
3. Hard to modify un-unified & close-source test solution
4. Hard to port test cases from one solution to another

There’s a common need to find a software test framework which can address above issues.
SOLVE PITFALLS - WHY FUEGO?

Jenkins-based open source test automation solution

Portable by running Fuego on top of Docker

Easily expand the supported features, utilizing the Jenkins plugins

Able to utilize the existed features to optimize test execution

Easily add more test cases individually or in groups

Can solved P1
Can solved P3
Can solved P2
Can solved P3
Can solved P4
USE FUEGO - THE KNOWN EFFORT [1/2]

2014
• Fujitsu contributed new ethtool test cases.

2015
• Mitsubishi showed how to run LTP efficiently with LTSI test project.
• AGL deployed it as official AGL CIAT solution.

2016
• Toshiba proposed improvement on Post-processing tool to summarize LTP test result.
USE FUEGO - THE KNOWN EFFORT [2/2]

- Renesas has also put many efforts to apply Fuego into test automation solutions.
- Building up automation test for R-Car platform which could execute selected test cases without external hardware’s hotplug operation.
- Summarize the test results (logs) automatically and output them as a report (excel file).

A FUNCTIONAL AUTOMATION TEST SOLUTION BASED ON FUEGO
WHAT IS A FUNCTIONAL AUTOMATION TEST SOLUTION?

Typical requirements for a functional automation test solution:

- **R1**: Able to perform the tests automatically as submitted schedule
- **R2**: Have efficient solution for device management
- **R3**: Support managing test cases, test results and test report creation
- **R4**: Automatically notify status of test execution to testers
- **R5**: Able to automatically trigger the test based on source code update (CIAT)
- **R6**: Able to complete the test case without human intervention
FUEGO VS FUNCTIONAL AUTOMATION TEST SOLUTION

- **R1**: Able to perform the test automatically as submitted schedule
- **R2**: Have efficient solution for device management
- **R3**: Support managing test case, test result and test report creation
- **R4**: Automatically notify status of test execution to testers
- **R5**: Able to automatically trigger the test based on source code update (CIAT)
- **R6**: Able to complete the test case *without* human intervention

- **Fuego supported**
- **Fuego partly supported**
- **Fuego has not supported yet**

- Local and remote board control service
- Need scalable test database service
- Email notification
- Git event hook service
- Need hardware solution for board control

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BRIEF IMAGE ABOUT FUEGO INTEGRATED SYSTEM

Fuego integrated system in our view point.
REALIZE FUEGO INTEGRATED SYSTEM
INTEGRATING SOFTWARE SOLUTIONS

- Lava as Fuego’s “board management” facility.
  - Strong open-source solution for board management.
    - Local boards and remote boards
    - Support interface to extend board management capabilities, like power supply ON/OFF, etc
Gerrit as Fuego’s “test event trigger” facility.

Strong open-source solution for source code review and source code management.

Well-known combination to realize CI infrastructure.
REALIZE FUEGO INTEGRATED SYSTEM
INTEGRATING SOFTWARE SOLUTIONS

- Testlink as Fuego’s “test case and test result database” facility.
  - Strong open-source solution for test case management.
    - Manage test specification.
    - Manage test plan -> execution.
    - Generate test execution matrix report.
    - Import/export
  - Jenkins plugin is available.
REALIZE FUEGO INTEGRATED SYSTEM
INTEGRATING HARDWARE SOLUTIONS

- What features hardware solutions can support?
  - Power supply control
  - Boot from power-on-reset (cool boot) or from hardware reset (warm boot)
  - Firmware update
  - Suspend-to-RAM’s resume trigger
  - External connections’ hotplug
REALIZE FUEGO INTEGRATED SYSTEM
INTEGRATING HARDWARE SOLUTIONS

Power supply control

Boot from power-on-reset (cool boot) or hardware reset (warm boot)

From schematics of R-Car Starter Kit Pro
REALIZE FUEGO INTEGRATED SYSTEM
INTEGRATING HARDWARE SOLUTIONS

**SD Card hotplug**

<table>
<thead>
<tr>
<th>Pin number</th>
<th>Pin name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DAT3</td>
</tr>
<tr>
<td>2</td>
<td>CMD I/O</td>
</tr>
<tr>
<td>3</td>
<td>VSS</td>
</tr>
<tr>
<td>4</td>
<td>VDD</td>
</tr>
<tr>
<td>5</td>
<td>CLK</td>
</tr>
<tr>
<td>6</td>
<td>VSS</td>
</tr>
<tr>
<td>7</td>
<td>DAT0</td>
</tr>
<tr>
<td>8</td>
<td>DAT1</td>
</tr>
<tr>
<td>9</td>
<td>DAT2</td>
</tr>
</tbody>
</table>

Control VDD pin to hotplug SD Card

**USB hotplug**

The type-A plug (left) and type-B plug (right)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VBus (+5 V)</td>
</tr>
<tr>
<td>2</td>
<td>Data-</td>
</tr>
<tr>
<td>3</td>
<td>Data+</td>
</tr>
<tr>
<td>4</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Control Vbus pin to hotplug USB

Maintain the quality of GPIO signal is crucial for the hot-plug feature.

**HDMI hotplug**

Control pin19 to hotplug HDMI

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With this system, Fuego has been enhanced to support test automation solution.
FEEDBACK TO FUEGO UPSTREAM
FEEDBACK TO FUEGO UPSTREAM [1/2]

- To realize the functional test automation solutions, need to offer the reference implementation which integrating other software solution to expand Fuego capability.
  - Need reference design showing the integration.
  - Considering to add more features as Fuego own features.
FEEDBACK TO FUEGO UPSTREAM [2/2]

- Via this presentation, Renesas shows the possibility to integrating additional hardware solution and software solutions with Fuego to enhance test efficiency.

- To make the integration smoothly, Fuego should have standardized interfaces for the features.
  - E.g test result database management, Gerrit integration, email notification
FUTURE WORK
FUTURE WORK

- Renesas will **continue contributing feedback to Fuego current development features as well as planning features for next releases.**

- Renesas will **continue using Fuego as test automation solution** and explore more ways to improve test efficiency with Fuego.

- One of the next challenges is to **introduce audio test automation and video test automation** to Fuego.
BIG IDEAS FOR EVERY SPACE
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