Towards Early Validation of Firmware using UVM simulation framework

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AGENDA

• Firmware in simulation – UVM framework
• Advantages of “Firmware in simulation”
Firmware in Simulation – UVM Framework

- UVM and Firmware Amalgamation

Accommodate FW's precise cycle time requirements

GCOV/LCOV
Advantages

- RTL Verification
- FPGA Emulation

Opportunity to discover corner RTL issues

- Power ON
- Post Si Validation

Emotional Confidence

Consistency across platforms

Issue reproduction and debug capabilities in RTL

Relatively stable FW

Env re-use

Stable FW Emotional Confidence for PON

Left shift in PON Exit
Advantages

• Reduction in time-to-revenue

<table>
<thead>
<tr>
<th>Projects</th>
<th># of lines of code before silicon</th>
<th># of lines of code changed after silicon until power ON</th>
<th>% of change done after silicon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Project (no firmware validation during RTL simulation, only partial validation in emulation)</td>
<td>3432</td>
<td>921 (addition of APIs/sequences, changes in APIs/sequence orders, deletion of sequences, changes in register setting values, change in array sizes)</td>
<td>27%</td>
</tr>
<tr>
<td>Project-1 (with firmware validated during RL simulation)</td>
<td>3201</td>
<td>195 (Addition of code to support specific PHY pad trainings for an issue root caused during ATE characterization, changes in some register settings after assessment of silicon behavior)</td>
<td>6%</td>
</tr>
<tr>
<td>Project-2 (with firmware validated during RTL simulation)</td>
<td>4350</td>
<td>519 (Code change due to introduction of new frequency plan for some customers, change in other register settings)</td>
<td>12%</td>
</tr>
</tbody>
</table>
Advantages

• Faster Power ON exit
• Firmware abstraction layer

```
FW API-1 -> extern C Wrap-1 -> Import - 1
FW API-2 -> extern C Wrap-2 -> Import - 2
...........................................
...........................................
FW API-n -> extern C Wrap-n -> Import - n

System Verilog
```

```
FW API-1

..............
..............

extern C Wrapper for boot
FW API-1

Just One import for boot

System Verilog

FW API-p

Runtime individual imports with less and simple arguments

FW API-n

.......
`
Questions