2013/6/12 Version

# “**CompRunner**” ISS/RTL Runtime Verification Environment

Renesas Electronics Corporation

CPU Development Department / Masayuki KIMURA

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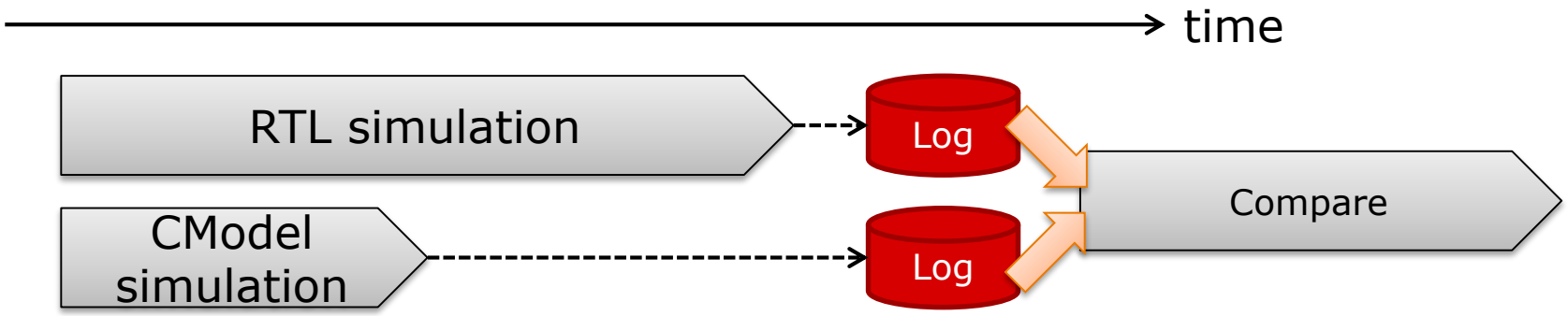
# Introduction

- Two methods of G4H verification using instruction set simulator(ISS)
  - Post simulated verification (CompTrace)
  - Runtime Verification (CompRunner)

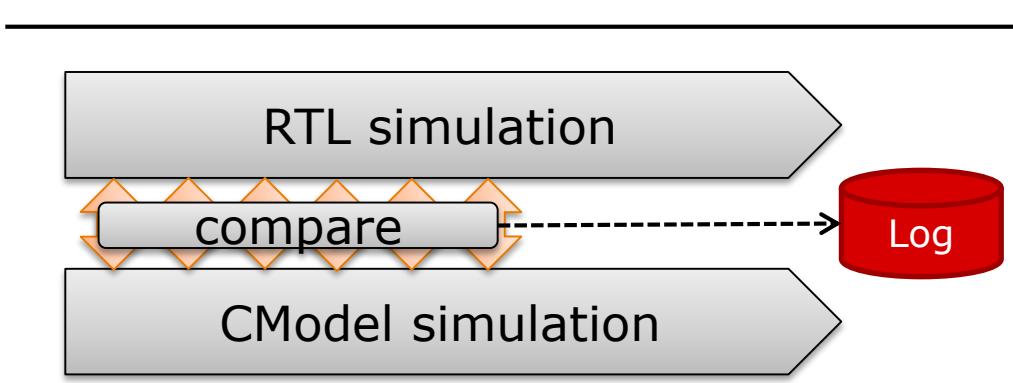
- This materials explains overview of CompRunner, runtime verification environment and how to connect RTL to ISS.

# CompTrace v.s. CompRunner

- **CompTrace** (Post verification)

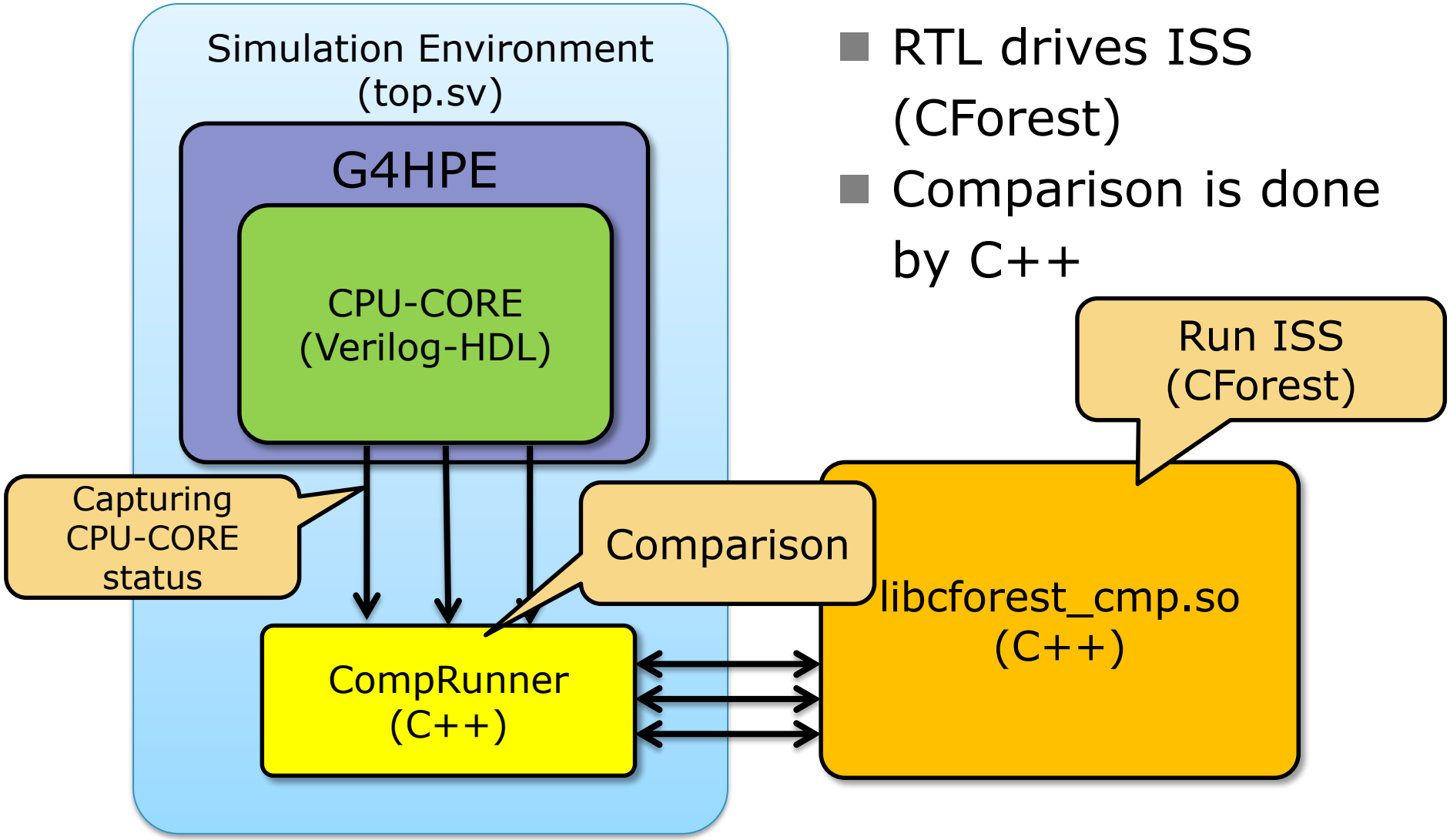



- **CompRunner** (Run-time verification)



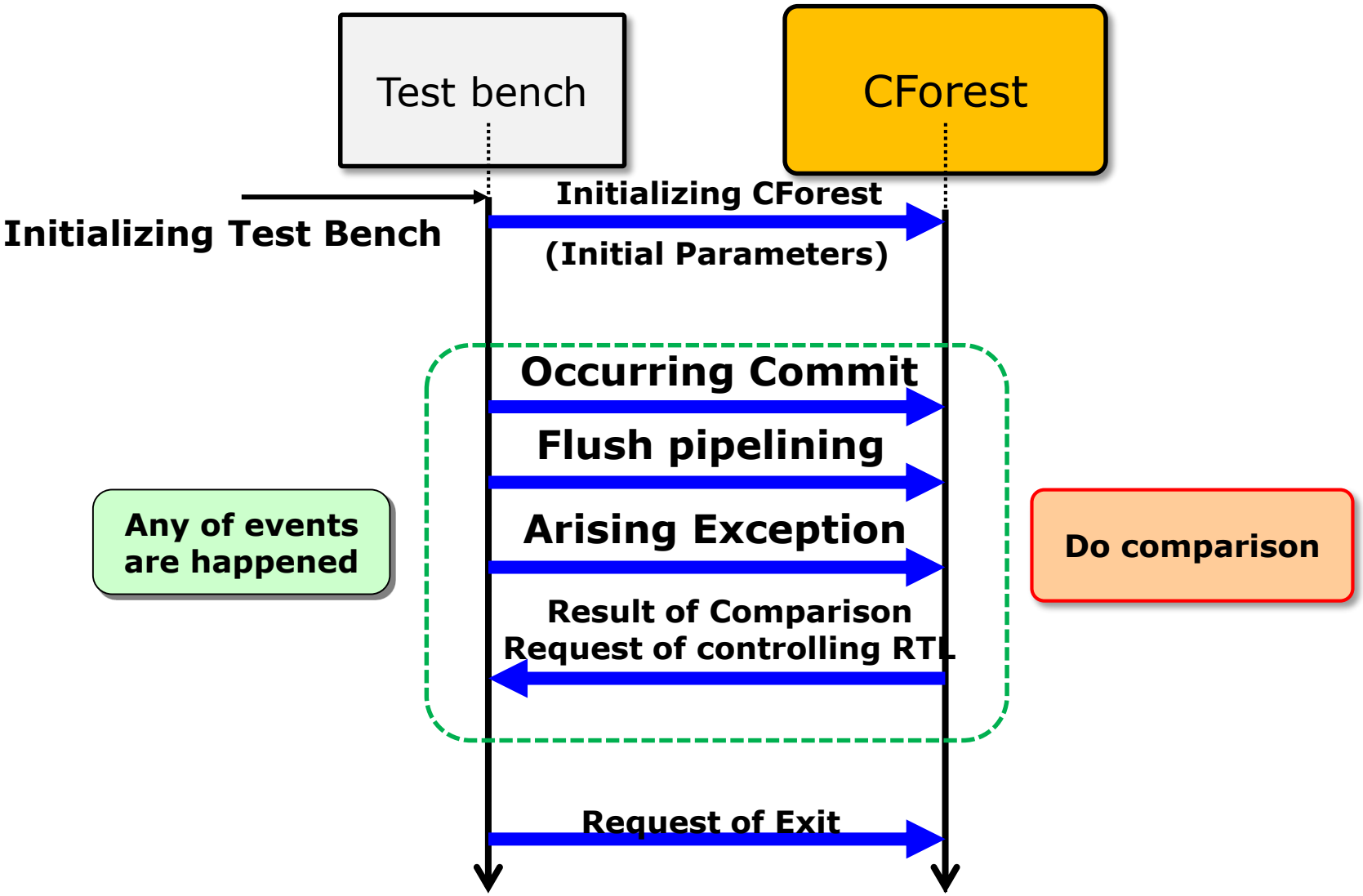

  - CompRunner needs not explicit “Comparison” time.
  - Comparison is could be done during simulation

# Actual Implementation



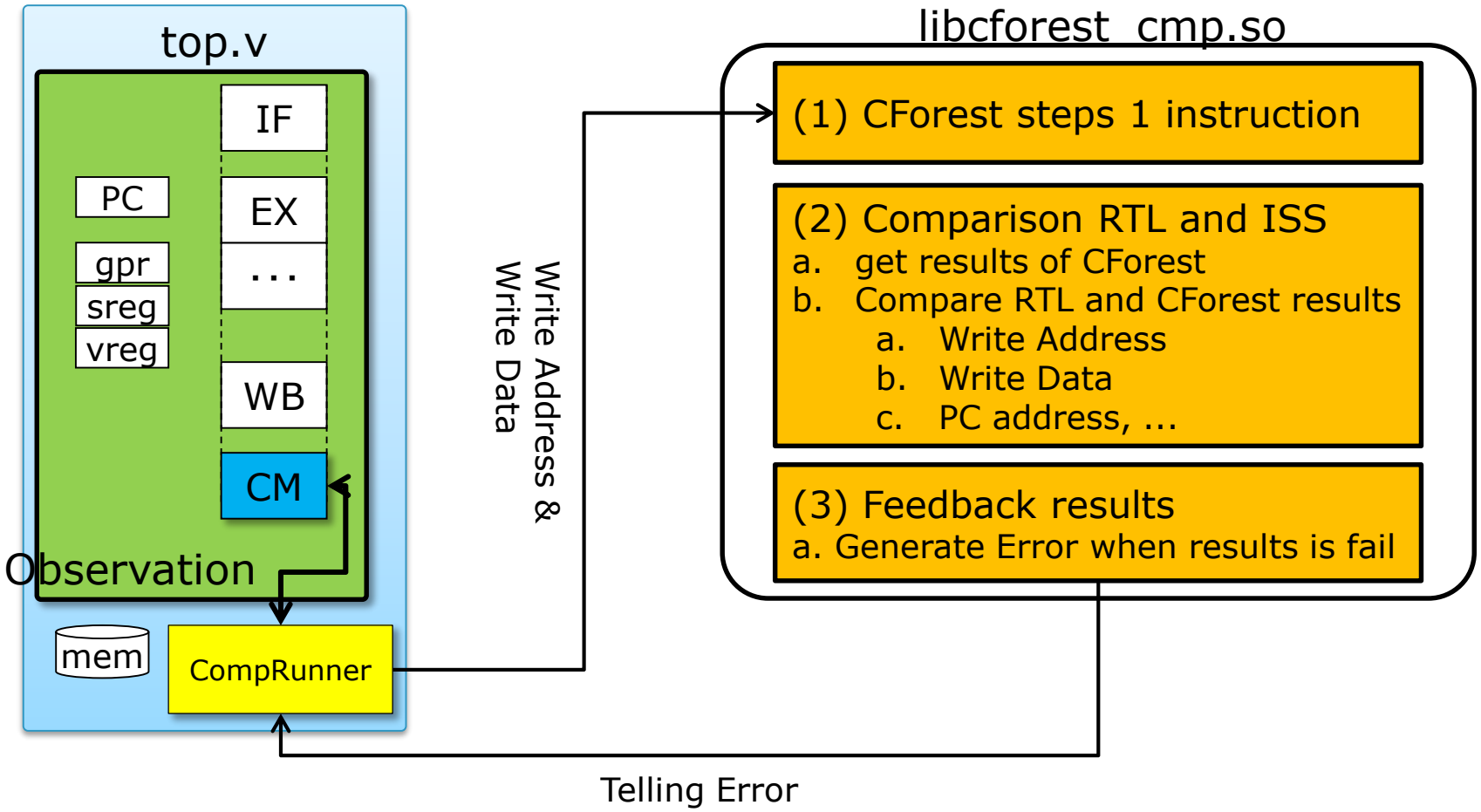

- RTL drives ISS (CForest)
- Comparison is done by C++

# Test flow for ISS-RTL



# Comparison flow

- Driven by Register write
  - RTL tells CForest when Commit is occurred
  - CForest steps 1 instructions → Compare results



# Sample of CompRunner log

```
...
 [0000024e] 0000001f ; movw 1193267,r1          GR[01]<=00123533
 [00000250] 35330621 ; movw 4900,r2             GR[01]<=00123533
 [00000256] 13240622 ; movw 4916,r3             GR[02]<=00001324
 [0000025c] 13340623 ; movhi -20971520,r0,r1    GR[03]<=00001334
 [00000262] fec00e40 ; divu r1,r2,r4            GR[01]<=fec00000
X[00000266] 22c217e1 ; add r1,r3
            VALUE MISMATCH RTL:GR[03]<=00001234,  ISS:GR[03]<=00001233
 [00000266] 22c217e1 ; st.h r3,8[r1]
 [0000026a] 000019c1 ; ld.h 8[r1],r3            GR[03]<=fec01334
 [0000026c] 00081f61 ; st.b r3,16[r1]
 [00000270] 00081f21 ; ld.b 16[r1],r3           GR[03]<=00001334
 [00000274] 00101f41 ; mul r1,r2,r4             GR[04]<=00001324
 [00000278] 00101f01 ; div r1,r2,r4             GR[03]<=00000034
 [0000027c] 222017e1 ; ld.w 16[r1],r3           GR[02]<=00000000
 [0000027c] 222017e1 ; movr r5,r4               GR[04]<=00000000
...
```

Case of comparison is failed

# Advantage of Runtime Verification

| | ポストシミュレート検証 | ランタイム検証 |
|---|---|---|
| 速度 | ISS/RTL実行&ログ取得<br>→ ログ突合せ<br>低速 | ISS/RTL実行<br>→ 1命令毎に結果突合せ<br>高速 |
| ディスク使用量 | ISS/RTL双方でログを<br>格納する領域が必要<br>使用量大 | ログが存在しなくても突合せ可能<br>→ ディスク使用量節約<br>使用量小 |
| | | |

# Variations in SystemVerilog Environments

| | DPI | VPI |
|---|---|---|
| Speed of Simulations | Faster | Slower |
| Calling strategies | Call to SV task/functions | Only called from SV |
| Google tells | 43,100 pages | 29,100 pages |
| Support | **Synopsys VCS**<br>**Cadence IUS**<br>Verilator | **Synopsys VCS**<br>**Cadence IUS**<br>Veritak |
| | | |

ルネサス エレクトロニクス株式会社