TOSHIBA

Leading Innovation

Moving Forward: Overcoming from Compatibility issues BoFs

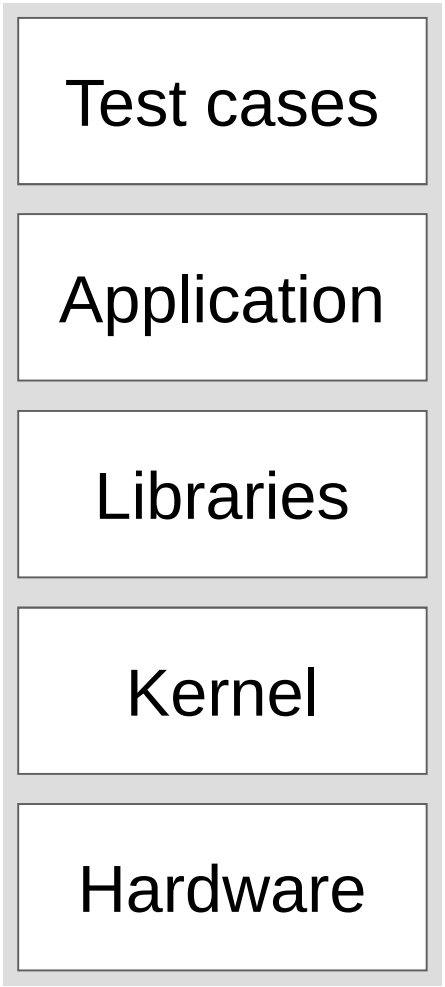
Yoshitake Kobayashi
Advanced Software Technology Group
Corporate Software Engineering Center
TOSHIBA CORPORATION

13 Apr, 2011

Copyright 2011, Toshiba Corporation.

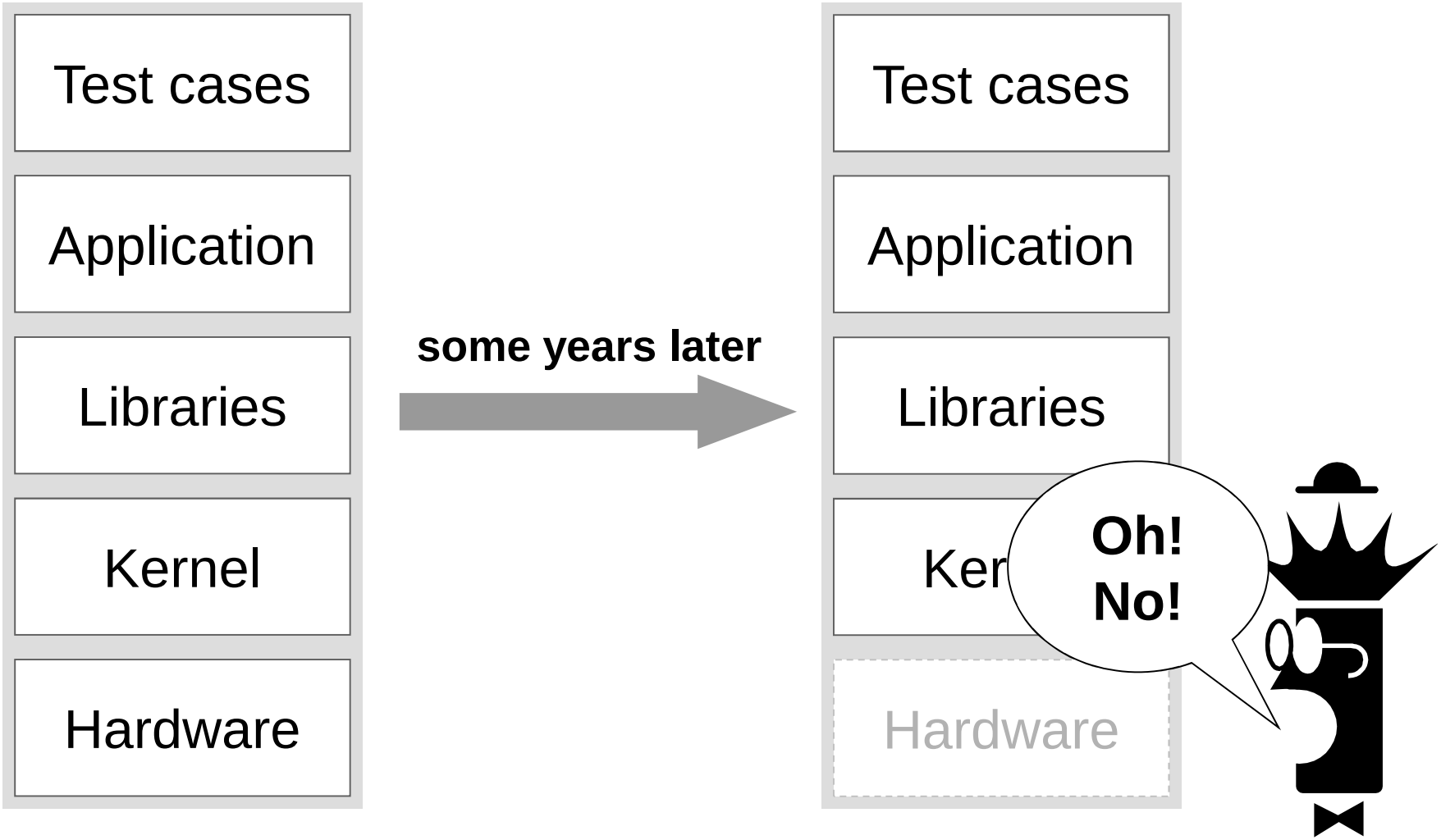
Problem definition

Product life cycle: more than 10 years



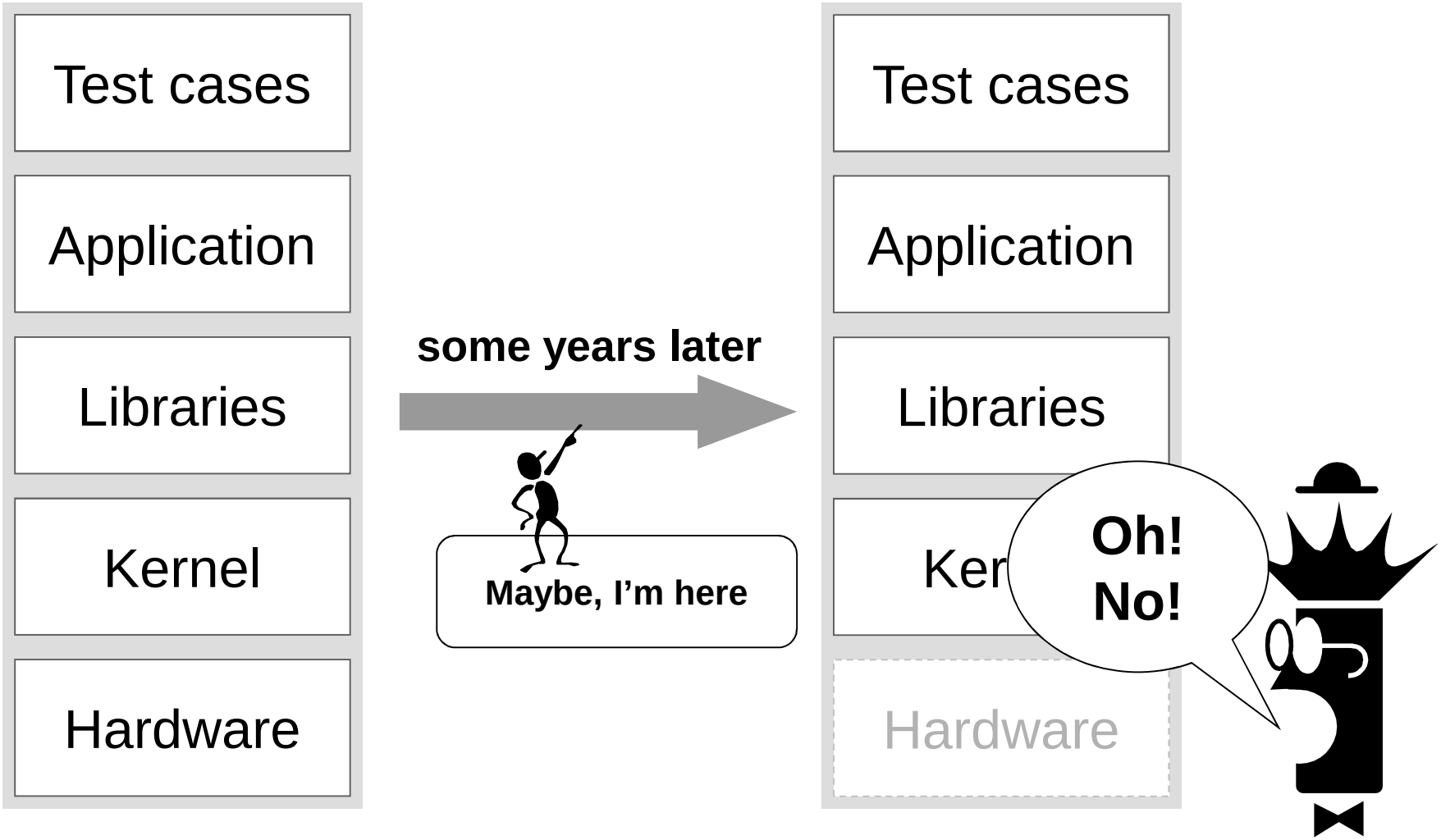
Problem definition

Product life cycle: more than 10 years



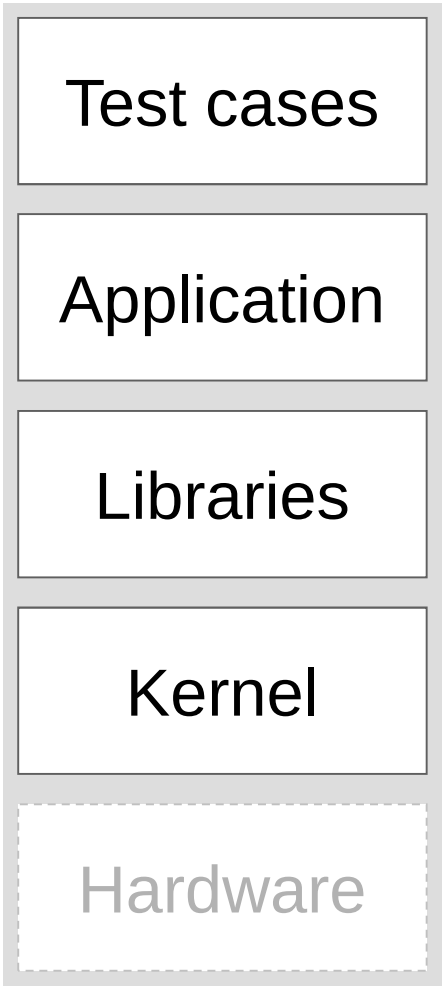
Problem definition

Product life cycle: more than 10 years

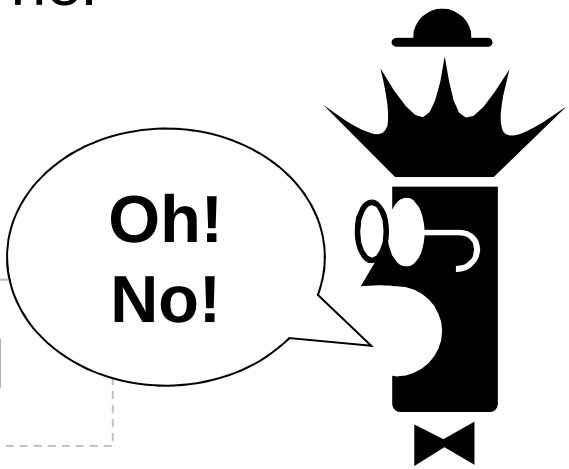


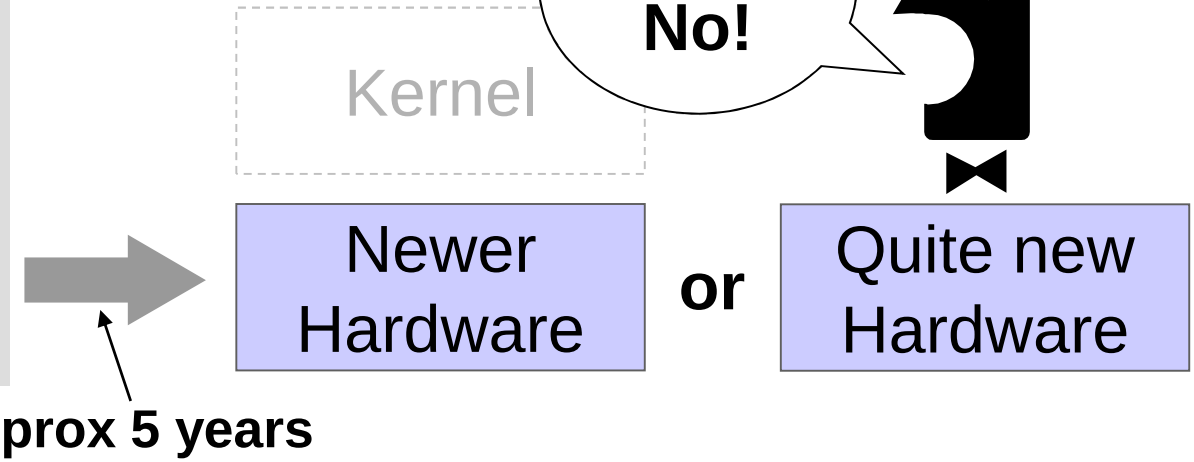
Problem definition

To overcome the hardware discontinuation:



- Is new hardware introduction enough?
  - No!
- Need to check supported hardware for the current kernel
  - Mostly not….





Question 1: How to adapt the new hardware

- Which approach is the better?
  - Upstream kernel driver backports on the old kernel
  - Change the current product's kernel to newer one

Question 1: How to adapt the new hardware

- Which approach is the better?
  - Upstream kernel driver backports on the old kernel
  - Change the current product's kernel to newer one
- The answer is …
  - I'm not sure
- The correct answer depends on:
  - Hardware specification
  - User's (or Programmer's) requirement
- In this BoF, think about use newer kernel version to move forward

Question 2: Required tests

- What kind of test do I need to do to make sure the compatibility?

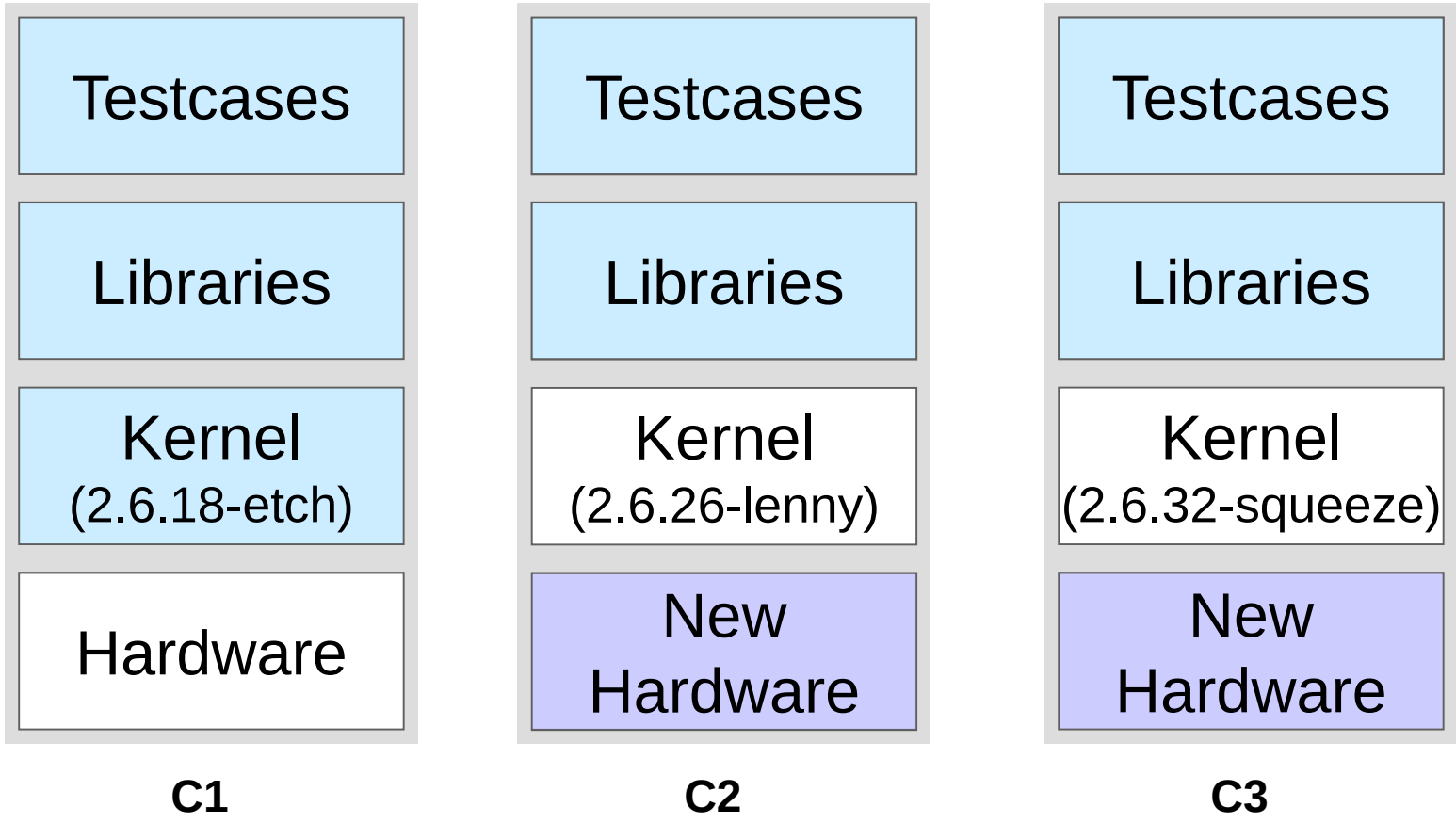
Question 2: Required tests

- What kind of test do I need to do to make sure the compatibility?

- The following slides describe three aspects:
  - API level
  - Performance verification
  - Service quality verification

Case study 1: API level tests

- Test environment
  - Same libraries and testcases are used on each kernel version



LTP resluts

- C1: 2.6.18-etch + Etch environment
  - Error count that failed only on new hardware: 1
    - cron02
  - Note: This kernel doesn't fully support new hardware

- C2: 2.6.26-lenny + Etch environment
  - Error count that failed only on new hardware: 3
    - getcpu01, stime01, cron02
    - needs to run separately: mtest06, cron_deny01
  - Note: This kernel supports almost all devices on new hardware

- C3: 2.6.32-squeeze + Ethc environment
  - Error count that failed only on new hardware: 7
    - execve04, getcpu01, swapon03, sched_cli_serv, clock_gettime03, timer_create04
  - Note: This kernel supports almost all devices on new hardware

Determine the reason for the errors on 2.6.26

- getcpu01
  - Only runs >2.6.20
  - Need NUMA support
- stime01
  - time() retuens stime()-1
  - A bug fix is available on 2.6.27.13
  - Easy to fix

Case study 2: Performance verification

- CPU performance
  - Has to be better than old one if the application's CPU usage is high
    - This is easy to fix
- Network throughput
- I/O throughput

- The following aspects are important for real-time systems
  - Scheduling latency
  - Network latency
  - …(any others?)

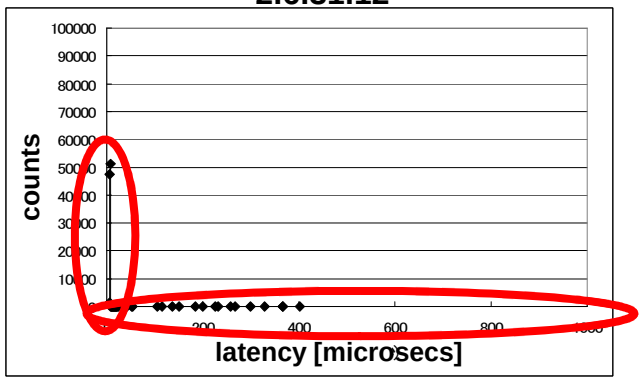
Latency test (cycle 300µs / cpu and memory load)

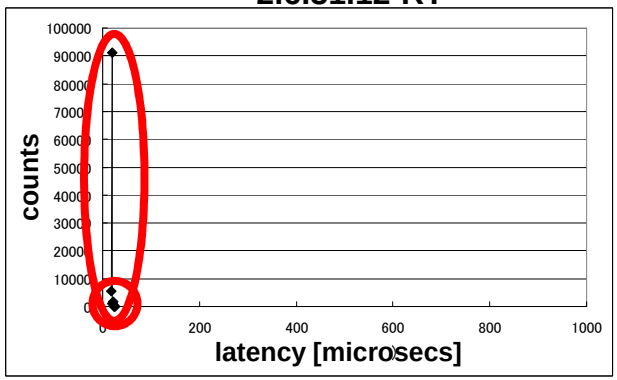
CPU load

2.6.31.12

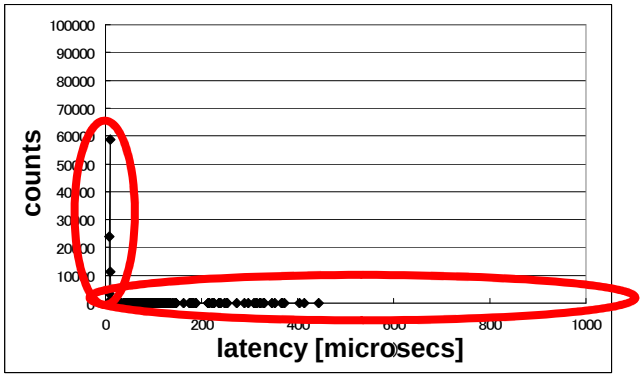
2.6.31.12-RT

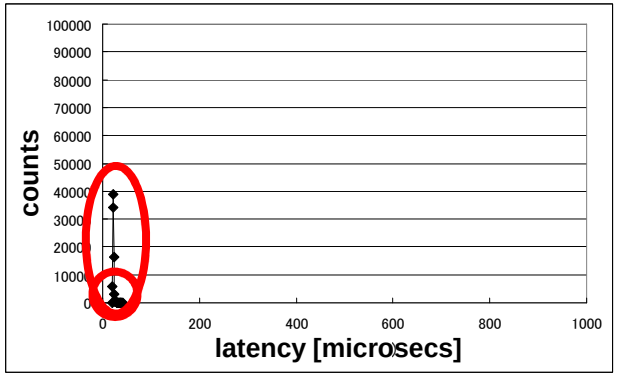
0 %



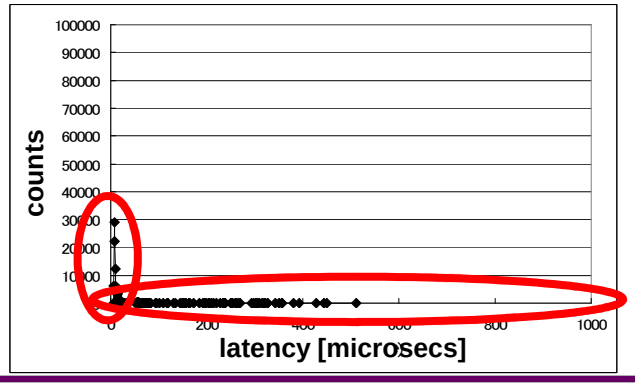


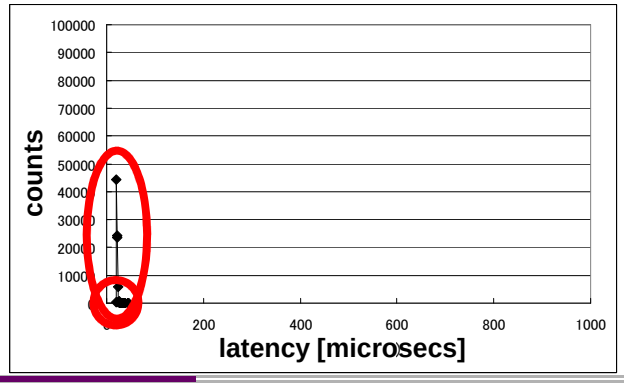
50 %





100 %





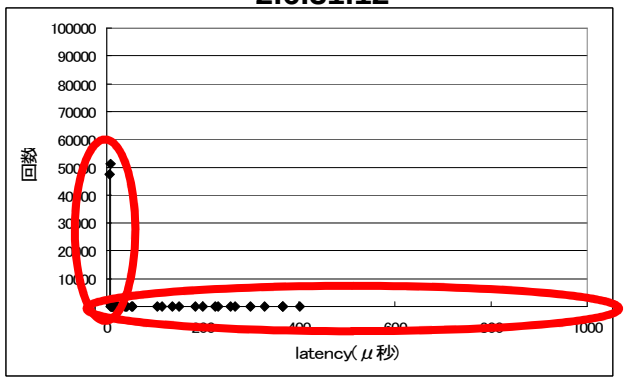
Latency test(cycle 300µs / CPU load only)

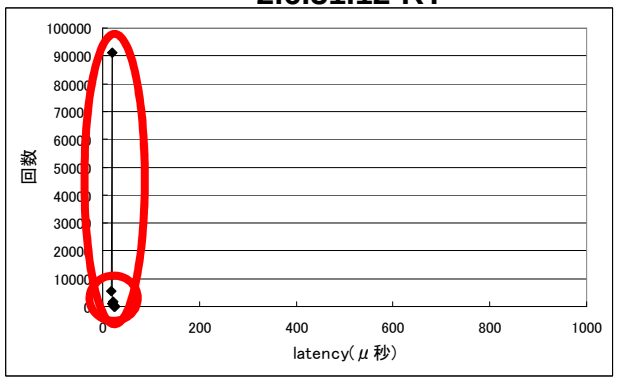
CPU負荷

2.6.31.12

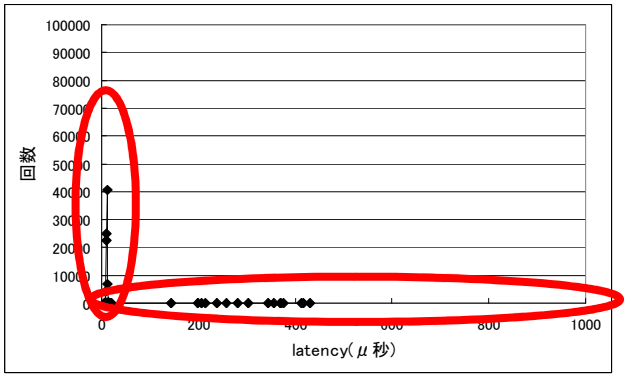
2.6.31.12-RT

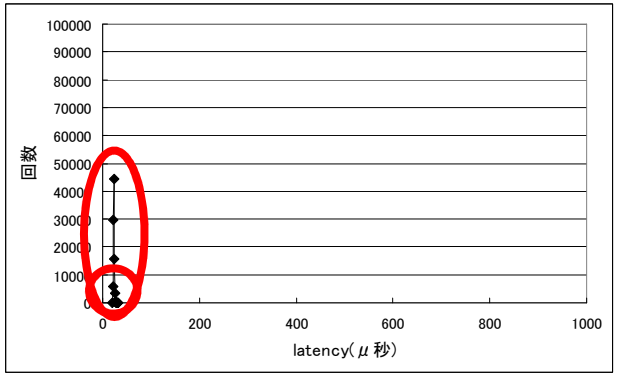
0 %



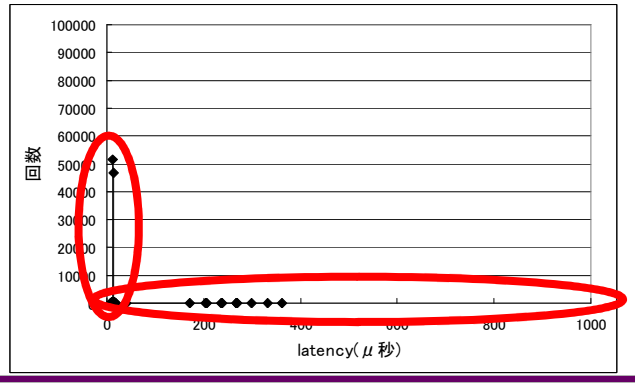


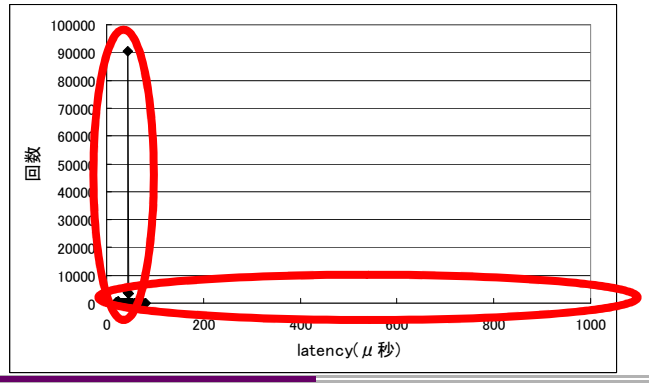
50 %





100 %





Why this happens?

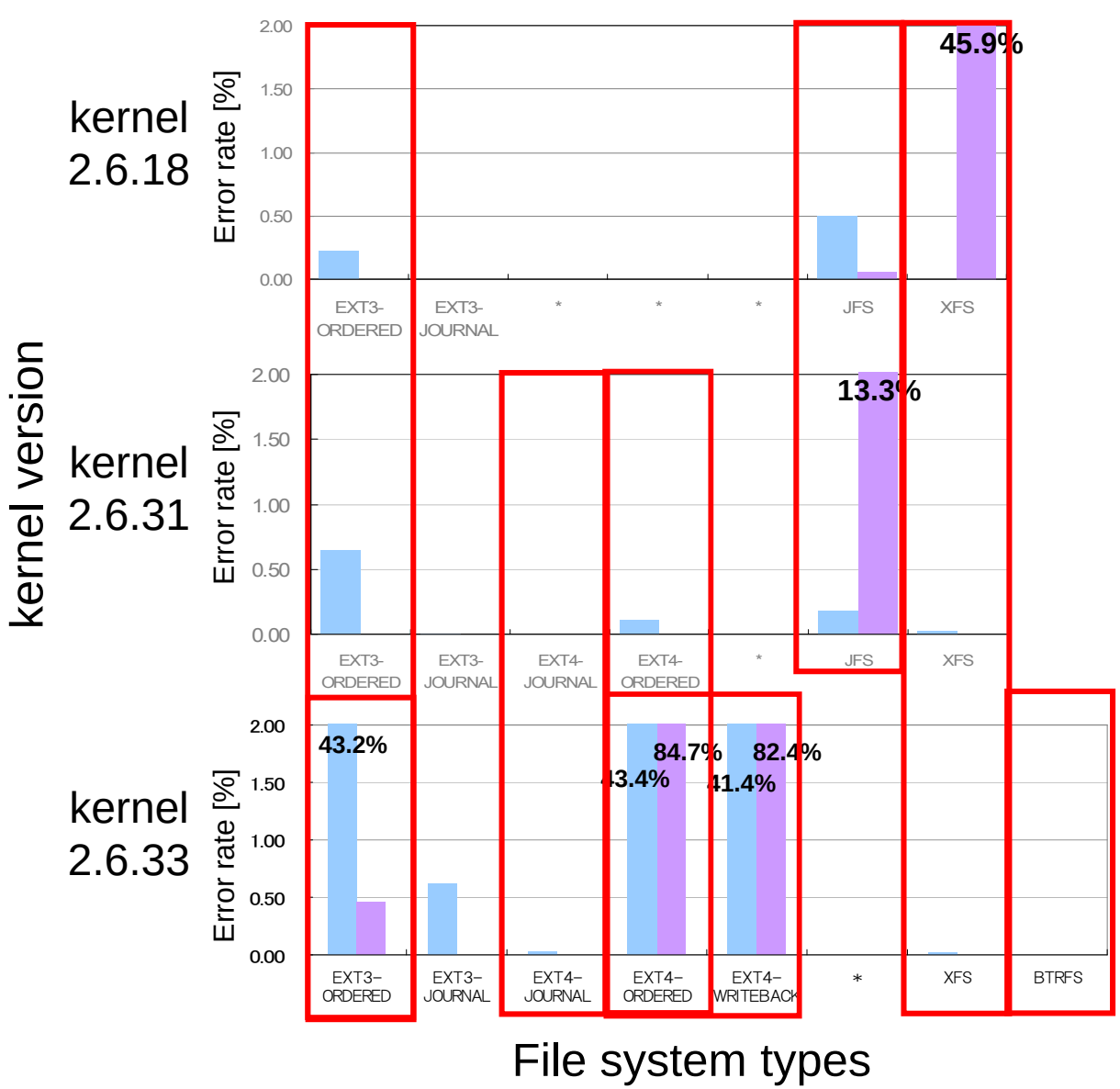
- **Probably** hardware problem
  - Try to find the bottlenecks by ftrace
    - This latency problem randomly happens in the kernel
  - If same test runs on other machines, nothing happened

- In this case, just throw away the hardware
  - or ask customer service

Case study 3: Quality verification

- Quality verification for:
  - File systems
  - Long-term running

Results of data reliability tests



File size mismatch rate
Data mismatch rate

Point 1:
An filesystem has different characteristics on different kernel

Point 2:
2.6.33 has high error rate on ordered and writeback mode

Point 3:
Ext4-journal and Btrfs has good resluts

Conclusion

- This BoF discussed what kind of tests are required to follow newer kernel version
  - The following aspects are only examples
    - API level compatibility
    - Performance compatibility
    - Service quality compatibility

- Of course, application specific tests has to run

TOSHIBA
Leading Innovation