Linux: Reducing the cost of upstream development to encourage collaboration

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### Summary

1. **Introduction**
2. **Upstream issues**
3. **Forked kernels’ issues**
4. **Pros of upstream development**
5. **Making testing cheaper**
Linux is everywhere

- Most of the servers/networking equipments;
- 80% of smartphones (Android) and 65% of tablets;
- Entertainment systems (at home, cars, planes, ...);
- Majority of IoT devices.
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World domination?

No, because all products use outdated kernels!

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- Poorer Quality/Security: Less eyes per tree, fixes duplicated.
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Objectives of making a product

Get it as good as possible, and as quickly as possible
## Why upstream is no good for vendors?

### Upstream from a vendor’s perspective

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#### Challenges with upstream

- Linux development not product-oriented:
  - Releases not in sync with products;
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**Upstream issues**

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**Forked kernel?**

- Full control over the code;
- None of the above challenges!
Issues with forked kernel

What should be done when the next product comes?

- Re-use the previous product’s kernel? ⇒ technical debt;
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  - Risk that internal changes break your features and userspace;
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  - Rebasing generates no revenue.
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Pros of upstream development

Nice features of upstream development

- Non-regression of the user ABI makes updates easy;
- Never need to rebase: Others improve Linux and your code;
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Problem: Testing isn’t free!

- Unless constantly tested, a feature gets accidentally broken;
- Without continuous testing, updating isn’t free!
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### How to make testing cheaper?

#### Reducing manual testing to 0
- Pre-merge testing is the best way to prevent regressions;
- Linux accepts about 8 changes per hour, in average;
- ⇒ all testing needs to be automated!
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Problems with automated testing
- The full product needs to be tested;
- Requires system-level testing;
- ⇒ Need for better HW-assisted test suites!
How to make testing cheaper?

Example of full product testing: Project treble

- Android 8 de-couples the UI from the vendor-provided system;
- The vendor interface is fully unit tested;
- ⇒ could be used for continuous integration!
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What can we do on our side?
- Lead by example: provide regression free graphics!
How to provide regression-free graphics?

Many dependencies

- Improve the coverage of Open Source test suites to test:
  - all graphic-related features of the kernel;
  - all drivers.
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  - Controller instance hosted on fd.o?