Cells: A new virtual machine architecture for mobile phones

ACM 10 Diao Kelu

March 16, 2013

Why we need Cells

1. Why we need virtualization
2. Limits in mobile devices
   - resource
   - users' tolerance
3. Cells is a lightweight virtualization architecture

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What does Cells do

1. Lightweight OS virtualization.
   - only one OS
   - isolation
   - yet, with combining filesystem
2. Foreground-background-model: take full advantage of the small display of smartphone
3. Provide independent phone numbers for each virtual phone(VP) without using multiple SIM cards
4. Fully support present hardware devices with nearly no overheads

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Key words

The key words are:

- switch
- security
- authority

Foreground-background-model

Figure: foreground-background-model

Foreground-background-model

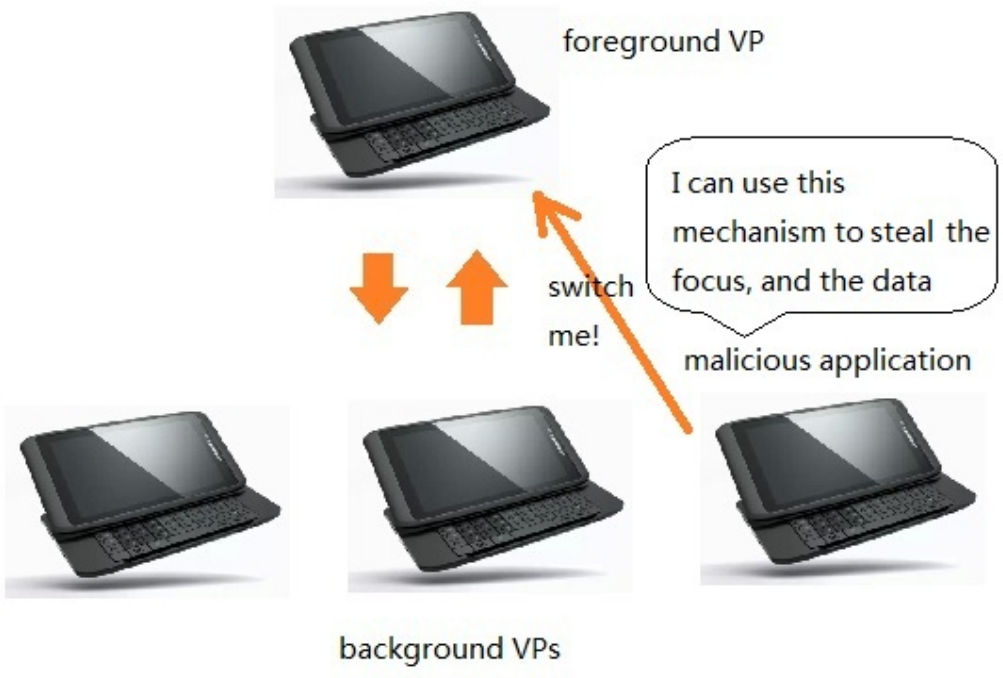

Figure: malicious application

Foreground-background-model

Figure: forbid auto-switching

Authority

Figure: user tends to modify the application

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Authority

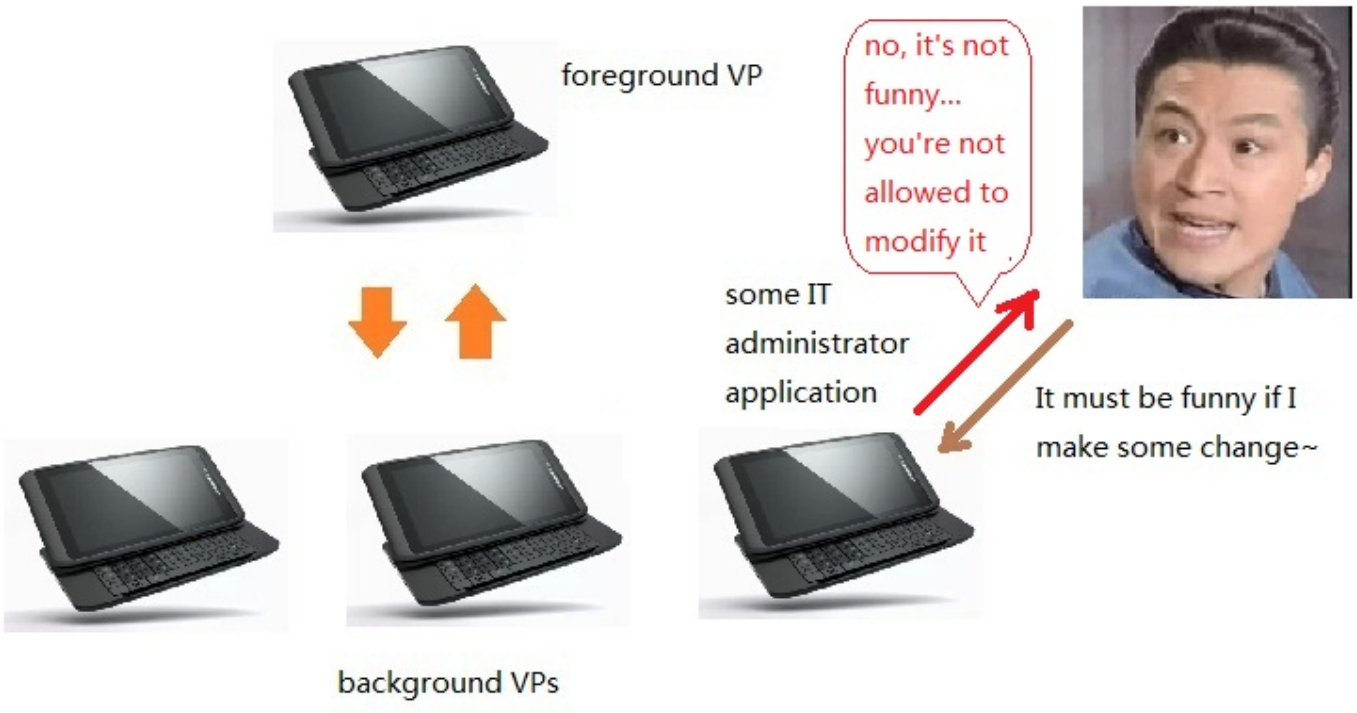

Figure: set the authority

Three access rights

1. no access
   - This VP have no access to a certain device(IT admin's VP)
2. shared access
   - Some device(e.g. frame buffer) can not be set to shared access
3. exclusive access
   - It's necessary for mobile security(e.g. microphone)
   - It's used to implement part of the isolation

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Architecture

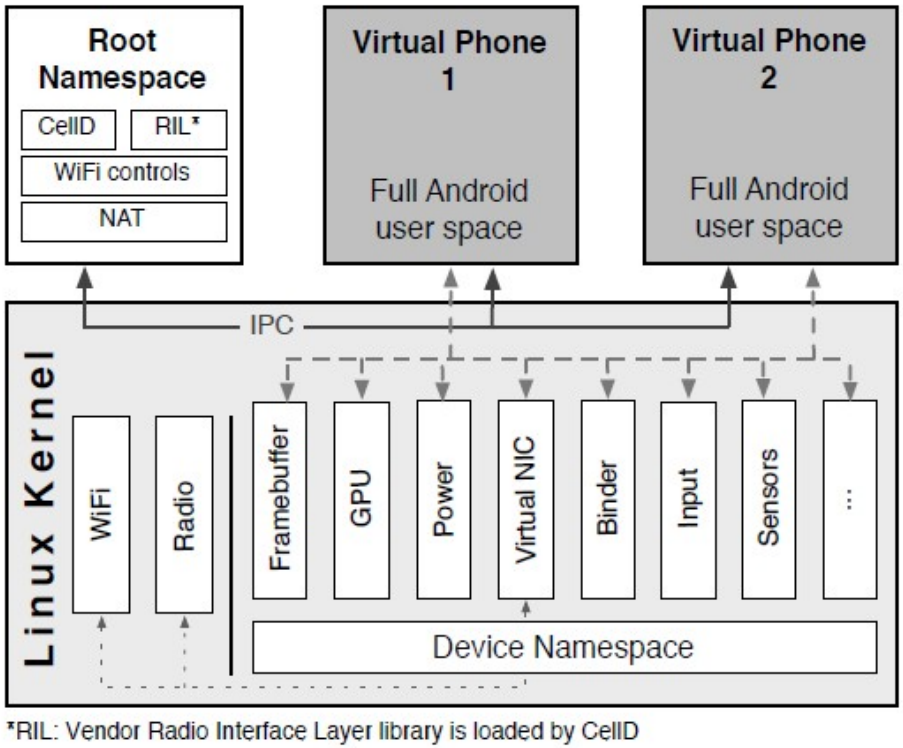

Figure: Overview of Cells architecture

Three ways for scalability

1. the same base file system is shared read-only among VPs.
2. when a new VP is started, Cells enables Linux Kernel Samepage Merging (KSM) for a short time
3. Cells leverages the Android low memory killer to increase the total number of VPs, making it possible to run on a device without sacrificing functionality.

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1. user credentials
2. kernel-level device namespaces
3. mount namespaces
4. CellID(create device nodes)

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Multi mobile phone numbers

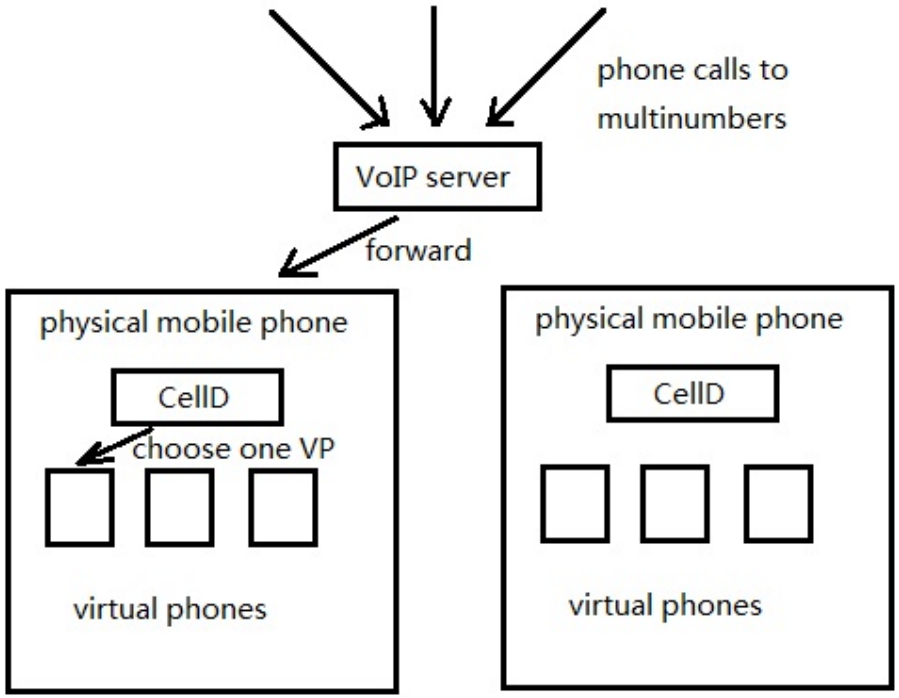
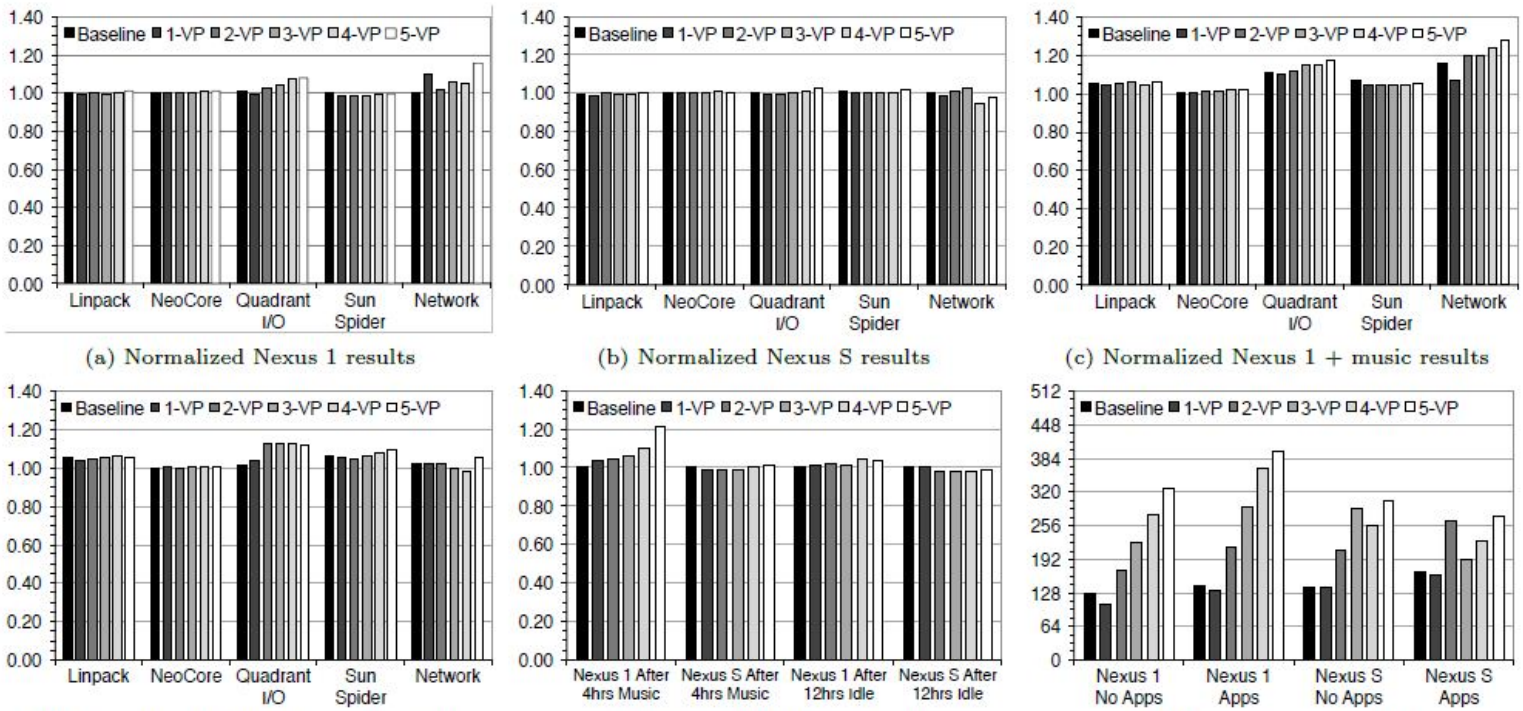


Figure: multi phone number mechanism

Experimental results



(a) Normalized Nexus 1 results

(b) Normalized Nexus S results

(c) Normalized Nexus 1 + music results

(d) Normalized Nexus S + music results

(e) Normalized battery capacity

(f) Memory usage in MB

Figure 3: Experimental results

Conclusion

This Cells thing sucks!

1. All the security it can provide can be provided by normal mobile phones
   - from applications
   - from other users
2. The only highlights of this Cells architecture is the multi phone number support
3. Unfortunately, We have Phelps copycat mobile and iphone: double card double standby
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Cells sucks

Sorry for wasting your time

Q & A

Is there really a Q & A section?