History of Hypervisor

April 19, 2018 | Xen ARM open source software focused

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    Demo to show two Linux OS running and how to protect smartphone against hacker's attack

Origin of virtualization

- Virtual machine monitor? Type-1 virtualization? Hypervisor?
- IBM developed Hypervisor first, for migration of bank transaction service without interrupt of the service in 70s.
- Hypervisor for server massively adopted in data center from 2008.
- On the other hand, development of Hypervisor for mobile devices on ARM CPU started from around 2005.

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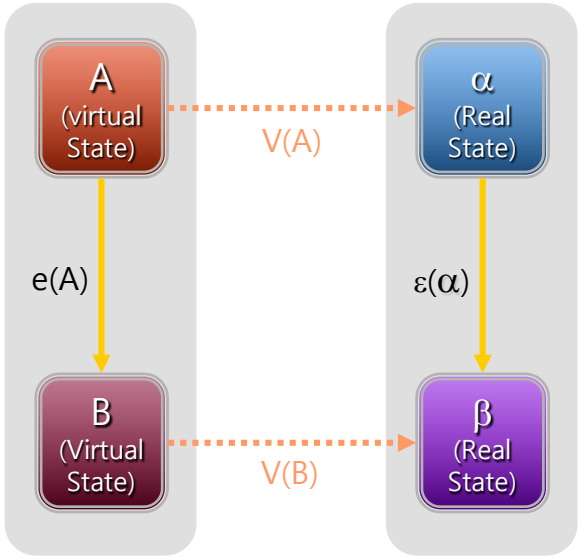
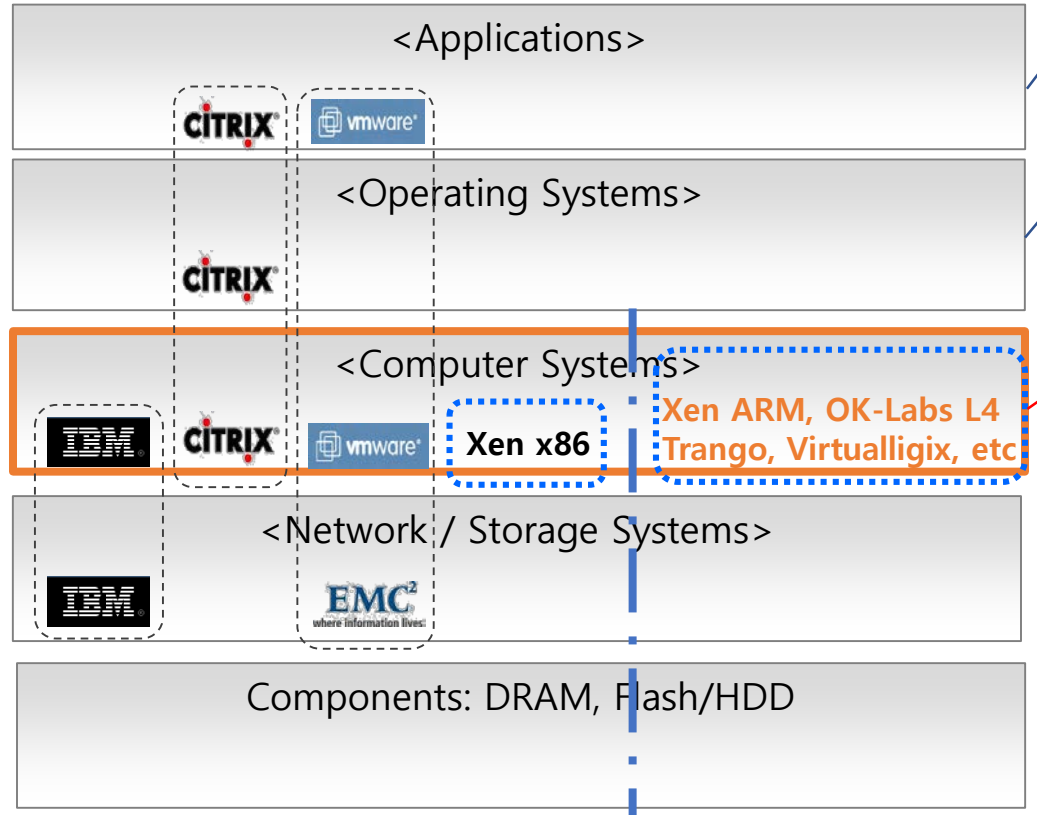
Virtualization at 2008

Theory: simple vs. Practice: complexity of design & implementation comparable to that of Linux kernel



Virtualization is the construction of an isomorphism between a virtual system and a real system
[Virtual Machines] James E. Smith/Ravi Nair , 4p

<Ex: Vendors and open source software projects>



Application virtualization

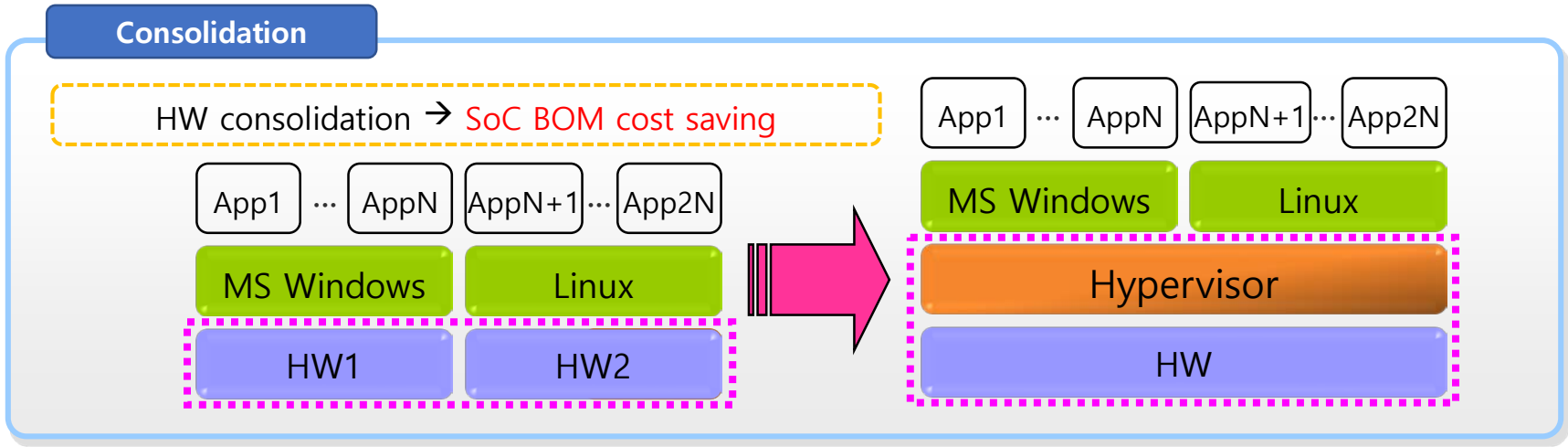
OS kernel virtualization

Hypervisor

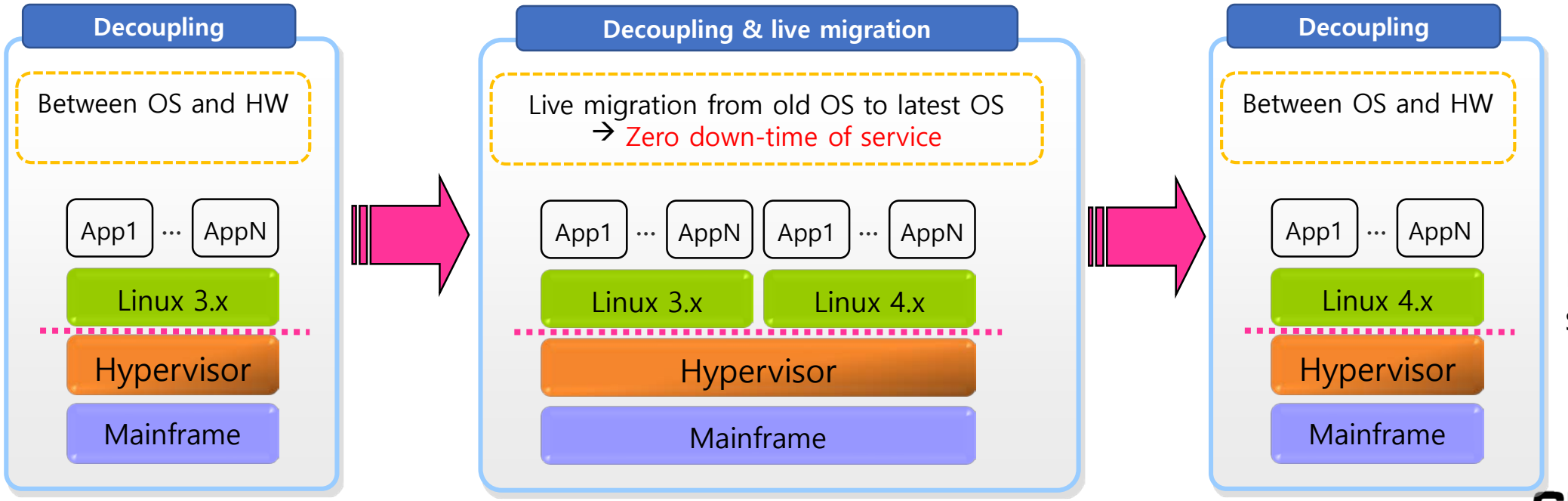
For server system side

For mobile system side

Why hypervisor in the past?



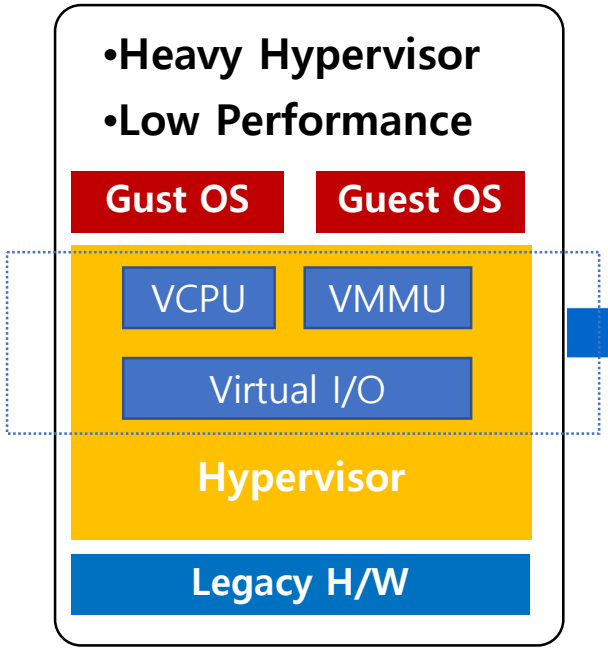
Data center:
IT industry
since 2008~



Bank service:
IBM
since 70s~

Hypervisor Evolution (1/2)

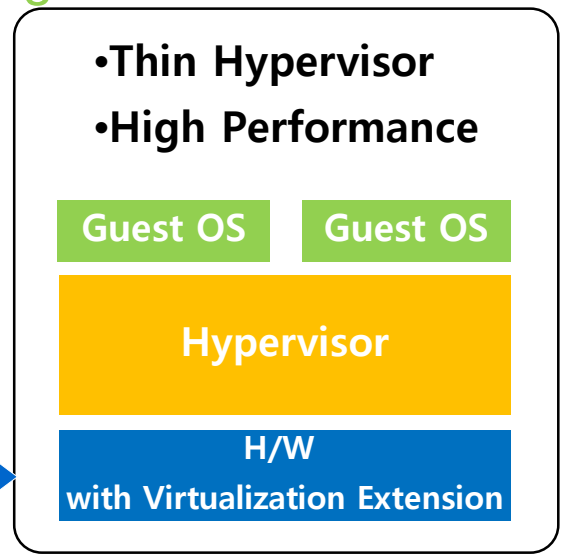
Guest OS CAN NOT run on hypervisor, without modifying source code of guest OS.



Past

No Hardware support

Guest OS runs on hypervisor, without modifying source code of guest OS.



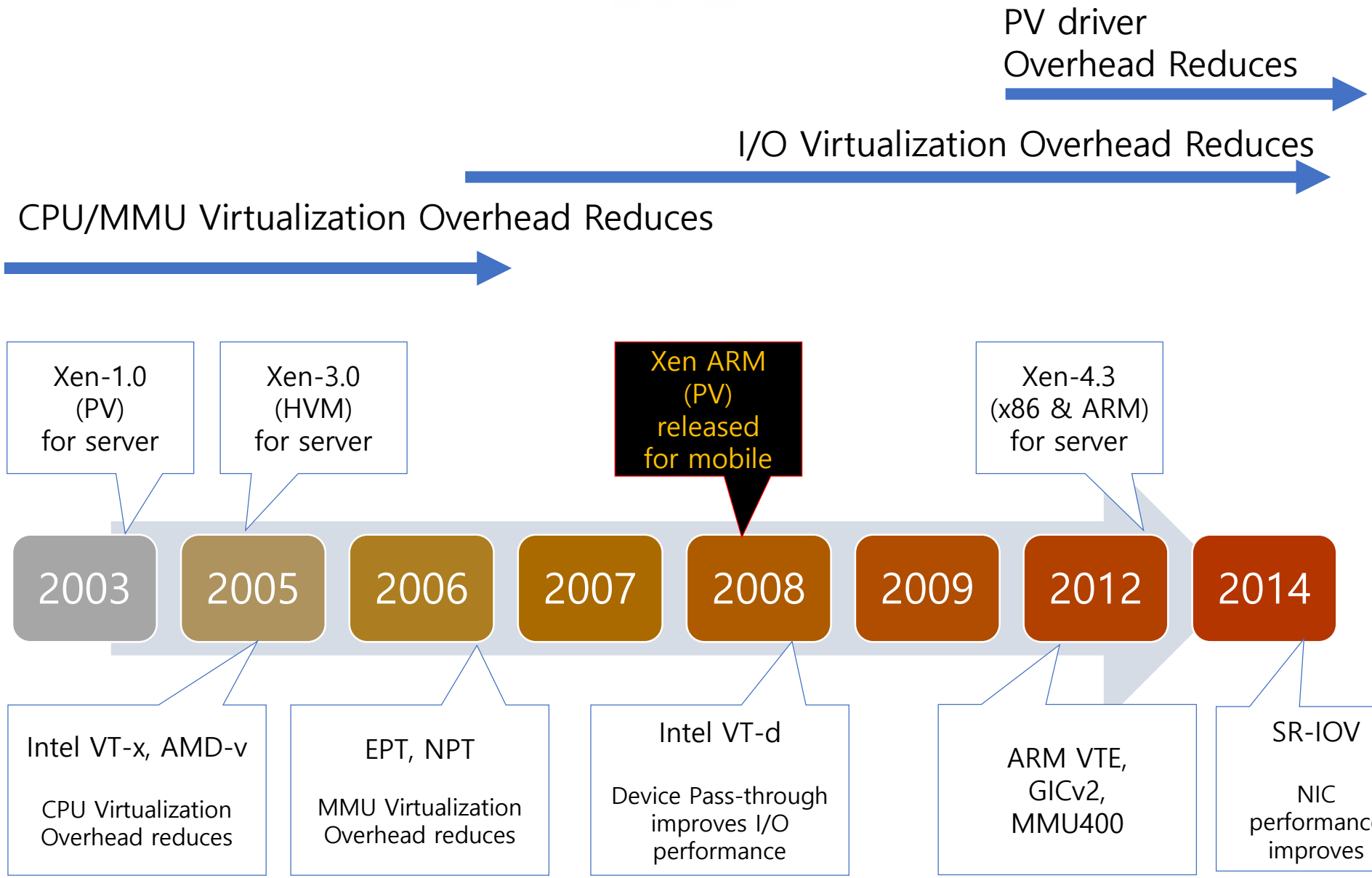
After SoC Architecture reflecting virtualization requirements of customers:

- CPU/MMU Virtualization
- I/O Virtualization

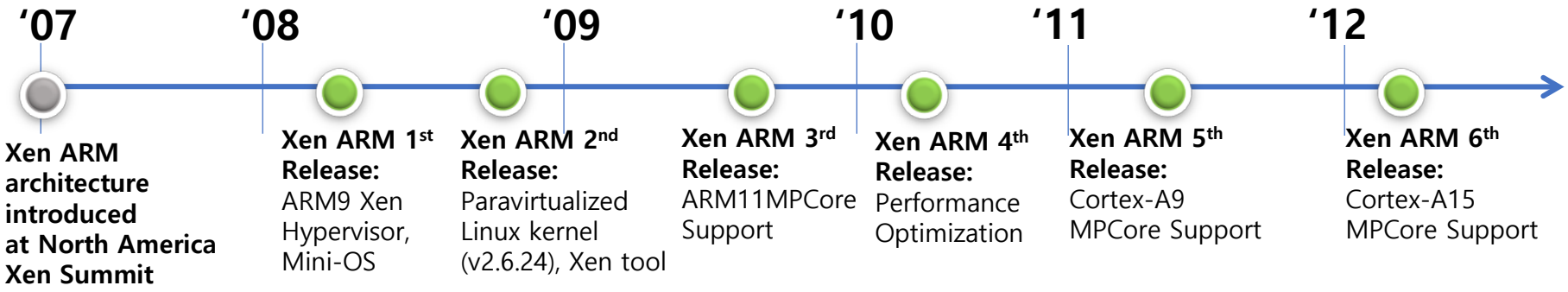
Today

Simpler, stronger Hypervisor by ARM/ x86 SoC hardware assist

Hypervisor Evolution: Xen case (2/2)



History of Xen ARM hypervisor



Xen ARM Feature

- CPU overhead: 3% on average after optimization
- Memory footprint: 1~2 MB DRAM

Supported Hardware & Guest OS

- **ARM926EJ-S (i.MX21, OMAP5912)**
- **Xscale 3rd Generation Architecture (PXA310, Samsung SGH- i780)**
- **ARM1136/ARM1176(Core Only)**
- **Goldfish (EQMU Emulator)**
- **Versatile Platform Board**
- **ARM11MPCore (Realview PB11MP)**
- **Tegra250**

- **Linux v2.6.11, v2.6.18, v2.6.21, v2.6.24, v2.6.27 (multicore supported)**
- **uC/OS-II**

Smartphone prototype based on Xen ARM:

Two Linux OS running on Xen ARM with mandatory access control, guaranteeing enhanced security.

Secure Smartphone on Xen ARM

Thank you!

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