Cloud services on top of uKernel

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About

• Ksys labs

• Small RnD company
  – Technology transfer (40%)
  – Experimental developments (40%)
  – Applied research (20%)

• Security
  – Embedded & Cyberphysics
  – Networks
About

• Since 2011 working with L4 microkernels
    • Gen.1 OMAP3, L4Linux, L4Re, Fiasco.OC, GUI (Disko)
    • Gen.2 OMAP3/4, Fiasco.OC, Genode
    • Gen.3 IMX6, TZ, Genode
  – Network gateways (2012-2013)
    • X86, L4Linux, Genode/L4Re
  – Stack protection (2013-2014)
    • Non-executable memory support for L4Re
  – X86-based tablet:
    • NOVA, VirtualBox, Genode, Android
Technology Push

• Genode FW goes to general purpose OS, rapidly increase software support, sometimes in detriment of performance.
• SEL4 is just published (half year ago)
• L4Re – another set of libraries, plus L4Linux.
• More and more experimental projects...
Market Pull

• Performance
  – Let’s say 10% degradation for any kind of test (network, calculation)

• Security
  – Microkernel is good as concept, Capability – nice, but:
    • Stack protection, ROP protection, IDS
    • Denial-of-Service attacks
    • Resilience
Gap

• Security
• Performance
• Libraries (functionality)

• Something useful, that could become of interested of somebody..
Bridging the gap...

• Network cloud services
  – Key-value store (memcached, redis, leveldb)
  – http (nginx)
  – HAProxy (DevOps way)
  – Distributed filesystems (GlusterFS)

• Embedded
  – Multi-agent platform
Bridging the gap...

• Distributed as configurable VMs. i.e. do not need to build whole Environment tree

• Two applications – one VM
  – REST interface + something
    • REST-based KVS
    • HTTP
    • Filesystem? REST interface to GlusterFS?

• Aim: provide comparable (performance, security, functionality) to Linux-based cloud solution.
Work in progress

• First example (Mid 2014): Redis, NOVA, Genode, real hardware:
Work in progress

• Now (30.01.2015): Redis, NOVA, Genode
Tuning...

- Lwip is faster
- One thread
- Pre allocation
- Notifications, queues, etc..
- Good for start, but not enough for real life
Same for

- Nginx
- Memcached
- HAProxy
Now:

• Benchmarking kernels and environments with custom KVS (without network)
Should we think about Linux

• No, of course

• Our main concurrent: OSv
  – Unikernel
  – Guest VMs
  – Less security, but much more performance:
Redis: OSv vs Linux
Thank you.

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