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OPENFLOW: WHAT'S REAL, WHAT'S VIRTUAL?

Curt Beckmann

Principal Architect

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What I'll talk about

- Good News / Bad News
- Conventional wisdom on OpenFlow
- Expectations Management
- Quick review of OpenFlow 1.0, 1.1 and 1.2
- How can you engage?

Good News / Bad News

Double-edged stuff

SDN gives you the power to do whatever you want

- Tons of flexibility, but also enough rope to hang yourself
  - Conclusion: Better know what you're doing

The number of interesting SDN applications are huge

- Lots of energy behind it, but not well aligned, many interests
  - It'll take some time for consensus to form

The Compute Stack can serve as a model for Networking

- A familiar framework can help, but the analogy ain't perfect
  - We can see the value in a stack, but recognize where the differences are
  - E.g. Networking lacks de facto standard HW and OS, runs on many boxes

Conventional wisdom on OpenFlow

- Shenker: "OpenFlow doesn't let you do anything … [new]"
  - Really?!?
  - Often omitted: "[But] it gives you a programmatic interface…"
    - So, yeah, if you're a switch developer, OF doesn't enable anything new.
    - But if you're an indie SW developer, OF lets you write apps you couldn't before
    - Or if you're a network operator who can code, OF might let you do new things.

- OpenFlow enables all kinds of possibilities
  - Sort of. 1.0 and 1.1 (and 1.2) don't enable all that much just yet
  - Of course, it's the idea of OF that enables things
    - Historically, networking SW was controlled by (and funded by) HW vendors.
    - Soft switches alter the equation somewhat: e.g. OpenVSwitch
    - OF changes the rules on COTS hardware, too (for vendors that support it)
    - SW innovation can move at a different pace→expect explosive innovation

Expectations Management, 100 foot view

Some apparent contradictions are due to different time context

- OpenFlow 1.0 and even 1.1 are pretty limited
  - Missing: IPv6, HA, configuration, topology discovery, etc, etc
  - Those cool demos? Many are pre-standard or extension-based
- Some cool stuff will come in *foreseeable* future
  - Possibly even within your planning horizon ("it depends")
  - ONF is pushing to get OF 1.3 and 1.4 out within 8 mo
    - Adding: v6, config, topo discovery, certification, capability negotiation, more
- More advanced missing stuff will slowly make it into OF
  - Need to build foundation, get "soak time", prioritize, wrangle

Expectations Management, 10,000 foot view

- In the near term, expect:
  - Prior to certification, interoperability is uncertain
    - Switch & app/controller providers (vendors or buyers) will partner/co-support
  - It's early days, the app your looking for may not be for sale
    - So maybe OpenFlow will be guiding vendor choice more than product choice
  - Switch vendors will typically add OF, not create new boxes
    - Low early volume can't justify "OF-only" box, so OF is added work, not less
- Medium term:
  - More interoperability in basic applications (whatever those are)
  - But even with certification, extensions → frequent partnering
  - Vendors will (continue to) focus on applications or market segments
- Long term:
  - Interoperability will increase, partnering will decline
  - Consolidation will give many vendors broad coverage

Quick Review: OpenFlow 1.0

Release December 31, 2009

- OpenFlow 1.0 was great start, some gaps
  - Treated switch intelligence as a single big table,
    - Not hard for existing hardware to support (subset of common capability)
    - Tricky to achieve complex functionality
  - Many features not defined
    - But left room for extensions
  - Did not include multicast
- Result:
  - Some hardware vendors implemented
  - Some solutions built (or in development) using extensions
  - Growing interest in 1.1

Quick Review: OpenFlow 1.1

Release in February 28, 2011 (14 months after 1.0)

- OpenFlow 1.1 added powerful things
  - Multicast!
  - New features!
    - But IPv6 features and some other still missing
  - Multiple tables!
    - Added “go to next table” as an action
    - This powerful / flexible capability can exceed what hardware can do
    - Also, “go to” makes it tricky for switch hardware to know “intent”
- ONF formed in March.
  - Some expectation of quick 1.2
- Result:
  - Adoption of 1.1 was spotty (ongoing efforts on 1.0)

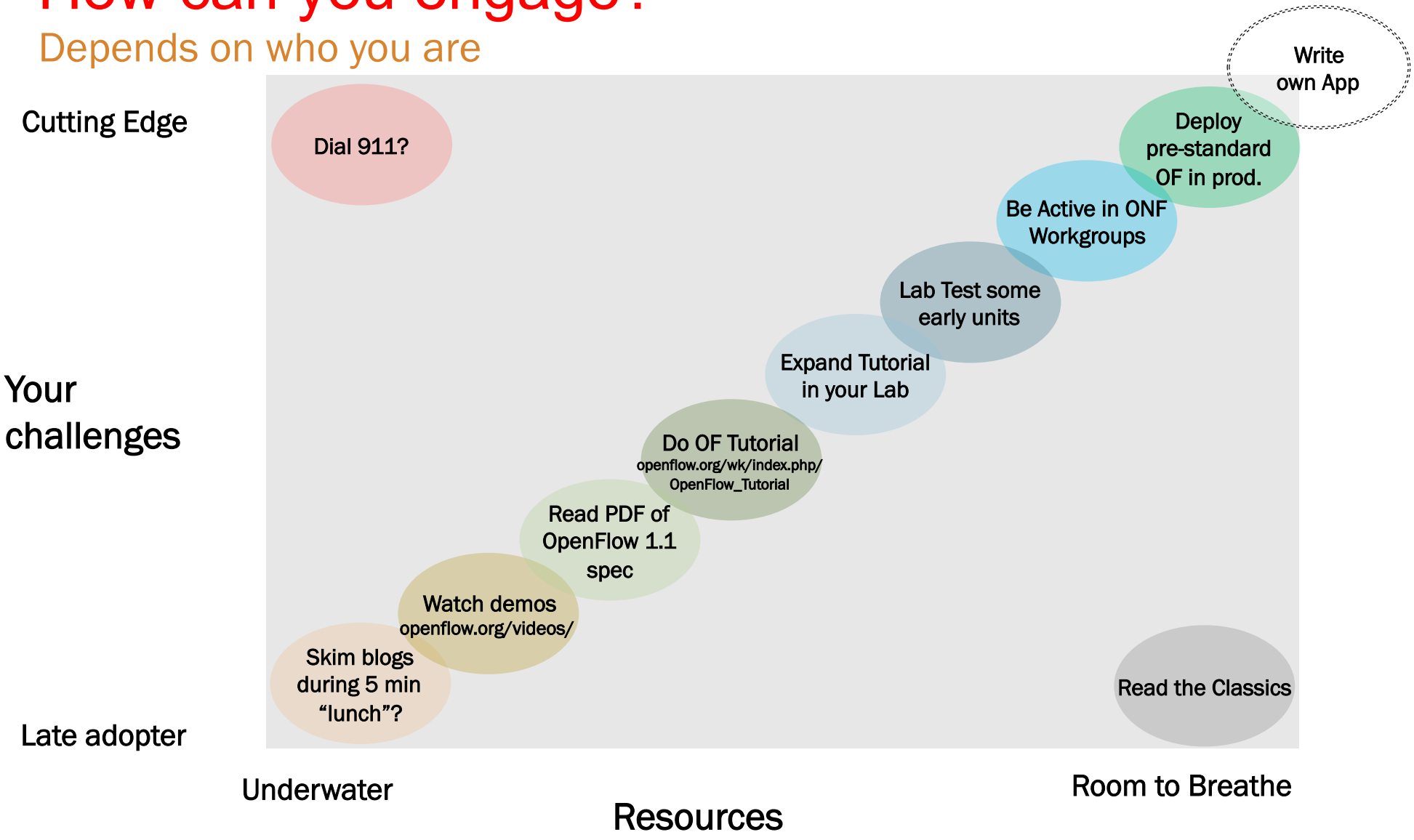
Quick Review: OpenFlow 1.2

Release in December 8, 2011 (9 months after 1.1)

- ONF caused big expansion of participation
  - Clamor for everyone's pet feature
  - Clamor for more "extensibility" and "modularity"
  - Creation of new workgroups: testing, configuration
  - Recognition of 1.1 HW adoption challenge was slow to emerge
    - Openflow-future activities are now on the trail of a good solution
- OpenFlow 1.2 added many things
  - Many new features, including some v6, etc
  - Other features did not quite meet the deadline
- Result
  - Many process issues sorted out, great position for 1.3 (April?)
  - Hybrid workgroup formed, config, test making progress.

How can you engage?

Depends on who you are



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Questions?