SDN

Fad or Phenom?

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So What Exactly is SDN?
Recently Described SDN Architecture

Figure 1: SDN state distribution and management conceptualized in layers: (A)pplication, (S)tate Management, (P)hysical Network

Model Enables, Among Other Things...

- Rapid innovation
  - new control planes
  - forwarding planes
  - applications

- New ability to reason
  - about control planes and other applications
  - NPLs, “network compilers”, ...

- Tracking of Moore’s law

- New network economics

- Straight forward data center use cases
  - And new enterprise and SP use cases emerging almost daily

- All goodness, but....
Danger Will Robinson!!

- There are still open questions
  - **Logical centralization**
    - State distribution
    - Control plane reactivity
  - **Scalability**
    - Flow setup
    - Controller transaction
  - **Abstractions**
    - OF’s “simplicity” appealing, however...
    - Too simple → Information Loss/Leakage
    - ASIC forwarding targets
    - “Northbound APIs”
  - ...

The good news is that steady progress is being made on these and many of the other hard problems. See for example, SIGCOM 2012
“SDN-hard” Problems

• **Technology**
  • Control Plane Scalability and Resilience
    – Logical Centralization
  – Flow Setup Scalability and Performance
    • “intent templates”?
  – Abstractions
    • *Sweet spot*: Leverage ideas from distributed systems, programming languages, and other areas to bridge the gap between the centralized controller abstraction and the distributed/hierarchical reality
      – Simple Switch/Programming Model
      – How long until TCAMs are power efficient, have hundreds of thousands of entries with multiple tables?
      – “Northbound” APIs
  – Reasoning Systems
    • headerspace analysis, NPLs, network compilers...
  – Operational Models
    • And how to you build/operate/debug these networks?

• **Sociology**
  – OF/SDN approach challenges much of our *central dogma*
  – Not the least of which are
    • Circuits vs. Hop-by-hop forwarding
    • Centralized vs. Distributed control planes
  – Shift in influence bases from NetOps → DevOps

• **Economics**
  – Well...
That Said...

The SDN genie is out of the bottle...
Thanks!