Manage the Data Center Network as We Do the Servers

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Agenda

- Why Software Defined Networking
- Data Center server management
- Data Center network management
- Next steps

Why Software Defined Networking

- Get innovation to the network faster
  - Reducing the cost+time from H/W realization (ASICs, switches, chassis) to high confidence deployment
    - Goal: Scale deployment soon after unit tests pass
  - Enabling new features as needs arise, without a new switch OS image
    - Goal: APIs/protocols to simple agents running onboard hosts and devices, extending features as needs arise
- Run a more robust network
  - Zero human touch, predictable, highly reliable
    - Goal: automated deployment, triage, RMA
      - S/W at edge to cope with extreme churn in service and VM creation
  - Simpler, higher capacity physical network
    - Goal: reliably move bits really really fast
      - Detect error and route around them quickly

Cloud Data Centers
Key Components

- H/W: large #s of devices; small #s of SKUs
- S/W: systems control of all resources; single extensible end-host OS

- High pressure to innovate in the infrastructure
  - New H/W+S/W, driving functionality up and costs down
  - Phenomenally high rate of service introduction, increasingly impacting the network
- Principles
  - Software control
    - End-host networking stack / vswitch provides versatility and agility in S/W to meet high pressure from new scenarios
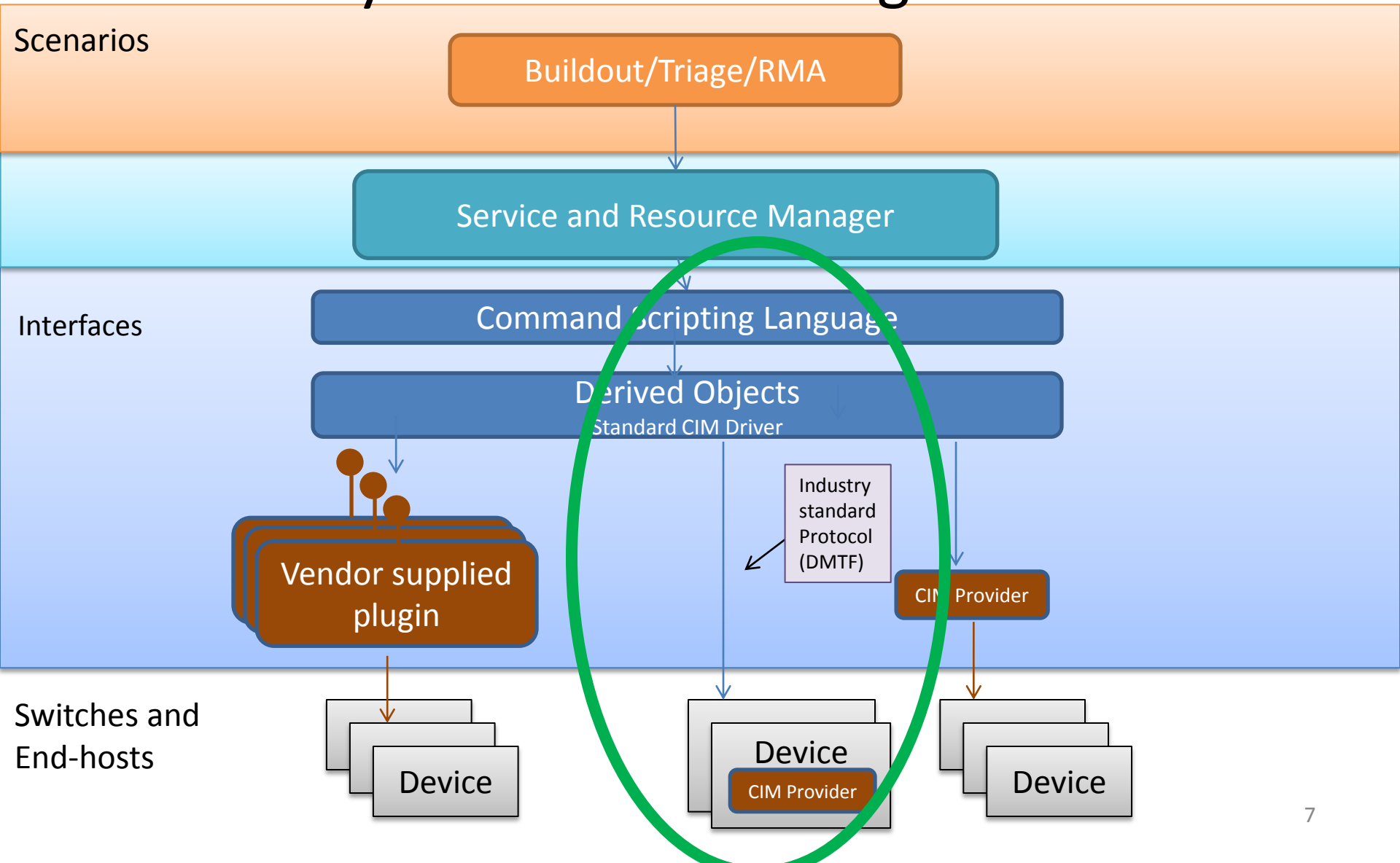 - Scale, simplicity, reliability

Data Center Server Management Architecture

- Service Manager: Goal State Generator
  - Generates goal states (desired policies) for resources, meeting tenant requests
  - Integrated mgt of all compute/storage/network resources
  - Logically centralized (modest scale-out)
- Resource manager: Goal State Driver
  - Drives current state for resources to goal state
  - Logically centralized (modest scale-out)
- End-host agents: Simple/local Goal State Drones
  - The foot soldiers who execute will of resource manager (high scale-out; monitoring the most intensive task)

Data Center Network Management Architecture (Adheres to Same Principles!)

- Service Manager generates goal states
- Network Resource Manager drives goal states
  – End-host networking stack/vswitch (fine grained)
  – Physical Network devices (coarse grained)
- Host/Device Agents drive to goal states
  – Agents on each end-host (again, high scale-out) executing will of the network manager

Concrete SDN Approach
Physical Device Configuration

Delivered By

Microsoft

Device Vendor

Scenarios

Buildout/Triage/RMA

Service and Resource Manager

Interfaces

Command Scripting Language

Derived Objects
Standard CIM Driver

Vendor supplied plugin

Industry standard Protocol (DMTF)

CIM Provider

Switches and End-hosts

Device

Device
CIM Provider

Device

Next Steps

- Now
  - Apply principles proven for sound management of servers, storage, power to network
    - Select protocols and mechanisms already prevalent in the server world (Windows, Linux) and widely used in data centers: such as WS-MAN
    - Apply and reuse!
  - Continue to innovate in the end-hosts / hypervisor
    - Performance predictability, low latency, …
- Next few years
  - Engage industry on APIs for direct SDN control of physical devices, for realization of new features
    - Opportunities for better monitoring or direct control