Industry Perspectives of SDN: Technical Challenges and Business Use Cases

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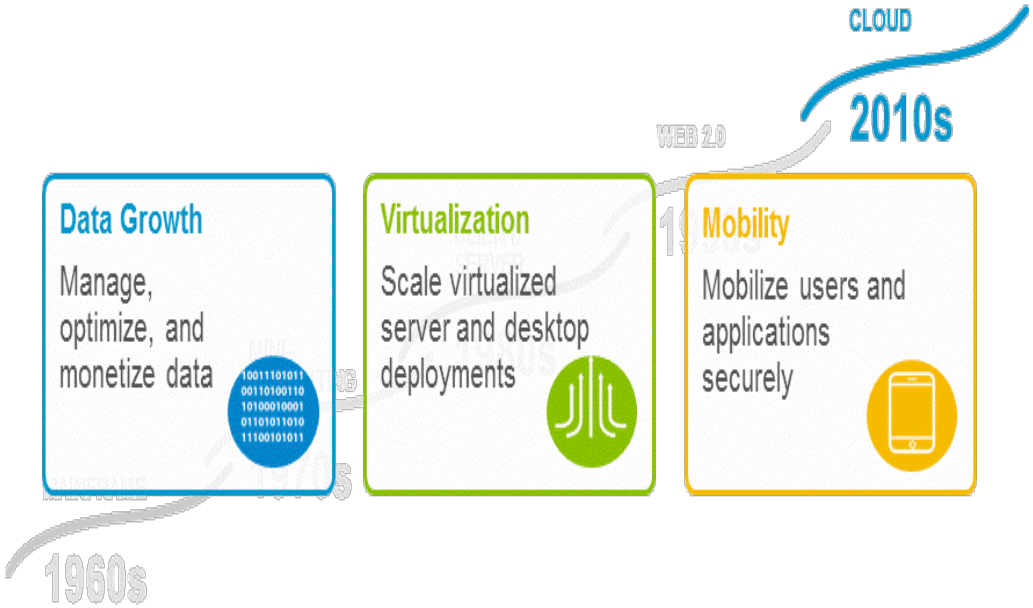
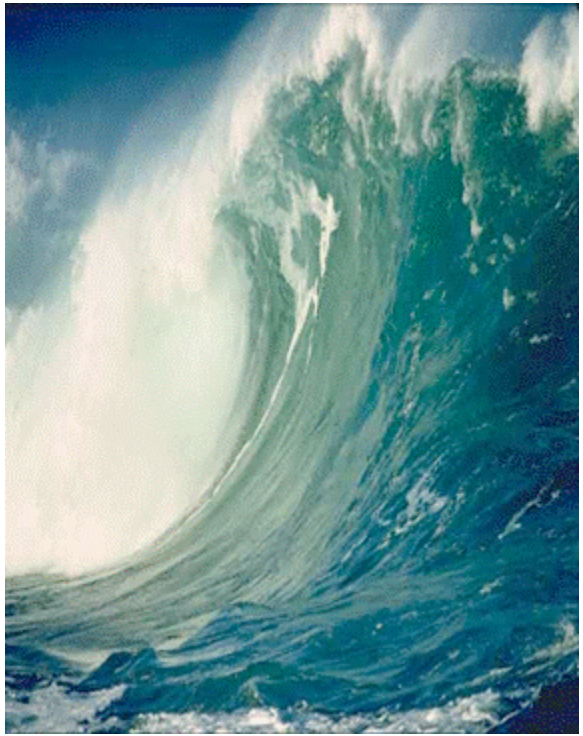
Sea Change is Coming to Networking





New requirements for the network

Data center networking
- Converged infrastructure
- Virtualization & automation
- Business agility

Campus networking
- Unified control plane
- Unified management, security and user policy

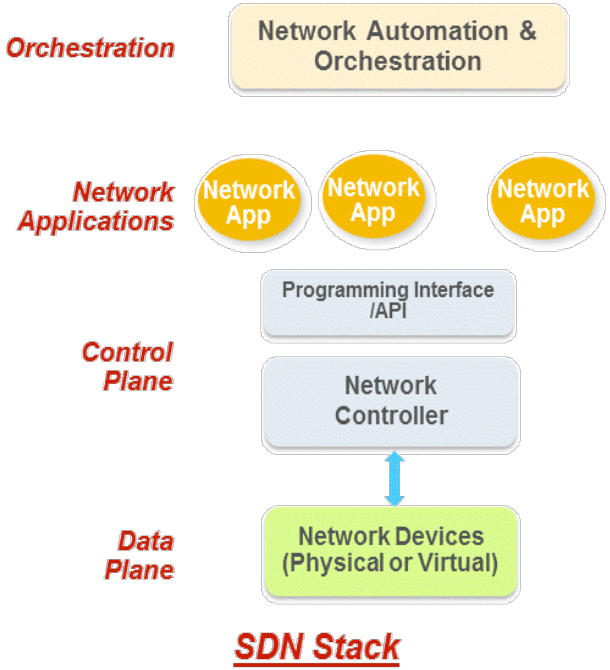
Can SDN be the savior?

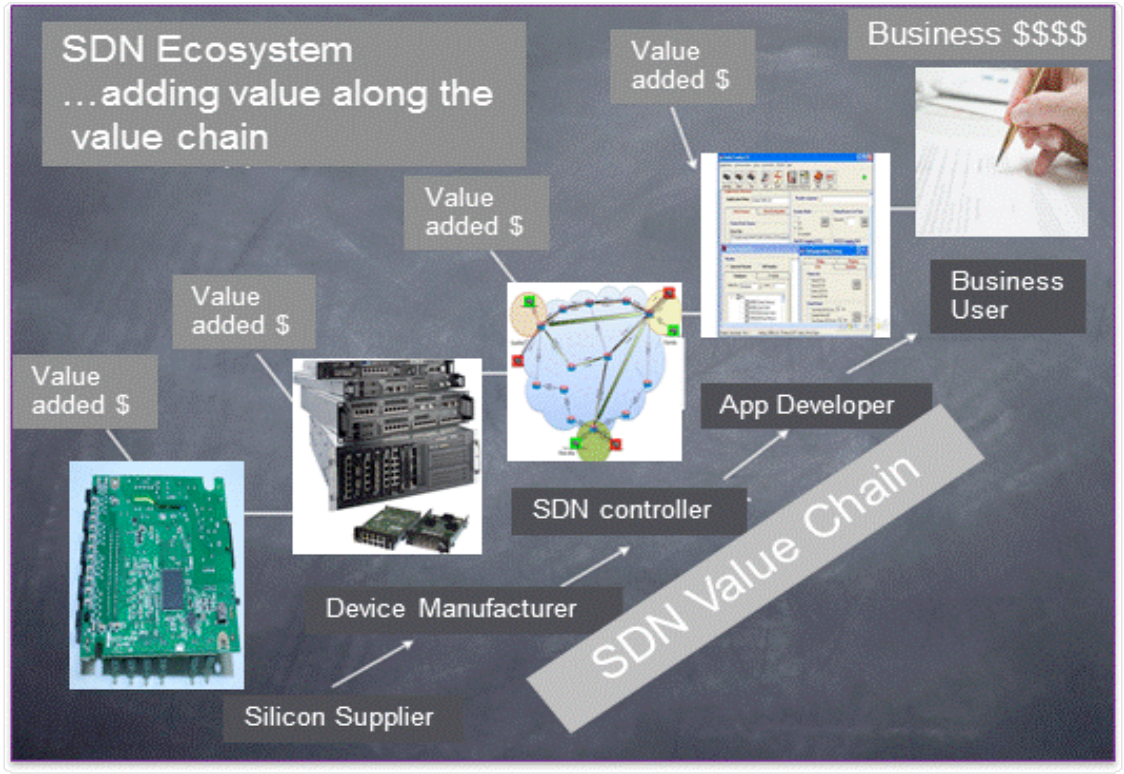
L4+ Network services
- Virtualization-aware
- Application driven

Hyper-Scale cloud networking
- Infrastructure-aware middleware
- Application optimization
- New scale and economics

CIO buying behavior change: convergence, flexibility, application driven

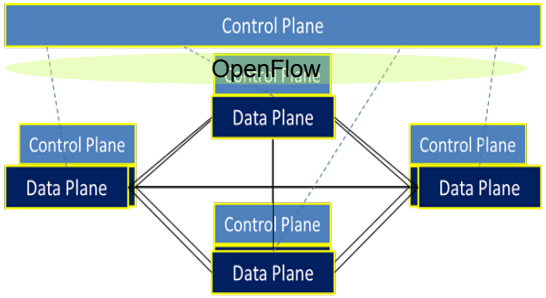
The SDN Ecosystem and Business Value Chain

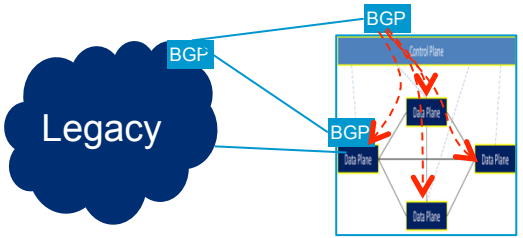




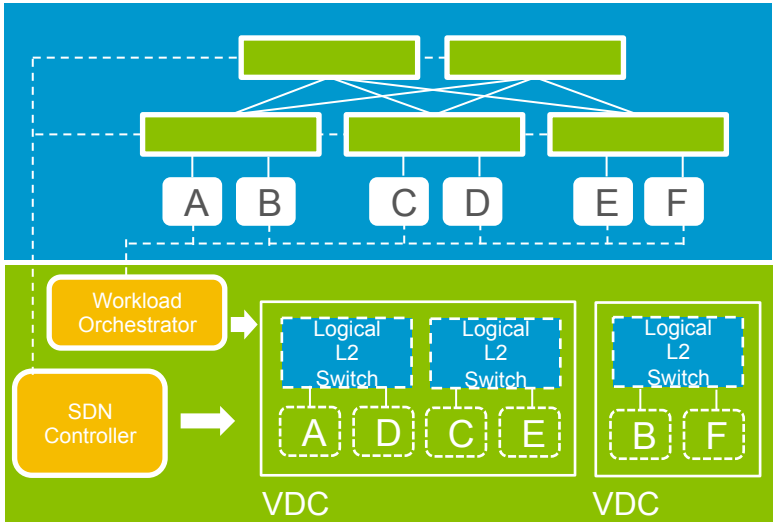
SDN is a Journey

- The network will evolve towards a software defined paradigm
  - OpenFlow represents the most promising approach… but need to be collaborative with hypervisor virtual networking frameworks
- SDN requires the development of the entire business value chain
  - Silicon vendor… device manufacture… control plane software… network applications...
  - New software tools… programming model… developer skills…
  - Ecosystem approach… new business model…
- Disruptive without Disruption
  - Seamless integration with existing customer networks
  - Innovation with well defined boundaries… abstraction





SDN as a Journey - Real World Use Case:
Multi-tenant Data Center

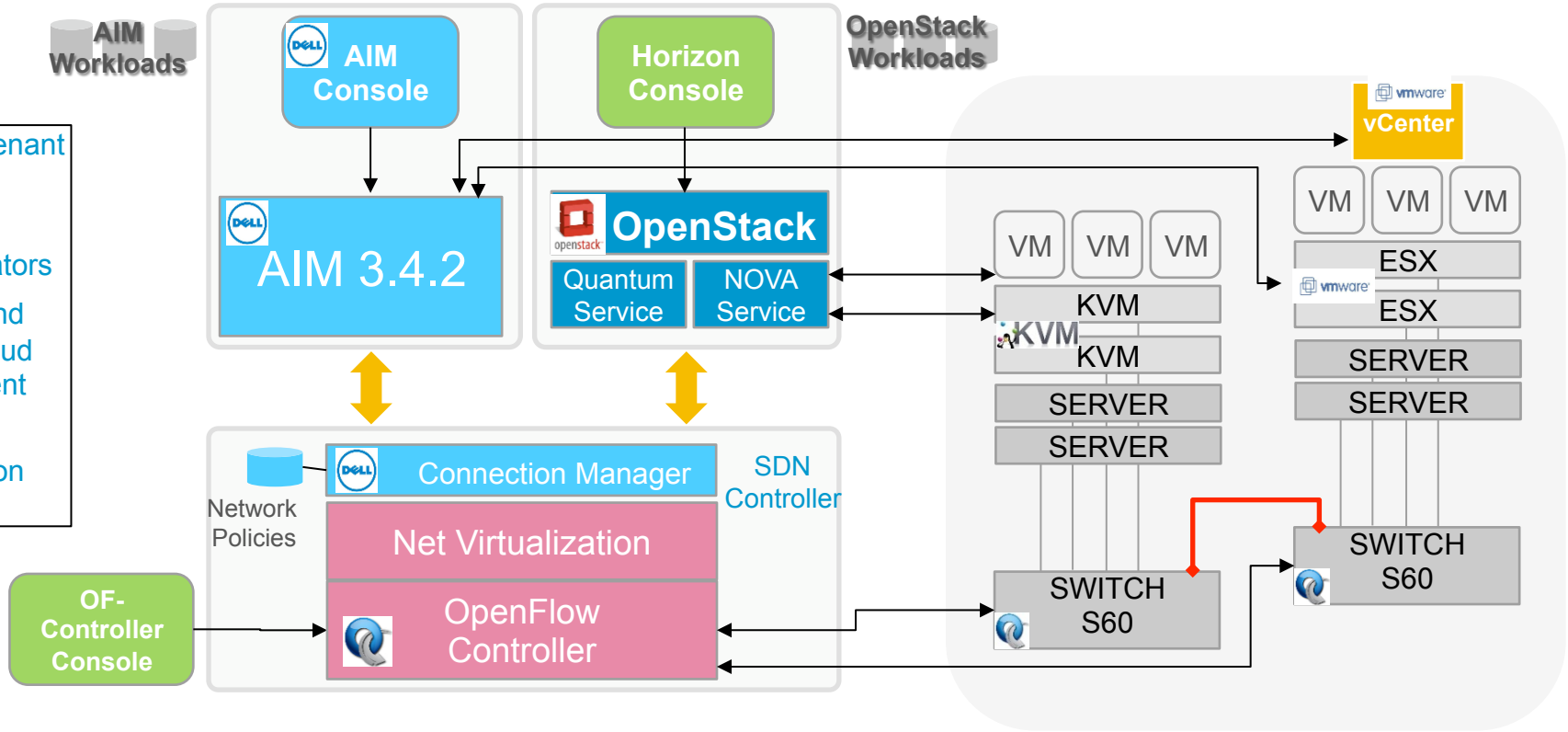


- Customers
  - Hosted service providers
  - Enterprise private clouds

- Issues… support multiple virtual data centers on a shared physical infrastructure
- Solution… OpenFlow-enabled Mutli-Tenancy Data Center application
  - Dynamically created and segregated data planes on the same physical network infrastructure
  - Provides support for workload aware network orchestration, traffic steering, service insertion
- Taday's solution…
  - VLAN-based segregation with external management and orchestration systems
  - Static… no network abstraction… CLI as "programming language"… VLAN limits

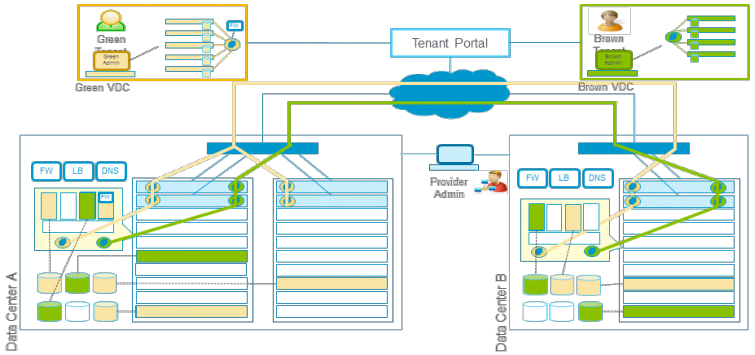
Dell Multi-Tenancy Data Center Solution

- Logical Tenant Views
- Multiple Orchestrators
- Private and hybrid cloud deployment scenarios
- Connection Manager

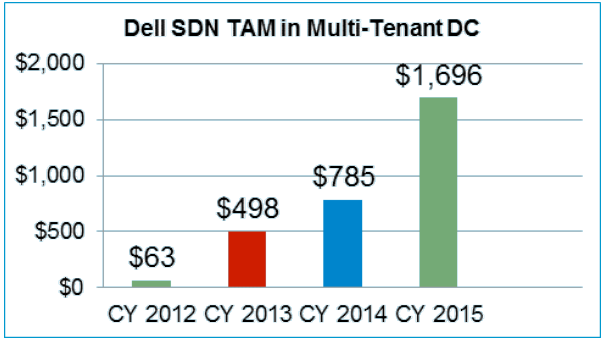


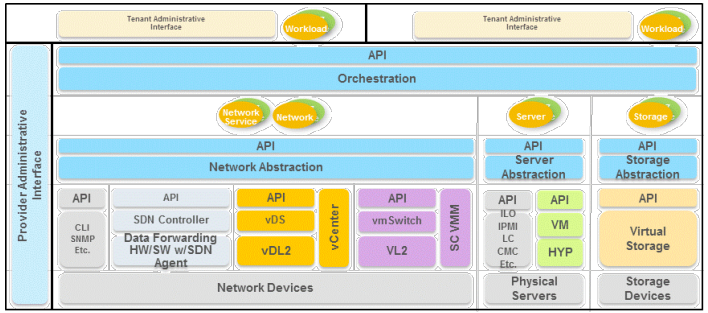
Near Term SDN Market Opportunity
Multi-tenant Data Center

- Easier manageability of tenant networks, workload mobility and tenant network extensibility
- Ease of inserting network services, traffic steering, and integration with L4-L7 services
- Allows more granular control of the traffic engineering, security, and QoS on per tenant basis
- Enhances legacy network architectures rather than replacing it



Multi-Tenant DC Infrastructure Solution





Multi-tenant DC Software Solution

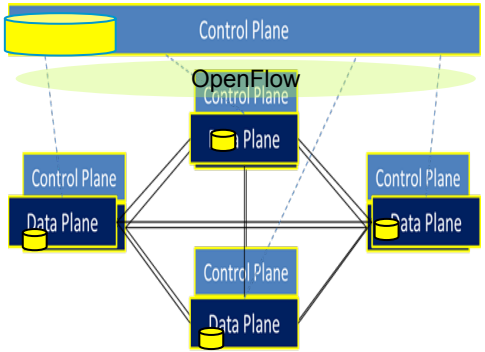
SDN as a Journey - Data-Plane Challenges

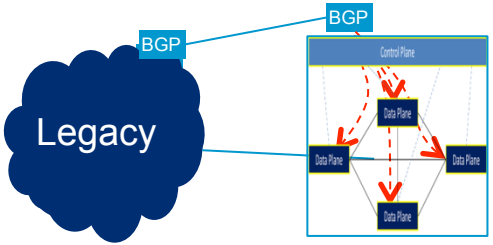
- State of Specification
  - Maturity Concerns
  - OF 1.0 best leverages ACL tables… OF 1.1 leverages multiple tables
- Silicon Concerns
  - Spec is much ahead of silicon development… OF Spec is a moving target for merchant silicon
  - Merchant silicon is not optimized for OF… supports of current networking features is a higher priority
- Specific issues
  - Scalability of Flow-Matches (limited by TCAM size)
  - Cost concerns exclude rich multicore xPU ecosystem
    - X = N, G, C

SDN as a Journey – Control Plane Challenges

- Control Plane scalability
  - Centralized vs. distributed controllers...
  - Single view of the state of the network, forwarding tables,… is this a distributed database problem?

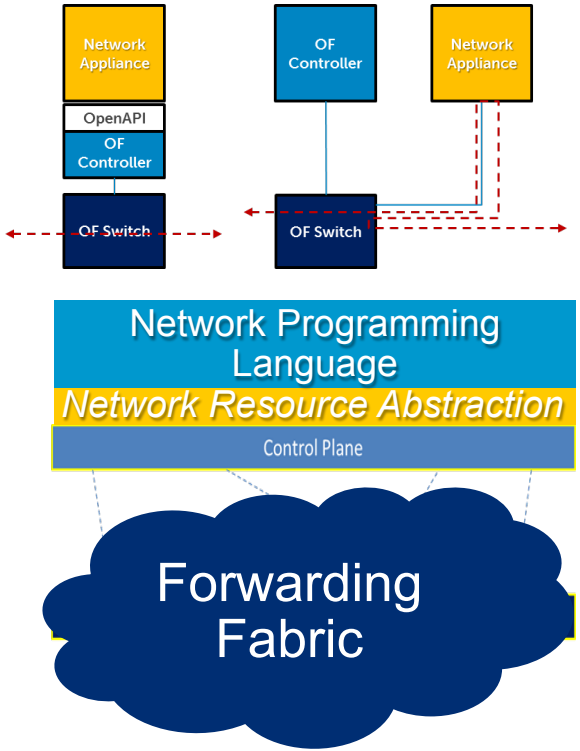
- Interoperability
  - SDN/NON-SDN
  - Inter-Controller
    - Between different controllers
    - Orchestrating SDNs managed by different controllers
  - With Hypervisor virtual networking





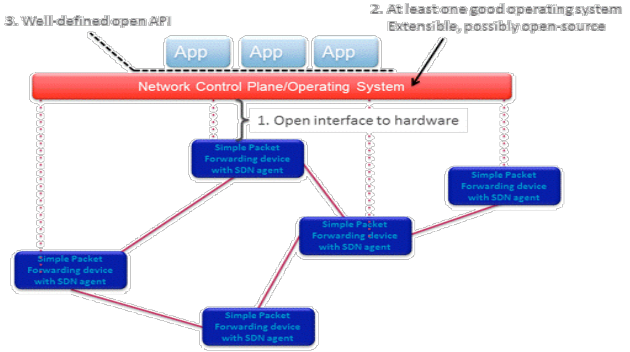
SDN as a Journey - Application Environments Challenges

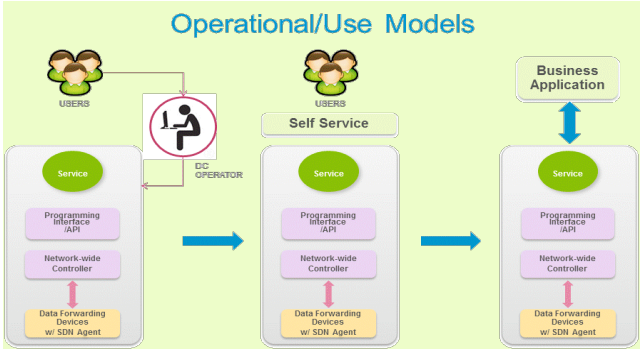
- Network Resource Abstraction & Conflict Resolution
  - Resource abstraction
  - Conflict resolution among different application actions
- Development tools and New Application Paradigm
  - Computing system style application…
  - New class of Network Programming Languages… New tools
  - New development skills… New talents... New education curriculum…



Summary

- Networking architecture is moving towards a software defined networking paradigm
- Solid business use cases emerging… business world takes low hanging fruits approach…
- Technology challenges… silicon… data plane… control plane… application environment
- OpenFlow represents the best approach of SDN thus far… but needs to collaborate with the hypervisor virtual networking frameworks
- SDN is a journey… entire networking business value chain will be transformed





Thank You!