Building an Open, Adaptive & Responsive Data Center using OpenDaylight

Vijoy Pandey, IBM
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Email: vijoy.pandey@gmail.com  
Twitter: @vijoy
Agenda

Where does ODP (& SDN) fit in the bigger picture

Building an ODP-based SDN (SDI) product

Benefits & Challenges of using ODP for your SDN**

As an End User
As a Software and/or Systems vendor

**Thanks to Dave Meyer for discussions and thoughts on this topic
New Systems & IT Complexity

**Systems of Interaction**

**Transactional**
- Enterprise applications
- Core transactions
- Operational analytics

**Engagement**
- Mobile
- Social
- Big data analytics

**Systems of Record**
- Single function infrastructure
- In-elastic data center
- Simpler consumption model
- Simpler SLA & Security issues

**Systems of Engagement**
- Highly shared infrastructure
- Agile and Elastic data center
- Complex consumption models
- Complex SLA & Security issues

**Emerging**
- (Hardwired)
- (pre-packaged)

**Transitional**

**OPEN DAYLIGHT SUMMIT**
Application Patterns & Consumption Models

1. (pre-packaged) (application pattern)

2. (programmable) (dev-ops)

Solution definition

Software Pattern
TOSCA

Infrastructure Pattern
Heat

Software Defined
Infrastructure (SDI)

Open
Responsive
Adaptive Infra
Complete Data Center Software Stack

- Cinder
- Swift
- Nova
- Neutron

Application Aware
Application & Infrastructure Patterns

SDI Stack
Resource Smart Optimization Software

OpenDaylight Summit
Complete Data Center Software Stack

[Diagram showing various components of a data center software stack, including Orchestration Services, Platform Level Services, and Resource Smart Software.]

- IBM OpenStack Platform
- Resource Smart
- Compute
- Cinder
- Swift
- Nova
- Storage
- Neutron
- SDN

[Links to TOSCA Docs and Heat Maps for Application and Infrastructure Patterns]
Open APIs, Open Standards, Open Source

Client value: Unified, open, interoperable SDN platform to create an ecosystem of automated network services
- IBM is a platinum member and active contributor
- Contributing DOVE & other technologies

Client value: Interoperability, agility, and flexibility through a common cloud computing stack
- 250+ IBMers working on OpenStack
- 10% of Open Stack projects led by IBMers

Client value: Enterprise-grade, cost effective, open virtualization alternative
- IBM founding and governing Board member
- OVA moving into Linux Foundation to target broader industry visibility

Client value: Provide cloud users freedom of choice, flexibility, and openness as they have with traditional IT
- 400+ organizations participate
- IBM founding sponsor
Benefits & Challenges: End Users

Benefit: Open Source –
- Freedom of choice with no vendor lock-in
- Ability to build your own services and extensions
- Power to influence direction
- Typically less buggy and more secure (no backdoors!)

Benefit: Community-backed Project –
- Large vendor community – enough said
- Large user base – fluid experience sharing
- Large developer base – easier to find skills

Build your own: Free (?)
Commercial: Powered by ODP
1. **IBM SDN-VE Platform**: Unified SDN controller based on OpenDaylight

2. **Connectivity Service Chaining & UX**: A service chaining framework that eases deployment of application patterns over the networking tier in data centers.

3. **Network Services**: Routing, OpenFlow, Security and LB services running on the controller

4. **Network Drivers**: Plug-ins or drivers specific to network technologies

5. **Virtual Appliances**: Virtual-Physical Gateways; Overlay control servers for end-point mgmt; Security & LB Virtual Appliances that are distributed for scalability.

6. **Data Plane**: Virtual switches for data forwarding/routing, as well as agents for HW elements to enable forwarding control via the SDN controller.
## Block Architecture & ODP

<table>
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<tr>
<th>Logical Network API</th>
<th>OpenStack Neutron integration</th>
<th>Connectivity Service Chaining (+Heat)</th>
<th>VTN</th>
<th>DDOS</th>
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<tbody>
<tr>
<td>CMR, APIs, Role-based Auth</td>
<td>Analytics &amp; Troubleshooting (incl. Log, Statistics, …)</td>
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<tr>
<td>SPARTA</td>
<td>Span, Tap, Redirect</td>
<td>LB</td>
<td>Layer 3 Function</td>
<td>Policy Manager</td>
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<td>Multicast</td>
<td>Flow Groups Manager</td>
<td>Conflict Resolution</td>
<td>DOVE Management Console</td>
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<td>Base Network Service Fn</td>
<td>(Topology Mgr, SW mgt, Host Tracker, SPF)</td>
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<td>Service Abstraction Layer (SAL)</td>
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<td>Clustering, HA, Data store</td>
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<td>Messaging service</td>
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### OpenFlow
- 1.0
- 1.3

### OVSDB
- DOVE CP

### Logical Network Functions
- NETCONF
- PCEP
- SNMP
- LISP
- BGP-LS

### OpenStack Neutron Integration
- Integration

### Other Network Services
- DNS
- DHCP

### Connectivity Service Chaining
- (+Heat)

### Analytics & Troubleshooting
- (incl. Log, Statistics, …)

### Key
- ODP: Not in product
- ODP as-is, product
- ODP/OSS modified
- Contributed
- IBM
UX: Connectivity Service Chaining

Working with the community at #OpenDaylight and #OpenStack
Network Virtualization with Open DOVE

DOVE (Distributed Overlay Virtual Ethernet) is an overlay based network virtualization service that uses VXLAN for the data plane, and OVSDB for interfaces to the physical network. DOVE has 5 main components -

• **DMC**: The DOVE Management Console enable configuration and management of tenants and logical networks and is service running on the controller.

• **DCS**: The DOVE Connectivity Server is a scale out cluster of virtual appliances that provide address dissemination and management of tunnel end points.

• **DOVE Gateways**: Gateways are either physical HW switches or virtual appliances that enable physical networks/end points to participate in logical networks, or allow for access to the internet.

There is ecosystem support for 3rd party security and LB virtual or physical appliances.

• **Virtual Switches**: These are the data plane forwarding elements that create and terminate tunnel end points and provide the overlay data functionality. They are implemented as part of a hypervisor vSwitch.
Suite of OpenFlow Services

- **Flow Rep. | Span and Tap**: To efficiently tap and mirror traffic from points within the network for debugging and troubleshooting large scale networks.
- **SPARTA**: A scalable per destination multi path service for deployment in L2 Clos topologies that doesn't require new tunnel support in HW.
- **Load Balancer**: A datacenter wide layer 4 stateless load balancer which works at line rate along with traffic steering capabilities for scaling software appliances such as security, compliance etc. [*not in product yet, contributed to ODP]*
- **Logical Networks**: Visually define and deploy multi-tenant virtual networks on an OpenFlow fabric
- **Static Flow Pusher**: Programming APIs for deploying user-defined OpenFlow rules
- **Policy Manager**: unified policy framework for managing security rules, ACL, QoS, and service chain policies
- **OpenStack Neutron**: Plug-in for integration with OpenStack Networking using standard Neutron APIs including extensions for L3 and security groups.
- **Service Chaining**: basic service chaining to support application patterns on OpenFlow networks

Contributed some OpenFlow services; Worked with community on others at #OpenDaylight
Benefits & Challenges: Vendor

Challenge: Productization –
  User Experience (UX): Deployment | Usage | Verticals
  Test: Interoperability, Scale, Availability
  Sync: synchronization issues with upstream code

Benefit: Community-backed Project –
  Large user base – fluid experience sharing
  Large developer base – easier to find skills, solutions

Benefit: Raises the bar –
  Large vendor community – competitiveness
  Agile developer community – internal process agility
  Pushes innovation via community
  Improves organizational culture

Benefit: Better Focus –
  Focus on customer-driven value
  Flexible architecture retains corporate value
Thank You

Vijoy Pandey, Ph.D.
CTO, Network OS & SDN
IBM Distinguished Engineer

4400 N. First Street
San Jose, CA 95134
M: (650) 260-4620
P: (408) 497-6065
vijoy.pandey@us.ibm.com
@vijoy