Intent Networking Use Cases – for OPNFV

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Use Cases

- ETSI Key Leaders
- Application Benefits
- Networking
- Japanese
- General Use cases

So… what is stopping SDN ?

- Virtual clouds are made of Networks, CPUs to run applications, and data storage **… but**

- Unless the application collaborates with the network – the utilization of networks, CPU, and data storage is only 66%, if they collaborate it can reach 95%+

So.. Who will help the applications?

Why Intent Important to Telefonica

"**To complete the promise of SDN we need something like a "Network SQL":**

- a *declarative language* based on a formal network model that would allow both defining network properties and manipulating network behavior, and,

- … of capital importance [is to] support the **seamless integration** of these **definitions and manipulations within general-purpose applications**.

App 2

App 1

Declarative language
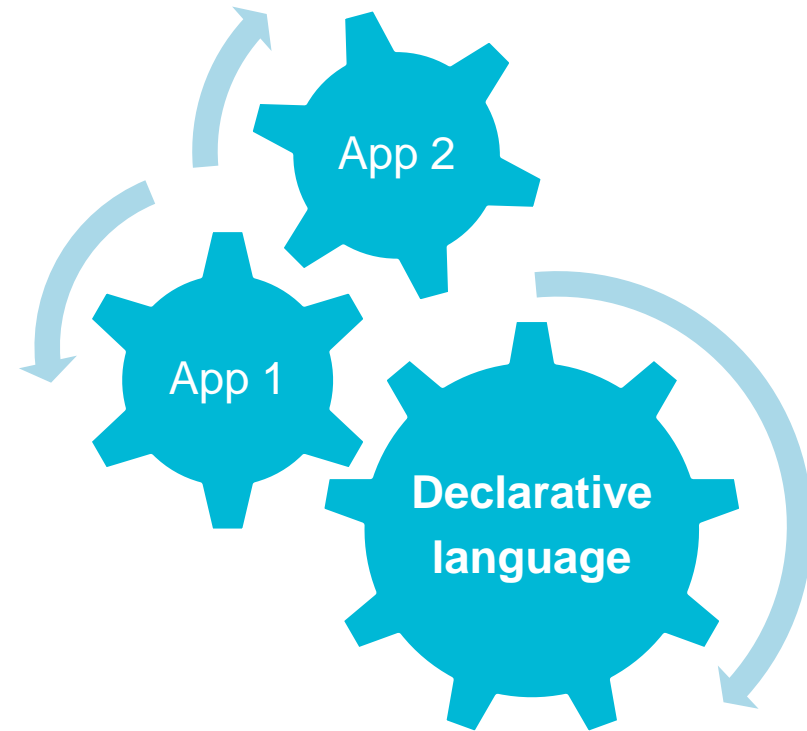
The Intent Model Paradigm is…

An approach to managing a network which uses:

- **a common API** and abstraction to hide many of the network specific details
- **A portable way of integrating networked applications** with network infrastructure
- **A single Intent "rendering engine"** is the exclusive single writer of flow rules and arbiter of all resource usage.
- **Extending Controller functionality** is realized by **extending Intent "language"** and then implementing additional renderer module to translate that intent into southbound device control

A Research Direction – Lots of Proof-of-Concepts (2014-2015) and initial trails

What does Carriers Want

- Users input to create their services via NFV
- Enter their intent
- NFV automation find the resources in the network or tells users of options

- Go from next month to next minute services for networks
- Access nodes are reduces

Purpose and Goal

- **Create Meta-Data for Intent Interface**
  - To describe distributed workload interaction and behaviors.
  - To be portable by removing/abstracting any reference to implementation details (aka protocols, vendors, physical media).
- **Derive benefits from a single ecosystem and network effect with**
  - Common Intent interface across diverse infrastructure controllers.
  - Single "narrow-waist" interoperable NBI that enables fungible (interchangeable, interoperable) solution components
  - More users due to no vendor lock-in

Keystone – Classifying Intent
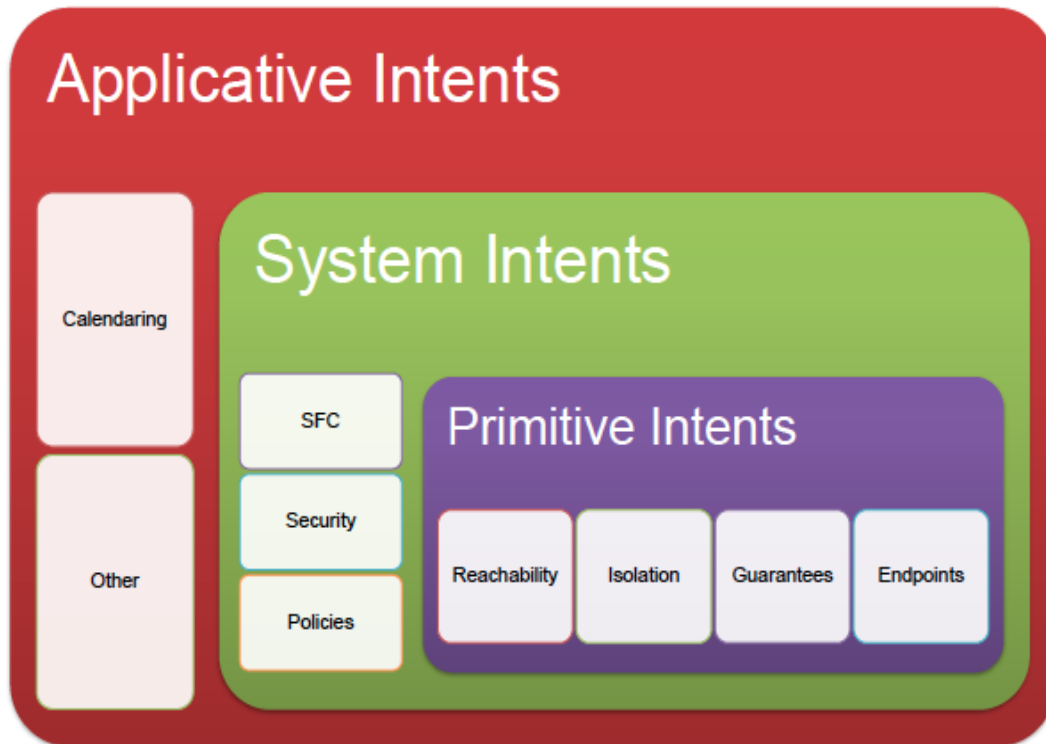
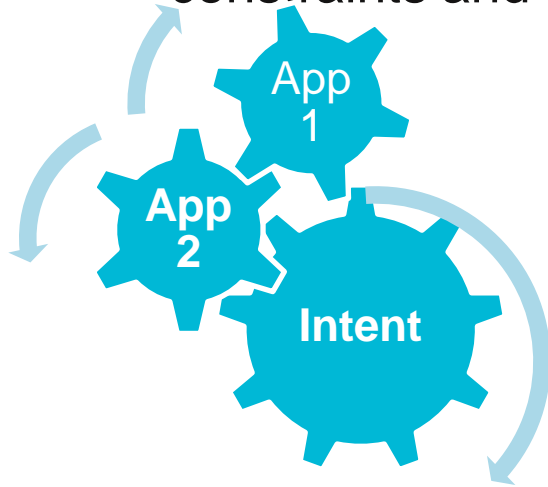
Language translators look for vocabulary and grammar

Intent efforts are developing language and grammar to translate business and service to SDN controller

MSO Operators Dreams

MSO Delightful

- Users select what they want on a portal
- Intent engine runs and network automatically creates network based on users preloaded constraints and

App 1

App 2

Intent

- **MSO Nightmare**
- Three wonderful services controlled by SDN control
- SDN controllers fight over control of network, and both controllers fail because each assumes control

[multi-writers problem]

SDN CTL 1

SDN CTL 2
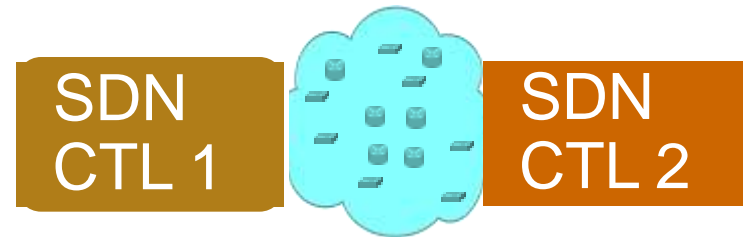
Comparison of Intent NBI Projects	ONF	ODL-NIC	Nemo ODL / OPNV	GBP	Open Stack
Community developed	√	√	√ IETF		
Intent separated from prescriptive	√	√	√	½	
Easy for non-networking App Developers	√		√		
Extend NBI for extended functions	√	√	√		
Fully models App Behavior not Net	√	½			
Context detects & resolves conflict	√		√	½	
Designed as only "NBI" to SDN	√	√	√		
Designed to Grow organically	√	√	√		
Operator tools control mapping	√	√	√	½	
Complementary to Congress	√	√	√	√	
Portable	√	√	√		
Diverse Open Source Projects	√		√		

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Late Breaking news

Service	Group	Transport/ mapping	Subject	Action
L2VPN	Client to HeadEnd	L2 Bridge Domain: MPLS LSP, VXLAN, mGRE L3Context: Aggregation	*	Allow
L2VPN – Corporate	RemoteGroup - External	as above	HTTP/ HTTPS	Service Chain {DPI, Firewall} Allow
	RemoteGroup Finance- Finance	""	From SAPclient; To SAP	QoS, Metering, Allow

Snapshots from Application Vendors

- Database app
  - Databases use different patterns for nightly transfers (Big Data, HR info, Sales), but may have instant needs to high bandwidth transfers on demand.
  - Data-base service runs remote off to Data Center, or mobile to data center
  - Government sales means service chaining for
- Data center
  - Use cases Mentioned – instant virtual LANs, DC case (ODL NIC), Access Control
  - Intent is invariant, portable, composable, scales out not up, provides context

Snapshots from network Vendors

- Plexxi
  - Intent of data flows on L1/L2 infrastructure
  - DC underlays for traffic within the datastruture
- Juniper
  - Declarative Policy at heart of Contrail Systems
  - Declarative Intent free network to automate Fiber Rings, and other new L1 topology
  - Data Center or Fiber in Countries (IPOP 2015)
- Ciena + Cyan
  - More automation, more services
 - Fiber + Mobile Backhaul for ATT

Japanese

- Why Automation
  - Island country with Tsunami disasters
  - Links South-eastern Asia to Japan
  - DC to DC, remote-office to HQ, mobile network
  - Links to Japanese Equipment
- NEC lead in SDN – now sees Intent
  - Ditto HP, Oracle,
- Fijitsu
  - See Intent As gateway to SDN promise via Object-Oriented Networking
  - Ditto HP, Oracle,

Time of Day

**1st -** App use NEMO language to programming their service:

- **Flow** sitea2siteb **Match** srcip:10.0.0.1 dstip:10.0.1.1;

- **Policy** day **applyto** flow sitea2siteb condition 0800<time<2000 action gothrough {R1,R2,R4};

- **Policy** night **applyto** flow sitea2siteb condition 2000<time<0800 action gothrough {R1,R3,R4);};
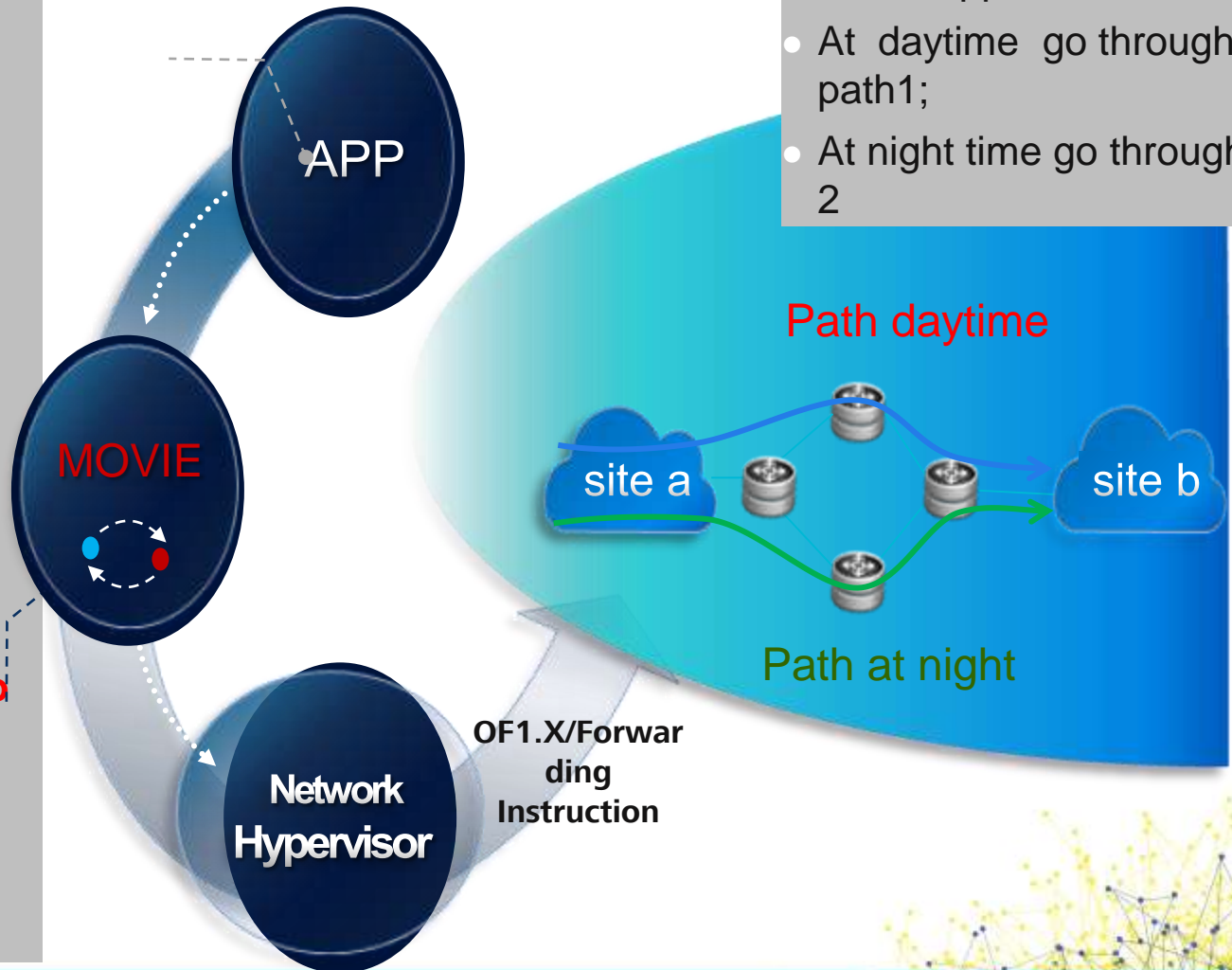
- **2nd -** NEMO Compiler resolver NEMO code to southbound instruction and maintain a state machine for each app.

- At daytime go through path1;

- At night time go through path 2

APP

MOVIE

Network Hypervisor

OF1.X/Forwarding Instruction

Path daytime

site a

site b

Path at night

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Use Case: Virtual WANs

- **Large IT enterprises want to setup their own virtual WAN for more control and optimization.**
- **Description**
  - **Link l1 Endnodes (Beijing, London) Properties Flow Video gothrough R2**
  - **Link l2 Endnodes (Beijing, London) Properties Flow Database gothrough R3**
- **Network Controller**
  - **Deploys virtual routers and links for a customized topology.**
  - **Identifies flows**
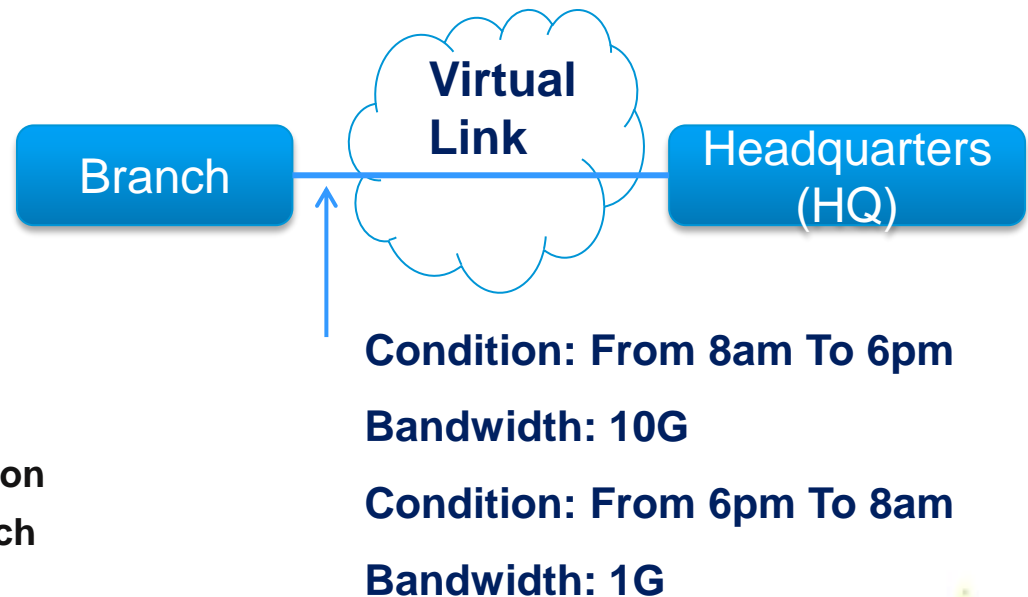 - **Steers flows though different path.**

Virtual WAN

real-time path

Beijing Office — R1 — R2 — London Office

R4 — R3

broadband path
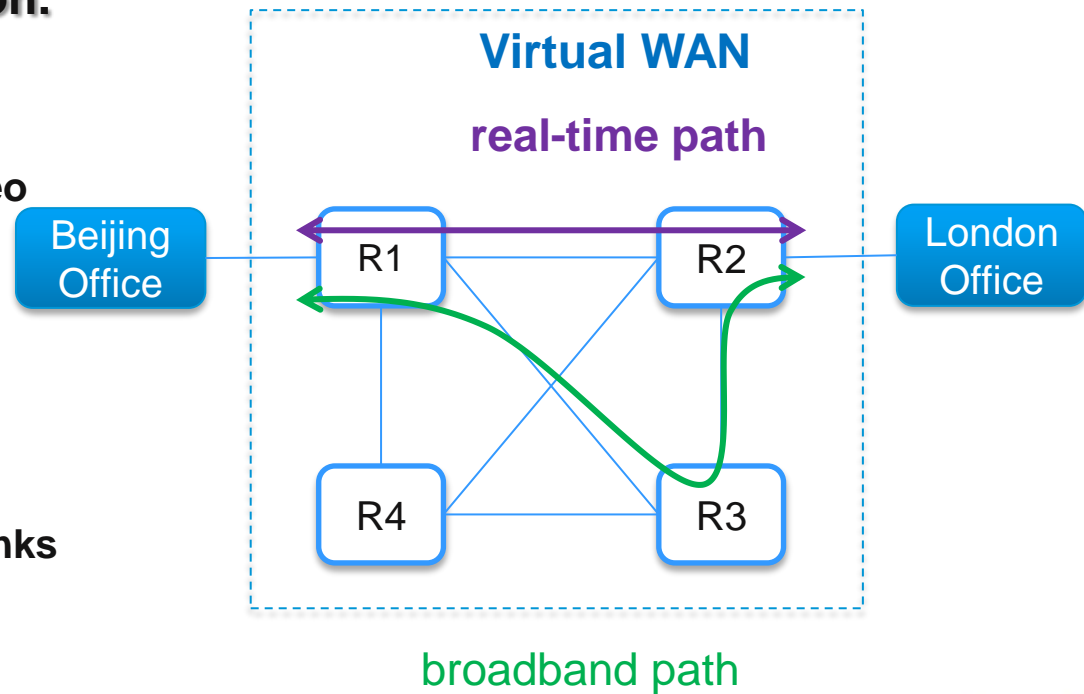
Use Case: DC Networks

- **Create a virtual DC network for process of email traffic through firewall and spam filter before processing**
- **Description**
  - **Pulls up Model Template with all vDC nodes**
  - **Link Endnodes (access-node, email server) Properties flow customer-email gothrough (router, firewall, DMZ, email-spam-filter, protected zone router)**
- **What Intent Processor creates**
  - **Virtual router to link virtual DC (vDC)**
  - **vDC structure, which may consist of a firewall, DMZ, email-spam filter a protected zone, and several network services (E.g. hosted Email)**

Access Node

Router

firewall

DMZ

Email Spam Filter

Protected Zone Router

Email server
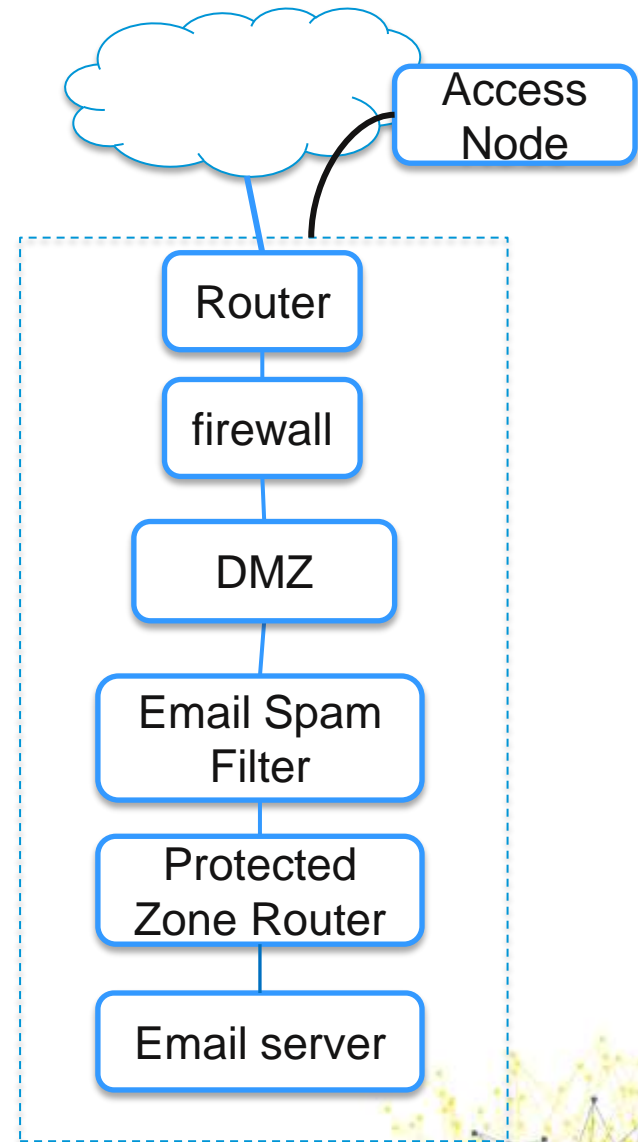
Use Case: Bandwidth on Demand

- **There is a virtual link between the branch and headquarter offices.**
- **Description**
  - **Link Endnodes(branch, HQ) Properties Flow Day 10G**
  - **Link Endnodes(branch, HQ) Properties Flow Night 1G**
  - **Flow Day match … time (8am,6pm)**
  - **Flow Night match … time (6pm,8am)**
- **What Intent processor sets up**
  - **Adjust Virtual Link Bandwidth on demand for link between Branch and Headquarters**
  - **Triggered by "conditions" meet by time change**

Virtual Link

Branch —— **Headquarters (HQ)**

Condition: From 8am To 6pm

Bandwidth: 10G

Condition: From 6pm To 8am

Bandwidth: 1G

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Use-Case: Service Chaining

- **Create Service Chaining Function path**
    - **Network functions in path: firewall, load balancer, WAN optimization between virtual private cloud and the internet.**
- **Description**
    - **Link sf1 Endnodes (VPC,Internet) Properties flow1 inbound flow2 outbound**
    - **Flow1 match Internet-Traffic Policy ID1**
    - **Policy ID1 gothrough (firewall, WoC)**
- **Intent Based Process**
    - **Allocate VNFs linked to vRouter for firewall & WoC**
    - **Set of Filters for outgoing & incoming flows**
    - **Apply policies to steer flows to go through different service paths**

VPC — Firewall — WoC — Internet

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Resolving conflicts – Service Chaining Example

Prescription

- New rule
  - Match: 5-tuple-A, Action: forward on port 12 (forward towards VF1).
- Existing rule
  - Match: 5-tuple-A, Action: forward on port 11 (forwards toward Internet) .
- Analysis: "There is a conflict"
- Resolution: not possible, no context

Intent

- New rule
  - When members of sales group access Internet send traffic through VF1, VF2 & VF3
- Existing rule:
  - Members of the sales group are allowed to access the Internet
- Analysis: "There is no conflict"
- Resolution: Render Intent into rules

Mobile network to DC

- Do not have actual details
- Need input on this work

Backup slides

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