Dynamic Orchestration & Operation of Chained Network Services

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Agenda

- SFC
- Orchestration and Operation
- Architecture & Solution
- Summary
Key challenges in Network Function Virtualization

Performance & Reliability Vs Hardware Costs
- General Purpose Processor vs Special-purpose HW
- Parallel Processing, Hyper Threading, CPU cores
- Packet processing and RAM Architecture

Eco System Integration
- Verification, Validation, Testing & Integration
- Responsibility?
Rich types & On-demand Use of Resources

**Single Chain**

Service Chain1: 1-2-3-4

**Multiplex of several chains**

Service Chain1: 1-2-3-4  
Service Chain2: 1-2-5-6  
Service Chain3: 1-2-7-8

**Multiple Chains**

Service Chain1: 1-2-3-4  
Service Chain2: 6-7-8-9  
Service Chain3: 10-11-12-13

**Load Balance**

Service Chain1: 1-2-3-4
Service Chaining

Features:
- Virtualized Network Functions
- Dynamic addition / deletion
  - New Service Functions
- Programmable Traffic Steering
- Integration with SDN
- Policy driven service delivery
- Interoperable and standards-based
- Integration with existing infrastructure

Challenges:
- Visibility into use of VAS resources.
- Complex orchestration & manageability
Gi LAN Use Case

- SDN based flexible Architecture
- Rapid New Service integration
- Efficient Service Provisioning
- Lower Service Latency

- App-aware DPI integration
- User aware PCRF interworking
- L3&L4 Load balancing
- Smart Network Controller
- Virtualized Environment
**Service Chaining: Illustration**

- **NetMatrix:** Decoupling the logical service chain.
- **Policy Server:** Mapping of Service Chains
- **SDN Controller (SNC):** Logical service to physical resource association.
- **Service Node (SN):** Classification of flows and tagging chain ID/NSH to the flow packets;

Service information to Policy Server and SDN controller
- Policy Server: User_A = Chain ID 1
- SDN Controller: Chain ID 1 = VAS FW + Cache
- Policy Server: User_A + Chain ID1 to Service Router(DPI)
- SDN Controller: Flow tables to service switches.

1. User A on line
2. Policy Server trigger DPI for User_A's traffic
3. SNC classifies the flow and tag Chain ID 1 to User_A's traffic
4. Service Switches forward traffic based on flow tables
SFC OAM Architecture

• Features
  • Functionality
  • Resiliency and Reliability
  • Scalability and Security
  • Orchestration

• Provisioning and Configuration of SF, SFP, Policy etc
• Verification and Validation of SF and SFC
• Detection and Fault Identification
• Performance and Scale
• Notifications and Alarms
Example SFC Layering Model

NE means Network Element

Service Layer

Classifier  SF₁  SF₂  SF₃  SF₄  SF₅  SF₆  SF₇

NE₁  NE₂  NE₃

Network  Transport  Link
SFC OAM components

- **Service Function** - To test the service functions from any SFC aware network devices (i.e. classifiers, controllers, other service nodes)

- **Service Function Chain** - To test the service function chains (SFC) and the service function paths (SFP)

- **Classifier** - To test validity of the classifiers
SFC OAM Functions

• Connectivity, Continuity & Trace
• Validation & Verification
• Performance Measurement
• Data Collection & Notifications
• Self Check, Proxy & End-to-End Operations.
Connectivity, Continuity & Trace

- Connectivity verification of an SFP
- Continuity check of an SFP
- Trace the SFP and identify SF’s and associated SFF
Validation and Verification

Validate SF

Functional Verification of SF

Validation of SFP
Performance, Data Collection & Notifications

**Performance Metrics**
- CPU Load
- Packet Counters
- Resource Usage
- Jitter
- RTT

**Data Collection**
- Local data collection
- On Demand poll
- API

**Notifications**
- Pro active notification
- Errors and Alarms
- Configurable Thresholds
Packet Formats

**OAM Packet format**
- OAM Packet as data packet
- Marked as OAM packet

**Test Request Packet Format**
- Contains more than one test request
- Self test or on-demand verification

**SF test packet format**
- Specifies type of test
- Response code to indicate the status

**SF requests**
- Multiple SF requests
- Test results as response codes
SFC OAM Framework draft

Published SFC OAM Framework draft

Orchestration and Management enables SFC
- Manageability is Key element of SFC Architecture
- True potential of SFC realized with right tooling
Thank You