

Dynamic Orchestration & Operation of Chained Network Services

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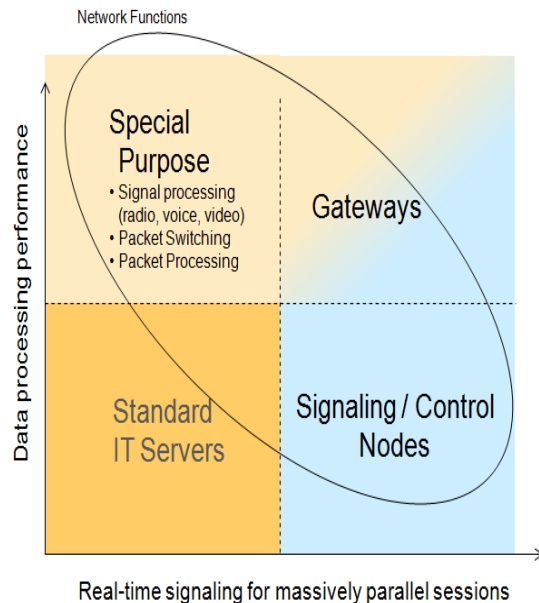


Agenda

- SFC
- Orchestration and Operation
- Architecture & Solution
- Summary



Key challenges in Network Function Virtualization

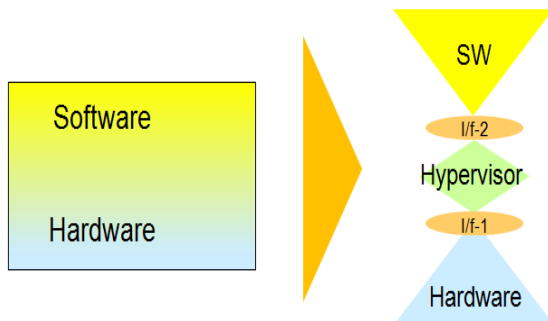


Performance & Reliability Vs Hardware Costs

- 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?



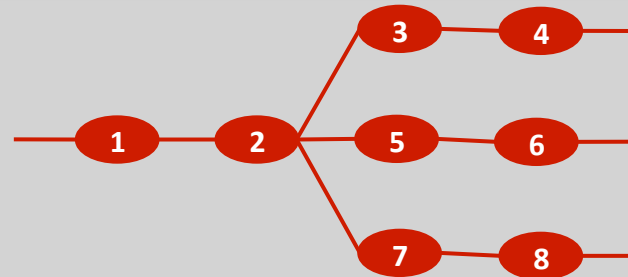
Rich types & On-demand Use of Resources

Single Chain



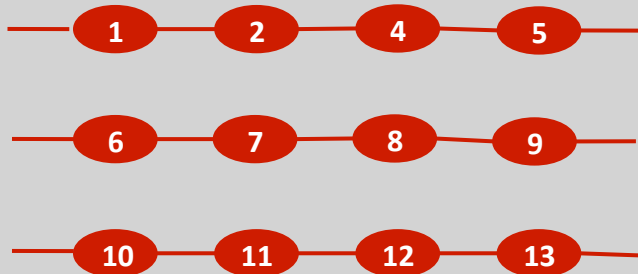
Service Chain1: 1-2-3-4

Multiplex of several chains



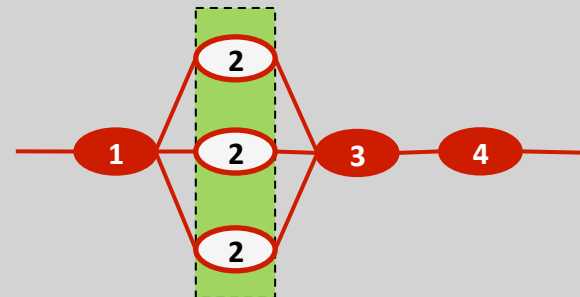
Service Chain1: 1-2-3-4
Service Chain2: 1-2-5-6
Service Chain3: 1-2-7-8

Multiple Chains



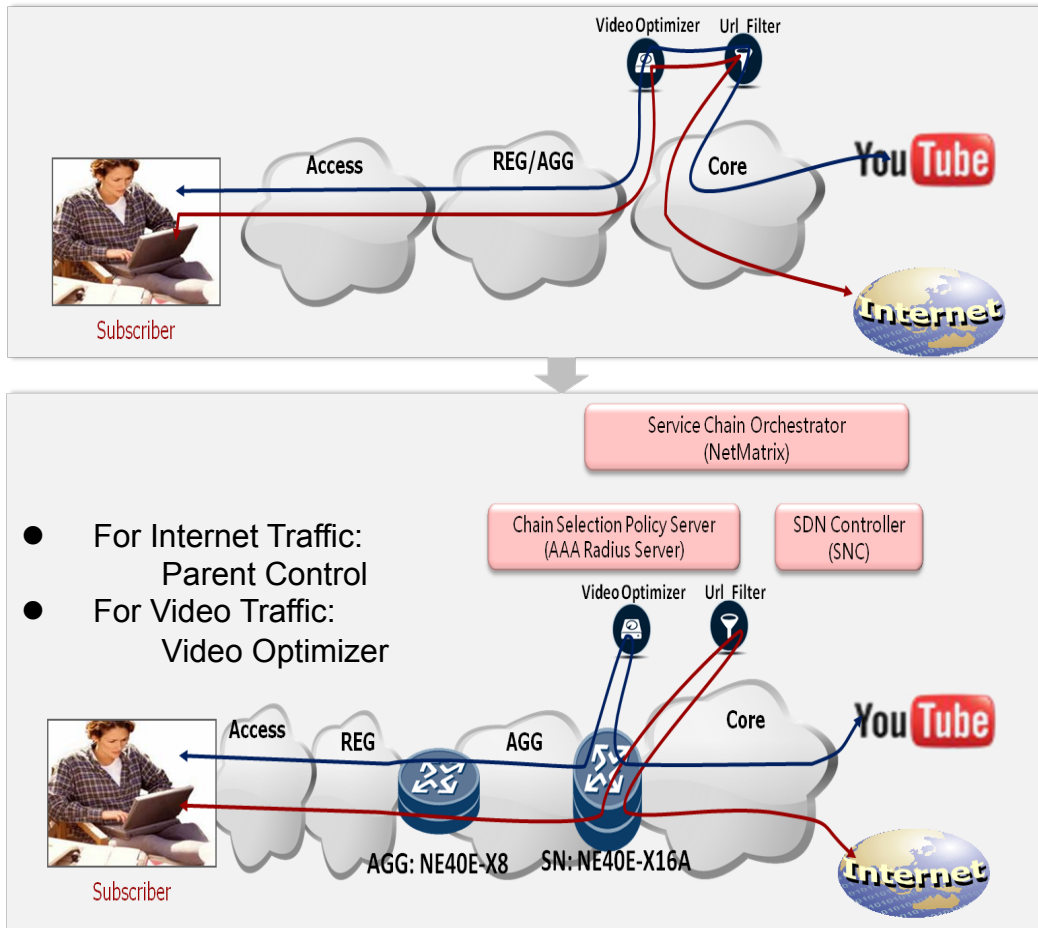
Service Chain1: 1-2-3-4 Service Chain2: 6-7-8-9
Service Chain3: 10-11-12-13

Load Balance



Service Chain1: 1-2-3-4

Service Chaining



Features :

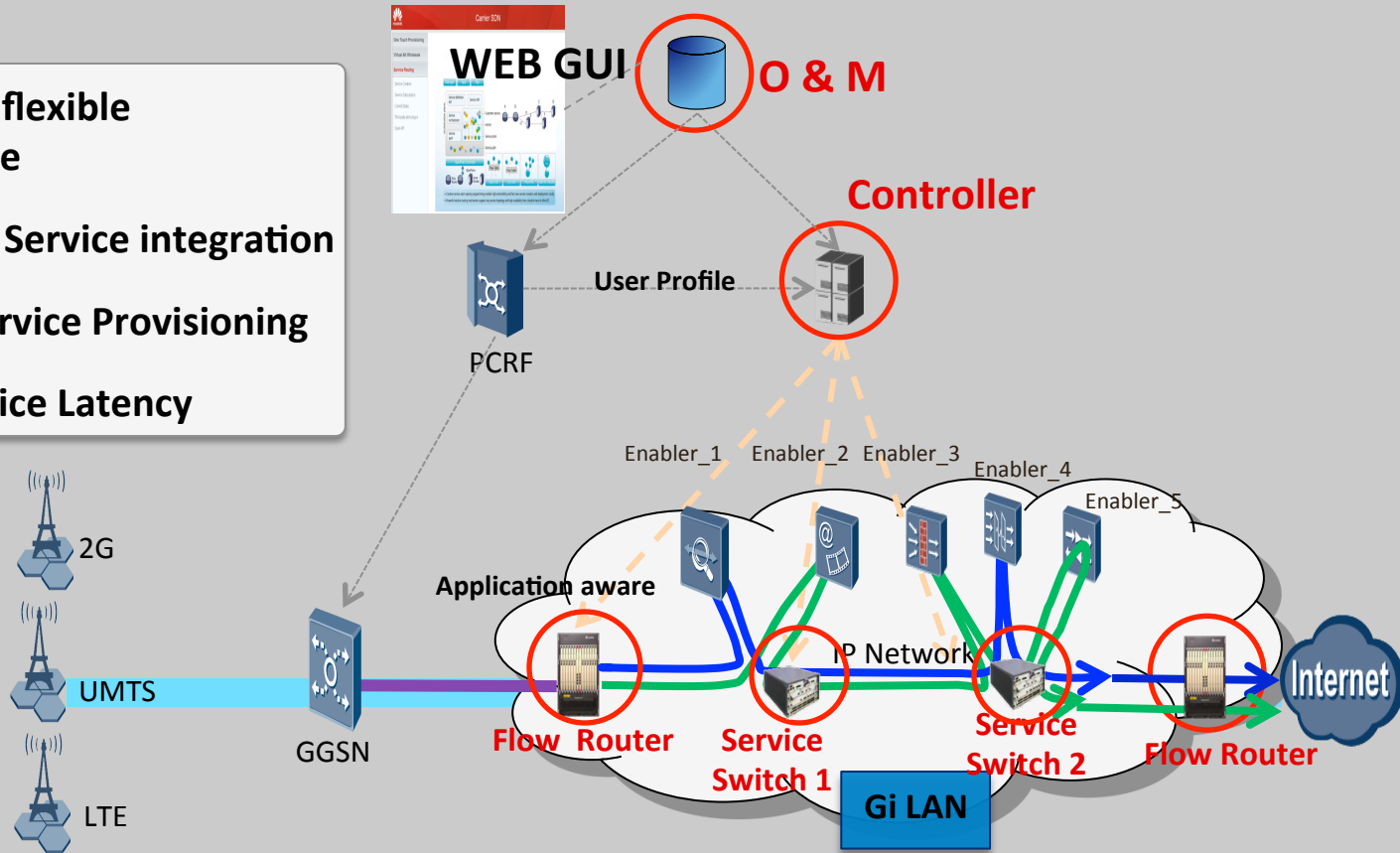
- Virtualized Network Functions
- Dynamic addition / deletion
 - New Service Functions
- Programmable Traffic Steering
- Integration with SDN
- Policy driven service delivery
- Interoperable and standards-based
- Integration with existing infrastructure

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

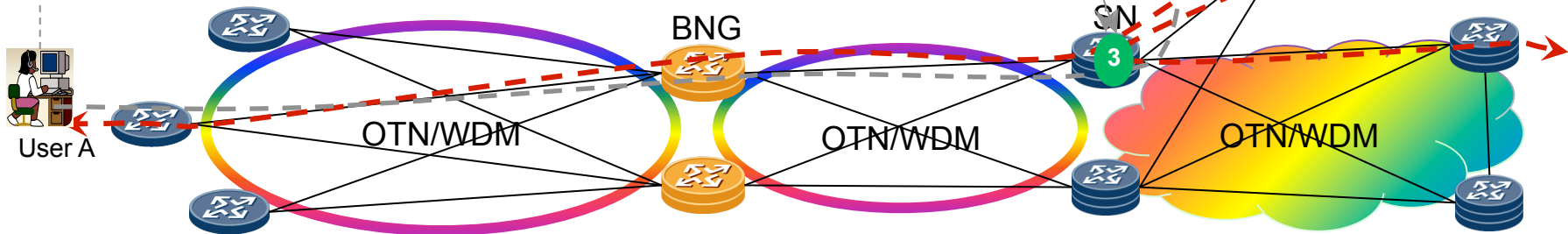
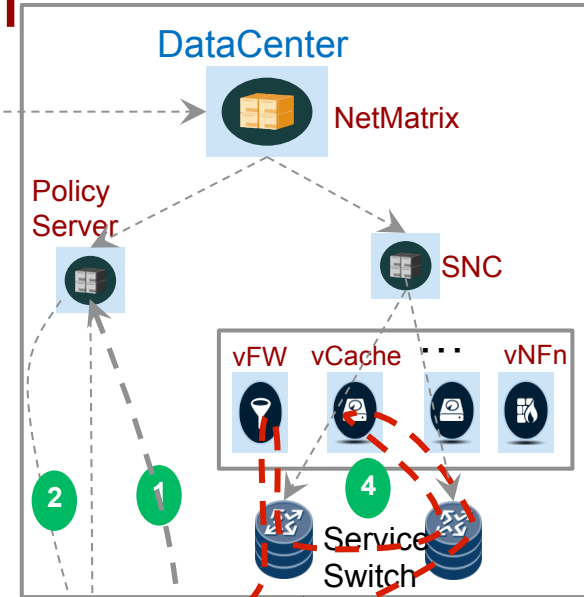


- App-aware DPI integration
- User aware PCRF interworking
- L3&L4 Load balancing
- Smart Network Controller
- Virtualized Environment



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.

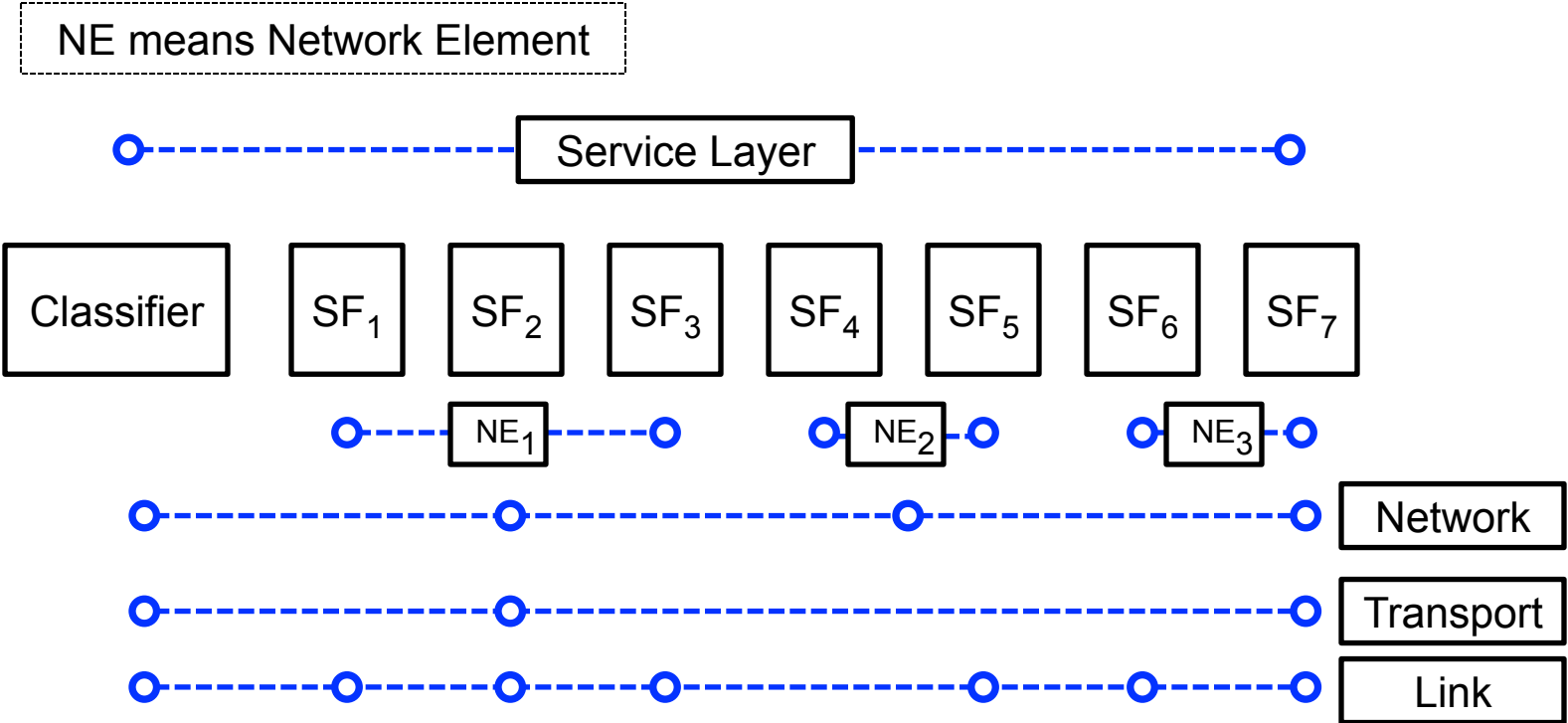
- 1 User A on line
- 2 Policy Server trigger DPI for User_A's traffic
- 3 SNC classifies the flow and tag Chain ID 1 to User_A's traffic
- 4 Service Switches forward traffic based on flow tables

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



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

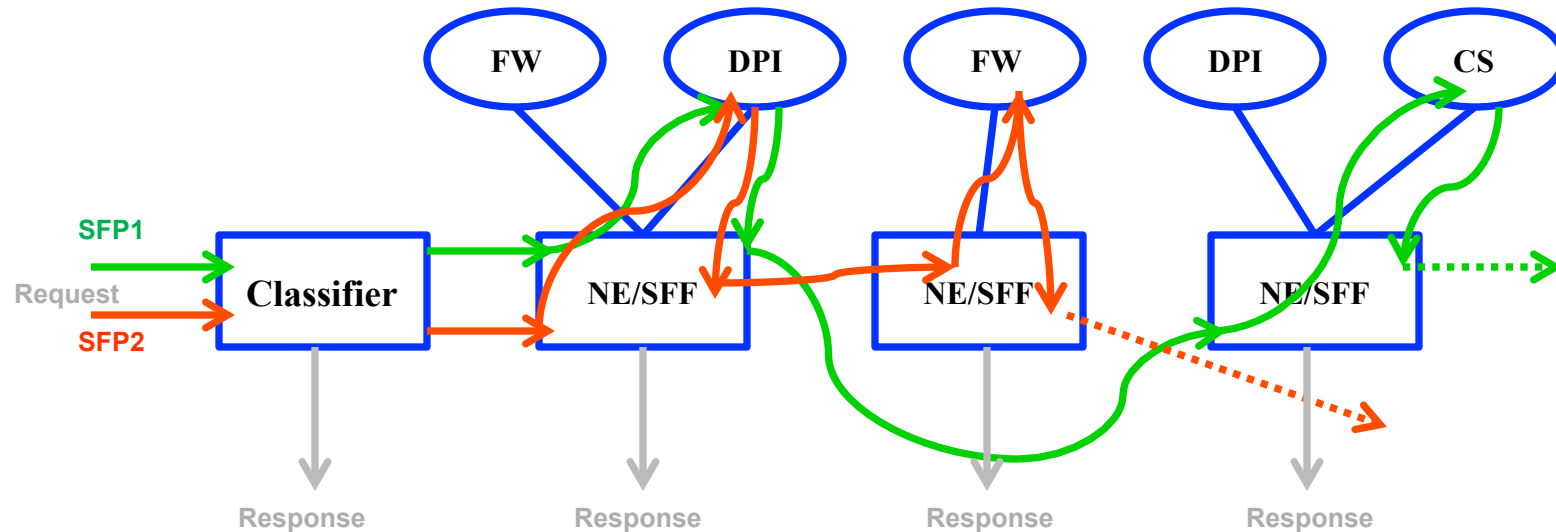


SFC OAM Functions

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



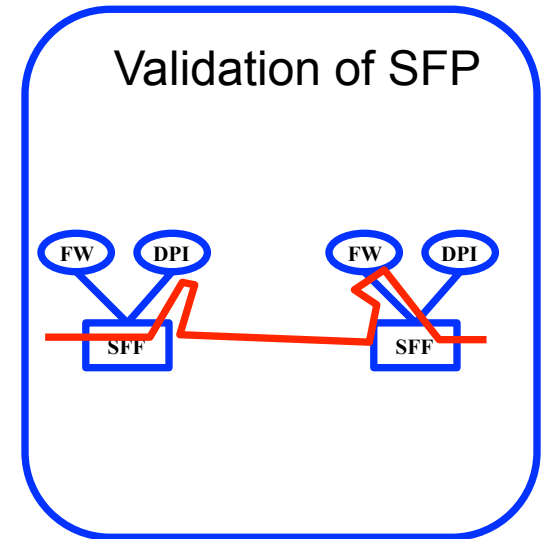
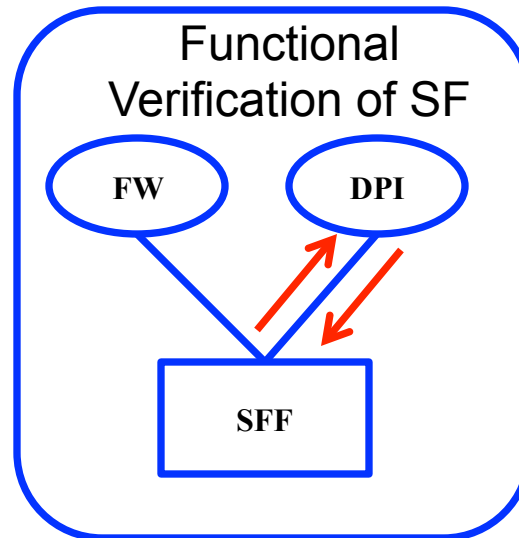
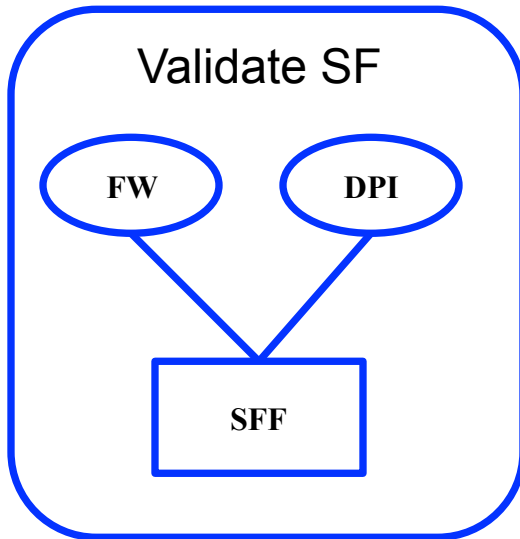
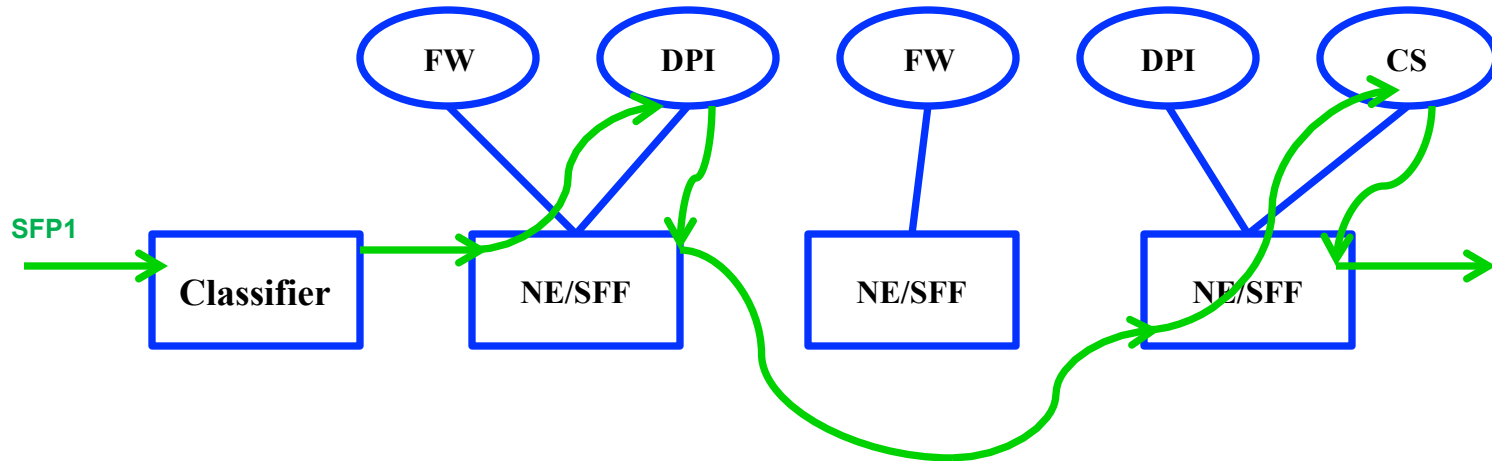
Connectivity, Continuity & Trace



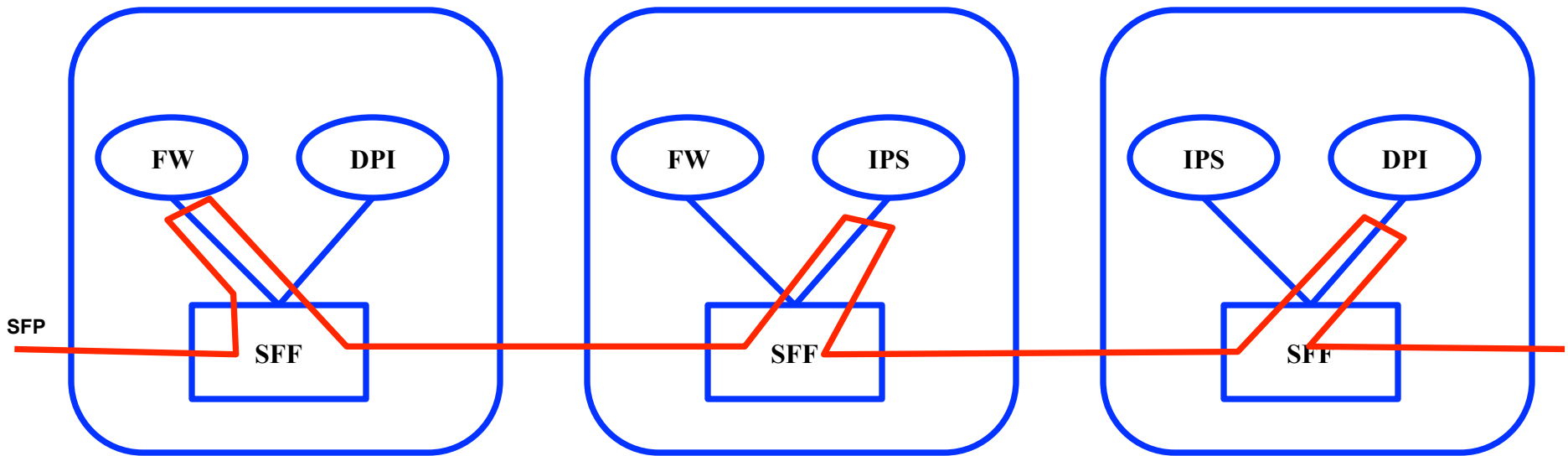
- Connectivity verification of an SFP
- Continuity check of an SFP
- Trace the SFP and identify SF's and associated SFF



Validation and Verification



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

L2 header	L3 header	Overlay header	Service header	OAM Payload
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Test type	Trigger type	Timeout
Test data		

Service function	SF Hop count
Test Request	Response code
Test request	Response code

Service Function	Overall response code
Service Function	Overall response code
Service Function	Overall response code

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

<http://datatracker.ietf.org/doc/draft-aldrin-sfc-oam-framework/>



Summary

SFC

Functionality

Resiliency

Scalability

Provisioning &
Configuration

Orchestration & Management

Verification

Data Collection

Path Tracing

Fault Isolation

Validation

Notifications

Consistency

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



Thank You

