Network Service Chaining

Research Directions in Network Service Chaining

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Outline

1. NSC Definition
2. NSC Requirements
3. NSC Today
4. Dynamic NSC
5. Research Directions
**NSC Definition**

“The required functions and associated order that must be applied to packets and/or frames”

- Quin et al.

“A carrier-grade process for continuous delivery of services based on network function associations”

- Wolfgang et al.

“Catalogs of network resources and related policies (QoS parameters and bandwidth) to which applications can be applied as they move onto the network”

- Magnus Furustam
Requirements

• Rapid new service installation/modification without degrading QoE

• Fast failure recovery

• Low CAPEX/OPEX
NSC in today’s networks (1)

Figure from paper “Research Directions in Network Service Chaining”
NSC in today’s networks (2)

• Middleboxes $\rightarrow$ Network Ossification

• Static configurations $\rightarrow$ OPEX $\uparrow$

• Scalability $\rightarrow$ CAPEX $\uparrow$
Dynamic NSC

Figure from paper “Research Directions in Network Service Chaining”
Dynamic NSC

- SDN: service chains can be provisioned and constantly reconfigured from the controller.

- NFV: moves functionality out of dedicated hardware into software.
NSC Lifecycle

1. NSC Description & Programming

2. Service Instance Deployment

3. Continuous Service Delivery

4. Security Considerations
1) NSC Description & Programming

a) Description of complex service policies

b) Description of HW resources

Challenge: Scalability w.r.t #service chains

c) Description of monitoring & troubleshooting

Challenge: Amount of necessary information & privacy concerns
2) Service Instance Deployment

a) Heterogeneous NW equipment causes deployment hurdles

**Challenge:** Physical architectures for future NW devices

b) Placement of NW functionality

**Challenge:** Modular design of NW functionality

**Challenge:** Mapping NW functionality to available resources
3) Continuous Service Delivery

a) Need to rapidly develop & introduce chains

Challenge: Workflow definition for testing, validating, and troubleshooting

Challenge: Testing through model checking methods

b) Need for observability in each chain

Challenge: scalable observability
4) Security Considerations

a) Shift from device-based authentication to userID-based one

Challenge: Scalable public key architectures