

# Verification of NFV Services : Problem Statement and Challenges

draft-irtf-nfvrg-service-verification-01

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# Changes since IETF94

- Add a new challenging issue
  - Stateful VNFs with multiple physical views
  - Examples
- Some editorial updates

# Stateful VNFs with multiple physical views

- Stateful VNFs

- packet/flow processing depending on the **previous states(packets, actions, etc)**

- ex) middleboxes, firewall, NAT, loadbalancer, flow rules with counter/soft timeout...

- One-to-Many Mapping

- One logical network view v.s. Many physical network resources
- for service chaining, virtualization, performance scale out, etc

- Correctness model?

# Stateful VNFs with multiple physical views

## Case#1: OF Switch 1 & 2 as a Firewall

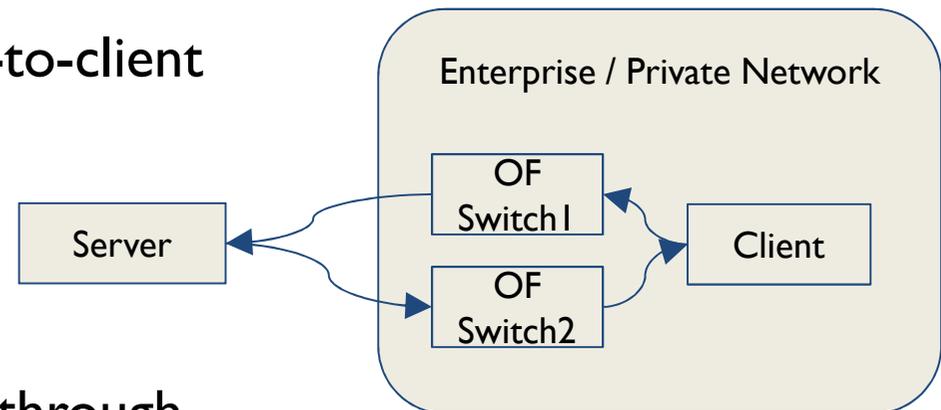
(1) Client to Server:

(a) add flow rule for the server-to-client

(2) Server-to-Client:

(a) if known traffic: forward

(b) else block/drop



**Problem:** what if a packet goes out through switch1 and comes back through switch2 ?

- Block/drop the response packet

To mitigate the situation, states of all instances for one logical VNF must be considered to verify the correctness.

# Stateful VNFs with multiple physical views

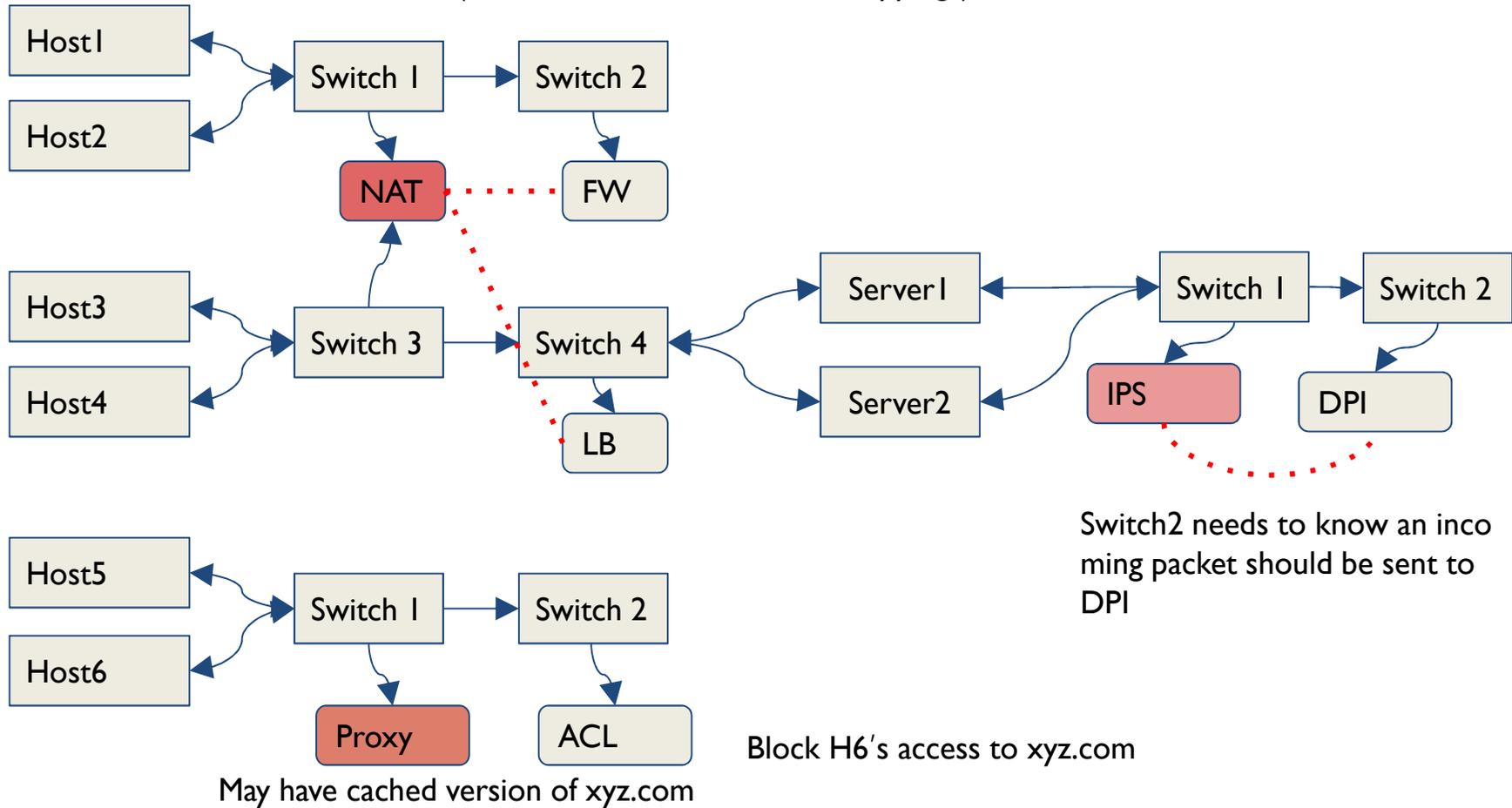
**Case#2**: if there are VNFs whose behavior depend on the previous VNF, those dependency must be considered as well.

For example, if firewall and load balancer gets packets go through NAT service, they need to know the header mapping information that the NAT have set to correctly process their functions. If the FG consists of IPS followed by DPI and those functions are connected different switches, the switch connecting DPI must know if the incomming packets should be forwarded to DPI or not. Port knocking is also well-known example of stateful function.

To mitigate the situation, the states of all VNFs having behavioral dependency must be considered when they are verified.

# Examples

NAT changes original header  
(FW & LB need to know the mappings)



Switch2 needs to know an incoming packet should be sent to DPI

**Other stateful example : port knocking...**