

YANG model for finite state machine

draft-sambo-netmod-yang-fsm-00

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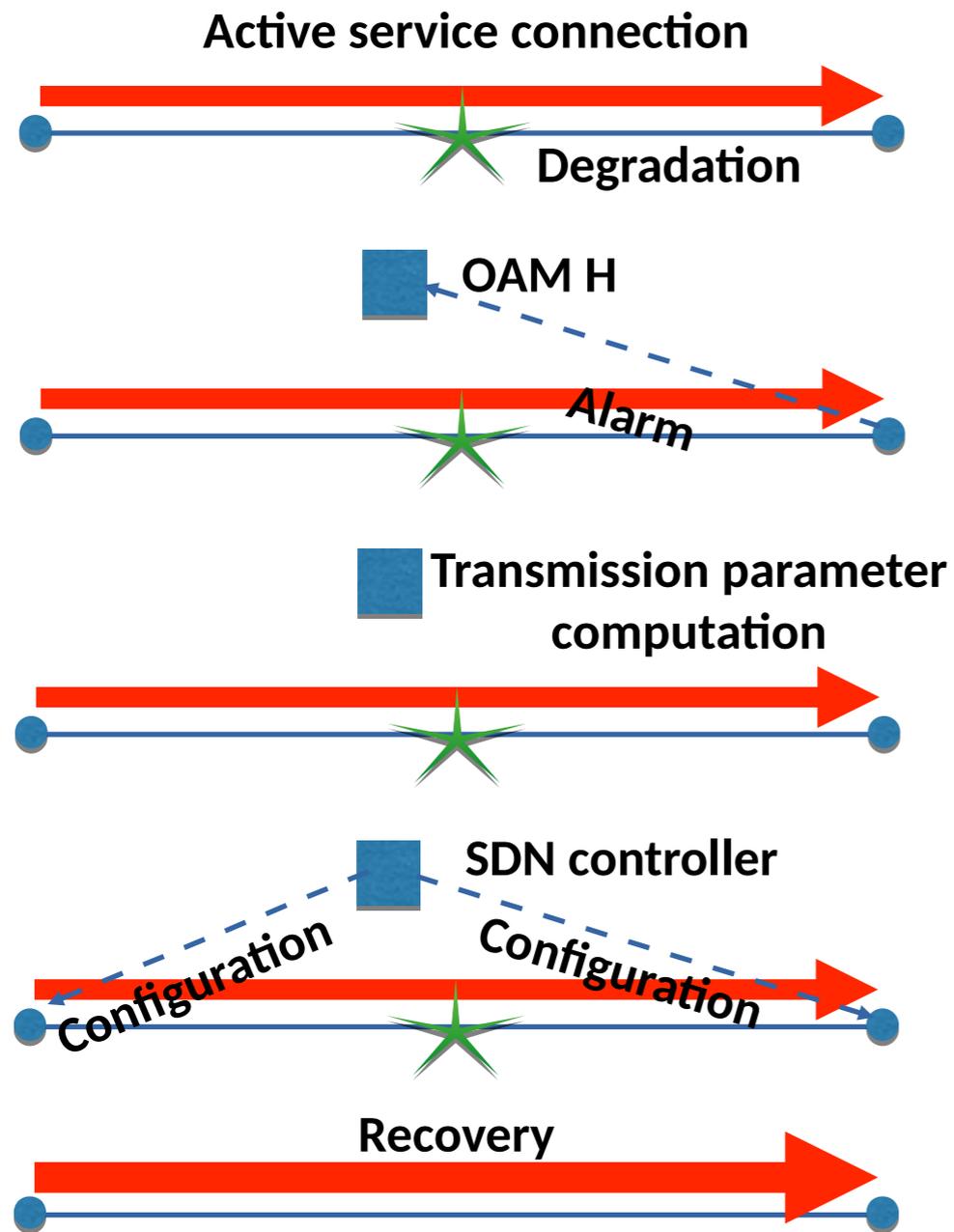
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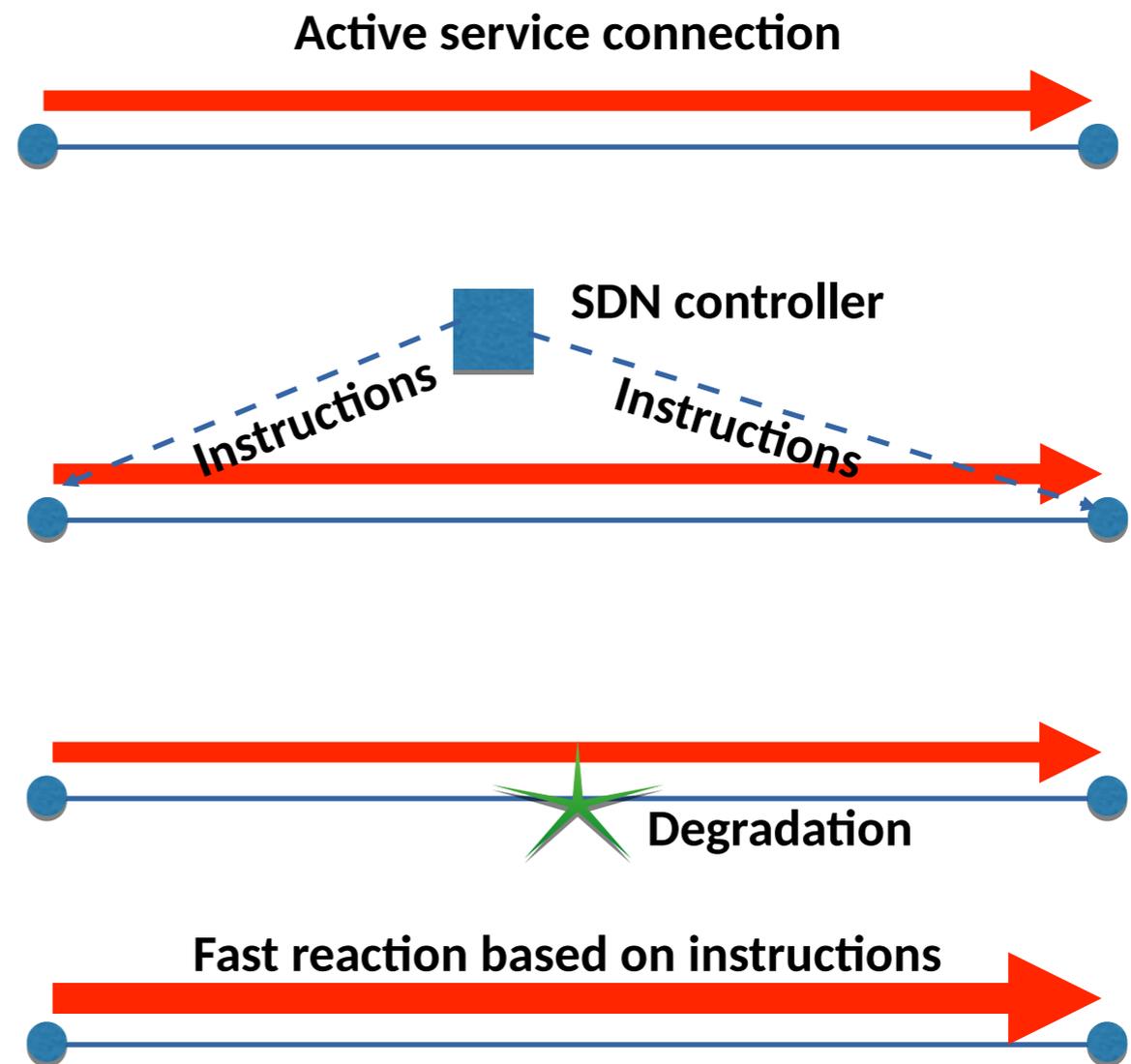
Proposal

- YANG model for finite state machine (FSM) to increase programmability of network elements
- Use cases:
 1. Pre-instruct data plane devices on reconfiguration in case of optical layer degradations
 2. Custom data probing in network telemetry applications
 3. Monitoring of packet loss and delay through a network clustering approach

Use case 1: Pre-instruct recovery actions in flexible optical transponders



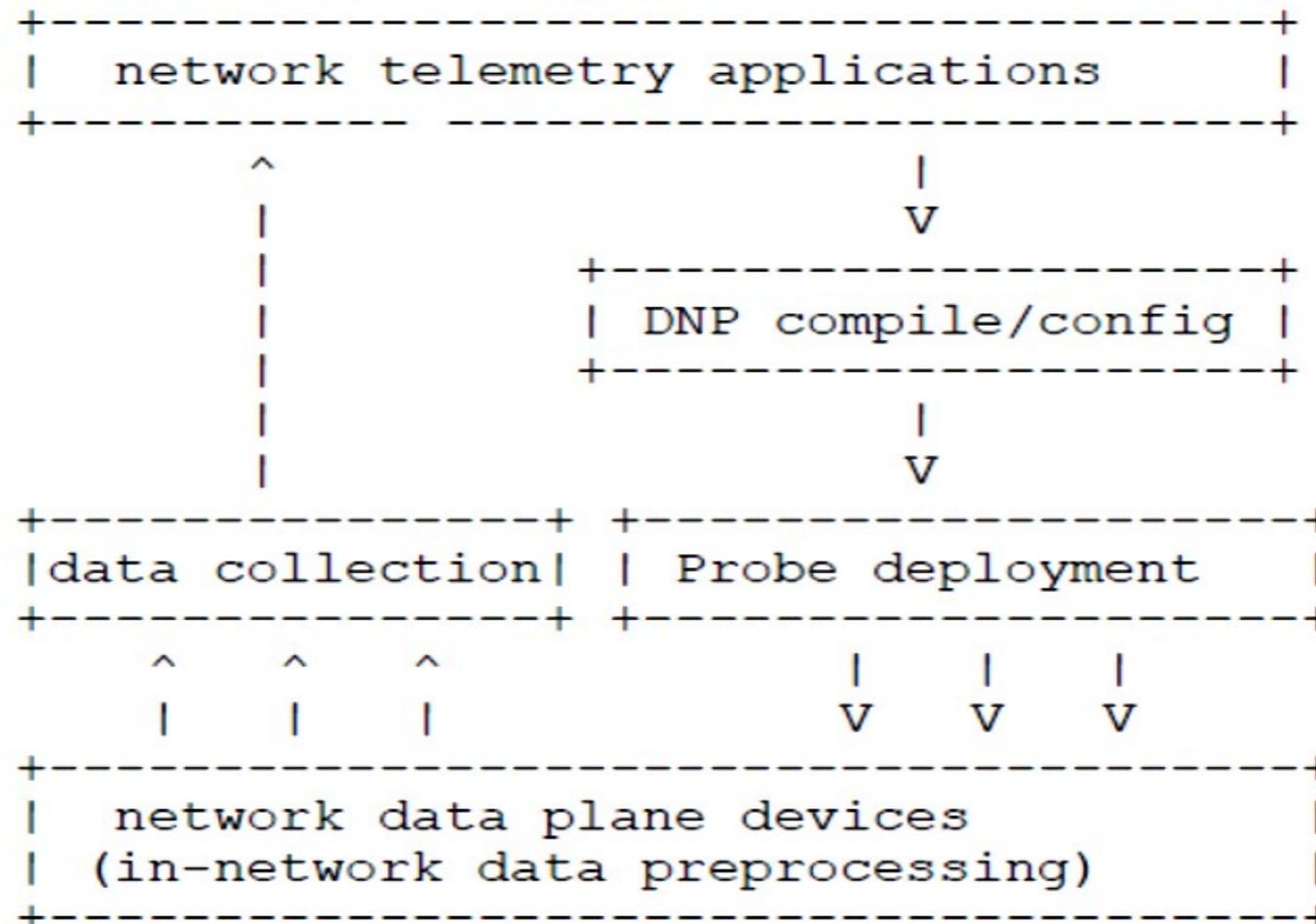
Time consuming



Faster

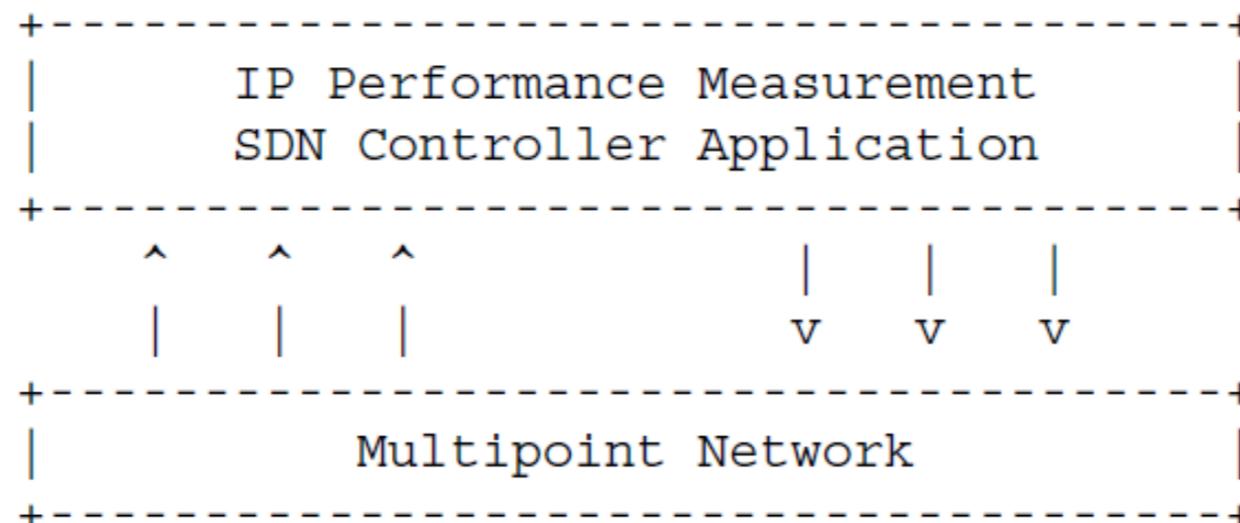
Use case 2: Deploying Dynamic Probes for Programmable Network Telemetry

- Dynamically customized network data collection instead of raw data extraction
- Reduce telemetry data bandwidth through on-demand data collection
- Take advantage of in-network data processing capability of the programmable data plane
- Many network probes can be described as FSMs
- As an example, congestion control: we can consider two thresholds on the buffer depth defining three regions, each one associated to a state of the FSM



Use case 3: IP Performance Measurements on multipoint-to-multipoint large Networks

- An SDN controller can orchestrate network performance measurements tasks
- The IP Performance Measurement SDN Controller Application can calibrate how deep can be obtained monitoring data from the network by configuring measurement points roughly or meticulously
- This idea is general and can be applied to different performance measurements techniques both active and passive (and hybrid)
- One of the most efficient PM methodology is the Alternate Marking method, (see [draft-ietf-ippm-alt-mark](#) and [draft-fioccola-ippm-multipoint-alt-mark](#))
- It is possible to monitor a Multipoint Network without examining in depth by using the Network Clustering (subnetworks that are portions of the entire network that preserve the same property of the entire network) While, in case there is packet loss or the delay is too high, the filtering criteria could be specified more in order to perform a per flow detailed analysis
- A FSM can be programmed such that each state represents a composition of clusters



YANG model for FSM

```
module: finite-state-machine
  +--rw current-state? leafref
  +--rw states
    +--rw state [id]
      +--rw id state-id-type
      +--rw description? string
      +--rw transitions
        +--rw transition [name type]
          +--rw name string
          +--rw type transition-type
          +--rw description? string
          +--rw filters
            +--rw filter [filter-id]
              +--rw filter-id yp:filter-id
            +--rw actions
              +--rw action [id]
                +--rw id transition-id-type
                +--rw type enumeration
                +--rw conditional
                  +--rw statement string
                  +--rw true
                    +--rw execute
                      +--rw next-action? transition-id-type
                      +--rw next-state? leafref
                  +--rw false
                    +--rw execute
                      +--rw next-action? transition-id-type
                      +--rw next-state? leafref
              +--rw simple
                +--rw execute
                +--rw next-action? transition-id-type
                +--rw next-state? leafref
```

e.g., state [0]= 'normal operation'

e.g., BER increase

To put a threshold on the BER: e.g., BER>TH

e.g., change modulation format

an <rpc> is called

Summary

- YANG model for finite state machine (FSM)
- We have **implementation**
- **Successful experiment** of pre-programmed reconfiguration of optical transponder (**use case 1**) in the EU H2020 ORCHESTRA project
- Next step: ask for **adoption**

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