

YANG model for finite state machine

draft-sambo-netmod-yang-fsm-02

**N. Sambo¹, P. Castoldi¹, G. Fioccola², F. Cugini³, H. Song⁴,
T. Zhou⁴**

1: Scuola Superiore Sant'Anna, Italy

2: Telecom Italia, Italy

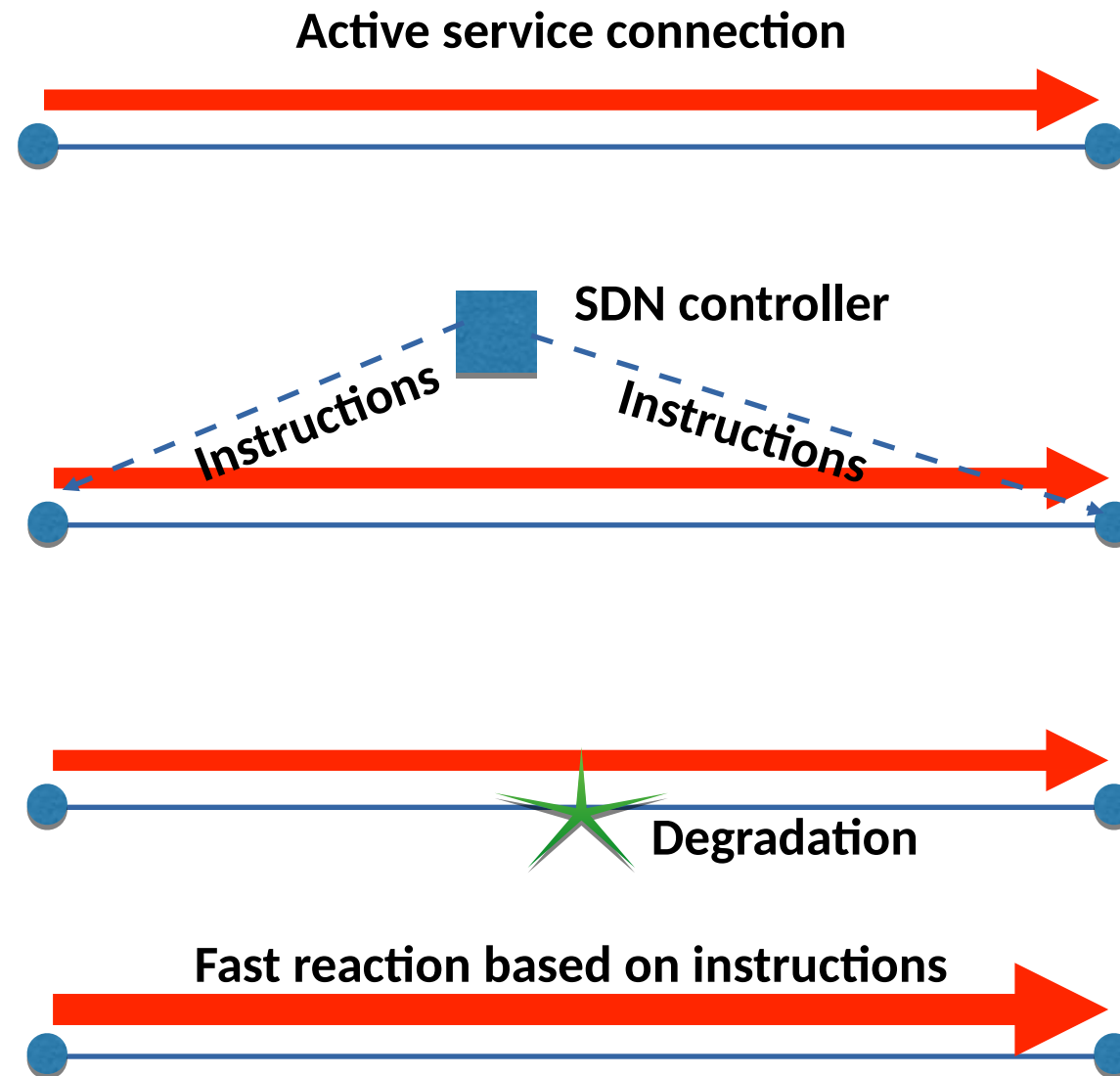
3: CNIT, Italy

4: Huawei, China

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 physical layer degradations
 2. Custom data probing in network telemetry applications
 3. Monitoring of packet loss and delay through a network clustering approach

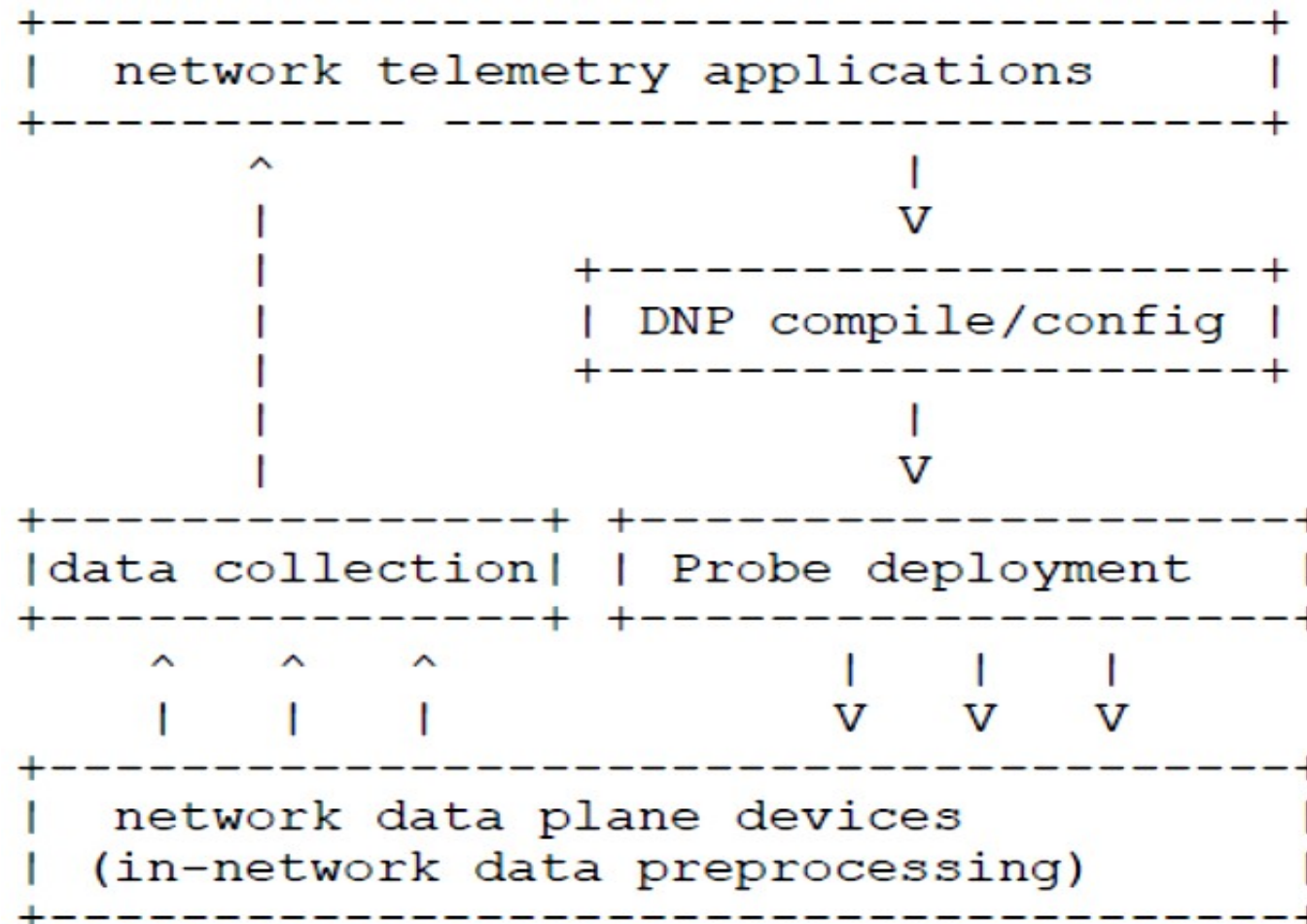
Use case 1: Pre-instruct recovery actions in flexible optical transponders



More details about this use case (ccamp session):
draft-sambo-ccamp-yang-fsm-transponder-reconf-00

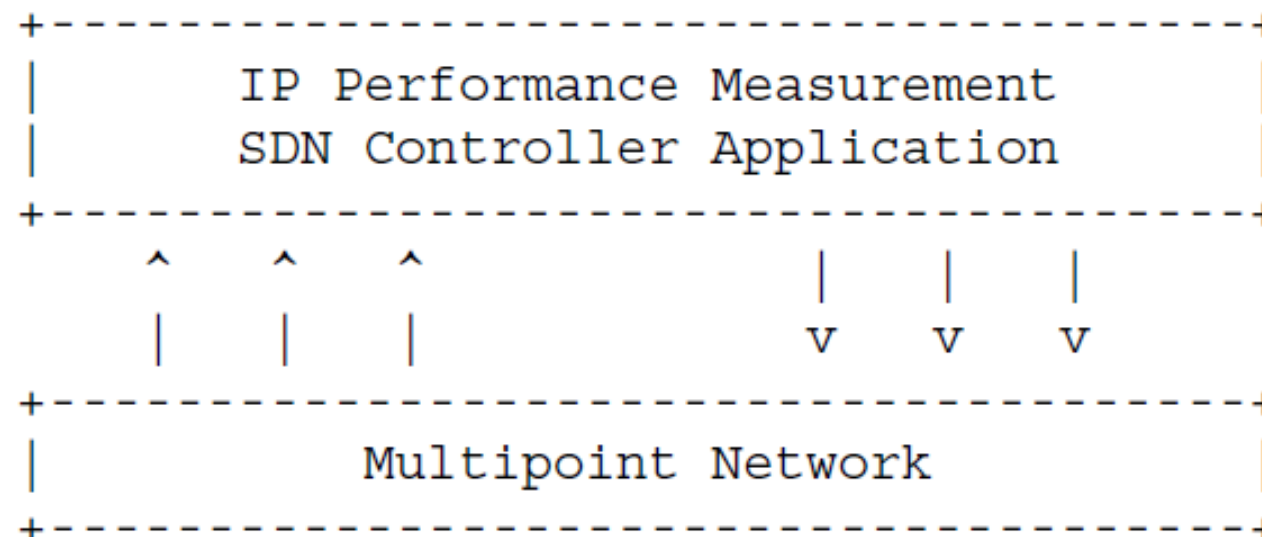
Use case 2: Deploying Dynamic Probes for Programmable Network Telemetry

- 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
- e.g., OAM data preprocessing & congestion status monitoring



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 [RFC 8321](#) and [draft-fioccola-ippm-multipoint-alt-mark](#)).
- It is possible to monitor a Multipoint Network by using the Network Clustering (subnetworks that are portions of the entire network that preserve the same property of the entire network).
- We can start without examining in depth, and in case there is packet loss or the delay is too high, the filtering criteria and clusters partition can be specified in different ways to perform a more 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)
- Progresses with respect to previous versions:
IETF validation syntax issues \Rightarrow fixed
- Asking for **adoption**

email: nicola.sambo@sssup.it