

# RFC3535, 20 Years Later from an Operator's Perspective (Deutsche Telekom)

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# YANG is Successful

- NETCONF/YANG has been broadly adopted and implemented in a large number of common network devices
- Vendors are keeping their proprietary device YANG modules updated with every new software release
- Years of lag between new features and MIB updates are a thing of the past!
  - Although you do need to update your automation to keep pace
- YANG1.1 is widely deployed managing millions of devices – IT WORKS!

**Now that YANG 1.1 is widely understood and implemented, we should think **\*\*very\*\*** carefully before making any changes that could jeopardize this**

# Intra/Inter Domain Service Management with YANG

- A key feature of YANG is its flexibility and wide applicability
  - Entire domain and cross-domain services can be modelled as well as device configuration
- However, YANG is often perceived as being just for the configuration of devices, with other (imperative) protocols/models necessary for higher layers in the automation stack
- Designing and implementing layered automation with multiple modelling languages/approaches is significantly harder, due to:
  - Loss of declarative configuration, e.g., through use of workflows
  - ‘Impedence mismatches’ of translating from one modeling language to another

**The IETF should do more to describe and promote how YANG can be used to model layered services both intra and inter-domain, and the advantages of this approach**

# Difficulty with Mapping YANG to the BSS Domain

- Service layer models, e.g.: ‘ietf-l3vpn-svc’ have proved to be extremely well thought out, flexible, and useful for the technical description and configuration of any L3 VPN service regardless of the underlying technology (MPLS, SR, SD-WAN, etc.)
- However, for the BSS domain, other SDO’s APIs are being widely adopted (e.g.: TMForum)
- This is not a bad thing – YANG and TMForum APIs are designed for different functions

**The IETF should work with the TMForum to standardize the interface between the TMForum APIs in the BSS domain and YANG modelled network domains**

# The Split in Configuration & Operational State Data

- Historically, configuration and collection of operational state information have been technically (and organizationally) split
  - This results in duplication of efforts, making correlation and root-cause analysis more complex
- The 'device' YANG models are written with combined configuration and operational
  - This enables a 'single pane of glass' interface, and a holistic approach to device configuration and monitoring
- However, the 'service' and 'service-delivery' YANG modules are only focused on configuration
  - E.g., 'ietf-network', 'ietf-network-topology', and 'ietf-l3vpn-svc'

**To enable, and simplify building closed-loop automation device, domain, and service models should be updated/augmented with operational state nodes**

# The lack of Free, Open-Source Software NMS Implementations

- While NETCONF/YANG servers have been widely implemented in devices from many vendors, this is not matched in availability of NMS platforms
- The lack of options here has become a barrier to adoption of the protocols
  - The potential for vendor lock-in is significant enough to affect the choice of protocols and modelling language
- More commercial options would certainly help here
  - However, the man-hours invested in developing automation for any NMS platform means that changing NMS vendors is highly impractical

**Open-Source NMS alternatives would provide a solution for these problems, removing barriers for adoption. The IETF should actively foster and enable collaboration on such efforts**

# Lack of IETF Device Model Implementations

- The IETF has expended a huge amount of effort to create a library of device YANG modules
- These promise the possibility of device/vendor agnostic management, helping to reduce/remove:
  - Development overhead for updating automation for changes in proprietary models
  - Vendor lock-in due to device vendor's proprietary models
- However, implementations of the IETF device models, in commercially available products are almost non-existent

**The IETF should foster collaboration on open-source 'off-box' translation of IETF device models to vendor proprietary YANG**