Overview and Using Open Source Tools For Network Management

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Libnetconf/Libnetconf2

• NETCONF library is needed to build NETCONF client and servers
• Comes from the Netopeer project.
• Two versions are available:
  • libnetconf
    • based on libxml2
    • Maintenance stopped in 2017
    • https://github.com/CESNET/libnetconf
  • libnetconf2
    • is based on libyang library instead of libxml2
    • It rapidly improves performance
    • increases the processing speed and decreases memory consumption
    • https://github.com/CESNET/libnetconf2
Libnetconf2

• NETCONF 1.0 (RFC 4741) and NETCONF 1.1 (RFC 6241) supported
• The main features include:
  • NETCONF over SSH (RFC 4742, RFC 6242), using libssh.
  • NETCONF over TLS (RFC 7589), using OpenSSL.
  • DNSSEC SSH Key Fingerprints (RFC 4255)
  • NETCONF over pre-established transport sessions
  • NETCONF Call Home (RFC 8071).
  • NETCONF Event Notifications (RFC 5277),
Libyang

• Netopeer project origin
• libyang is YANG parser implemented and provided as a library with API in C language.
• It allows you to load and validate the YANG schemas and data.
• The schemas are supported in YANG as well in YIN format
• Data are supported in XML and JSON representation.
• The source codes:
  https://github.com/CESNET/libyang
Libyang cont’d

• Support:
  • YANG 1.0 ([RFC 6020](https://tools.ietf.org/html/rfc6020)) as well as YANG 1.1 ([RFC 7950](https://tools.ietf.org/html/rfc7950)).
  • Parsing, validating and printing instance data in JSON format ([RFC 7951](https://tools.ietf.org/html/rfc7951)).
  • Support for default values in the instance data ([RFC 6243](https://tools.ietf.org/html/rfc6243)).
  • Support for YANG Metadata ([RFC 7952](https://tools.ietf.org/html/rfc7952)).

• Features:
  • Parsing (and validating) schemas in YANG format.
  • Parsing (and validating) schemas in YIN format.
  • Parsing, validating and printing instance data in XML format.
  • Manipulation with the instance data.
  • Support for YANG extensions.
  • **yanglint** - feature-rich YANG tool.
Sysrepo

- Sysrepo is an YANG-based configuration and operational state data store for Unix/Linux applications.
- https://github.com/sysrepo
- YANG 1.1 support
- ability to store / retrieve YANG-modeled data elements addressed by Xpath
- startup, running and candidate datastore support
- data consistency and constraints enforcement according to YANG models
Sysrepo cont’d

- no single point of failure design (does not require any daemon to be running)
- full transaction and concurrency support
- notifications of subscribed applications about the changes made in the datastore
- commit verifiers (change verification by subscribed applications)
- operational data support (publishing of application's state data to sysrepo)
- plugins infrastructure for loosely-coupled integration with sysrepo
- custom RPC, Event Notifications, YANG 1.1 Actions support
- Python 2 & 3, Lua 5.1 & 5.2, Java bindings
- notification store & notification replay
- NACM (NETCONF Access Control Model) - disabled by default
pyang

• pyang is a YANG validator, transformer and code generator, written in python.
• It is used to:
  • validate YANG modules for correctness
  • to transform YANG modules into other formats,
  • and to generate code from the modules.
pyang cont’d

- pyang is compatible with the following IETF RFCs:
  - RFC 6020
  - RFC 6087
  - RFC 6110
  - RFC 6643
  - RFC 7950
  - RFC 7952
Tools are available

• Why do we need them?
• How to use them?
• A management entity and central data store is needed
• A protocol to communicate with external systems
• A schema that describes devices/protocols/functions
How FRR daemon’s were managed?
New Northbound Architecture
Conclusion

• Mature products
• There is work to be done for implementation to make it work