

Overview and Using Open Source Tools For Network Management

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RTG WG

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](#)) as well as YANG 1.1 ([RFC 7950](#)).
 - Parsing, validating and printing instance data in JSON format ([RFC 7951](#)).
 - Support for default values in the instance data ([RFC 6243](#)).
 - Support for YANG Metadata ([RFC 7952](#)).
- 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.

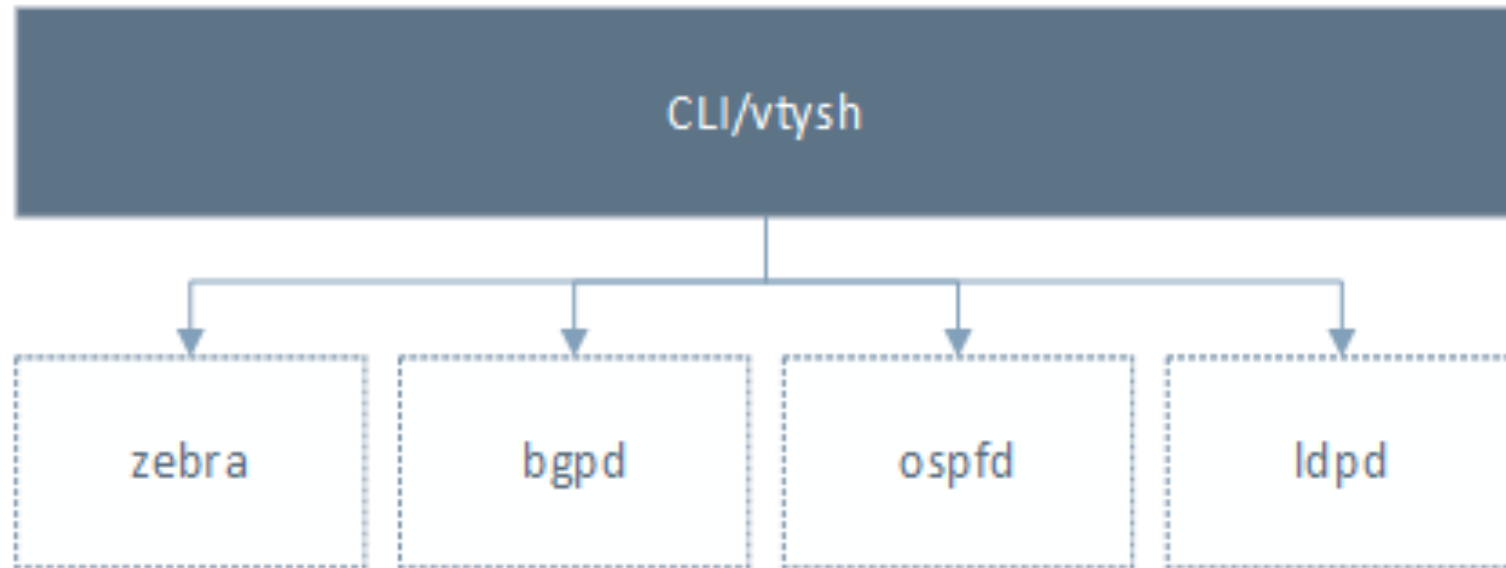
pyang cont'd

- pyang is compatible with the following IETF RFCs:
- [RFC 6020](#)
- [RFC 6087](#)
- [RFC 6110](#)
- [RFC 6643](#)
- [RFC 7950](#)
- [RFC 7952](#)

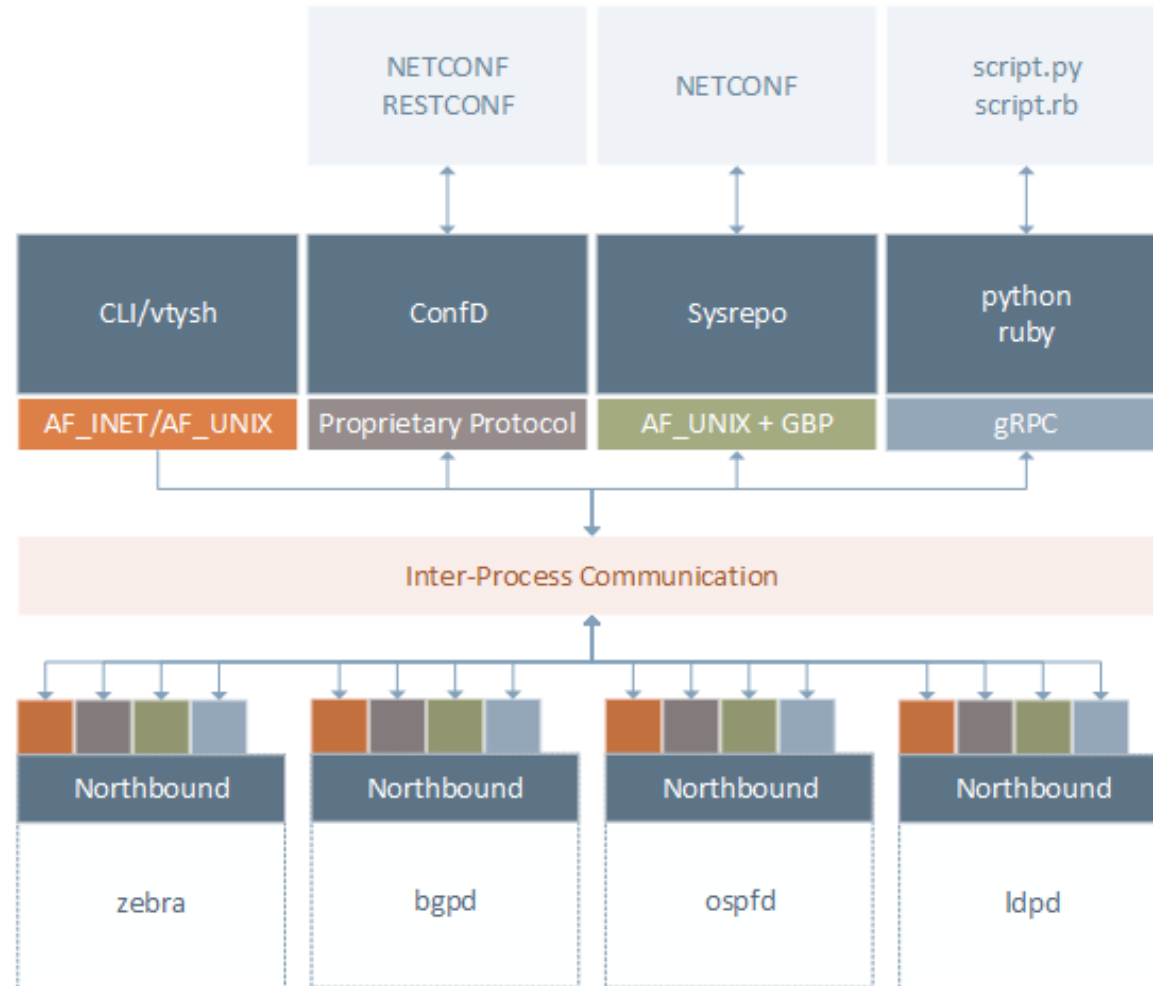
Tools are available

- 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

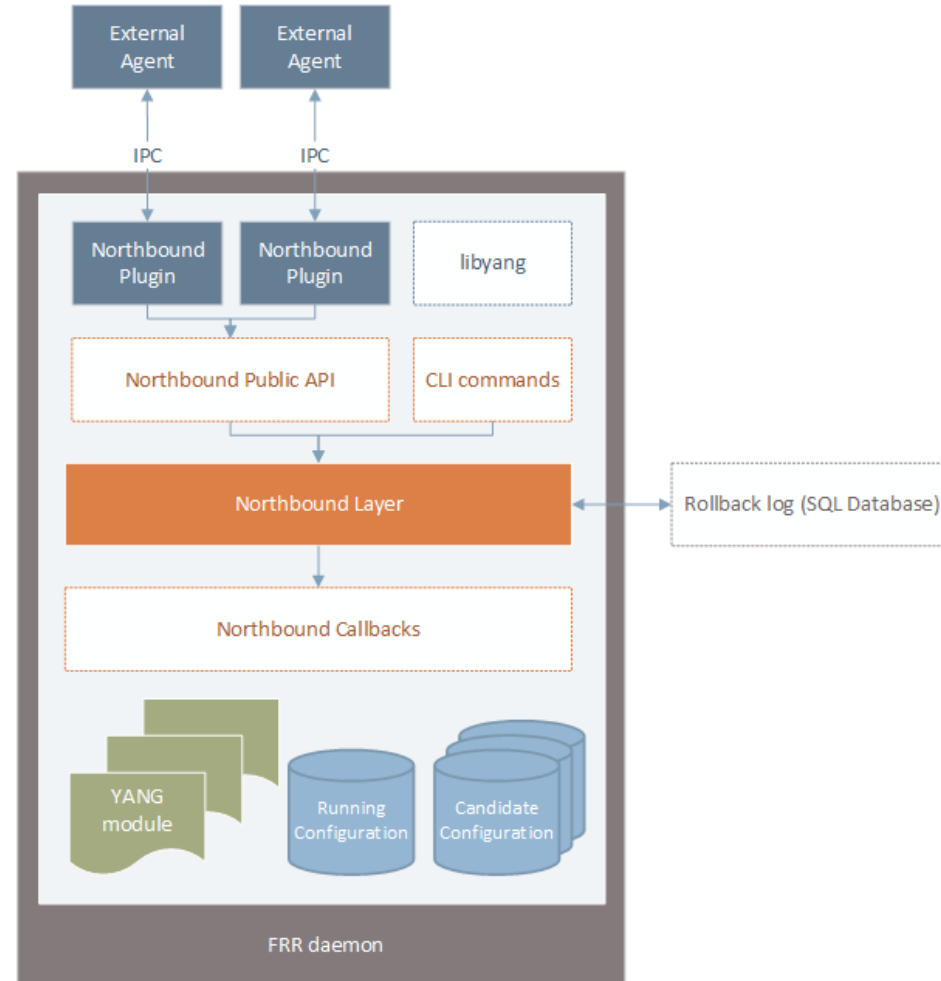
How FRR daemon's were managed?



New Northbound Architecture



New Northbound Architecture – Internal View



Conclusion

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