

An Overview of ndCONF Agent Development Studio Evaluation Package

NuDesign's NETCONF, RESTCONF, CLI and SNMPv3, YANG based ndCONF Agent Development Studio evaluation package provides:

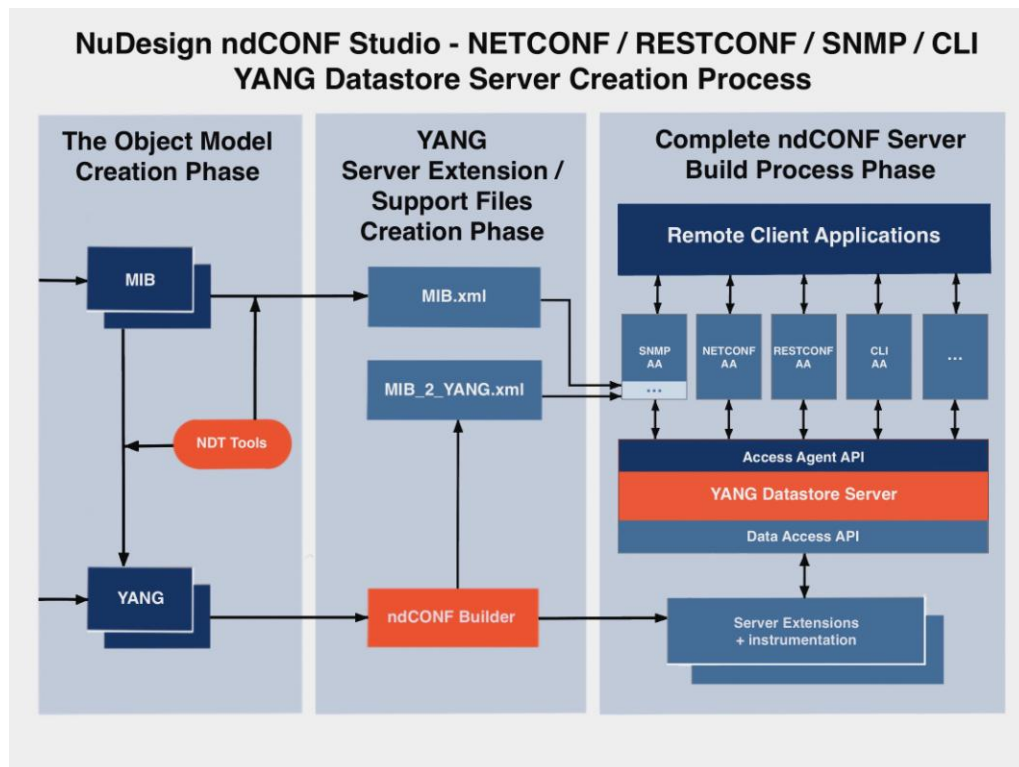
1. pre-built, extensible YANG Datastore Server, source code included.
2. NETCONF and RESTCONF Access Agents with sample NETCONF and RESTCONF Client application.
3. for optional SNMP access - SNMPv3 Access Agent and mib_2_xml compiler tool.
4. YANG and MIB modules of two Loadable Data Handler (LDH) extension samples, with the source code pre-generated by ndCONF Builder included.
5. NETCONF / YANG eval SDK libraries.

The user builds a complete sample ndCONF Agent with NETCONF / RESTCONF / CLI and SNMPv3 access and tests its functionality using NuDesign's or their own NETCONF / RESTCONF and SNMPv3 Client applications.

The evaluation package does not contain NuDesign's ndCONF Builder, a C++ code generator of YANG Datastore Server extensions, however, after having extended the YANG Datastore Server with the provided sample Loadable Data Handlers (LDH), the user is invited to submit their own YANG and optionally MIB modules to NuDesign and receive their custom module's LDH extension source code and project files, generated by the NuDesign's ndCONF Builder. Then, the user can build their specific ndCONF Agent with NETCONF, RESTCONF, CLI and optionally SNMPv3 access, for further evaluation.

With the full version of the ndCONF Agent Development Studio tools, the user receives a full version of ndCONF Builder, the generator of C++ code and project files for YANG Datastore Server's extensions.

A Detailed Review of ndCONF Agent Development Studio Evaluation and Build Process



The current release of NuDesign ndCONF Agent Development Studio Evaluation tools supports Linux / QNX targets, the development process has been tested on these Linux distributions: Fedora, RHEL, Debian, Ubuntu and OpenSUSE, primary x86_64bit and ARM_32/64bit versions.

The user needs to install several components and perform the following tasks on their Linux host:

1. review provided ndCONF Server Evaluation documentation package.
2. enable Python environment rev3.x or newer on your Linux host.
3. install PYANG rev2.4.0 or newer (PYANG is a free, BSD licensed, Python written, YANG module validation tool and extensions framework). It can be downloaded from Python Software Foundation PYANG page at <https://pypi.python.org/pypi/pyang#downloads>
4. enable SSHD Server for NETCONF access on their Linux host.
5. install NuDesign ndCONF Agent evaluation package that contains:
 - a. an extensible YANG Datastore Server with APIs to protocol Access Agents & APIs to the YANG Datastore object providers (LDH extension modules).
 - b. NETCONF / YANG Datastore SDK libraries, implementing standard RFCs, with basic CLI access.
 - c. NETCONF and RESTCONF Access Agents with NETCONF and RESTCONF Client application.
 - d. SNMP access components (for optional SNMP access).
 - the SNMPv3 Access Agent.
 - the mib_2_xml compiler tool, that converts MIB modules into a MIB.xml files.
 - e. YANG Garage module LDH package that contains:
 - simple Garage module example, which contains the MIB and the MIB OID annotated YANG modules.
 - Garage LDH extension source code, the MIB_2_YANG.xml mapping file and the project files, both generated by the ndCONF Builder for the Garage project.
 - prebuilt Garage.so, ready to run with access from the CLI, NETCONF and RESTCONF Clients.

For optional SNMP access, the included mib_2_xml compiler generates the MIB.xml file. Finally, adjusting some files' location & configuration data, as per included documentation, makes the ndCONF Agent, with the Garage.so subagent, enabled for either NETCONF, RESTCONF, CLI or SNMP Client application queries.
 - f. YANG VLAN LDH package that contains:
 - simple VLAN MIB module example, hypothetically implemented in a legacy SNMP Agent.
 - VLAN YANG Module 1 - the direct, rfc6643 translation of the VLAN MIB module into a VLAN YANG RFC6643 compliant module, by NuDesign MIBuilder - this file contains auto-generated MIB OID annotations.
 - VLAN YANG Module 2 - a manually edited Module 1 aiming to have a "more CLI aligned" structure. The module preserves the auto-generated MIB OID annotations.
 - compilable extension sources & project files generated for Module 2 by the ndCONF Builder, demonstrating how to re-use existing VLAN SNMP instrumentation code. This project needs to be built into the VLAN.so by the user. Review included document describing the sources & YANG VLAN Module 2's manual modifications along with possible test scenarios.
 - the MIB_2_YANG.xml mapping file, binding SNMP OID's to YANG leaf objects, and auto-generated by the NuDesign's ndCONF Builder.

Now, after reviewing the Garage.so directories of the Server project, the user adds the VLAN.so directories created during the VLAN LDH creation. For optional SNMP access the mib_2_xml compiler tool is used to generate the MIB.xml file. Finally, adjusting some files' location & configuration data, as per included documentation, makes the ndCONF Agent with Garage & VLAN LDH subagents enabled for either NETCONF, RESTCONF, CLI or SNMP Client application queries.

The objective is for the evaluator to get the ndCONF Agent working with the prebuilt demonstration Garage.so extension, then build and add a VLAN.so extension to the Agent, based on a supplied VLAN source code.

Finally, optionally provide NuDesign with your custom YANG (PYANG validated) module and / or optionally MIB documents, and we will generate your code using NuDesign's ndCONF Builder. Your LDH module building process is identical to the Garage / VLAN LDH build process, thus enabling further testing (the Agent will have the initial configurations for your objects).

If building a custom YANG Datastore Server's extension LDH from a MIB OID annotated YANG module, in addition to getting the Server's extension source code, the NuDesign's ndCONF Builder also generates the MIB_2_YANG.xml, MIB OID Mapping support file, which otherwise must be manually created for SNMP access.

The YANG Datastore Server supports dynamic loading of LDH extensions.

A Summary of Additional Tools for Optional SNMP Access

In addition to Linux based, SNMP Access Agent and mib_2_xml compiler tool, the following SNMP tools' evaluation are available for Windows only:

1. Visual MIBuilder (contains a MIB to YANG rfc6643 compliant translator) - used to build a custom MIB, or to perform translation of any MIB into a YANG module, adding MIB OID annotation for every YANG object.
2. Visual MIBrowser Pro - SNMPv3 Client application for testing SNMP access to the NETCONF / RESTCONF / CLI and SNMPv3 management Agent based on the YANG Datastore Server.

Object Model Development Scenarios – YANG (optionally MIB) Module Creation

1. A YANG module is created, using an open source or commercially available YANG editor.
To enable SNMP access as well, these additional files are required:
 - a. an SNMP MIB module, with MIB object definitions using some or all objects that are defined in the YANG model. The MIB OID annotation should be added to every YANG module object.
 - b. a compiled MIB file, MIB.xml, providing MIB object's SMI properties, created by mib_2_xml tool.
 - c. an OID mapping file, MIB_2_YANG.xml, that binds the MIB objects to the appropriate leafs of a YANG module. Auto created by ndCONF Builder for MIB OID annotated YANG modules.
2. Alternatively, a developer starts from an existing MIB module and using NuDesign's MIBuilder tool, auto-translates it into the equivalent YANG module (an rfc6643 compliant process), possibly enhancing it with additional constructs and a structure better aligned to the desired CLI access.

To enable SNMP access with this approach, note that the MIB OID annotations are added to the YANG module by the MIBuilder tool, and the ndCONF Builder generates the MIB_2_YANG.xml OID mapping file automatically. A compiled MIB file, MIB.xml, needs to be created using the provided mib_2_xml compiler tool.

The second approach might be a requirement for projects with a large base of legacy SNMP instrumentation code, since it provides for re-use of this code in the instrumentation phase of YANG Datastore Server's LDH extensions, as demonstrated by the VLAN example.

Summary

The tools of ndCONF Agent Development Studio provide for building of integrated multiprotocol ndCONF Agent with the NETCONF / RESTCONF / base CLI and SNMPv3 support.

The ndCONF tools, with exception of Windows based SNMP Visual MIBuilder and Visual MIBrowser Pro, are Linux hosted, the Agent's targets are Linux and QNX operating systems.

Please also review these NuDesign's [Technical Briefs](#):

1. ndCONF Agent Studio Evaluation Package Quick Start.
2. Overview of NuDesign's ndCONF Agent Development Studio Tools for NETCONF, RESTCONF, CLI & SNMP Access.
3. Overview of NuDesign's ndCONF extensible YANG Server Build Process for NETCONF, RESTCONF, CLI & SNMP Access.

The resource links below provide additional information.

NETCONF / YANG / PYANG Web Accessible Resources

1. NETCONF - <https://datatracker.ietf.org/wg/netconf/documents>
2. YANG - <https://datatracker.ietf.org/wg/netmod/documents>
3. SNMPv3 - <https://datatracker.ietf.org/wg/snmpv3/documents/>
4. YANG Editors and PYANG Validating Tools Resources - <https://1.ieee802.org/yangsters/tools-for-yang/>
5. YANG Modeling for Network Automation - <https://www.linkedin.com/pulse/quick-look-yang-data-modeling-network-automation-sachin-verma/>

About NuDesign Technologies

NuDesign Technologies, Inc., based in Toronto, ON, Canada, specializes in providing NETCONF, RESTCONF, CLI & SNMPv3 Agent & Manager development applications, tools, libraries and consulting services to developers and networking OEMs worldwide. The benefits of deploying NuDesign's management software technologies are reliable, low risk, well integrated and quick-to-market solutions, supporting remote management operations over secure networks in carrier, campus, enterprise and IoT settings.

Contact Information



NuDesign Technologies, Inc.

tel: 416 737 0328 / fax: 416 445 9101

toll free: 1 866 886 SNMP (7667)

contact@ndt-inc.com

www.ndt-inc.com / www.snmp4windows.com