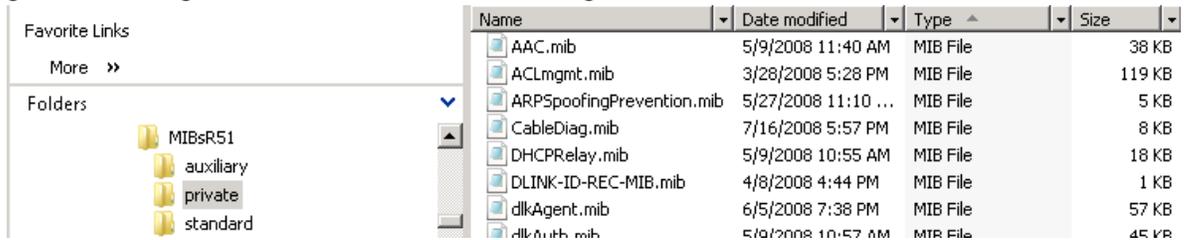# Creating user defined PNSM object types

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1. **Obtain MIB files matching the device(s) you want to access via PNSM**
   For this guide, I'm using a low-end *DLink DES-3526* managed switch as test device.

   MIB files for DLink DES-3526 downloaded from www.dlink.com

2. **Explore device with some MIB walker (e.g. JetView Pro)**
   You will probably need to import the custom MIB files into the MIB walker before you can "walk" the device. The MIB files may have internal dependencies forcing you to import additional files before the "hierarchy" is complete and can be walked.


   Values read off a DLink DES-3526 switch during walking, e.g. various SNTP (time) properties

3. **Compile MIB files into the PNSM server (the server running OPC DA Connector for the IT Server network)**
   Note: As a preparation, it is much recommended to study how the standard PNSM installation and PNSM Base library adds new MIBs as they are installed. The following example leave a lot to the reader to find out using Google, etc.

   The MIBs associated with the ready-made PNSM types are compiled by .BAT files executed during installation of base and type(s):
   - C:\Program Files\ABB Industrial IT\Optimize IT\PC, Network and Software Monitoring\MIBS\loadAllMIBS.bat
   - <PNSM Base ZIP>\install.bat
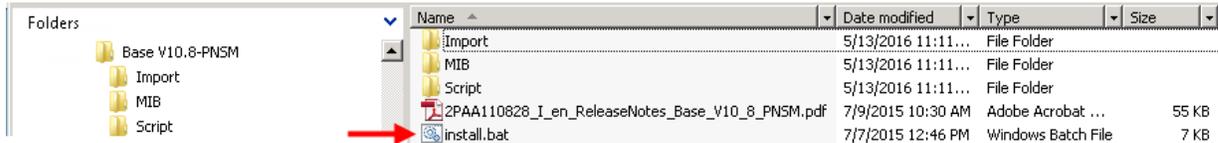
   The compilation is split into two steps:
   Step a) Convert MIB to MOF (tool="smi2smir.exe")
   Step b) Compile MOF into computer's SNMP repository (tool="mofcomp.exe")

   The complexity of this process depend on the size of the device's hierarchy, external files *included* with the device MIB download and files referenced but *not included* with the device MIB download. You may have to search/download additional MIB files to be able to compile. Before downloading, try searching the PNSM core and PNSM Base Library folders (listed above) – quite a number of standard MIBs are available there, e.g. the commonly used/referenced RFC1213 from C:\Program Files\ABB Industrial IT\Optimize IT\PC, Network and Software Monitoring\MIBS\General\rfc1213.mib

   To gain access to the DLINK-TIME-MIB we need to convert it into MOF (using smi2smir.exe) and subsequently compile into repository (using mofcomp.exe).

   DLINK-TIME-MIB references DLINK-ID-REC-MIB so we need to add it as argument when compiling:

```
DLINK-TIME-MIB DEFINITIONS ::= BEGIN

IMPORTS
      MODULE-IDENTITY, OBJECT-TYPE, IpAddress
          FROM SNMPv2-SMI
      DateAndTime, TruthValue , DisplayString
          FROM SNMPv2-TC
             dlink-common-mgmt
             FROM DLINK-ID-REC-MIB;
```

   Step a) Compile to MOF with smi2smir.exe:
```
C:\TEMP> smi2smir.exe /m 1 /g /ch DLK-TIME.mib DLINK-ID-REC-MIB.mib > DLK-TIME.mof
smi2smir.exe : Version <UnknownVersion> : MIB definitions compiled from "DLK-TIME.mib"
smi2smir.exe : Syntax Check successful on "DLK-TIME.mib"
smi2smir.exe : Version <UnknownVersion> : MIB definitions compiled from "DLINK-ID-REC-MIB.mib"
smi2smir.exe : Syntax Check successful on "DLINK-ID-REC-MIB.mib"
smi2smir.exe : Semantic Check successful on "DLK-TIME.mib"
smi2smir.exe: Generated MOF successfully
```

   Step b) Add MOF to the repository using mofcomp.exe:
```
C:\TEMP> mofcomp dlkTime.mof
Microsoft (R) MOF Compiler Version 6.0.6000.16386
Copyright (c) Microsoft Corp. 1997-2006. All rights reserved.
Parsing MOF file: DLK-TIME.mof
MOF file has been successfully parsed
Storing data in the repository...
…
Done!
```

4. Find desired properties in MIB file(s)

I have chosen a simple property, the IP-address of the primary external SNTP server in use:

```
…
        swSNTPServer1IPAddr OBJECT-TYPE
         SYNTAX   IpAddress
         MAX-ACCESS  read-write
         STATUS  current
         DESCRIPTION
             "Configure the SNTP server #1 IP address"
         ::= { swSNTP 3 }
…
```

The SNMP string (to be used in PNSM) becomes:

SNMP_DLINK_TIME_MIB_swSNTP=@.swSNTPServer1IPAddr

Hint: the SNMP class name above "xxx_swSNTP" can be found in the corresponding MOF file.

> …
> class SNMP_DLINK_TIME_MIB_swSNTP : SnmpObjectType
> …

To read array based properties (e.g. port statistics) you additionally need to find out the **index** variable name. As an example we can read some port statistics covered by a "standard" MIB called RFC1213.mib (note: only small parts of the large MIB file is included below)

```
        ifTable OBJECT-TYPE
            SYNTAX   SEQUENCE OF IfEntry
            ACCESS   not-accessible
            STATUS   mandatory
            DESCRIPTION
                    …
            ::= { interfaces 2 }

        ifEntry OBJECT-TYPE
            SYNTAX   IfEntry
            ACCESS   not-accessible
            STATUS   mandatory
            DESCRIPTION
                    …
            INDEX    { ifIndex }
            ::= { ifTable 1 }

        IfEntry ::=
            SEQUENCE {
              …
               ifMtu
                    INTEGER,
               ifSpeed
                    Gauge,
              …
               ifOperStatus
                    INTEGER,
             …
            }
```

The SNMP strings to read MTU, speed and operational status from port #1 then becomes:

SNMP_RFC1213_MIB_ifTable.ifIndex=1.ifMtu
SNMP_RFC1213_MIB_ifTable.ifIndex=1.ifSpeed
SNMP_RFC1213_MIB_ifTable.ifIndex=1.ifOperStatus

5. **Create a custom SNMP type object with corresponding IT asset configuration aspect**

    a) Below [Library Structure]PNSM Library/IT Status Devices/ROOT_SNMP, add your own custom SNMP type, e.g. "SNMP_DLINK_DES_3526". Then add some suitable sub-object, e.g. "SNMP_DLINK_MIB_test" to hold the desired data into a so called "IT Asset" type (which we will use later on – you may add more as you need dividing different properties into logical groups within your SNMP type), then add an *IT Device Configuration aspect* having a name beginning with "SNMP_xxx…" (the name is required to start with SNMP, or else it will not work).
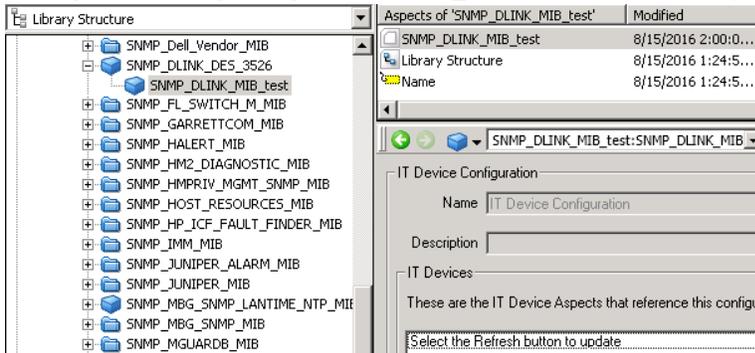
    b) Open the *Config View* of the *IT Device Configuration* aspect and add commonly used variables (called tokens) for IPAddress and SNMP Community using the white "New document" icon (hint: peek at some ready-made SNMP type nearby and copy their settings).

    c) Add the previously identified properties from the MIB using the yellow "Folder" icon. Again, peek at some ready-made object type to understand the settings (data type is crucial to get correct). Be careful with Update Rate to avoid overloading the PNSM OPC Server. Most ready-made object types uses 60000 ms. The "blue" icon with a plus sign (Additional information) can be used to set trend auto scaling properties (min, max, engineering unit and fraction).

    The ItemID shall look like this example (a fixed prefix with a suffix from the MIB file):
    wmi:@%IPAddress%:%Community%\\localhost\root\snmp\localhost:SNMP_DLINK_TIME_MIB_swSNTP=@.swSNTPServer1IPAddr

    To read array based data; use the previously identified array index variable like this:
    wmi:@%IPAddress%:%Community%\\localhost\root\snmp\localhost:SNMP_RFC1213_MIB_ifTable.ifIndex=1.ifOperStatus
    wmi:@%IPAddress%:%Community%\\localhost\root\snmp\localhost:SNMP_RFC1213_MIB_ifTable.ifIndex=1.ifSpeed
   wmi:@%IPAddress%:%Community%\\localhost\root\snmp\localhost:SNMP_RFC1213_MIB_ifTable.ifIndex=1.ifMtu
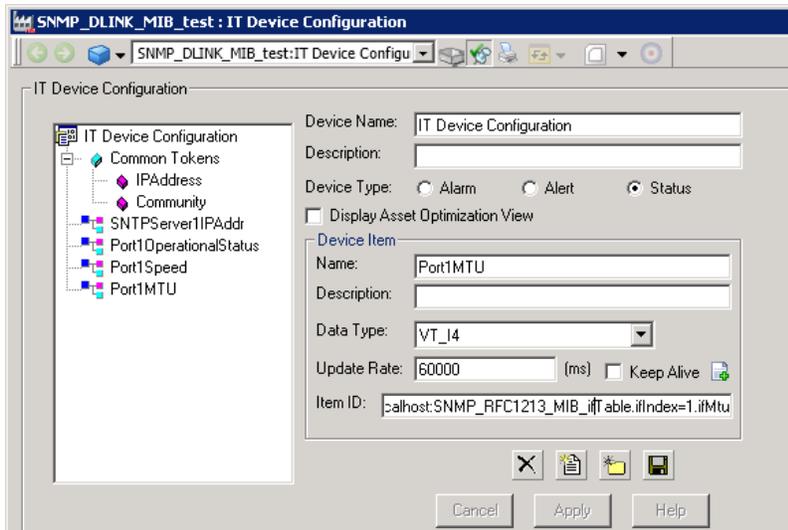
    Click the floppy disk icon, then Apply.

6. Create a new object type in the Object Type Structure

Note: For simplicity, I will not involve libraries, but it is recommended to put custom object types in libraries to ease the handling when exporting, import, productization, etc.

a) Create an *IT Device* aspect with a useful name (here I used "TestProperties" just for demonstration)

b) In *IT Device aspect*, click the "**…**" button and select the SNMP type created previously (an *IT General Property* aspect will automatically be added in this step)
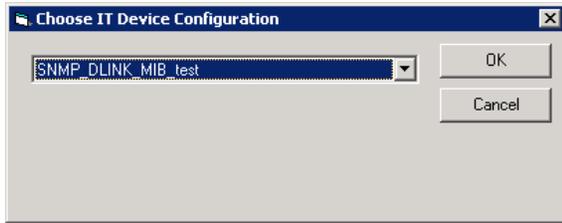
c) Add a *IT Device Manager* aspect and click the **Populate** button inside it (an *IT Control Connection* aspect will automatically be added in step)

d) On the *xxx Type Definition* aspect, enable **Copy to all instances** on the IT Device, IT Device Manager and IT General Property aspects (but not the IT Control Connection)

7. Create one instance of the new type below the IT Server network in the Control Structure

a) Update the *IT General Property* aspect with the IP address, and if needed the SNMP Community string.

b) Press the **Populate** button of the *IT Device Manager* aspect

c) Enable **Subscribe for live data** in the *IT Control Connection* aspect