Generating Skeleton Code for NETCONF Modules from SMI MIB Module Definitions

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Outline

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2. NETCONF
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3. Transforming MIBs to NETCONF modules
    1. Separation between state, config, and control data
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    3. Code generation
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SNMP Framework

Simple Network Management Protocol (SNMP)

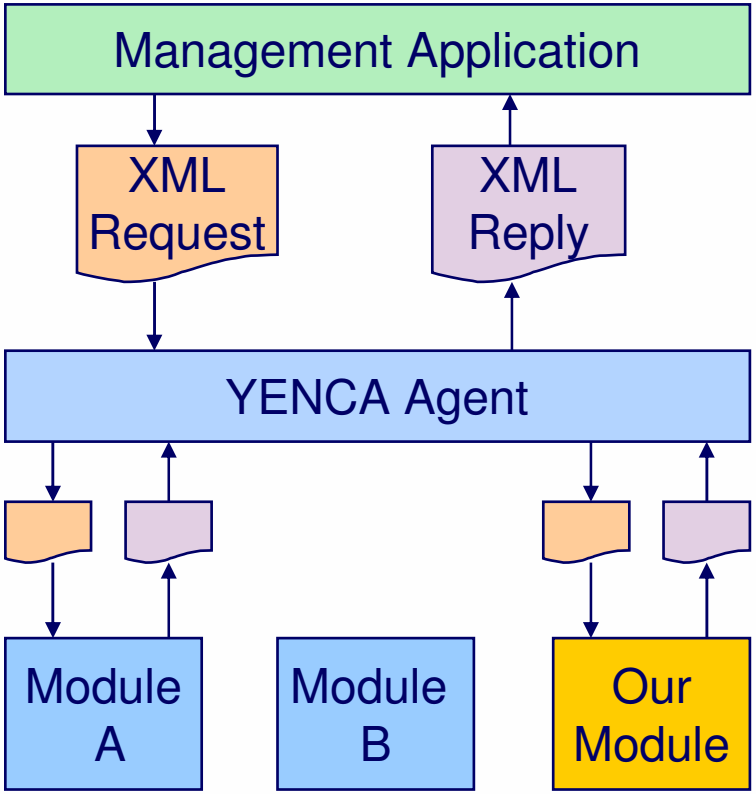
- Simple: small footprint (even in the late ´80s)
- Data Models
  - Structure of Management Information (SMI)
  - > 200 standard MIBs, >600 vendor MIBs
- Strength: Monitoring
- Weakness:
  - Low-level technology
  - Configuration

NETCONF Protocol

- Several evolutionary approaches failed
- New IETF protocol for configuration
  - XML-based RPC
  - Application protocol independent
- Existing mappings for application protocols
  - SSH
  - BEEP
  - SOAP
- Current status: Internet Draft

Yenca C NETCONF Agent

- NETCONF agent prototype
- From MADYNES Team (INRIA, France)
- Modular concept
  - Plug-in new modules
  - Loose coupling
  - Generate complete replys to incoming requests



Transforming MIBs to Yenca Modules

- Why?
  - No NETCONF data models available
  - Large number of MIBs already there
- What?
  - XML representation of data
- How?
  - Separate state, control, and configuration data
  - Generate C code

XML Data Representation

- Flattened element hierarchy
  - No deeply nested elements
  - Not more than 5 levels (except for „tables in tables“)

```
<rpc-reply message-id="101"
  xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
 <config>
  <snmpv2>
   <system>
    <sysContact>admin@l3s.de</sysContact>
    <sysName>aligator</sysName>
    <sysLocation>L3S, Hanover, Room 104</sysLocation>
   </system>
  </snmpv2>
 </config>
</rpc-reply>
```

Separation of Config, Control, and State Data

- Data types
  - Counters always state data
  - `RowStatus` objects can be ignored
- Access level
  - Read-only data must be state data
  - Writable objects: config or control data
    - No automatic distinction possible
    - Annotations in SMI needed (e.g. special keywords in the `DESCRIPTION` clauses or in a separate file)
    - Interactive script: generate annotations

Code Generation

- Module for smidump (MIB compiler that is part of libsmi).
- Generate module header file
  - Define a data structure for module specific data
  - Declare functions for
    - registration
    - saving and restoring configurations
    - data retrieval
    - agent notification
- Generate module source file
    - Generate Code for declared functions (automatically)
    - Generate skeleton functions for setting/retrieval

Conclusion & Outlook

DONE:

- Skeleton code for Yenca NETCONF modules can be generated from SMI MIB modules almost automatically
- XML data representation
- Providing good starting point for developers

TODO:

- Optimization of the generated code
- Implement script for SMI annotations
- In the long run: define new data models

THANKS!

Questions?