

Writing YANG Profiles

Example of using profiles of IEEE YANG
in Industrial Applications

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YANG Profile in IEC/IEEE 60802

- **Overview of IEC/IEEE 60802**
- Digital Data Sheet
- Managed Objects of 60802 IA-stations
- Diagnostics
- Q+A

IEC/IEEE 60802 – TSN Profile for Industrial Automation

- Objective: **Interoperability** of OT and IT traffic
 - network configuration
 - stream configuration and establishment
- Selects features, options, configurations, defaults, protocols and procedures of bridges, end stations and LANs
- A common, standardized configuration interface for IA-stations is crucial for interoperability
- Standardized security measures are required

NETCONF/YANG provides all mechanisms to meet these requirements

IEC/IEEE 60802 – IA-station



- Contains a management entity
- Can contain IA-controller and/or IA-device functionality
- Can be a simple end station as source of destination for control data traffic according to IEEE Std 802-2014
- Can contain a bridge component according to IEEE Std 802.1Q

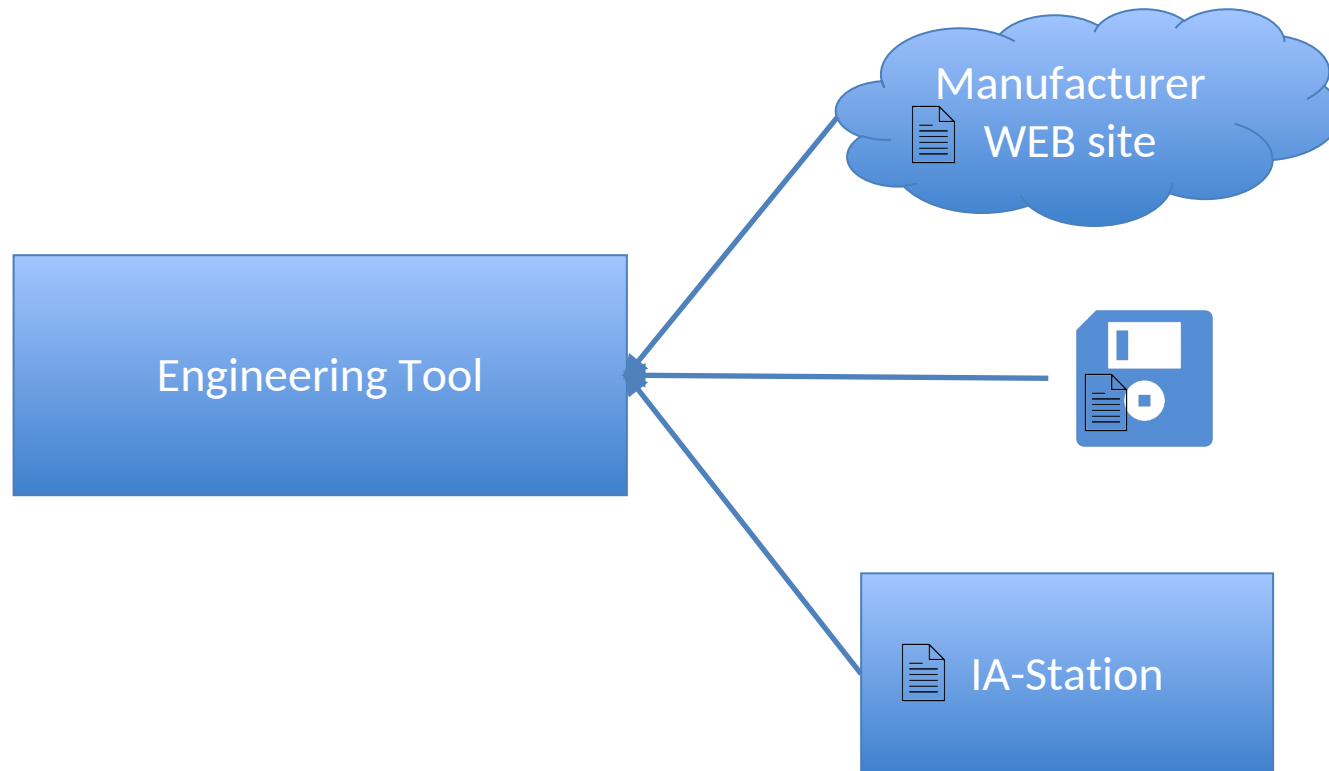
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Digital Data Sheet

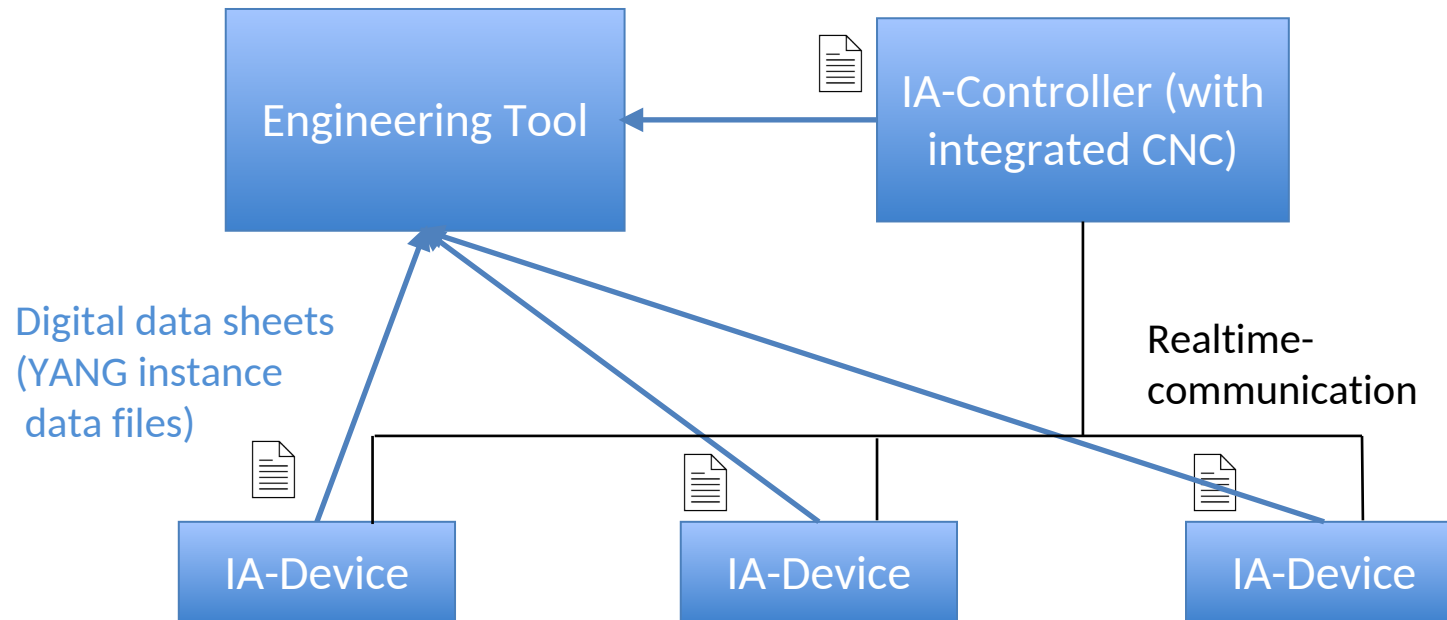
- Contains
 - capabilities
 - value ranges
 - quantities of IA-stations
- Modelled using YANG
- Online: the YANG instance data can be retrieved from the IA-stations
- Offline: in the form of a digital data sheet file
 - collection of all instantiated data nodes of all YANG modules (may be reduced to the minimum required nodes)
 - coding as XML file according to RFC 9195

How to obtain a Digital Data Sheet



- Download digital data sheet file from Manufacturer WEB site
- Load digital data sheet file from media, delivered with the device
- Read YANG instance data online from IA-Station

Obtaining Device Capabilities – Digital Data Sheet



- Engineering tool gathers capabilities of IA stations
- Engineering tool knows the structure of the YANG modules and reads required nodes

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Management

- Goal: Vendor-Independent management of IA stations for interoperability
- Selection of mandatory nodes for configuration out of IETF/IEEE YANG modules
- Selection of mandatory nodes for the digital data sheet
- Mandatory nodes are listed in the Std's Conformance-Section

Mandatory/Optional YANG Modules

ieee802-ethernet-
interface

ieee802-dot1ab-
lldp

ieee1588-ptp

ieee802-dot1as-
gptp

ieee802-dot1as-hs

ietf-keystore

ietf-truststore

ietf-netconf-acm

ietf-system-
capabilities

ietf-yang-library

ietf-subscribed-
notifications

ietf-notification-
capabilities

ietf-netconf-
monitoring

ietf-system

ietf-hardware

ietf-interfaces

ietf-dot1q-bridge

ieciieee60802-
ethernet-interface

ieciieee60802-
bridge

ieciieee60802-ia-
station

ietf-netconf-server

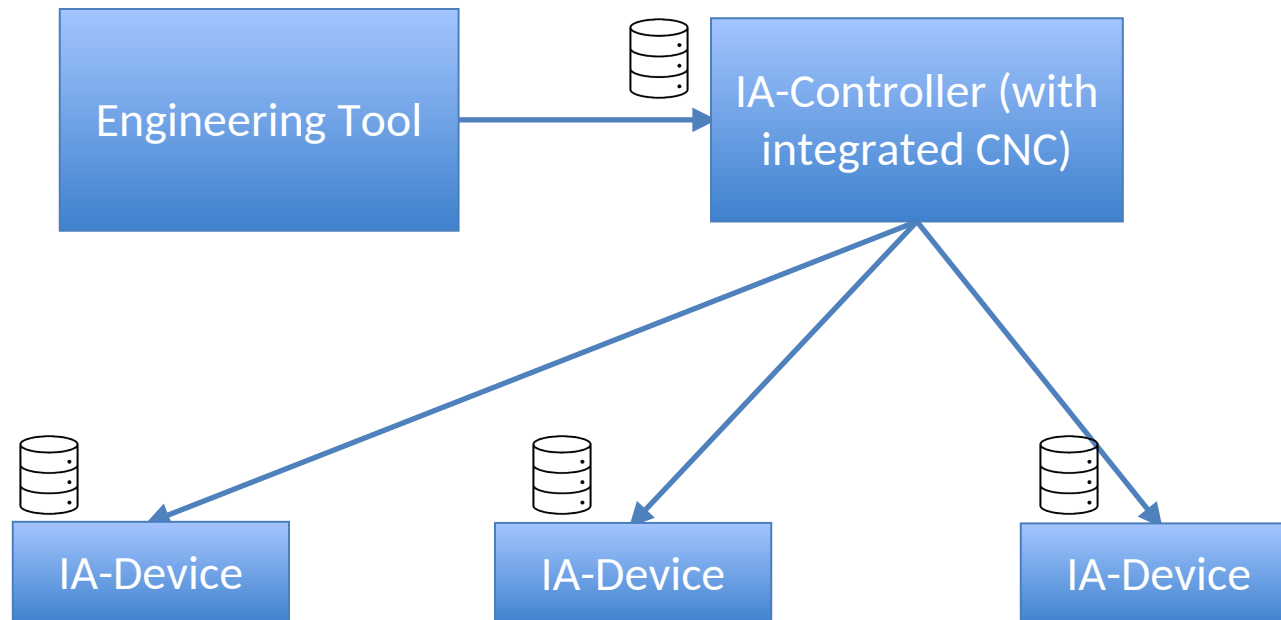
ieciieee60802-
subscribed-
notifications

ieee802-dot1cb-
stream-
identification

ieee802-dot1q-
psfp-bridge

ieee802-dot1q-
sched-bridge

Configuring Device Network Interfaces – NETCONF/YANG



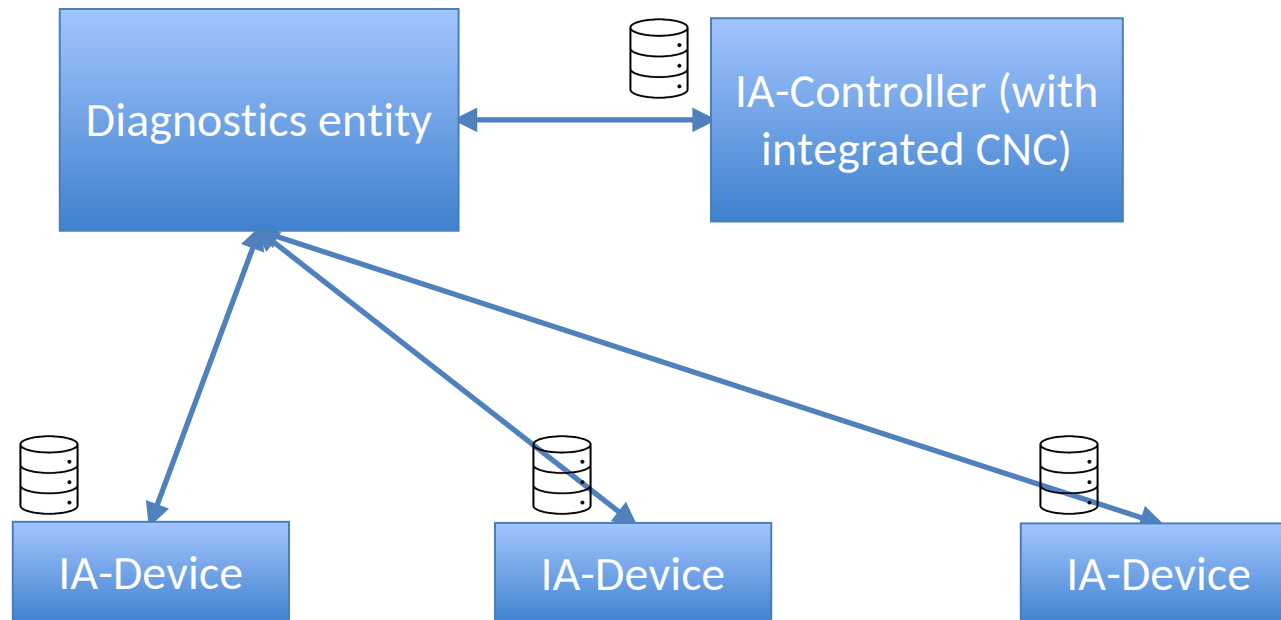
CNC northbound interface:
Used for manufacturer
specific configuration (with or
without streams)

CNC southbound interface:
Used for standardized
configuration via Managed
Objects (NETCONF/YANG)

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Obtain Diagnostics Information – YANG Push / NETCONF Notifications



Configure notifications in IA-stations and subscribes for diagnostic events:

- YANG-Push subscriptions according to IETF RFC 8641 (YANG Push) and
- IETF RFC 8639 (Subscribed Notifications)

Mandatory diagnostic data selection

- Selection of mandatory diagnostic data nodes:
 - Change of link-status per Ethernet port (/ietf-interfaces/interface-state/interface/oper-status)
 - Change of MAU-type per Ethernet port (/ieee802-ethernet-lldp/lldp/port/operational-mau-type)
 - Change of sync-status for ptp-instances
 - some selected Statistic counters

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