



Pydantify

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```
>>> qr = QRCode()  
>>> qr.add_data("https://www.linkedin.com/in/ubaumannch")  
>>> qr.print_ascii()
```





CLI config vs NETCONF

```
sw04-pod-6#conf t
Enter configuration commands, one per line.
End with CNTL/Z.

sw04-pod-6(config)#int gi1/0/24
sw04-pod-6(config-if)#mtu ?
<1500..9198>  MTU size in bytes
sw04-pod-6(config-if)#mtu 25000
^
% Invalid input detected at '^' marker.                                <rpc-error>
                                                               <error-type>application</error-type>
                                                               <error-tag>invalid-value</error-tag>
                                                               <error-severity>error</error-severity>
                                                               <error-path xmlns:t="http://example.com/schema/1.2/config">
                                                                 /t:top/t:interface[t:name="Ethernet0/0"]/t:mtu
                                                               </error-path>
                                                               <error-message xml:lang="en">
                                                                 MTU value 25000 is not within range 256..9192
                                                               </error-message>
                                                             </rpc-error>
```



How do engineers work with YANG?

```
1 <config>
2   <if:interfaces xmlns:if="urn:ietf:params:xml:ns:yang:ietf-interfaces">
3     {% for interface in vlan_interfaces %}
4       <if:interface>
5         <if:name>Vlanif{{ interface.name }}</if:name>
6         <if:description>uplink</if:description>
7         <if:type xmlns:iana-if-type="urn:ietf:params:xml:ns:yang:iana-if-type">iana-if-type:propVirtual</if:type>
8         <ip:ipv4 xmlns:ip="urn:ietf:params:xml:ns:yang:ietf-ip">
9           <ip:address>
10             <ip:ip>{{ interface.ip.split("/")@[0] }}</ip:ip>
11             <ip:prefix-length>{{ interface.ip.split("/")@[1] }}</ip:prefix-length>
12           </ip:address>
13         </ip:ipv4>
14       </if:interface>
15     {% endfor %}
16   </if:interfaces>
17 </config>
```



What I want I



What I want II

Netconf-XML_Artifact ready

Artifact Definition SRL_NetconfXML-Artifact Device leaf02

text

```
1 [
2 {
3     "srl_nokia-interfaces:interface": [
4         {
5             "srl_nokia-interfaces:name": "Loopback0",
6             "srl_nokia-interfaces:admin-state": "enable",
7             "srl_nokia-interfaces:subinterface": [
8                 {
9                     "srl_nokia-interfaces:index": 0,
10                    "srl_nokia-interfaces:ipv4": [
11                        "srl_nokia-interfaces:address": [
12                            {
13                                "srl_nokia-interfaces:ip-prefix": "10.255.255.1/32"
14                            }
15                        ]
16                    }
17                ]
18            ],
19        },
20        {
21            "srl_nokia-interfaces:name": "ethernet-1/1",
22            "srl_nokia-interfaces:description": "leaf02 to spine01",
23        }
24    ]
25},
26 {
27     "srl_nokia-interfaces:name": "ethernet-1/1",
28     "srl_nokia-interfaces:description": "leaf02 to spine01",
29 }
```

Raw



What I want III

- Python objects with typing, validation and documentation
- Consumable / as intuitive and user-friendly as possible
- IDE autocompletion
- IDE error checks
- IDE type-hints
- Serialization / Deserialization

Eco-System



- pyangbind
- ygot
- YANG Development Kit (ydk-gen)



How it started

- Midterm Project @ Eastern Switzerland University of Applied Sciences
Walther, Dominic and Jovicic, Dejan (2023)
Make Model Driven Network Automation Pythonic
<https://eprints.ost.ch/id/eprint/1089/>



Now

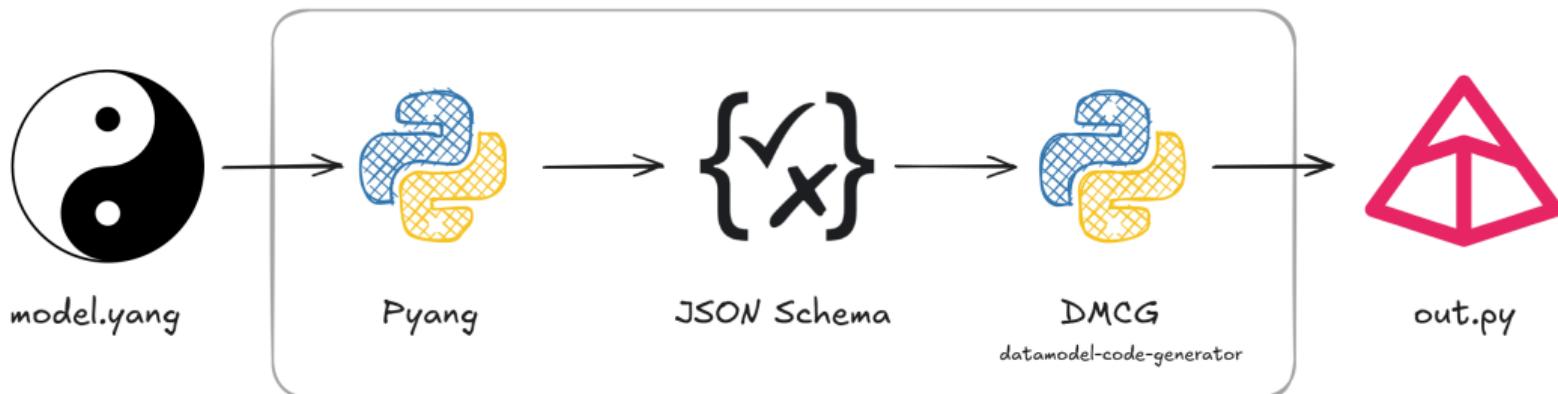
- <https://pydantify.github.io/pydantify/>
- <https://github.com/pydantify/pydantify>
- <https://pypistats.org/packages/pydantify>



- <https://github.com/srl-labs/pydantic-srlinux/>
experimental project
- <https://www.youtube.com/watch?v=CM3sT55zwto>
How can you use Pydantify? – Roman Dodin (Nokia)



Pydantify



YANG model



```
module my-endpoint {
    namespace
        "http://pydantify/ns/yang/pydantify-endpoint";
    prefix "ep";

    description 'Example model';

    typedef port {
        type uint16 {
            range "1 .. 65535";
        }
    }

    container endpoint {
        description "Definition of a endpoint";
    }
}

leaf address {
    type string;
    description "Endpoint address. IP or FQDN";
    mandatory true;
}
leaf port {
    type port;
    description "Port number between 1 and 65535";
    mandatory true;
}
leaf description {
    type string;
    description "Endpoint description";
}
```



YANG tree + JSON example

```
module: my-endpoint
  +-rw endpoint
    +-rw address      string
    +-rw port         port
    +-rw description? string
{
  "my-endpoint:endpoint": {
    "address": "::1",
    "port": 2222,
    "description": "Port 2222 on localhost"
  }
}
```



Create JSON data the pythonic way

```
from endpoint import Model, EndpointContainer

port = 8080
host = "localhost"

endpoint1 = Model(endpoint=EndpointContainer(address=host, port=port))
json_output = endpoint1.model_dump_json(indent=2, exclude_none=True)
```



Pydantic Model

```
class EndpointContainer(BaseModel):
    """
    Definition of a endpoint
    """

    model_config = ConfigDict(populate_by_name=True, regex_engine="python-re")
    address: Annotated[str, Field(alias="my-endpoint:address", title="AddressLeaf")]
    """

    Endpoint address. IP or FQDN
    """

    port: Annotated[
        int, Field(alias="my-endpoint:port", ge=1, le=65535, title="PortLeaf")
    ]
    """

    Port number between 1 and 65535
    """

    description: Annotated[
        Optional[str], Field(alias="my-endpoint:description", title="DescriptionLeaf")
    ] = None
    """

    Endpoint description
    """
```



Challanges / not supported

- Pydantify: YANG > Pyyang > **JSONSchema** > DMGC > Pydantic
- Context-aware validation
- must / if / ...
- xPath
- bits / decimal64 representation
- RegEx

Questions?

