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Lab Session: YANG

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Problem Y.1: *connecting to meat and finding software*

(5 minutes)

The YANG experiments will be done on `meat.eecs.jacobs-university.de`:

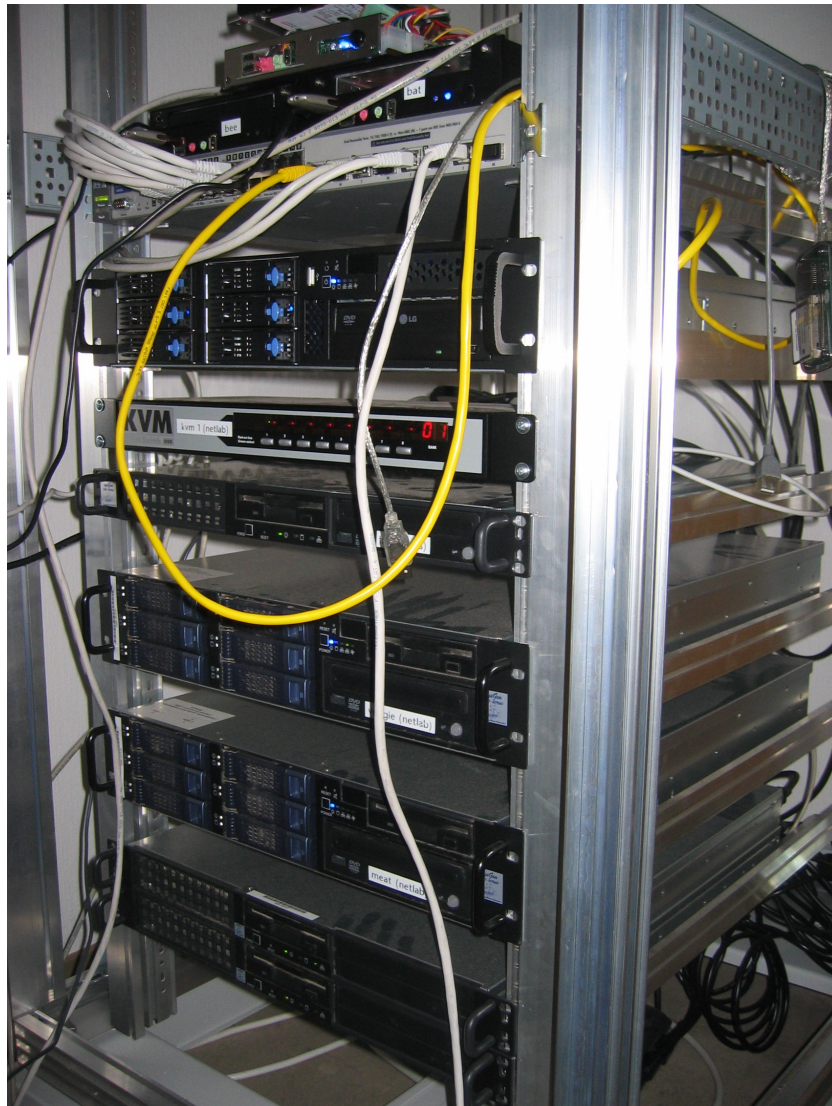
a) Log into `meat.eecs.jacobs-university.de` using

```
ssh <username>@meat.eecs.jacobs-university.de
```

b) On `meat`, you can run the programs `pyang`, `xmllint`, and several different editors (`emacs`, `vim`, ...). For help about how to use the programs, use the following commands:

```
pyang --help
```

```
xmllint --help  
man xmllint
```



Problem Y.2: YANG leafs, leaf-lists, lists, container

(10 minutes)

Consider the following four YANG fragments (1),..., (4):

```
container a;      leaf a {          leaf-list a {      list a {
                  type empty;      type string;      key b;
                  }                }                leaf b {
                                }                type empty;
                                }                }
                                }
```

Explain against which of the four YANG fragments the following XML fragments can be validated.

- a) <a/>
 - b) <a>
 - c) <a><a/>
 - d) <a>b
 - e) <a>b<a>c
 - f) <a>
-

Problem Y.3: YANG groupings and choices

(10 minutes)

Consider the following YANG module:

```
module foo {  
  
    namespace "urn:foo";  
    prefix foo;  
  
    grouping x {  
        choice d {  
            case e {  
                leaf f { type empty; }  
            }  
            case g {  
                leaf h { type string; }  
            }  
        }  
    }  
  
    container a {  
        list b {  
            key c;  
            leaf c { type uint8; }  
            uses x;  
            // uses x { choice d { mandatory true; } }  
        }  
    }  
}
```

Which of the following XML documents are valid?

- a) `<c>42</c><f/>`
- b) `<c>42</c><h>a</h>`
- c) `<c>42</c><f>a</f>`
- d) `<c>424</c><f></f>`
- e) `<c>42</c><e><f/></e>`
- f) `<c>42</c><d><f/></d>`
- g) `<c>42</c><d><e><f/></e></d>`
- h) `<c>42</c>`

How do your answers change if the line `uses x`; is replaced with the following line?

```
uses x { choice d { mandatory true; } }
```

Problem Y.4: YANG module for VLANs

(20 minutes)

Consider the following XML document representing the configuration of VLANs:

```
<bridge>
  <vlan-capacity>128</vlan-capacity>
  <vlans>
    <vlan>
      <id>1234</id>
      <name>engineering</name>
      <egress-ports>
        <port>2</port>
        <port>4</port>
      </egress-ports>
      <untagged-ports>
        <port>2</port>
      </untagged-ports>
      <status>active</status>
    </vlan>
    <vlan>
      <id>4321</id>
      <name>research</name>
      <egress-ports>
        <port>5</port>
        <port>7</port>
      </egress-ports>
      <untagged-ports>
        <port>7</port>
      </untagged-ports>
      <status>busy</status>
    </vlan>
  </vlans>
</bridge>
```

- a) Write a YANG module representing a possible data model for the VLAN configuration. Try to use reusable constructs.
 - b) Check your YANG module using `pyang`, fixing errors as needed.
 - c) Convert the YANG module to XML schema using `pyang`.
 - d) Use `xmllint` to validate the instance document against the XML schema.
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Problem Y.5: *VLAN statistics module augmenting the VLAN module*

(15 minutes)

Write a second YANG module which extends the VLAN list by providing basic statistics such as the count of octets transmitted / received per VLAN. Check the module using `pyang`.

References

- [1] M. Bjorklund. YANG - A data modeling language for NETCONF. Internet Draft (work in progress) <draft-ietf-netmod-yang-00.txt>, Tail-f Systems, May 2008.
- [2] J. Schönwälder. Common YANG Data Types. Internet Draft (work in progress) <draft-schoenw-netmod-yang-types-00.txt>, Jacobs University, May 2008.
- [3] Yang Design Team. Yang Central Web Site. Available at <http://www.yang-central.org/>, 2008. Last accessed May 2008.