```
user@box:~/demo$ sudo pip3 install pyang plantuml
[sudo] password for user:
/usr/local/lib/python3.8/dist-packages/pkg_resources/__init__.py:122: PkgResourcesDeprecationWarning: 0.23ubuntu1 is an
 invalid version and will not be supported in a future release
  warnings.warn(
/usr/local/lib/python3.8/dist-packages/pkg_resources/__init__.py:122: PkgResourcesDeprecationWarning: 0.1.36ubuntu1 is
an invalid version and will not be supported in a future release
  warnings.warn(
Collecting pyang
  Downloading pyang-2.5.3-py2.py3-none-any.whl (592 kB)
     |████████████████████████████████| 592 kB 4.3 MB/s
Collecting plantuml
  Downloading plantuml-0.3.0-py3-none-any.whl (5.8 kB)
Collecting lxml
  Downloading lxml-4.8.0-cp38-cp38-manylinux_2_17_x86_64.manylinux2014_x86_64.manylinux_2_24_x86_64.whl (6.9 MB)
     |████████████████████████████████| 6.9 MB 4.6 MB/s
Requirement already satisfied: httplib2 in /usr/lib/python3/dist-packages (from plantuml) (0.14.0)
Installing collected packages: lxml, pyang, plantuml
Successfully installed lxml-4.8.0 plantuml-0.3.0 pyang-2.5.3
```

```
user@box:~/demo$ mkdir ~/demo2
user@box:~/demo$ cd ..
user@box:~$ cp ~/iot/lesson9/intrusiondetection.yang ~/demo2
user@box:~$ cd ~/demo2
user@box:~/demo2$ cat intrusiondetection.yang
module intrusiondetection {

 namespace "http://netconfcentral.org/ns/intrusiondetection";

 prefix "intrusion";

 description
  "YANG module for Intrusion Detection IoT system";

 revision 2014-07-15 {
  description "Intrusion Detection System";
 }

 grouping room {
  leaf doorsensorID {
   type string;
   description
    "ID of door sensor in the room";
  }
  leaf motionsensorID {
   type string;
   description
    "ID of motion sensor in the room";
  }
 }
```

```
container intrusiondetection {
 presence
  "Indicates the service is available";

 description
  "Top-level container for all system objects.";

 leaf systemID {
  type string;
  config false;
  mandatory true;
  description
  "ID of the system";
 }

 leaf systemLocation {
  type string;
  config false;
  mandatory true;
  description
  "The location of the system";
 }

 leaf systemStatus {
  type enumeration {
   enum up {
   value 1;
   description
    "This is powered up";
   }
```

```
   enum down {
   value 2;
   description
    "This is powered down";
   }
   enum armed {
   value 3;
   description
    "This is armed";
   }
   enum disarmed {
   value 4;
   description
    "This is disarmed";
   }
  }
  config false;
  mandatory true;
  description
  "This variable indicates the current state of
   the system.";
 }
   container sensors {
  uses room;
  config false;
 }
}
```

```
rpc arm-system {
 description
  "Arm the system";
}

rpc disarm-system {
 description
  "Disarm the system";
}

notification systemArmed {
 description
  "Indicates that system has been armed.";

 leaf armStatus {
  description
   "Indicates the system arming status";

  type enumeration {
   enum armed {
   description
    "The system was armed.";
   }

   enum disarmed {
   description
    "The system was disarmed.";
   }

   enum error {
   description
    "The system is broken.";
```

```
user@box:~/demo2$ pyang -f yin -o intrusiondetection.yin intrusiondetection.yang
user@box:~/demo2$ cat intrusiondetection.yin
<?xml version="1.0" encoding="UTF-8"?>
<module name="intrusiondetection"
        xmlns="urn:ietf:params:xml:ns:yang:yin:1"
        xmlns:intrusion="http://netconfcentral.org/ns/intrusiondetection">
  <namespace uri="http://netconfcentral.org/ns/intrusiondetection"/>
  <prefix value="intrusion"/>
  <description>
    <text>YANG module for Intrusion Detection IoT system</text>
  </description>
  <revision date="2014-07-15">
    <description>
      <text>Intrusion Detection System</text>
    </description>
  </revision>
  <grouping name="room">
    <leaf name="doorsensorID">
      <type name="string"/>
      <description>
        <text>ID of door sensor in the room</text>
      </description>
    </leaf>
    <leaf name="motionsensorID">
      <type name="string"/>
      <description>
        <text>ID of motion sensor in the room</text>
      </description>
    </leaf>
  </grouping>
  <container name="intrusiondetection">
    <presence value="Indicates the service is available"/>
```

```
user@box:~/demo2$ pyang -f uml -o intrusiondetection.uml intrusiondetection.yang --uml-no=stereotypes,annotation,typedef
user@box:~/demo2$ cat intrusiondetection.uml
'Download plantuml from http://plantuml.sourceforge.net/
'Generate png with java -jar plantuml.jar <file>
'Output in img/<module>.png
'If Java spits out memory error increase heap size with java -Xmx1024m  -jar plantuml.jar <file>
@startuml img/intrusiondetection.png
hide empty fields
hide empty methods
hide <<case>> circle
hide <<augment>> circle
hide <<choice>> circle
hide <<leafref>> stereotype
hide <<leafref>> circle
hide stereotypes
page 1x1
Title intrusiondetection
package "intrusion:intrusiondetection" as intrusion_intrusiondetection {
class "intrusiondetection" as intrusiondetection << (M, #33CCFF) module>>
class "room" as intrusiondetection_I_room_grouping <<(G,Lime) grouping>>
intrusiondetection_I_room_grouping : doorsensorID : string
intrusiondetection_I_room_grouping : motionsensorID : string
class "intrusiondetection" as  intrusiondetection_I_intrusiondetection <<container>>
intrusiondetection *-- "0..1" intrusiondetection_I_intrusiondetection
intrusiondetection_I_intrusiondetection : systemID : string   {mandatory} {Config : false}
intrusiondetection_I_intrusiondetection : systemLocation : string   {mandatory} {Config : false}
intrusiondetection_I_intrusiondetection : systemStatus : enumeration : {up,down,armed,...}   {mandatory} {Config : false}
class "sensors" as  intrusiondetection_I_intrusiondetection_I_sensors <<container>>
intrusiondetection_I_intrusiondetection *-- "1" intrusiondetection_I_intrusiondetection_I_sensors
intrusiondetection_I_intrusiondetection_I_sensors : room {uses}
```

```
user@box:~/demo2$ cat intrusiondetection.uml
'Download plantuml from http://plantuml.sourceforge.net/
'Generate png with java -jar plantuml.jar <file>
'Output in img/<module>.png
'If Java spits out memory error increase heap size with java -Xmx1024m  -jar plantuml.jar <file>
@startuml img/intrusiondetection.png
hide empty fields
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hide <<case>> circle
hide <<augment>> circle
hide <<choice>> circle
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hide <<leafref>> circle
hide stereotypes
page 1x1
Title intrusiondetection
package "intrusion:intrusiondetection" as intrusion_intrusiondetection {
class "intrusiondetection" as intrusiondetection << (M, #33CCFF) module>>
class "room" as intrusiondetection_I_room_grouping <<(G,Lime) grouping>>
intrusiondetection_I_room_grouping : doorsensorID : string
intrusiondetection_I_room_grouping : motionsensorID : string
class "intrusiondetection" as  intrusiondetection_I_intrusiondetection <<container>>
intrusiondetection *-- "0..1" intrusiondetection_I_intrusiondetection
intrusiondetection_I_intrusiondetection : systemID : string   {mandatory} {Config : false}
intrusiondetection_I_intrusiondetection : systemLocation : string   {mandatory} {Config : false}
intrusiondetection_I_intrusiondetection : systemStatus : enumeration : {up,down,armed,...}   {mandatory} {Config : fals
e}
class "sensors" as  intrusiondetection_I_intrusiondetection_I_sensors <<container>>
intrusiondetection_I_intrusiondetection *-- "1" intrusiondetection_I_intrusiondetection_I_sensors
intrusiondetection_I_intrusiondetection_I_sensors : room {uses}
intrusiondetection : arm-system()
```
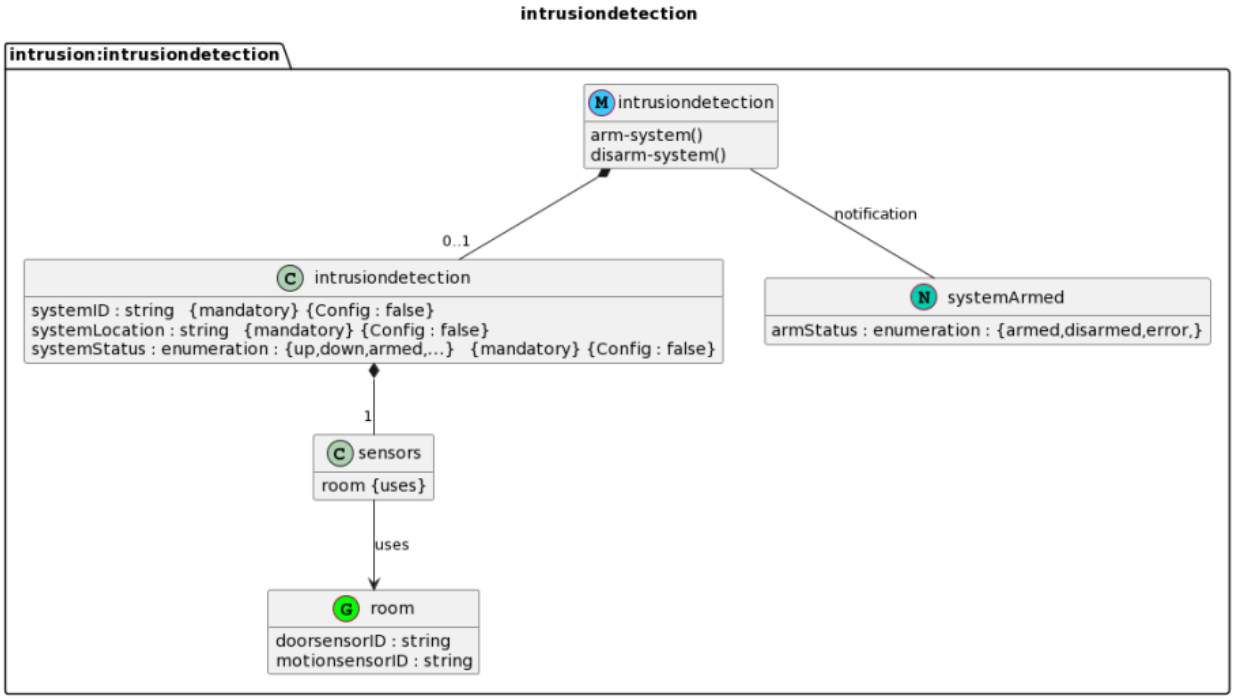

```
hide stereotypes
page 1x1
Title intrusiondetection
package "intrusion:intrusiondetection" as intrusion_intrusiondetection {
class "intrusiondetection" as intrusiondetection << (M, #33CCFF) module>>
class "room" as intrusiondetection_I_room_grouping <<(G,Lime) grouping>>
intrusiondetection_I_room_grouping : doorsensorID : string
intrusiondetection_I_room_grouping : motionsensorID : string
class "intrusiondetection" as  intrusiondetection_I_intrusiondetection <<container>>
intrusiondetection *-- "0..1" intrusiondetection_I_intrusiondetection
intrusiondetection_I_intrusiondetection : systemID : string   {mandatory} {Config : false}
intrusiondetection_I_intrusiondetection : systemLocation : string   {mandatory} {Config : false}
intrusiondetection_I_intrusiondetection : systemStatus : enumeration : {up,down,armed,...}   {mandatory} {Config : fals
e}
class "sensors" as  intrusiondetection_I_intrusiondetection_I_sensors <<container>>
intrusiondetection_I_intrusiondetection *-- "1" intrusiondetection_I_intrusiondetection_I_sensors
intrusiondetection_I_intrusiondetection_I_sensors : room {uses}
intrusiondetection : arm-system()
intrusiondetection : disarm-system()
class "systemArmed" as intrusiondetection_I_systemArmed << (N,#00D1B2) notification>>
intrusiondetection -- intrusiondetection_I_systemArmed : notification
intrusiondetection_I_systemArmed : armStatus : enumeration : {armed,disarmed,error,}
}

intrusiondetection_I_intrusiondetection_I_sensors --> intrusiondetection_I_room_grouping : uses
center footer
 <size:20> UML Generated : 2022-05-14 22:35 </size>
 endfooter
@enduml
user@box:~/demo2$ python3 -m plantuml intrusiondetection.uml
[{'filename': 'intrusiondetection.uml', 'gen_success': True}]
```




```
user@box:~/demo2$ pip3 install qiskit[visualization]
/usr/local/lib/python3.8/dist-packages/pkg_resources/__init__.py:122: PkgResourcesDeprecationWarning: 0.23ubuntu1 is an
 invalid version and will not be supported in a future release
  warnings.warn(
/usr/local/lib/python3.8/dist-packages/pkg_resources/__init__.py:122: PkgResourcesDeprecationWarning: 0.1.36ubuntu1 is
an invalid version and will not be supported in a future release
  warnings.warn(
Collecting qiskit[visualization]
  Downloading qiskit-0.36.1.tar.gz (13 kB)
Collecting qiskit-terra==0.20.1
  Downloading qiskit_terra-0.20.1-cp38-cp38-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (6.5 MB)
     |████████████████████████████████| 6.5 MB 1.2 MB/s
Collecting qiskit-aer==0.10.4
  Downloading qiskit_aer-0.10.4-cp38-cp38-manylinux_2_12_x86_64.manylinux2010_x86_64.whl (18.0 MB)
     |████████████████████████████████| 18.0 MB 159 kB/s
Collecting qiskit-ibmq-provider==0.19.1
  Downloading qiskit_ibmq_provider-0.19.1-py3-none-any.whl (240 kB)
     |████████████████████████████████| 240 kB 19.5 MB/s
Collecting qiskit-ignis==0.7.0
  Downloading qiskit_ignis-0.7.0-py3-none-any.whl (200 kB)
     |████████████████████████████████| 200 kB 19.9 MB/s
Collecting matplotlib>=2.1
  Downloading matplotlib-3.5.2-cp38-cp38-manylinux_2_5_x86_64.manylinux1_x86_64.whl (11.3 MB)
     |████████████████████████████████| 11.3 MB 4.9 MB/s
Collecting ipywidgets>=7.3.0
  Downloading ipywidgets-7.7.0-py2.py3-none-any.whl (123 kB)
     |████████████████████████████████| 123 kB 25.6 MB/s
Collecting pydot
  Downloading pydot-1.4.2-py2.py3-none-any.whl (21 kB)
Requirement already satisfied: pillow>=4.2.1 in /usr/lib/python3/dist-packages (from qiskit[visualization]) (7.0.0)
Collecting pylatexenc>=1.4
  Downloading pylatexenc-2.10.tar.gz (162 kB)
```

```
user@box:~/iot/lesson9$ python3 qiskit_ignis_example.py
qiskit_ignis_example.py:6: DeprecationWarning: The qiskit.ignis package is deprecated and has been superseded by the q
iskit-experiments project. Refer to the migration guide: https://github.com/Qiskit/qiskit-ignis#migration-guide on how
to migrate to the new project.
  from qiskit.ignis.verification.randomized_benchmarking import randomized_benchmarking_seq, RBFitter
^After seed 0, EPC 0.005801
C
After seed 1, EPC 0.005073
After seed 2, EPC 0.005797
After seed 3, EPC 0.005931
After seed 4, EPC 0.006017
```