



Guilin IBN PoC: An Vertical Industry Use Case

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Agenda

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- ONAP with Intent for Vertical Industry
 - Business Intent Input & Translation
 - Network Intent Load & Translation
 - Invoke the corresponding ONAP operation
 - Intent Implementation Complete
- Summary

Background

More and more vertical industries benefits from 5G network in different ways. For example, warehouse management industry can deploy 5G network and AGVs to achieve fully automatic management and transportation of goods which will greatly improve efficiency and reduce cost.

The output volume of warehouse management industry varies in different time. It may have a sharp rise in some time (e.g. Online Shopping Festival). At normal time, warehouse management industry can deactivate some AGVs and scale down the 5G network to save energy. When need to increase output volume, they can activate AGVs and scale up the 5G network dynamically.

Base on the fact that most vertical industries lack of experience and ability to manage the 5G network, it requires an automated and smart solution which can help vertical industry to manage 5G network according to their business needs.



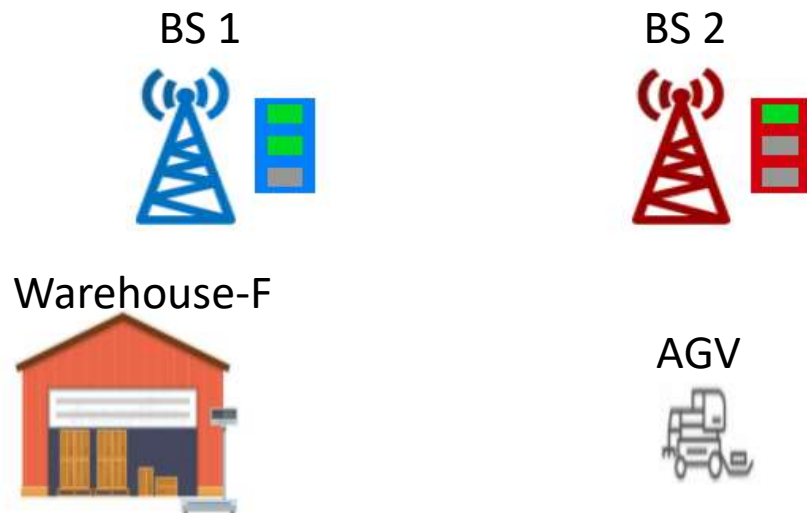
In R7, Intent technology was proposed as a proof-of-concept (REQ-329: <https://jira.onap.org/browse/REQ-329>).

In this PoC demo, we will present how ONAP with intent technology support warehouse management industry to manage their 5G network according to their business intent.

ONAP with Intent for Vertical Industry

Scenario Description:

An e-commerce and smart logistics company A has multiple warehouses in a city and its Warehouse-F is responsible for smart warehouse. Two base stations (BS 1&2) are deployed to support the connections of AGVs to 5G Network for Warehouse-F. Each base station was pre-configured three cells. Assuming that each cell can support the connections of 100 AGVs.



At normal time, the output volume of Warehouse-F is about 30000 per hour. It requires:

- Active AGV: 300
- Active Cell: 3



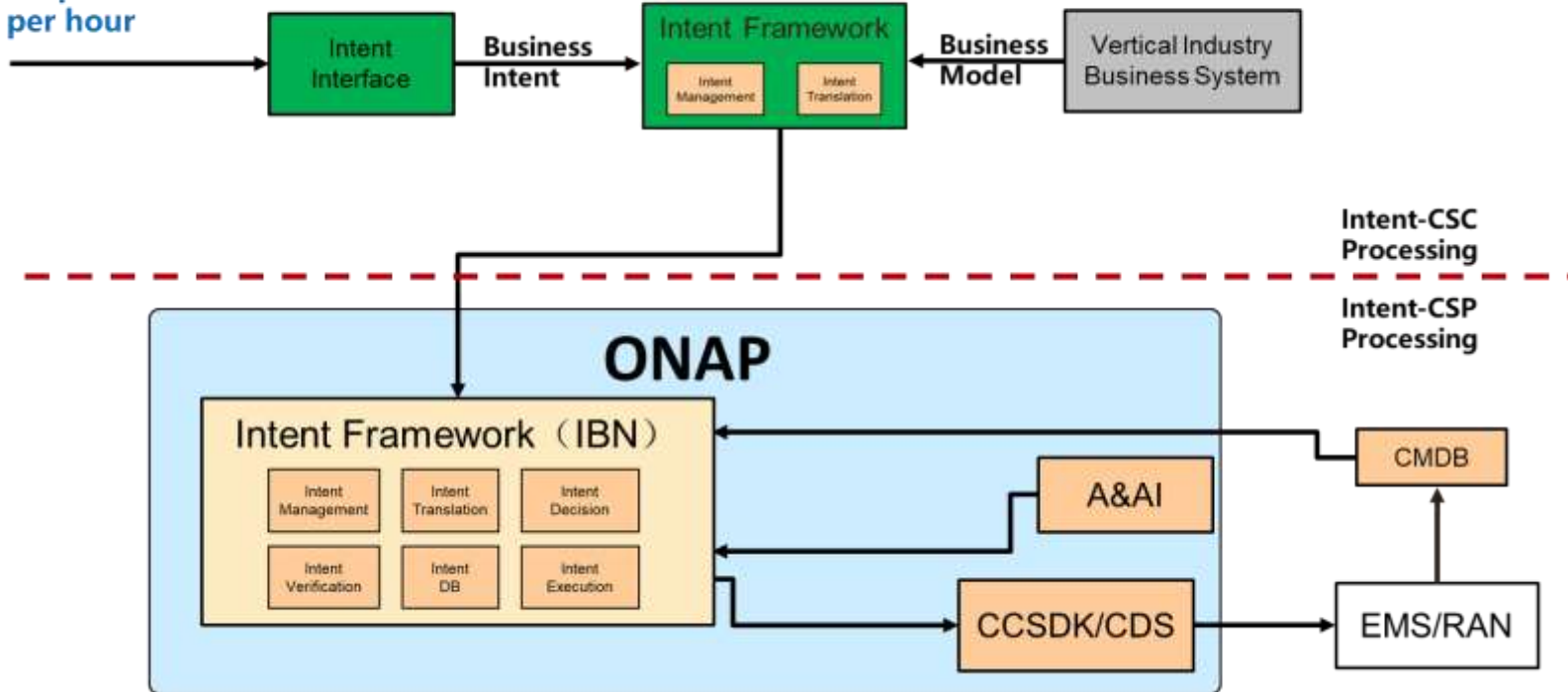
At peak time, the output volume of Warehouse-F is about 40000 per hour. It requires:

- Active AGV: 400
- Active Cell: 4

Business Intent Input & Translation

1. Warehouse manager input the business intent through UI : Increase the output volume to 40000 per hour

Intent Framework(Intent Translation) processes the business intent:
2. Decide the number of AGVs to achieve that output volume;
3. Translate into network intent: Provide 400 UE connections in Warehouse-F

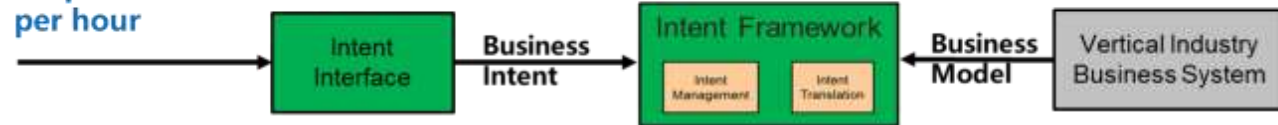


1. Intent Interface: The vertical industry manager use this interface to input business intent.
2. Intent Framework: used to translate business intent into network intent step by step.

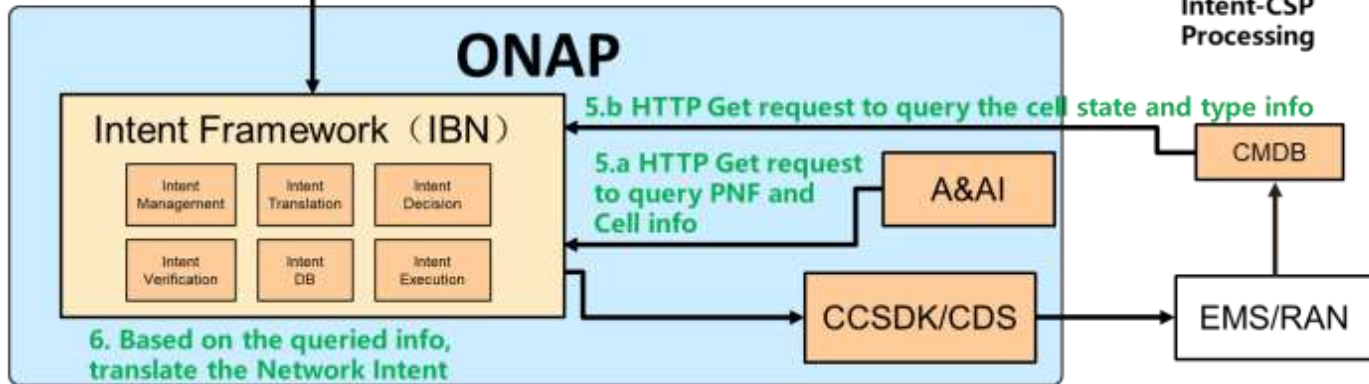
Network Intent Load & Translation 1/2

1. Warehouse manager input the business intent through UI : Increase the output volume to 40000 per hour

Intent Framework(Intent Translation) processes the business intent:
 2. Decide the number of AGVs to achieve that output volume;
 3. Translate into network intent: Provide 400 UE connections in Warehouse-F



4. HTTP POST request to Load the Network Intent: : The Network Deployed in WareHouse F provides connection service for 400 UEs



4. Send Network Intent (Intent-CSP) into ONAP Intent Framework (IBN):

```

    POST
    {
      "immediate": True,
      "intentExpression": {
        "Provision": {
          "max[ENumber": "400"],
          "Area": {
            "areaName": "warehouse-F"
          }
        }
      },
      "callbackUrl": "http://10.160.39.166:8090/ONAP/Intent/Intent-1"
    }
  
```

5a. ONAP IBN use RESTful API to query A&AI for PNF and Cell info:

```

    curl -s -k -u "AAI:AAI" -H "X-FromAppId: aalrest" -H "X-TransactionId: 1001" -H
    "Content-Type: application/json" -H "Accept: application/json" -X GET https://10.
    calhost:8443/aai/v14/network/pnfs?equip-location=warehouse-F | python -m json.too
    l
    {
      "pnf": [
        {
          "equip-location": "Warehouse-F",
          "equip-vendor": "hw",
          "in-maint": false,
          "nf-role": "BS",
          "pnf-name": "pnf1",
          "resource-version": "1603868322942"
        },
        {
          "equip-location": "Warehouse-F",
          "equip-vendor": "hw",
          "in-maint": false,
          "nf-role": "BS",
          "pnf-name": "pnf2",
          "resource-version": "1603868396047"
        }
      ]
    }
  
```

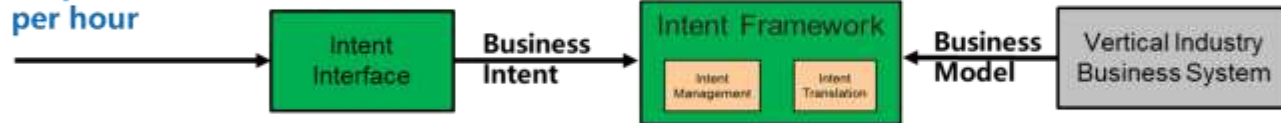
```

    curl -s -k -u "AAI:AAI" -H "X-FromAppId: aalrest" -H "X-TransactionId: 1001" -H
    "Content-Type: application/json" -H "Accept: application/json" -X GET https://10.
    calhost:8443/aai/v14/network/ran-resources/ran-resource-info/pnf1 | python -m js
    on.tool
    {
      "cell-local-ids": "cell1,cell2,cell3",
      "pnf-name": "pnf1",
      "resource-version": "1603868443963"
    }
  
```


Network Intent Load & Translation 2/2

1. Warehouse manager input the business intent through UI : Increase the output volume to 40000 per hour

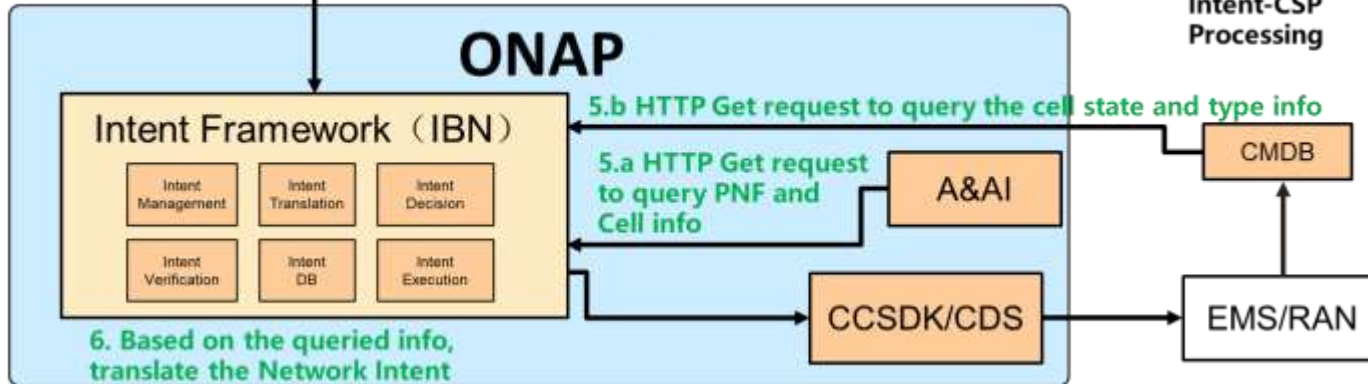
Intent Framework(Intent Translation) processes the business intent:
 2. Decide the number of AGVs to achieve that output volume;
 3. Translate into network intent: Provide 400 UE connections in Warehouse-F



4. HTTP POST request to Load the Network Intent : The Network Deployed in WareHouse F provides connection service for 400 UEs

Intent-CSC Processing

Intent-CSP Processing



5.b ONAP IBN use RESTful request to query the corresponding Cell state and type info

```

    ubuntu@wyg-node:~/onap/CMDB$ curl http://192.168.30.110:5000/cmdb/nrcellId
    {"data":[{"cellLocalId":"cell1","cellState":"ACTIVE","operationalState":"ENABLED"}, {"cellLocalId":"cell2","cellState":"ACTIVE","operationalState":"ENABLED"}, {"cellLocalId":"cell3","cellState":"INACTIVE","operationalState":"DISABLED"}, {"cellLocalId":"cell4","cellState":"ACTIVE","operationalState":"ENABLED"}, {"cellLocalId":"cell5","cellState":"INACTIVE","operationalState":"DISABLED"}, {"cellLocalId":"cell6","cellState":"INACTIVE","operationalState":"DISABLED"}]}
    
```

```

    ubuntu@wyg-node:~/onap/CMDB$ curl http://192.168.30.110:5000/cmdb/cellCap/BS/hw/5gdu
    {"cellType":"5gdu","neName":"BS","neNum":100,"vendorName":"hw"}
    
```

6. Based on the queried info:

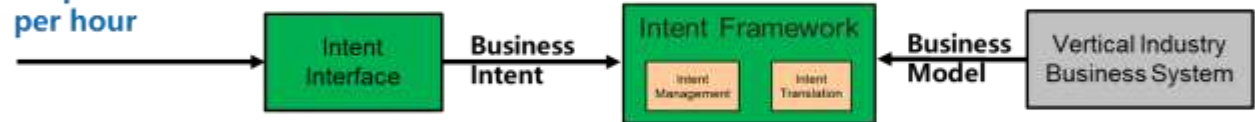
- 2 PNFs (PNF1 & PNF2) deployed in the area WareHouse-F;
- 3 Cells are created in each PNF (BS);
- In PNF1, Cell1 and Cell2 are active. In PNF2, Cell4 are active. The rest cells are inactive;
- The type of Cell is "5gdu" and can support 100 UEs (AGV)

Translate the Network Intent: To support 400 UEs, ONAP need one more active Cell.

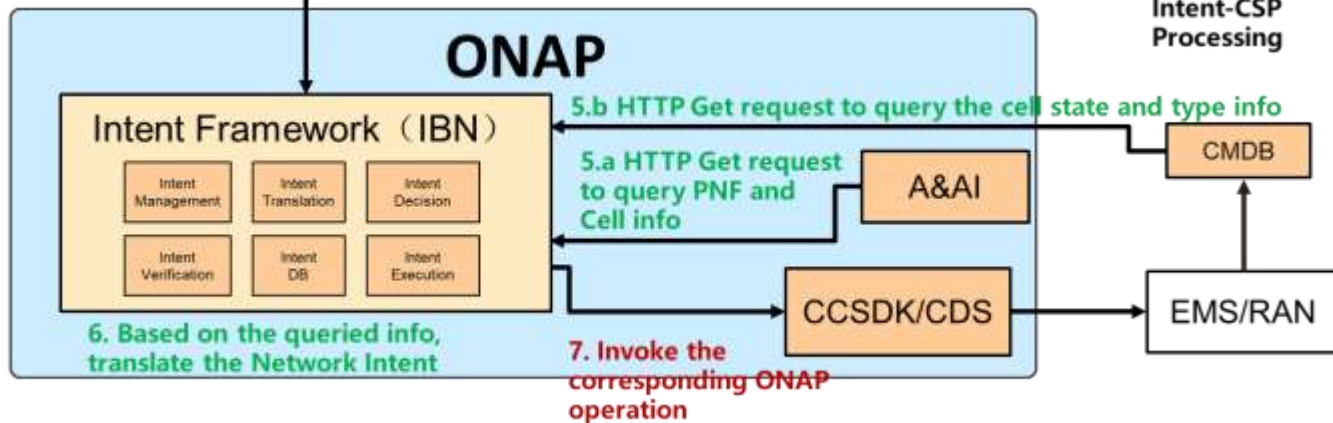
Invoke the corresponding ONAP operation

1. Warehouse manager input the business intent through UI : Increase the output volume to 40000 per hour

Intent Framework(Intent Translation) processes the business intent:
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4. HTTP POST request to Load the Network Intent: : The Network Deployed in WareHouse F provides connection service for 400 UEs



7. Invoke the corresponding ONAP operation

7. ONAP IBN send RESTful request to CCSDK/CDS to invoke [config-modify](#) operation to activate the cell(s)

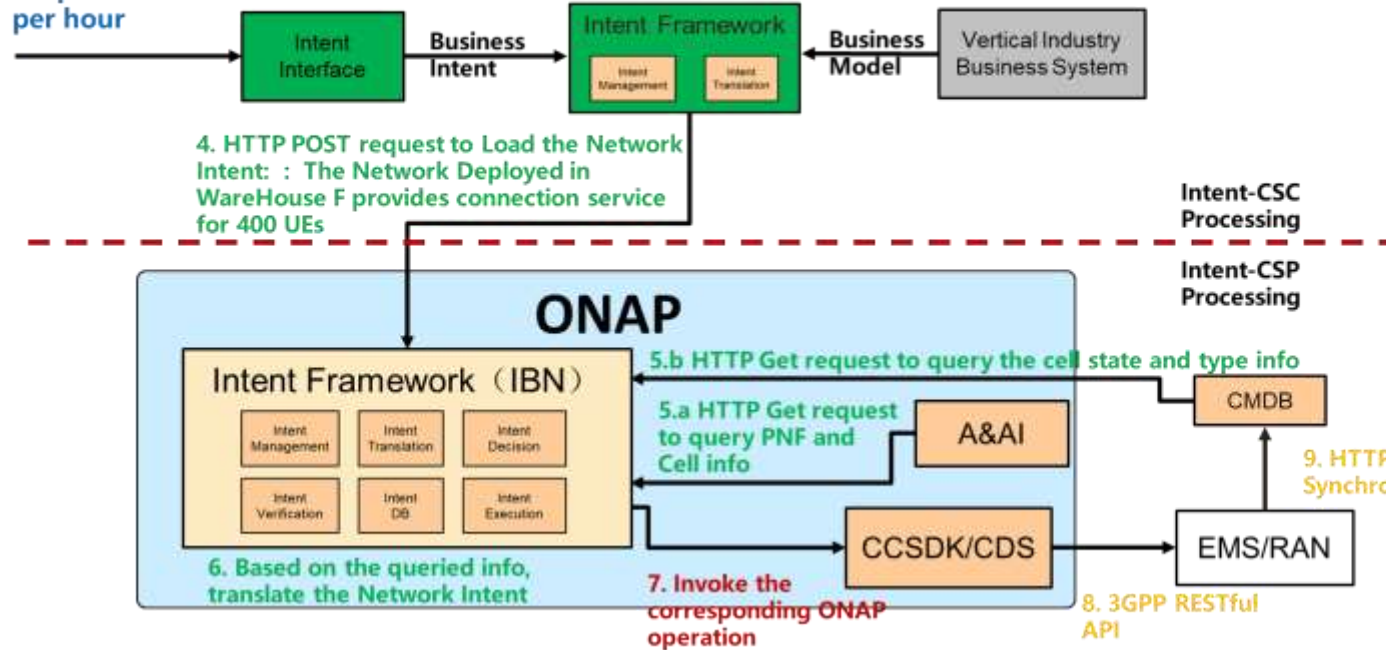
```
curl -k -X POST -H "Content-Type: application/json" -H "Accept: application/json" -d '{"requestId": "2020-10-20T02:08:11.5442", "originatorId": "onfdev", "requestId": "2234-5078", "subscriberId": "5a78-9812", "flags": null}', http://10.1.1.1:8080/api/v3/execution-service/process -s -w '%{http_code} \n' | python -c '{print %s}'
```

```
{
  "commonHeader": {
    "timestamp": "2020-10-20T02:08:11.5442",
    "originatorId": "onfdev",
    "requestId": "2234-5078",
    "subscriberId": "5a78-9812",
    "flags": null
  },
  "actionIdentifiers": {
    "elementName": "NRMReleaseprint",
    "elementVersion": "1.0.0",
    "actionName": "config-modify",
    "name": "run"
  },
  "status": {
    "code": 200,
    "eventType": "Event.CommonHeader_postCalled",
    "timestamp": "2020-10-20T02:08:11.5442",
    "errorMessage": null,
    "message": "success"
  },
  "payload": {
    "config-modify-response": {
      "result": {
        "/NRCelldu/pnf3-cel13": {
          "status": 200,
          "body": {
            "data": {
              "attributes": {
                "allLocalId": "cel13",
                "operationalState": "INACTIVE",
                "administrativeState": "UNLOCKED",
                "cellState": "ACTIVE",
                "pHNEList": [
                  {
                    "name": "NRC",
                    "mnc": "01"
                  }
                ]
              },
              "nrcid": 13,
              "arfrid": 1,
              "scsServiceId": 200,
              "schFrequency": 44,
              "schPeriodicity": 10,
              "schCarrCarrierSpacing": 15,
              "schOffset": 1,
              "schOverline": 1
            }
          },
          "class": "NRCelldu",
          "key": "/NRCelldu/pnf3-cel13",
          "id": "pnf3-cel13"
        }
      },
      "stepData": {
        "name": "config-modify-process",
        "properties": {
          "response-data": "",
          "status": "success"
        }
      }
    }
  }
}
```


Intent Implementation Complete

1. Warehouse manager input the business intent through UI : Increase the output volume to 40000 per hour

Intent Framework(Intent Translation) processes the business intent:
 2. Decide the number of AGVs to achieve that output volume;
 3. Translate into network intent: Provide 400 UE connections in Warehouse-F



8. CCSDK/CDS use RESTful executor to generate the 3GPP RESTful modify request and send to EMS/RAN (Leveraging the NRM CM Req in Frankfurt release)

9. Synchronize the Cell state in CMDB



Summary

Intent Technology can help vertical industry manage 5G network to satisfy their business needs:

- Vertical industry staffs can be aware of business intent only, and Intent Framework can do intent management at different levels:
 - At Intent-CSC level, Intent framework translate business intent into network intent based on business model provided by vertical industry
 - At Intent-CSP level, Intent framework translate network intent into the corresponding ONAP operation based on network inventory and state info
- To achieve the network intent for the demo, it is easier to use the existing components (such as NRM restful executor in CCSDK/CDS and provisioning MnS simulator in Integration).
- Model-driven is a very good feature in ONAP, such as controller blueprint of CDS and A&AI data model.



Thank You