

# Telco Smart Contract

- OSS Networks Configuration data (such as Transmitters / Antennas / Sites location) is shared between various OSS components and due to its nature the static configurations are corrupted or mismatched across various OSS downstream subsystem such as Planning Workflow, Inventory & Coverage generation.
- Due to loss of trust and audit of configuration Telco's face compliance challenges.
- Use Hyperledger Fabric to store configuration data changes as blockchain (ChainCode) and use SmartContracts to identify any anomaly in received data which is not in accordance (Proof of Consensus) between systems

# Requirements

Programming Languages	Go, Angularjs & nodejs
Third Party Tools	<ul style="list-style-type: none"><li>• Vagrant</li><li>• Visual Studio Code</li><li>• Hyperledger Fabric</li><li>• Hyperledger Composer</li><li>• Couch DB</li><li>• Docker</li></ul>
OSS Tools required	
Database	CouchDB
Target OS / Platform	Ubuntu
Any other tool used	<ul style="list-style-type: none"><li>• Composer Rest Server UI</li><li>• Composer Playground</li></ul>
H/W Requirement	RAM > 8 GB Processor > i5 Storage> 500 GB

## Genesis Block

Block Number

1

Nonce

5499

Data

A >> B: 40

Previous Block Hash

00000000000000000000000000000000

This Block Hash

0007b6e3f434c0154f135286d4c3d7f

HASH

MINE

NEW

## Block 2

Block Number

2

Nonce

0

Data

B >> C: 20

Previous Block Hash

0007b6e3f434c0154f135286d4c3d7f

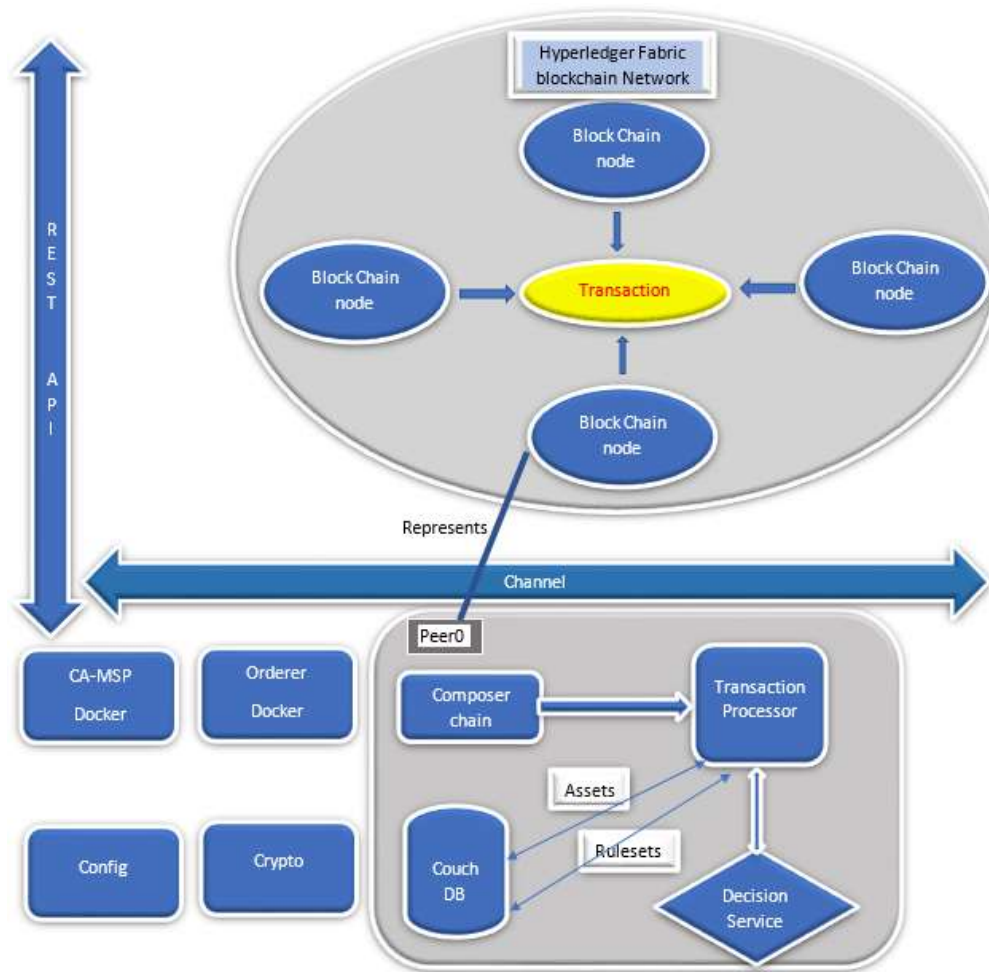
This Block Hash

0

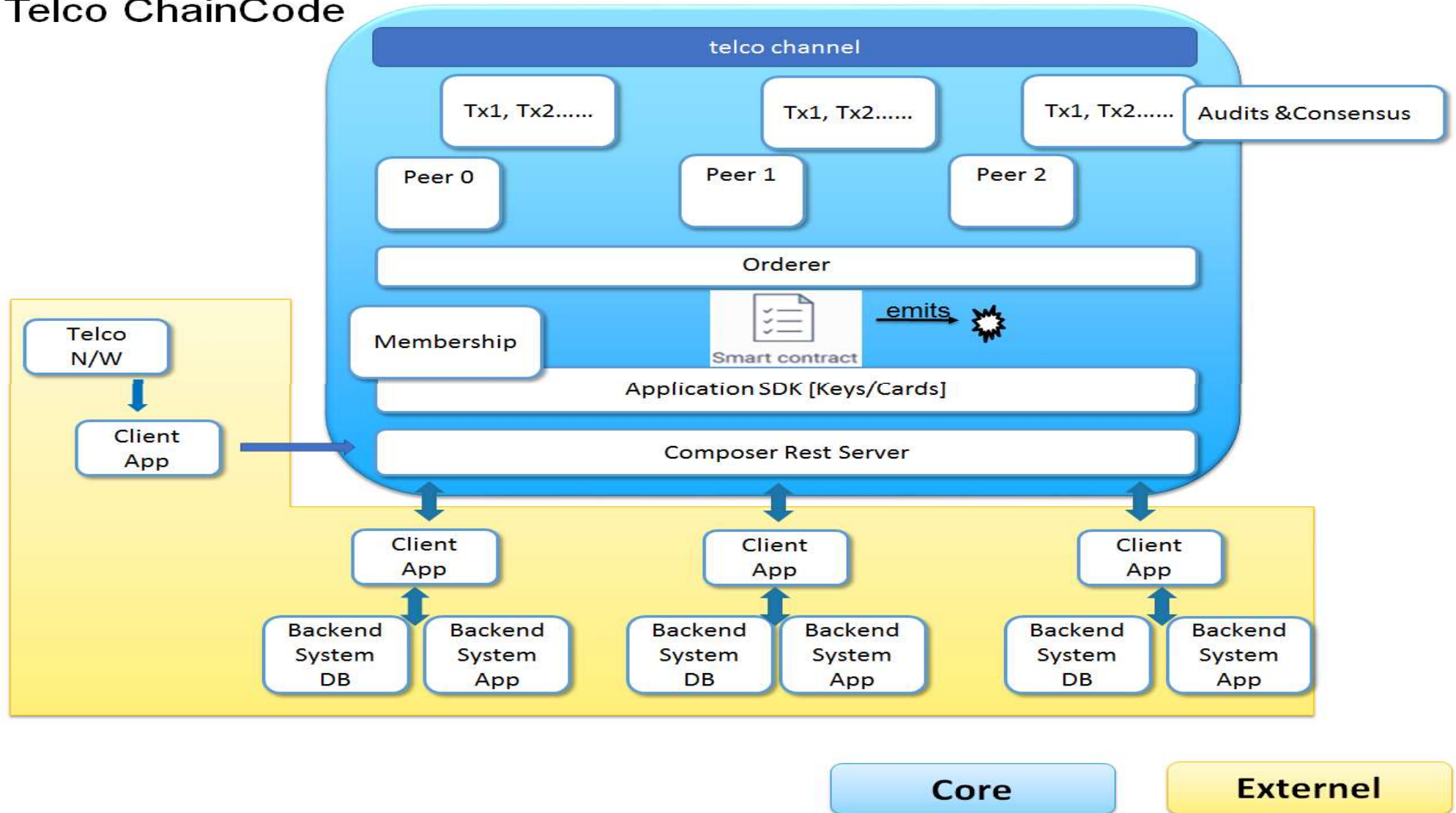
HASH

MINE

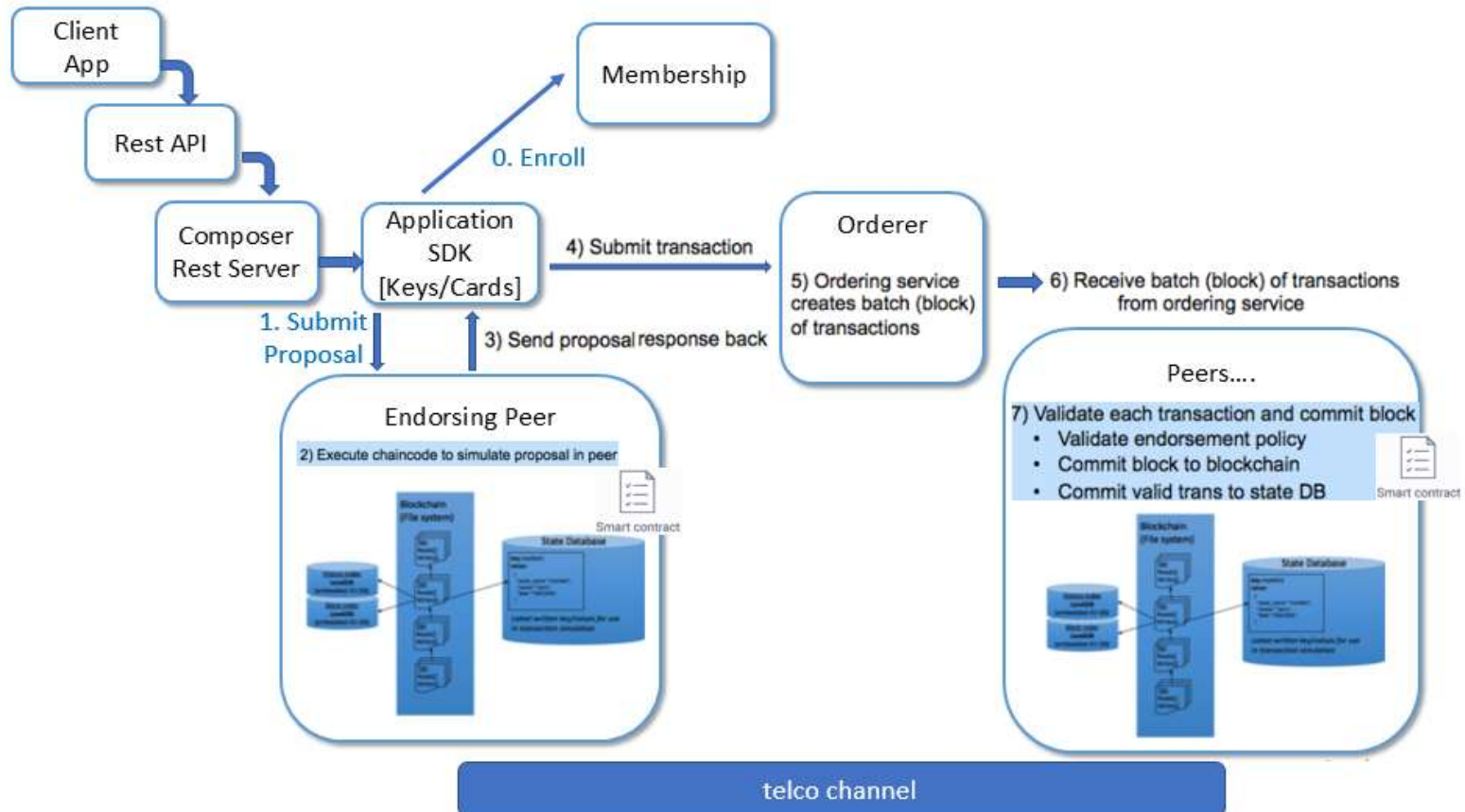
NEW



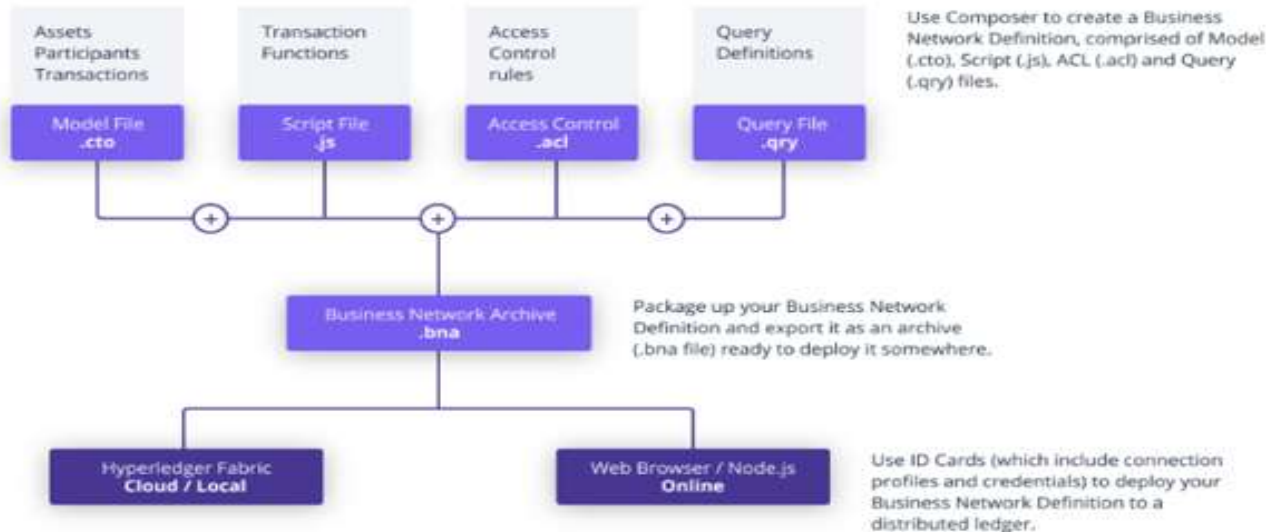
## Telco ChainCode



## Design Insights



# Insight of Telco Business Network in HyperLedger



Model File `models/org.telco.network.cto`

```
1 |++
2 * telco network
3 */
4 namespace org.telco.network
5 asset Antenna identified by antennaId {
6   o String antennaId
7   o Double electricalTilt
8   o Double gain
9   o Double beamWidth
10  --> Planner planner
11 }
12 participant Planner identified by plannerId {
13   o String plannerId
```

Script File `lib/logic.js`

```
26 async function removeIncorrectConfiguredAntennas(remove) {
27
28   let assetRegistry = await getAssetRegistry('org.telco.network.Antenna');
29   let results = await query('selectIncorrectConfiguredAntennas');
30
31   for (let n = 0; n < results.length; n++) {
32     let uantenna = results[n];
33
34     // emit a notification that a uantenna was removed
35     let removeNotification = getFactory().newEvent('org.telco.network', 'RemoveNotification');
36     removeNotification.antenna = uantenna;
37     emit(removeNotification);
38     await assetRegistry.remove(uantenna);
```

Query File `queries.qry`

```
32 description: "Select all antennas based on their planner"
33 statement:
34   SELECT org.telco.network.Antenna
35     WHERE (planner == _$planner)
36 }
37
38 query selectIncorrectConfiguredAntennas {
39   description: "Select commodities based on incorrect antenna configurations"
40   statement:
41     SELECT org.telco.network.Antenna
42       WHERE (electricalTilt < 15 AND gain > 30 AND beamWidth < 15)
43 }
44
```



# Insight of Telco Business Network TRANSACTIONS

## Transaction chaincode

Date, Time	Entry Type	Participant	
2018-05-31, 23:24:01	updateAntenna	admin (NetworkAdmin)	<a href="#">view record</a>
2018-05-31, 23:23:28	AddAsset	admin (NetworkAdmin)	<a href="#">view record</a>
2018-05-31, 23:23:01	AddAsset	admin (NetworkAdmin)	<a href="#">view record</a>

```
Transaction Events (1)
1 {
2   "class": "org.telco.network.updateAntenna",
3   "antenna": "resource:org.telco.network.Antenna#A004",
4   "editedByPlanner": "resource:org.telco.network.Planner#Planner3",
5   "transactionId": "c83c5db23325a60a607a372647959ca832...",
6   "timestamp": "2018-05-31T17:54:01.302Z"
7 }
```

```
Transaction Events (1)
org.telco.network.UpdateNotification#c83c5db23325a60a607a372647959ca832...
1 {
2   "class": "org.telco.network.UpdateNotification",
3   "antenna": "resource:org.telco.network.Antenna#A004",
4   "eventId": "c83c5db23325a60a607a372647959ca832637b192434c38589bad1e4985745c80",
5   "timestamp": "2018-05-31T17:54:01.302Z"
6 }
```



## Smart Contract

Smart contract

```
1 {
2   "class": "org.telco.network.Antenna",
3   "antennaId": "A001",
4   "electricalFilt": 20,
5   "gain": 20,
6   "beamWidth": 10,
7   "planner": "resource:org.telco.network.Planner#Planner3"
8 },
9 {
10  "class": "org.telco.network.Antenna",
11  "antennaId": "A002",
12  "electricalFilt": 14,
13  "gain": 20,
14  "beamWidth": 10,
15  "planner": "resource:org.telco.network.Planner#Planner3"
16 },
17 {
18  "class": "org.telco.network.Antenna",
19  "antennaId": "A003",
20  "electricalFilt": 20,
21  "gain": 10,
22  "beamWidth": 20,
23  "planner": "resource:org.telco.network.Planner#Planner3"
24 },
25 {
26  "class": "org.telco.network.Antenna",
27  "antennaId": "A004",
28  "electricalFilt": 10,
29  "gain": 40,
30  "beamWidth": 10,
31  "planner": "resource:org.telco.network.Planner#Planner3"
32 }
33 }
```

Response Class (Status 200)

## Response Body

```
[
  {
    "class": "org.telco.network.Antenna",
    "antennaId": "A004",
    "electricalFilt": 10,
    "gain": 40,
    "beamWidth": 10,
    "planner": "resource:org.telco.network.Planner#Planner3"
  },
  {
    "class": "org.telco.network.Antenna",
    "antennaId": "A002",
    "electricalFilt": 14,
    "gain": 20,
    "beamWidth": 10,
    "planner": "resource:org.telco.network.Planner#Planner3"
  }
]
```

Date, Time	Entry Type	Participant	
2018-06-01, 00:58:17	RemoveIncorrectConfiguredAntennas	admin (NetworkAdmin)	<a href="#">view record</a>

```
1 {
2   "class": "org.telco.network.RemoveIncorrectConfiguredAntennas",
3   "transactionId": "14dea864920b81b694e7726fee4635cafd1e2a249a3673ae861c286ee93384ef",
4   "timestamp": "2018-06-01T19:28:17.710Z"
5 }
```

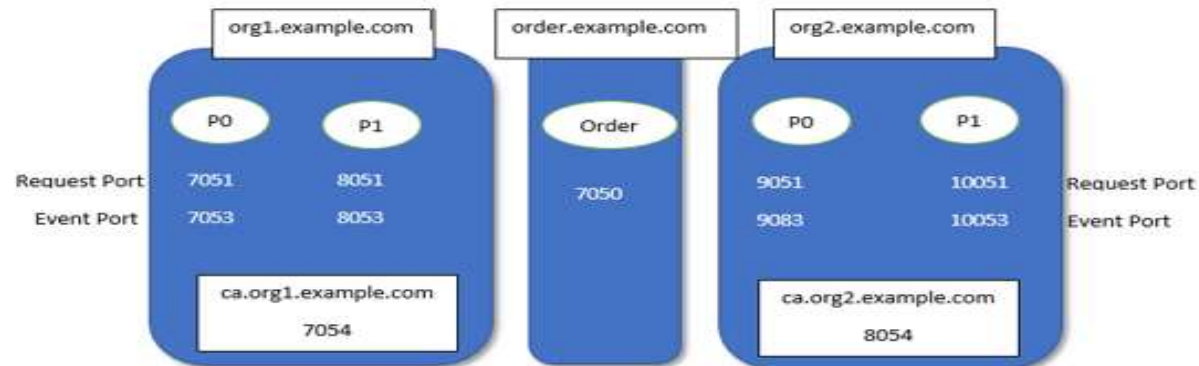
```
Transaction Events (2)
org.telco.network.RemoveNotification#14dea864920b81b694e7726fee4635caf...
1 {
2   "class": "org.telco.network.RemoveNotification",
3   "antenna": "resource:org.telco.network.Antenna#A004",
4   "eventId": "14dea864920b81b694e7726fee4635cafd1e2a249a3673ae861c286ee93384ef#0",
5   "timestamp": "2018-06-01T19:28:17.710Z"
6 }
```

```
org.telco.network.RemoveNotification#14dea864920b81b694e7726fee4635caf...
1 {
2   "class": "org.telco.network.RemoveNotification",
3   "antenna": "resource:org.telco.network.Antenna#A002",
4   "eventId": "14dea864920b81b694e7726fee4635cafd1e2a249a3673ae861c286ee93384ef#1",
5   "timestamp": "2018-06-01T19:28:17.710Z"
6 }
```

Activate Windows  
Go to PC settings to activate Windows.



# Design Insights Multi-Org



```
"peers": {
  "peer0.org1.example.com": {
    "endorsingPeer": true,
    "chaincodeQuery": true,
    "eventSource": true
  },
  "peer1.org1.example.com": {
    "endorsingPeer": true,
    "chaincodeQuery": true,
    "eventSource": true
  },
  "peer0.org2.example.com": {
    "endorsingPeer": true,
    "chaincodeQuery": true,
    "eventSource": true
  },
  "peer1.org2.example.com": {
    "endorsingPeer": true,
    "chaincodeQuery": true,
    "eventSource": true
  }
}
```

```
FIRST-NETWORK
├─ alice
├─ base
├─ bob
├─ channel-artifacts
├─ crypto-config
│   └─ ordererOrganizations
│       └─ example.com
│           └─ ca
│               └─ 3cb40cc2ca9e267839d872d0e0256..
│                   └─ ca.example.com-cert.pem
│           └─ msp
│           └─ orderers
│           └─ tlsca
│           └─ users
│       └─ peerOrganizations
│           └─ org1.example.com
│           └─ org2.example.com
│               └─ ca
│               └─ msp
│               └─ peers
│                   └─ peer0.org2.example.com
│                   └─ peer1.org2.example.com
│                   └─ tlsca
```

# Insight of Telco Business Network TRANSACTIONS

Transaction chaincode

Antenna

antennaId	electricalTilt	gain	beamWidth	planner	Name
A001	20	20	16	resource:org.telco.network.Planner#Planner1	Jenny
A002	14	50	10	resource:org.telco.network.Planner#Planner2	George
A003	30	10	20	resource:org.telco.network.Planner#Planner3	Jack
A004	10	40	10	resource:org.telco.network.Planner#Planner4	Austin

Transaction Events (0)

```
1 {
2   "$class": "org.telco.network.updateAntenna",
3   "antenna": "resource:org.telco.network.Antenna#A002",
4   "editedByPlanner": "resource:org.telco.network.Planner#Planner3",
5   "transactionId":
6     "38652e5bc37d89647f088c6ca7376b3e554da980f64df96aa072b9b612f41b3e",
7   "timestamp": "2018-06-02T05:22:08.326Z"
8 }
```

A002 14 50 10 resource:org.telco.network.Planner#Planner3



## Smart Contract

Smart contract

```
1 {
2   "$class": "org.telco.network.Antenna",
3   "antennaId": "A001",
4   "electricalTilt": 20,
5   "gain": 20,
6   "beamWidth": 16,
7   "planner": "resource:org.telco.network.Planner#Planner1"
8 },
9 {
10  "$class": "org.telco.network.Antenna",
11  "antennaId": "A002",
12  "electricalTilt": 14,
13  "gain": 50,
14  "beamWidth": 10,
15  "planner": "resource:org.telco.network.Planner#Planner2"
16 },
17 {
18  "$class": "org.telco.network.Antenna",
19  "antennaId": "A003",
20  "electricalTilt": 30,
21  "gain": 10,
22  "beamWidth": 20,
23  "planner": "resource:org.telco.network.Planner#Planner3"
24 },
25 {
26  "$class": "org.telco.network.Antenna",
27  "antennaId": "A004",
28  "electricalTilt": 10,
29  "gain": 40,
30  "beamWidth": 10,
31  "planner": "resource:org.telco.network.Planner#Planner4"
32 }
```

Define Test

austin

Date, Time

Entry Type

Participant

2018-06-02, 13:28:09

org.telco.network.RemoveIn  
correctConfiguredAntennas

RemoveInCorrectConfiguredA... Planner4 (Planner)

http://localhost:3000/api/Antenna

Response Body

```
[
  {
    "$class": "org.telco.network.Antenna",
    "antennaId": "A001",
    "electricalTilt": 20,
    "gain": 20,
    "beamWidth": 16,
    "planner": "resource:org.telco.network.Planner#Planner1"
  },
  {
    "$class": "org.telco.network.Antenna",
    "antennaId": "A003",
    "electricalTilt": 30,
    "gain": 10,
    "beamWidth": 20,
    "planner": "resource:org.telco.network.Planner#Planner3"
  }
]
```

Antenna

antennaId	electricalTilt	gain	beamWidth	planner
A001	20	20	16	resource:org.telco.network.Planner#Planner1
A003	30	10	20	resource:org.telco.network.Planner#Planner3









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