

Steps to set up and test asset tracking system in Composer play ground.

1) Create a new business network in the composer playground and copy the model.cto, permission.acl and script.js to the composer and deploy (all the files are given).

2) Create the participant Exporter

```
{
  "$class": "org.asset.tracker.Exporter",
  "exporterId": "0001",
  "exporterEmail": "exporter@gmail.com",
  "exporterAddress": "2345EE",
  "accountBalance": 10000
}
```

3) Create participant Importer

```
{
  "$class": "org.asset.tracker.Importer",
  "importerId": "0002",
  "importerEmail": "Importer@gmail.com",
  "importerAddress": "6770NN",
  "accountBalance": 1000000
}
```

4) Create participant Shipper

```
{
  "$class": "org.asset.tracker.Shipper",
  "shipperId": "0003",
  "shipperEmail": "shipper@gmail.com",
  "shipperAddress": "7623NE",
  "accountBalance": 20000
}
```

5) Issue New ID as **Importer** and map to 0001

6) Issue New ID as **Importer** and map to 0002

7) Issue New ID as **Shipper** and map to 0003

8) Create new asset **Shipment**

```
{
  "$class": "org.asset.tracker.Shipment",
  "shipmentId": "0001",
  "assetType": "Medicine",
  "shipmentStatus": "CREATED",
  "unitCount": 1000,
  "contract": "resource:org.asset.tracker.Contract#0001",
  "temperatureReadings": [],
  "accelerationReadings": [],
  "gpsReadings": []
}
```

9) Create new asset **Contract**

```
{
  "$class": "org.asset.tracker.Contract",
  "contractId": "0001",
  "exporter": "resource:org.asset.tracker.Exporter#0001",
}
```

```

"importer": "resource:org.asset.tracker.Importer#0002",
"shipper": "resource:org.asset.tracker.Shipper#0003",
"arrivalDateTime": "2019-10-19T02:33:30.590Z",
"unitPrice": 100,
"minimumTemperature": 10,
"maximumTemperature": 30,
"minimumPenaltyFactor": 1,
"maximumPenaltyFactor": 2,
"maximumAcceleration": 40
}

```

10) Change user to Shipper

11) Submit the transaction AccelerationReading

```

{
  "$class": "org.asset.tracker.AccelerationReading",
  "accelerationX": 11,
  "accelerationY": 12,
  "accelerationZ": 13,
  "latitude": "20",
  "longitude": "30",
  "shipment": "resource:org.asset.tracker.Shipment#0001"
}

```

12) submit transaction AccelerationReading

```

{
  "$class": "org.asset.tracker.AccelerationReading",
  "accelerationX": 50,
  "accelerationY": 22,
  "accelerationZ": 23,
  "latitude": "20",
  "longitude": "30",
  "shipment": "resource:org.asset.tracker.Shipment#0001"
}

```

This will emit **AccelerationThresholdEvent**

13) submit transaction Temperature Reading

```

{
  "$class": "org.asset.tracker.TemperatureReading",
  "celsius": 9,
  "latitude": "56",
  "longitude": "67",
  "shipment": "resource:org.asset.tracker.Shipment#0001"
}

```

This will emit **TemperatureThresholdEvent**

14) submit transaction Temperature Reading

```

{
  "$class": "org.asset.tracker.TemperatureReading",
  "celsius": 31,
  "latitude": "46",
  "longitude": "69",
  "shipment": "resource:org.asset.tracker.Shipment#0001"
}

```

This will emit **TemperatureThresholdEvent**

14) submit transaction GPSReading

```
{
  "$class": "org.asset.tracker.GPSReading",
  "latitude": "20",
  "latitudeDirection": "N",
  "longitude": "39",
  "longitudeDirection": "N",
  "shipment": "resource:org.asset.tracker.Shipment#0001"
}
```

15) submit transaction GPSReading

```
{
  "$class": "org.asset.tracker.GPSReading",
  "latitude": "67",
  "latitudeDirection": "N",
  "longitude": "70",
  "longitudeDirection": "N",
  "shipment": "resource:org.asset.tracker.Shipment#0001",
  "transactionId": "0ba07c18-5efa-44ce-b947-c5b3e8260726",
  "timestamp": "2019-10-09T03:12:28.196Z"
}
```

This will emit **ShipmentInAPortEvent**

16) submit the transaction ShipmentReceived

```
{
  "$class": "org.asset.tracker.ShipmentReceived",
  "shipment": "resource:org.asset.tracker.Shipment#0001"
}
```

17) In ShipmentReceived transaction all the calculation are done and balances of the shipper,Importer and Exporter will be updated. Also Shipment status will be marked as ARRIVED .

Logic in ShipmentReceived transaction

- 1)** Find out the minimum and maximum temperature from the Shipment asset temperature array
- 2)** Find minimum and maximum penalty by multiplying minimum penalty factor and maximum penalty factor with the deviation from contract temperature range.
- 3)** Find out the Maximum acceleration from all the recorded accelerations(accelerationX,accelerationY,accelerationZ)
- 4)** If recorded acceleration is greater than the Maximum acceleration in the contract find out the maximum penalty for the acceleration deviation by multiplying with the maximum penalty factor.
- 5)** Find total penalty by multiplying unit count with both maximum and minimum penalty.

- 6)** Find total payout by deducting total penalty from the expected total payout($\text{unitcount} \times \text{unit price}$).
- 7)** Deduct total payout from importers account and update Importer registry
- 8)** Add half of the payout to Exporter and update Exporter registry
- 9)** Add half of the payout to Shipper and update Shipper registry
- 10)** Update shipment registry with new status "ARRIVED".