

# Business Domain Modelling

## Discount Coupon Links to UDEMY courses:



<https://www.udemy.com/hyperledger/?couponCode=DKHLF1099>



<https://www.udemy.com/ethereum-dapp/?couponCode=DKETH1099>



<https://www.udemy.com/rest-api/?couponCode=DKRST1099>



mentoring, seeking Blockchain part time work, project guidance, advice ... ..

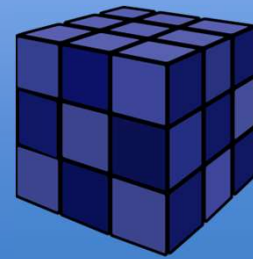
<http://www.bcmentors.com>

This deck is part of a online course on “Hyperledger Fabric Development with Composer”

raj@acloudfan.com

@acloudfan

<http://ACloudFan.com>



# ACME Airlines

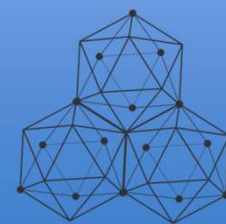
## Learning Objectives:

- ACME Airline's Story

raj@acloudfan.com

@acloudfan

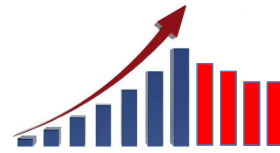
<http://ACloudFan.com>



## ACME AIR



### Regional Airlines



#### Unhappy partners

“NO visibility into commission payments”

“Information is stale”

“Their systems are antiquated”



#### Customer Dissatisfaction

“Unexpected flight delays & cancelation”

“Lost reservations”

“Even staff does not have the information”

## ACME AIR



### A Growing Regional Airlines



CTO



“A seamless Collaboration Platform with no boundaries”

Chief  
Architect

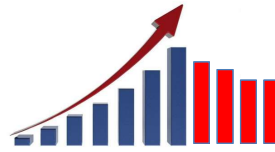


“Leverage the HL Fabric for creating a **Business Network** that would enable efficient **B2B** collaboration leading to better customer experience”

## ACME AIR



### A Growing Regional Airlines



**APPROVED**



Flight data

Reservations

Logistics

Transactions

Payments

Commissions

Rewards

Partner Contracts

Workflows

...

## ACME AIR



Let's go ahead and create the  
Business Model for ACME AIR




# Modeling Language

## Basic Terminology

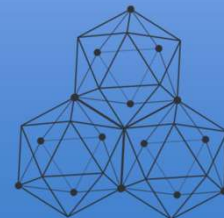
### Learning Objectives:

- Business Network

raj@acloudfan.com

 @acloudfan

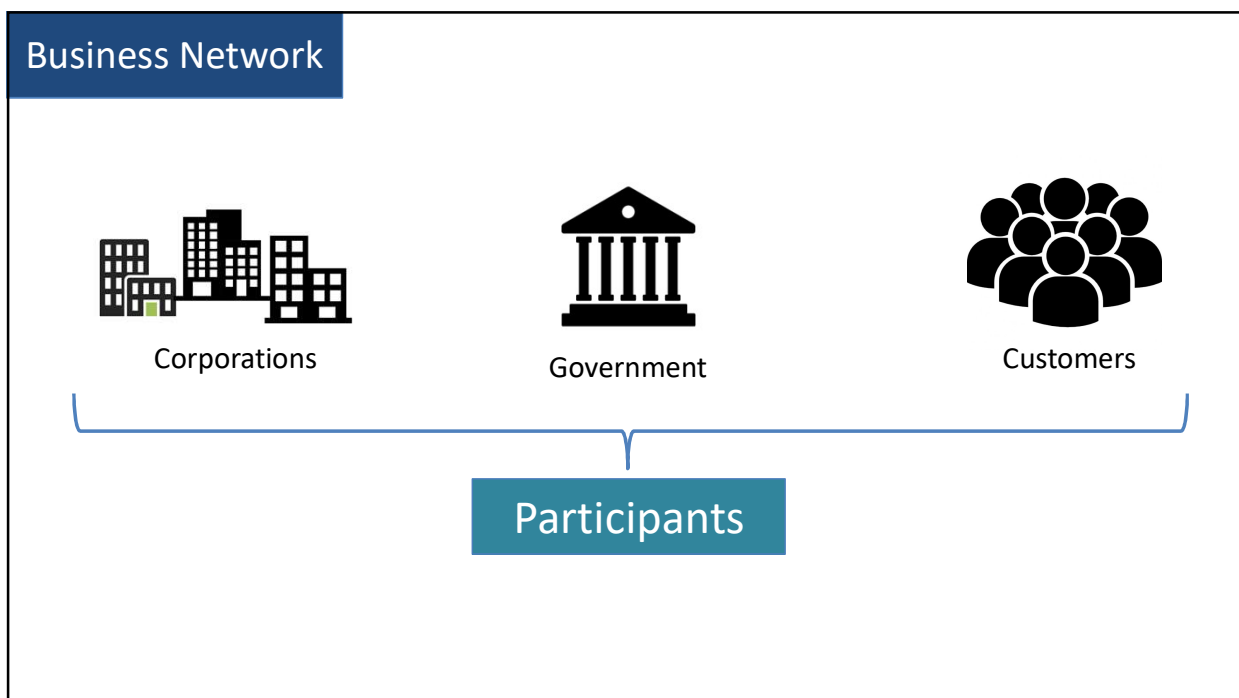
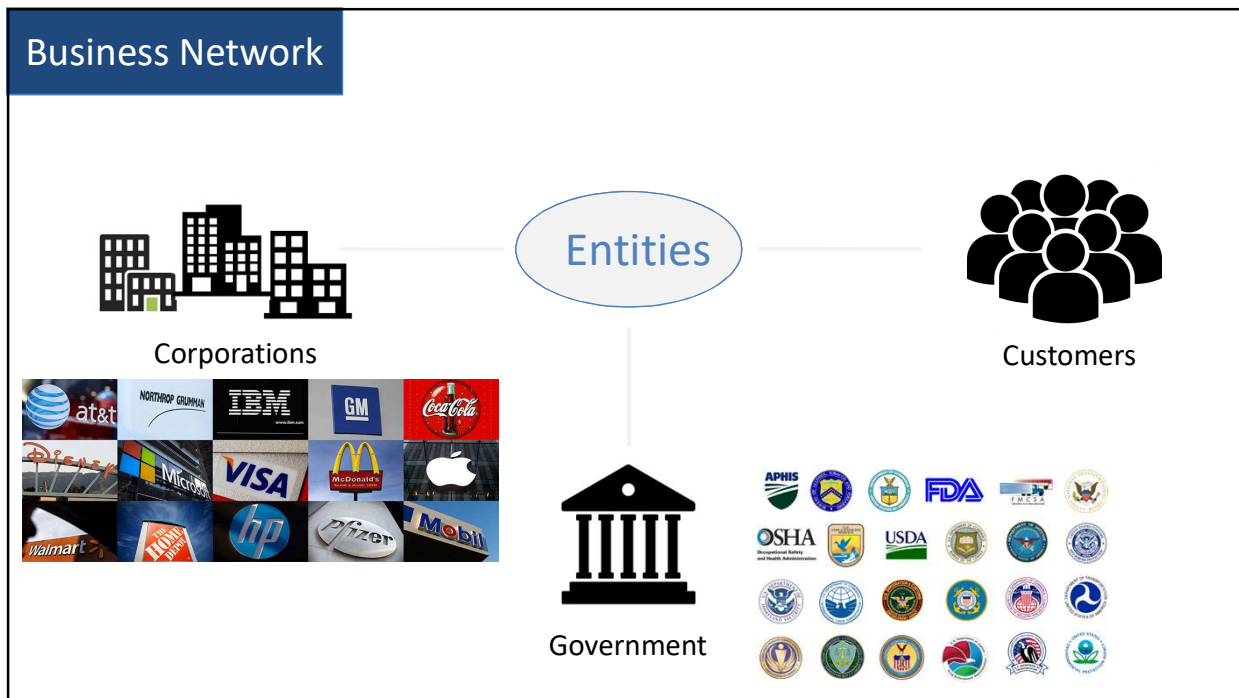
<http://ACloudFan.com>

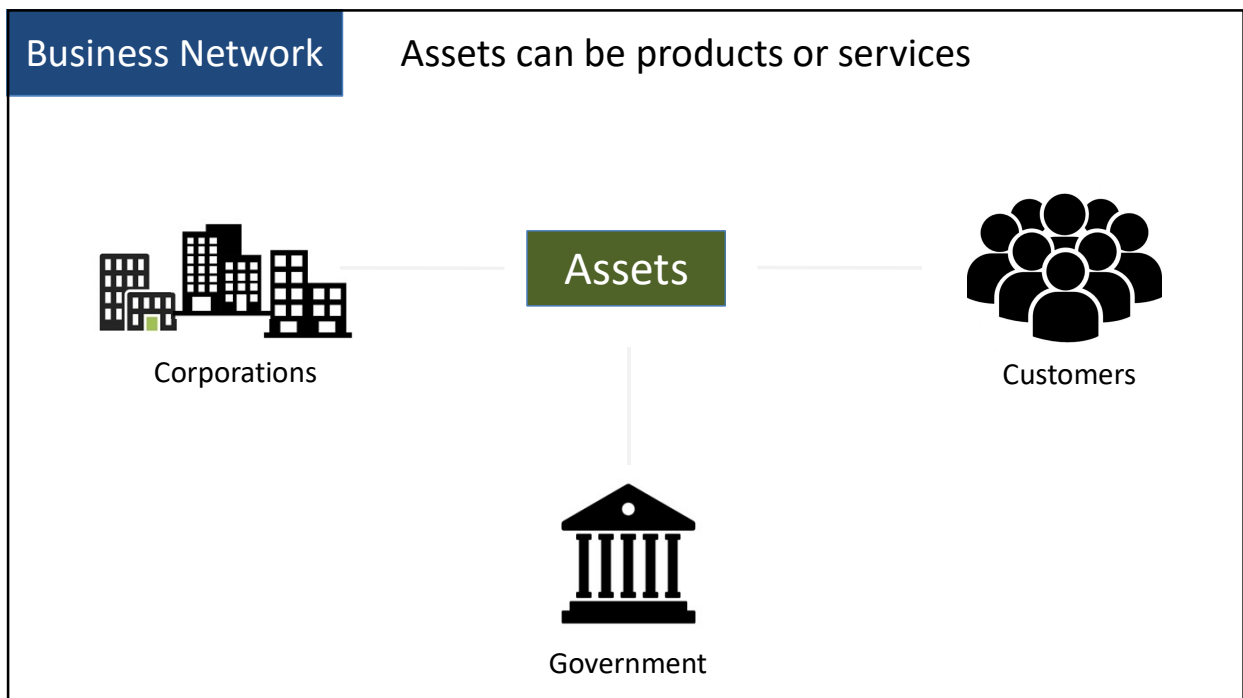
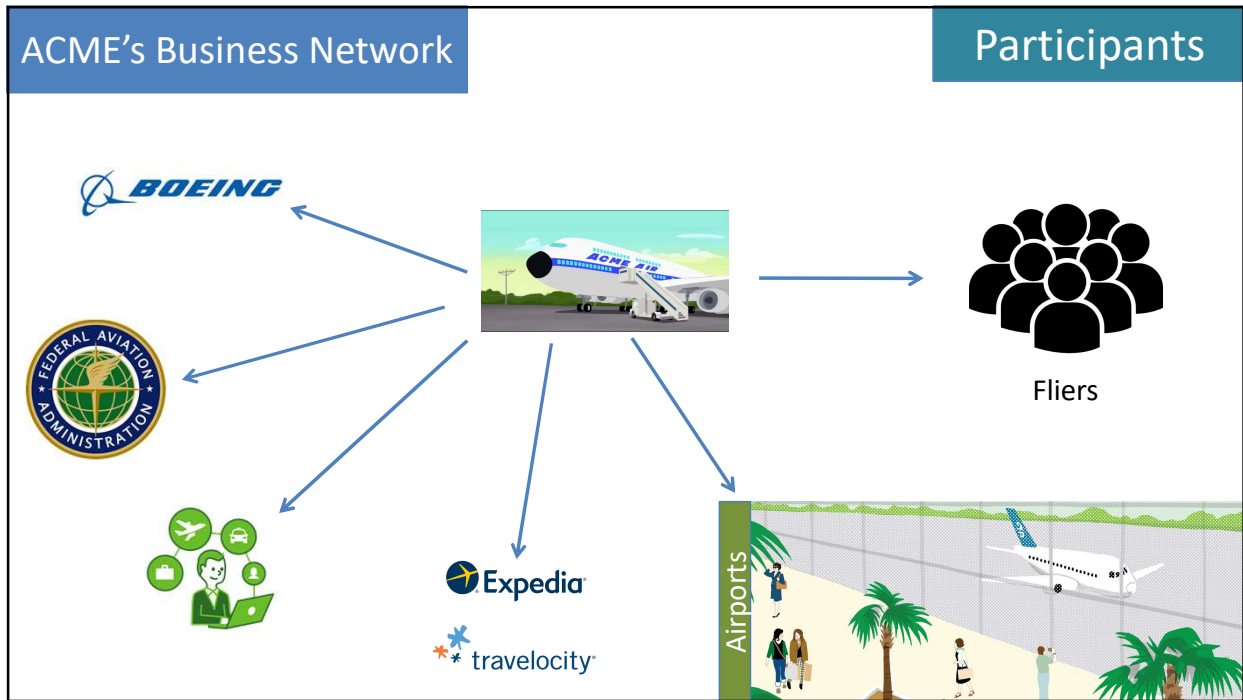


## Business Network

“

A collection of **entities** working together to accomplish certain goal







Assets

Airline seats on flights



Business Network

Participants submit transactions



Corporations



Government



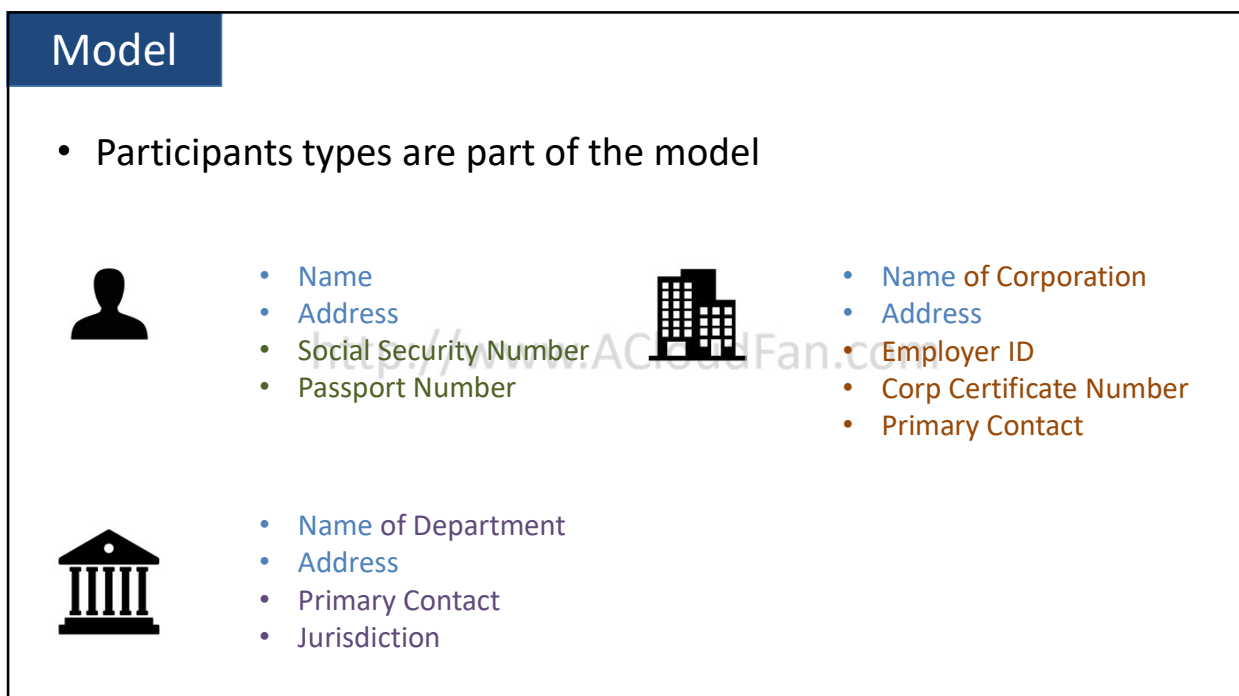
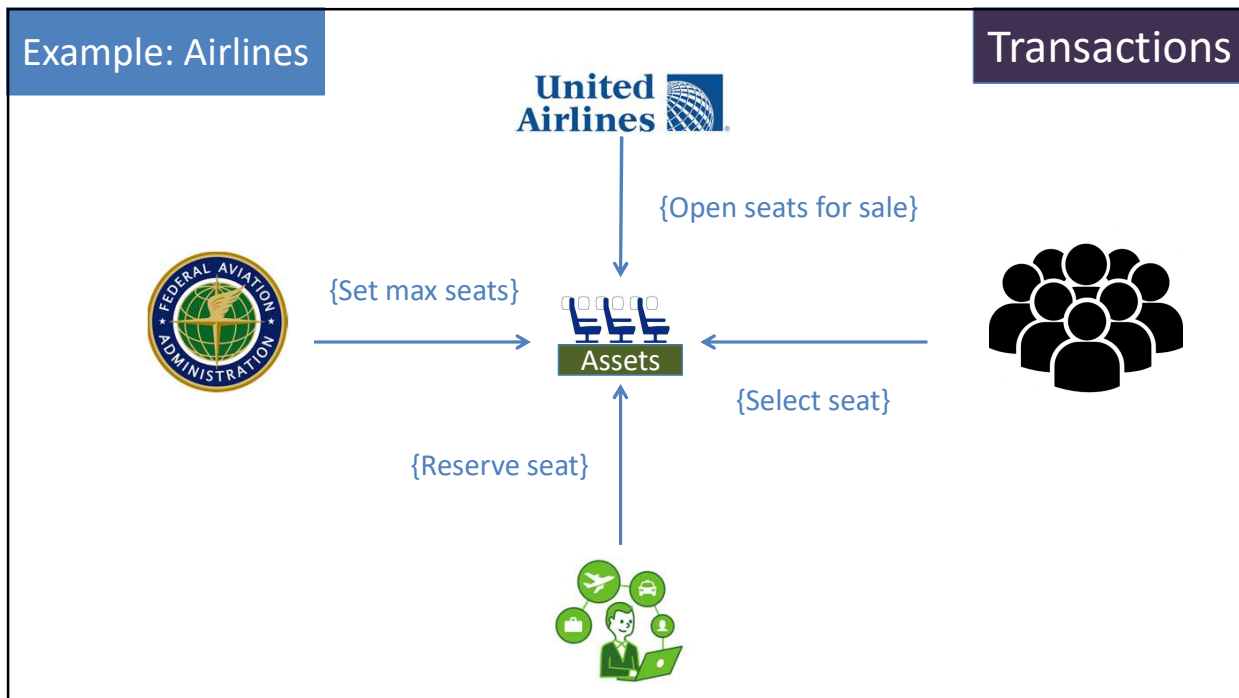
Customers

Participants

Transactions

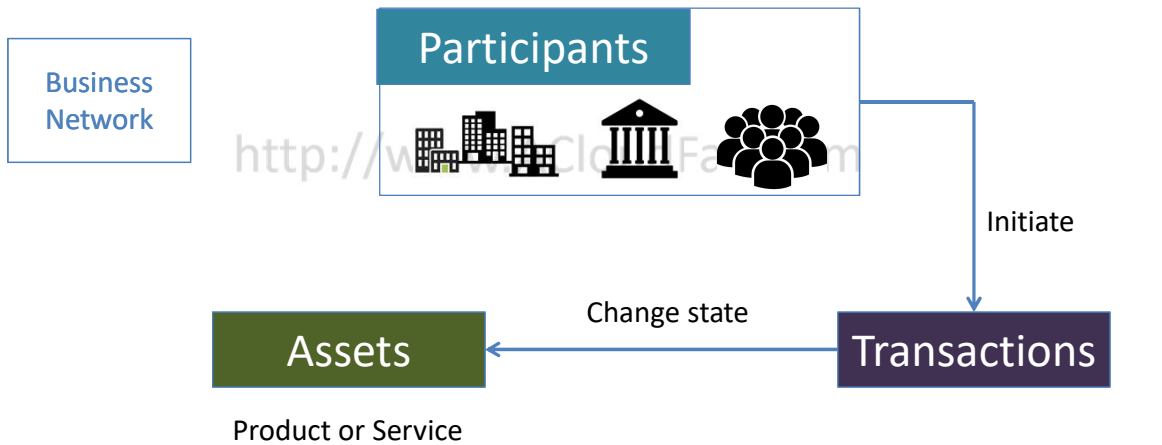
Assets

Events






# Summary



Get Ready for Development

# Composer Overview

raj@acloudfan.com

 @acloudfan

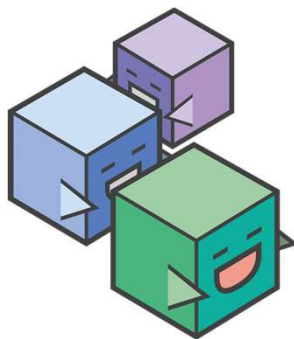
<http://ACloudFan.com>

## Learning Objectives:

- Fabric Composer

<http://www.ACloudFan.com>

## Composer Tool

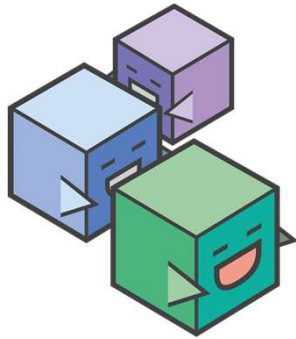


## Open Source Tool

1. Defining a business network
2. Deploying/managing of app
3. Integrating

<https://hyperledger.github.io/composer/>

## Composer Tool

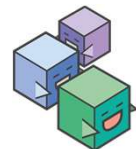


### Benefits

1. Reduced time to market
2. Shallow learning curve
3. Business focused

<https://hyperledger.github.io/composer/>

## Composer Tool



### Playground



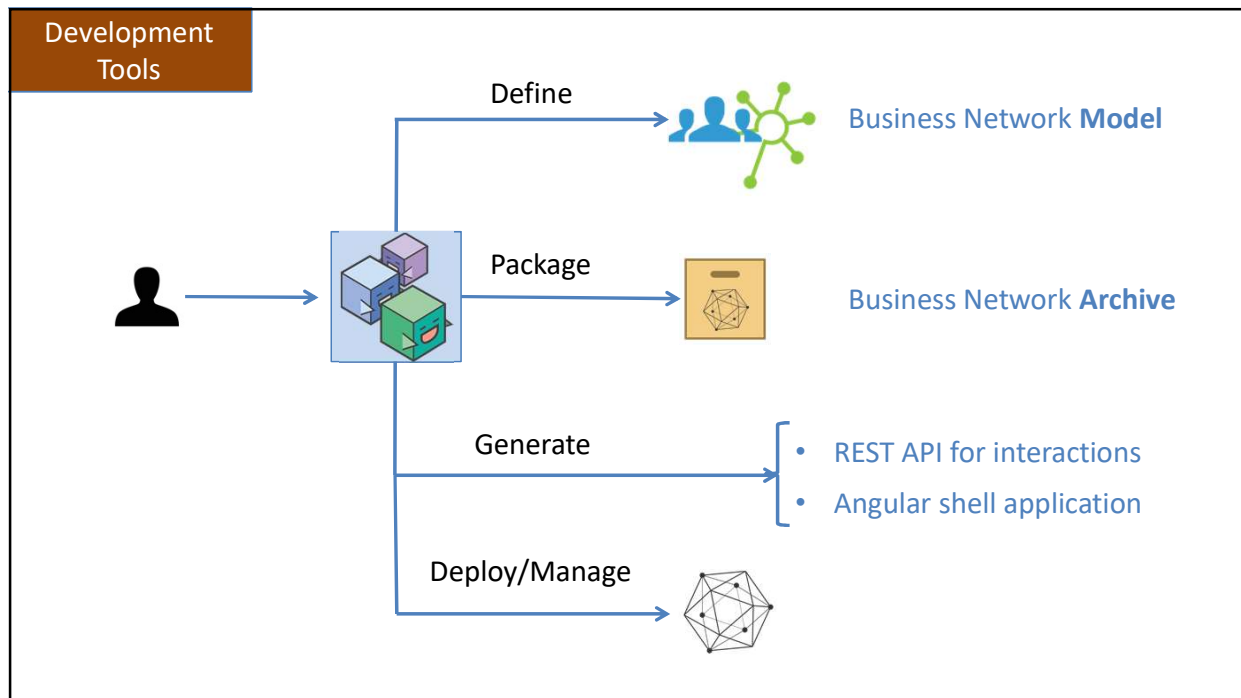
No local tools installation

**LOCAL**

Offline development

### Development Tools


- Node based CLI
  - Deploy/manage local fabric install
- Generate components



**Composer Tool**

## Tools

1. Command Line Tools (CLI)
2. REST Server

 node v6.x    npm v5.x

<https://hyperledger.github.io/composer/>


# Domain Model Files

## Learning Objectives:

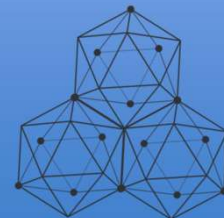
- What is in the Domain model?
- Structure model file

namespace

raj@acloudfan.com

 @acloudfan

<http://ACloudFan.com>



## Incremental Creation of ACME Air Domain Model

<https://github.com/acloudfan/HLF-Course-Domain-Model>

```
▶ airlinev1  
▶ airlinev2  
▶ airlinev3  
▶ airlinev4  
▶ airlinev5  
▶ airlinev6  
▶ airlinev7  
▶ airlinev8  
▶ airlinev9
```

## Modeling Language

“

An object oriented language for defining the [domain model](http://www.ACloudFan.com) for the business network

## Business Domain Model

“

A business domain [model](http://www.ACloudFan.com) defines representation of the:

Participants

Assets

Transactions

Events

## Model File

- Composer Modeling Language

Extension: **.cto**

### 1. Namespace

Applies to all resources defined in file

### 2. Resource

Assets, Participants, Transactions, Events

### 3. Import Resources

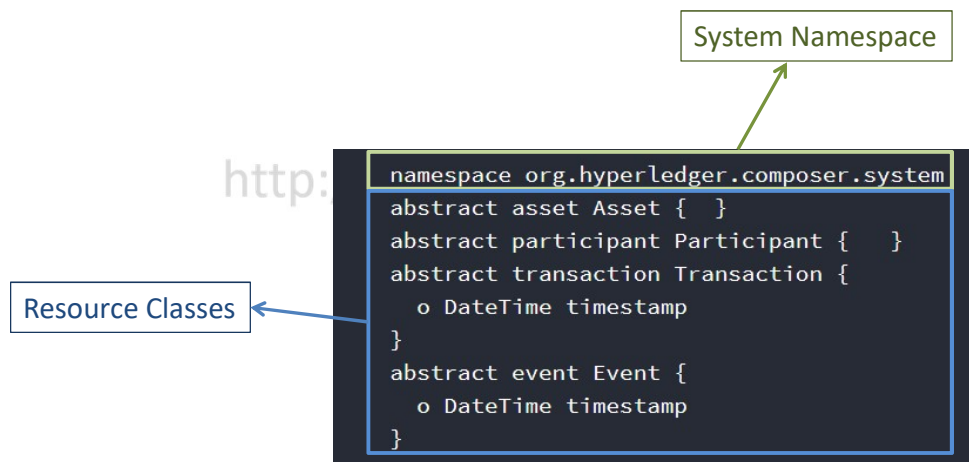
Optional

## Model Files

- Model may be spread across **multiple .cto** files
- Namespace cannot be repeated across files
- File naming convention: **namespace.cto**

## System Namespace

Contains base definitions of resources



> yo hyperledger-composer

<http://www.ACloudGan.com>



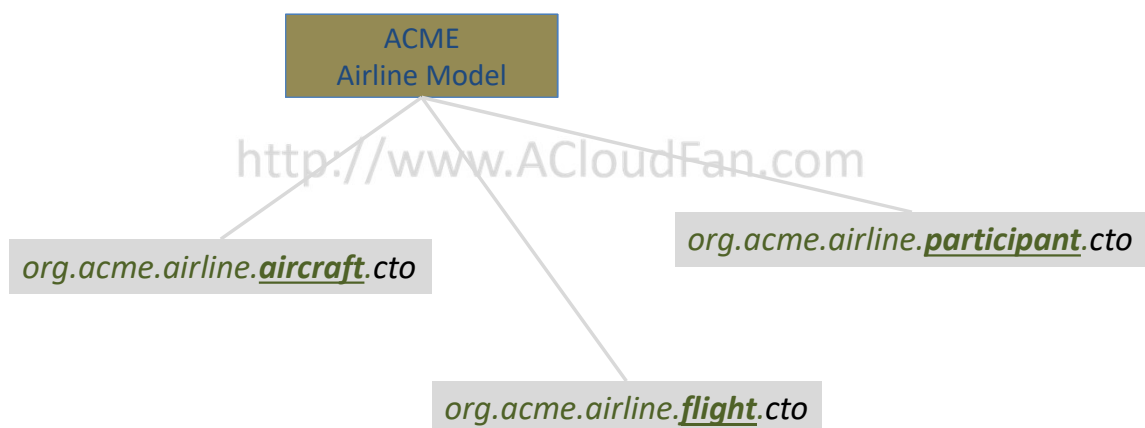
## ACME Air

## ACME airline domain model

http://airlinev1.udfan.com

## ACME Air

## ACME airline domain model



# Summary

Modeling Language

- Model may be spread across multiple *.cto* files

**namespace**

First statement in model file

- NS Applies to all resources in the file
- Unique across all model files
- File naming convention: *namespace.cto*

## User Defined

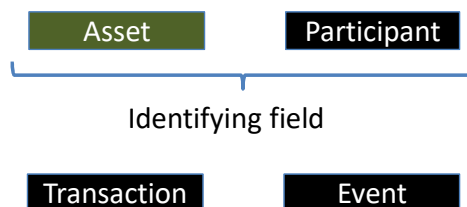
Namespace

- Applies to all resources in the file

```
namespace com.airlines.acme
```

Resource

- Extends system base class definitions



# Defining Resources

## Learning Objectives:

- Define an Asset

Identified by


asset

enum

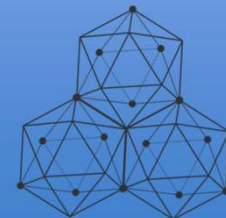
default

Optional

raj@acloudfan.com

 @acloudfan

<http://ACloudFan.com>



## Incremental Creation of ACME Air Domain Model

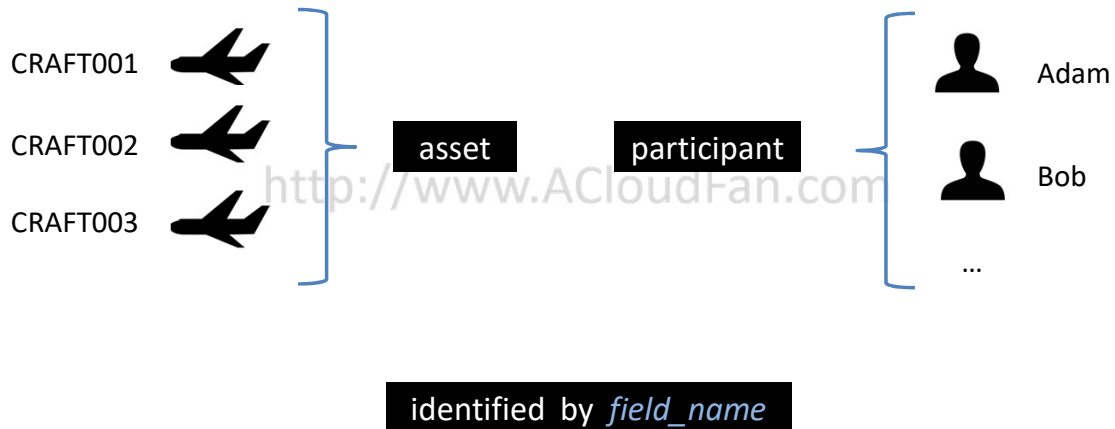
<https://github.com/acloudfan/HLF-Course-Domain-Model>

```

> airlinev1
> airlinev2
> airlinev3
> airlinev4
> airlinev5
> airlinev6
> airlinev7
> airlinev8
> airlinev9

```

## Resources



## Resource Fields

- Primitive types

```

o String    seatId      // A UTF8 encoded String
o Double    minimumPrice // A double precision 64 bit numeric value
o Integer    legroommm   // A 32 bit signed whole number
o Long      seatType     // A 64 bit signed whole number
o DateTime   installed   // An ISO-8601 compatible time instance
o Boolean    reserved    // True or False

```

## Enumeration

- User defined type
  - List of constant values that may be assigned to a field as value
  - Data is validated against the `enum` values

`enum`

Used for declaring an enumeration type

## Value Assignment

- By default value for all field is **Required**
  - Keyword `optional`
  - Required field may be initialized with a value
    - Keyword `default`

## ISO-8601 Datetime

YYYY-MM-DDThh:mm:ss.sTZD

<http://www.ACloudFan.com> 2018-01-31T19:20:30.45-05:00

<https://www.w3.org/TR/NOTE-datetime>

## Business Domain Modelling

### Discount Coupon Links to UDEMY courses:



<https://www.udemy.com/hyperledger/?couponCode=DKHLF1099>



<https://www.udemy.com/ethereum-dapp/?couponCode=DKETH1099>



<https://www.udemy.com/rest-api/?couponCode=DKRST1099>

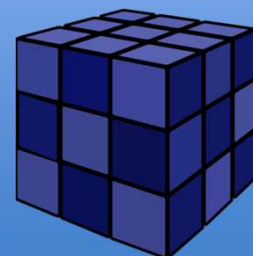


mentoring, seeking Blockchain part time work, project guidance, advice ... ..  
<http://www.bcmentors.com>

raj@acloudfan.com

@acloudfan

<http://ACloudFan.com>




This deck is part of a online course on “Hyperledger Fabric Development with Composer”

# Support for Object Orientation

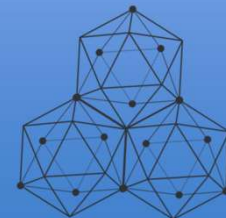
## Learning Objectives:

- Abstraction **abstract**
- Inheritance **extends**
- Association **concept**

raj@acloudfan.com

 @acloudfan

<http://ACloudFan.com>



## Incremental Creation of ACME Air Domain Model

<https://github.com/acloudfan/HLF-Course-Domain-Model>

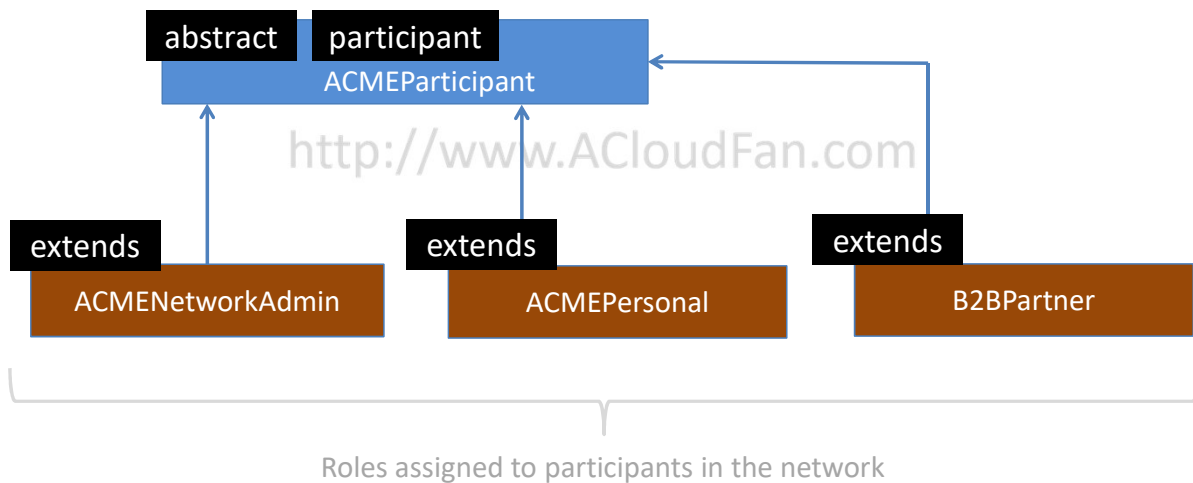
```
▶ airlinev1  
▶ airlinev2  
▶ airlinev3  
▶ airlinev4  
▶ airlinev5  
▶ airlinev6  
▶ airlinev7  
▶ airlinev8  
▶ airlinev9
```



## Inheritance

Resource marked as *abstract* cannot be created

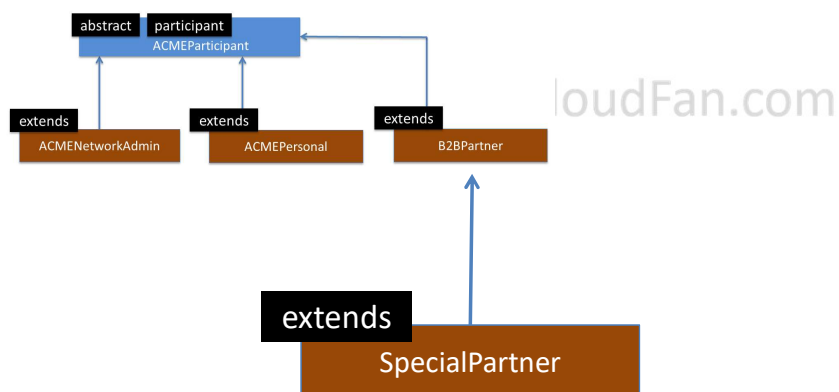
- Supports extension by inheritance



## Inheritance

New Resource should be the **same type as ancestor**

`participant ACMENetworkAdmin extends ACMEParticipant`

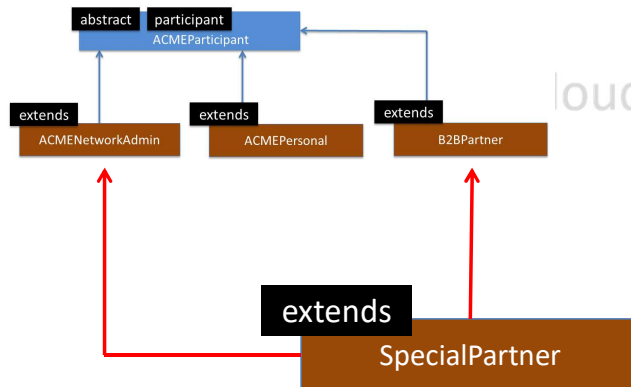




## Inheritance

New Resource should be the **same type as ancestor**

participant `ACMENetworkAdmin` extends `ACMEParticipant`



Multiple Inheritance  
**Not Supported**

## Concept

- Generic classes
- Does **NOT** represent Resource
- Instances of concepts contained in resource classes

Example: An Address Concept


Example: An `ACMEParticipant` have an Address

# Modeling Arrays

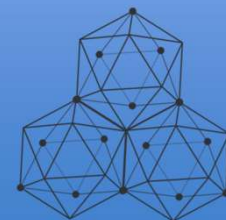
## Learning Objectives:

- Array declaration

raj@acloudfan.com

 @acloudfan

<http://ACloudFan.com>

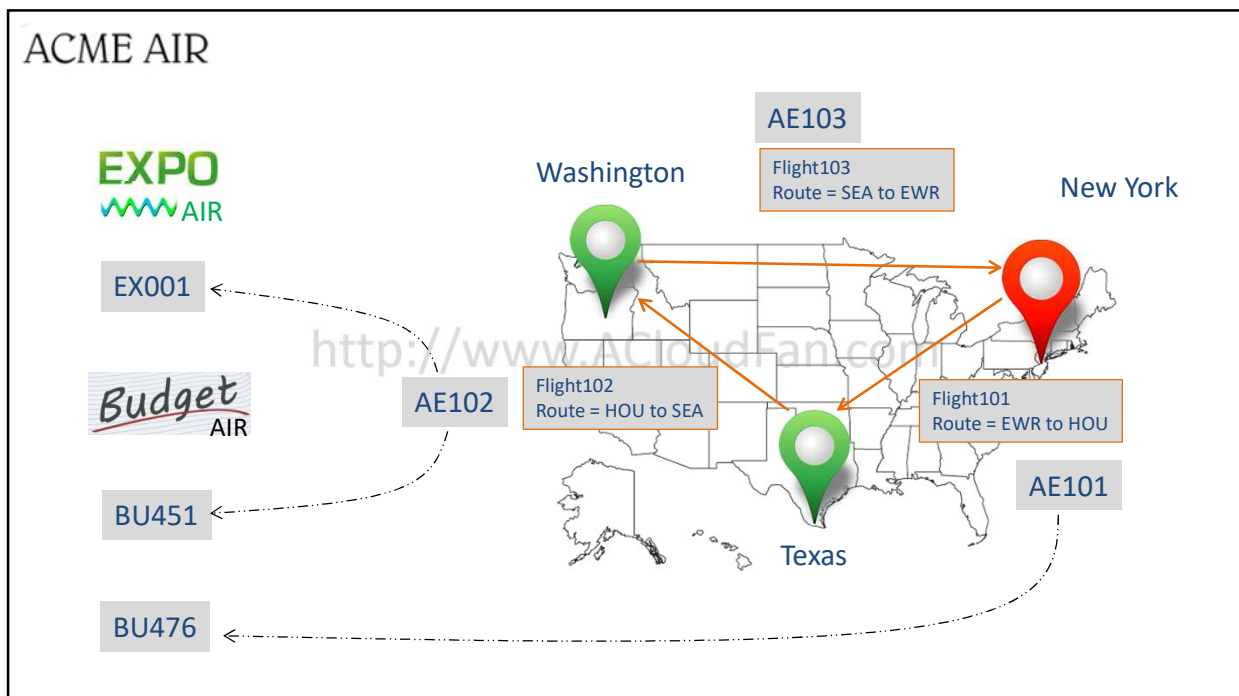
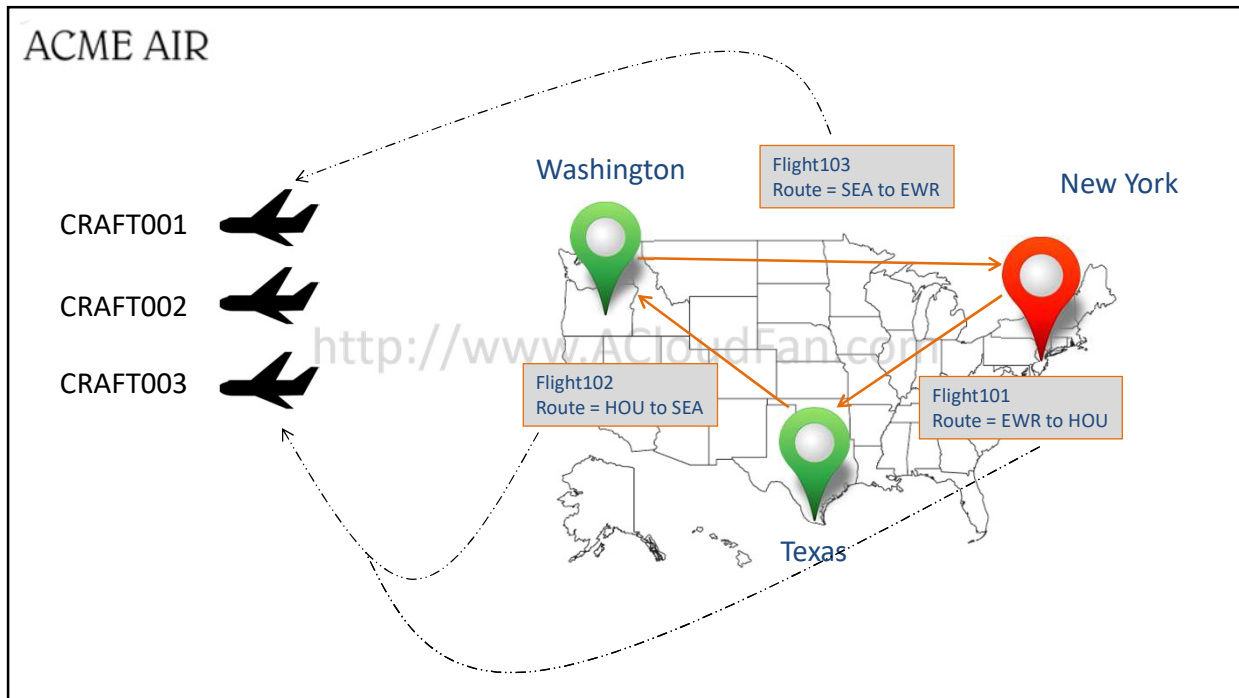


## Incremental Creation of ACME Air Domain Model

<https://github.com/acloudfan/HLF-Course-Domain-Model>

```
▶ airlinev1  
▶ airlinev2  
▶ airlinev3  
▶ airlinev4  
▶ airlinev5  
▶ airlinev6  
▶ airlinev7  
▶ airlinev8  
▶ airlinev9
```





## Arrays

- Declared with `[]` notation

Example: `Integer[] numbers`

Example: `String[] symbols`

- Array can be of any type

Example: `Route[] routes`

## Registries & Relationships

### Learning Objectives:

- Resource Registries
- Import resources
- Relationship

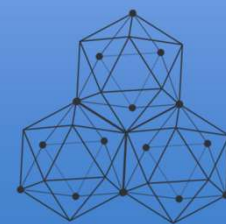
`import`

`-->`

raj@acloudfan.com

 @acloudfan

<http://ACloudFan.com>





## Incremental Creation of ACME Air Domain Model

<https://github.com/acloudfan/HLF-Course-Domain-Model>

```
airlinev1
airlinev2
airlinev3
airlinev4
airlinev5
airlinev6
airlinev7
airlinev8
airlinev9
```



## Registries

- Manages instances of resources
  - Each instance has a unique identity (*a.k.a. keys*)
  - Separate registry for each resource type



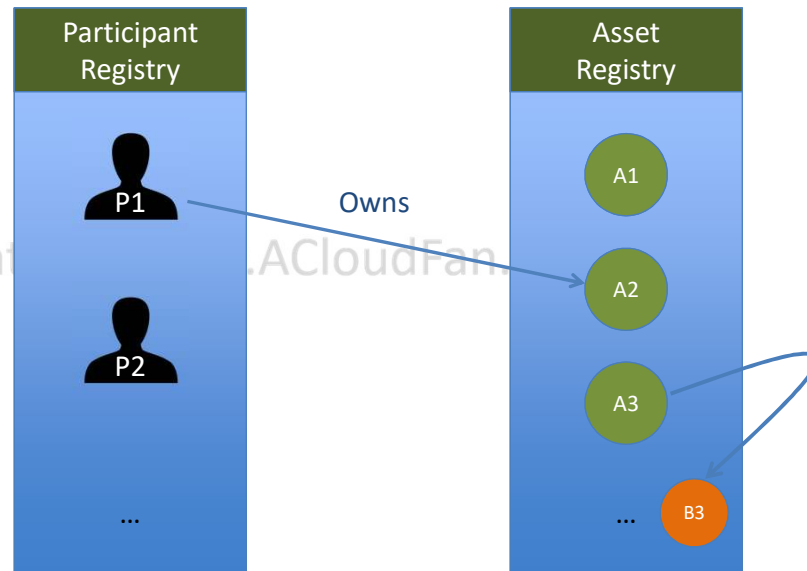
Aircraft



Participant

... ..

## Relations

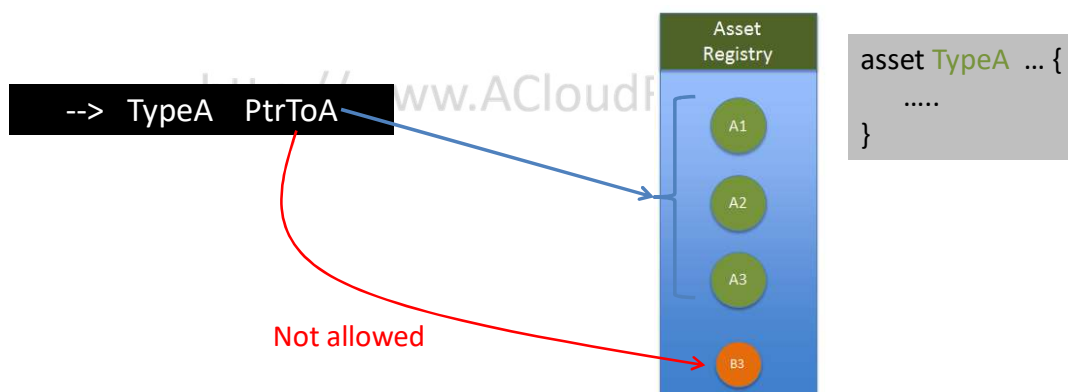


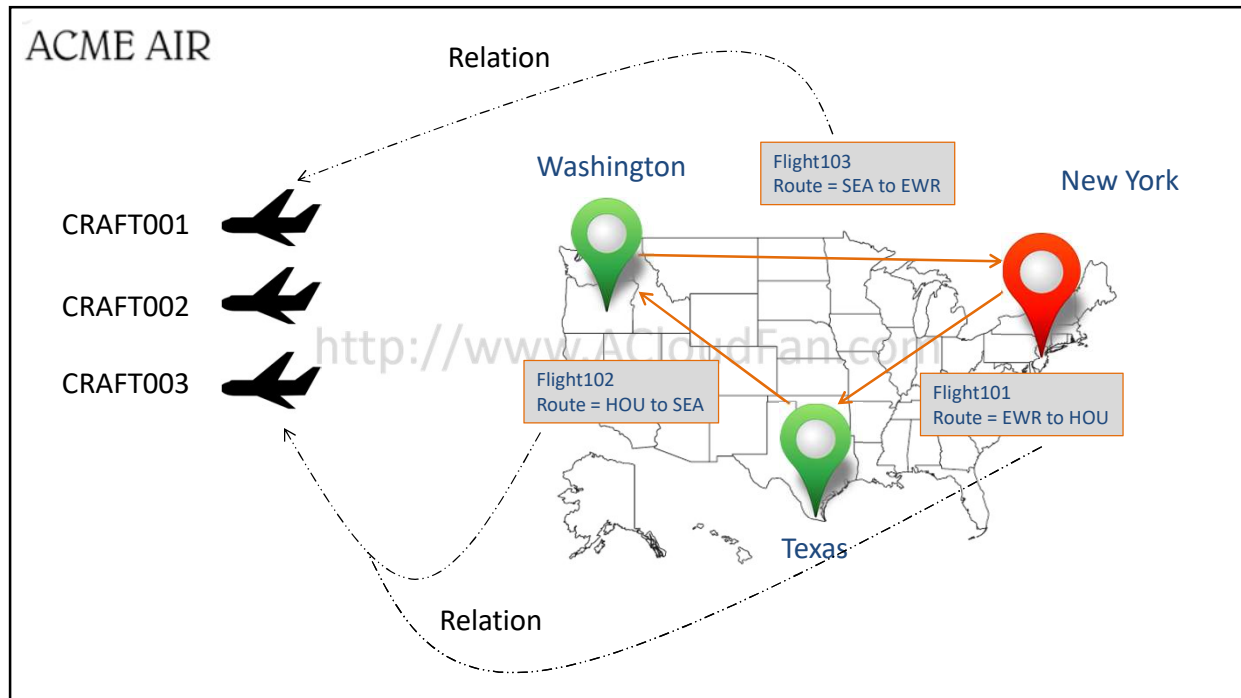
## Relationship

Depicted by using

-->

- Pointer to a specific asset type





## Organizing models

Refer to resources in other namespaces

import

- Import Single | All resources in the namespace (\*)

`org.acme.airline.aircraft.Aircraft`

import

`org.acme.airline.flight.Flight`

{Refers to Aircraft}

## Value Assignment

- Requires fully qualified resource name & identity

AE101  
Route = EWR to SEA

"aircraft": "org.acme.airline.aircraft.Aircraft #CRAFT001"



CRAFT001



CLI Tool

```
1 {
2   "name": "airlinev4",
3   "version": "0.0.1",
4   "description": "Incremental creation of the ACME model",
5   "scripts": {
6     "test": "mocha --recursive"
7   },
8   "author": "Dmitry"
9 }
```

Filename = airlinev4@0.0.1.bna

```
> mkdir dist
```

```
> cd dist
```

```
> composer archive create --sourceType dir --sourceName ../
```

<https://www.npmjs.com/package/composer-cli>



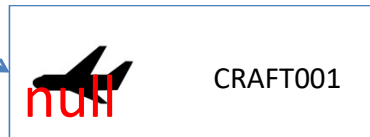
## Deletion of resource

- Requires fully qualified resource name & identity

AE101  
Route = EWR to SEA

"aircraft": "org.acme.airline.aircraft.Aircraft #CRAFT001"

- Deletion of referred resource leads to null



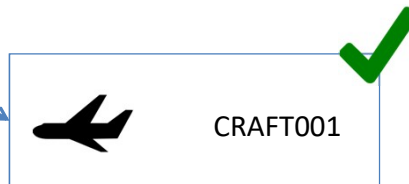
## Deletion

- Relationship is uni-directional

- Deletion of referrer has no impact on referred resource

AE101  
Route = EWR to SEA

"aircraft": "org.acme.airline.aircraft.Aircraft #CRAFT001"



# Field Validations


## Learning Objectives:

- Regular expressions 101

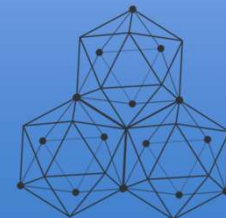
**regex=** String validations

**range=** Number validations

raj@acloudfan.com

 @acloudfan

<http://ACloudFan.com>



## Incremental Creation of ACME Air Domain Model

<https://github.com/acloudfan/HLF-Course-Domain-Model>

```
▶ airlinev1
▶ airlinev2
▶ airlinev3
▶ airlinev4
▶ airlinev5
▶ airlinev6
▶ airlinev7
▶ airlinev8
▶ airlinev9
```



## String Validation

- Format of the content is validated
  - Cannot be used for business rules

<http://www.ACloudFan.com>

- Format specified by way of regular expressions

regex=

## Regular Expressions

= Describes search or validation pattern



E-Mail:

`^([a-zA-Z0-9_\-\.]+)@([a-zA-Z0-9_\-\.]+)\.([a-zA-Z]{2,5})$`

[raj@acloudfan.com](mailto:raj@acloudfan.com)

[Raj\\*acloudfan.com](mailto:Raj*acloudfan.com)

<http://www.ACloudFan.com>



Phone Numbers:

`^\(?([0-9]{3})\)?[-.●]?([0-9]{3})[-.●]?([0-9]{4})$`

5555556666 (555)5556666 555-555-6666

555\*555\*6666

## ACME AIR

## Airport Code standard

- 3 Letters, all in capital

ATL	Atlanta
-----	---------

LAX Los Angeles

ORD	Chicago
-----	---------

DFW Dallas/Fort Worth

JFK	New York
-----	----------

DEN Denver

## Airport code validation

<http://www.ACloudFan.com>

`[A-Z][A-Z][A-Z]`

- Cannot be used for business rules

Airport code == EWR or HOU or SEA

## Number Validation

- Applies to Double, Long, Integer
- Check for range

<http://www.ACloudFan.com>

range=

`[100, ]` Any number from 100 and above

`[ , 100 ]` Any number 100 or less

`[ 5 , 10 ]` Between 5 & 10

# Business Network Model


## Participants

### Learning Objectives:

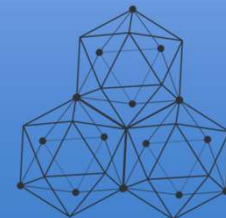
- Organizing models

participant

raj@acloudfan.com

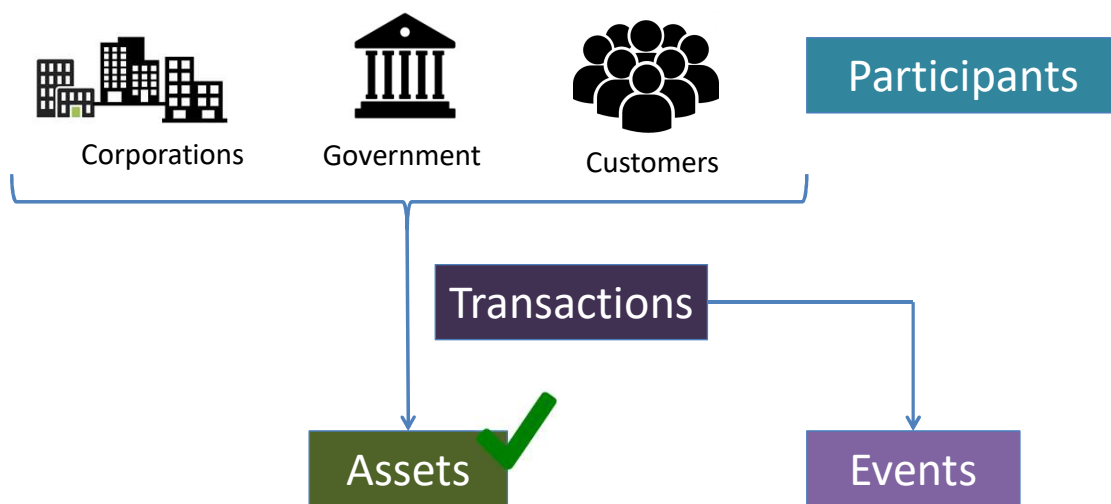
 @acloudfan

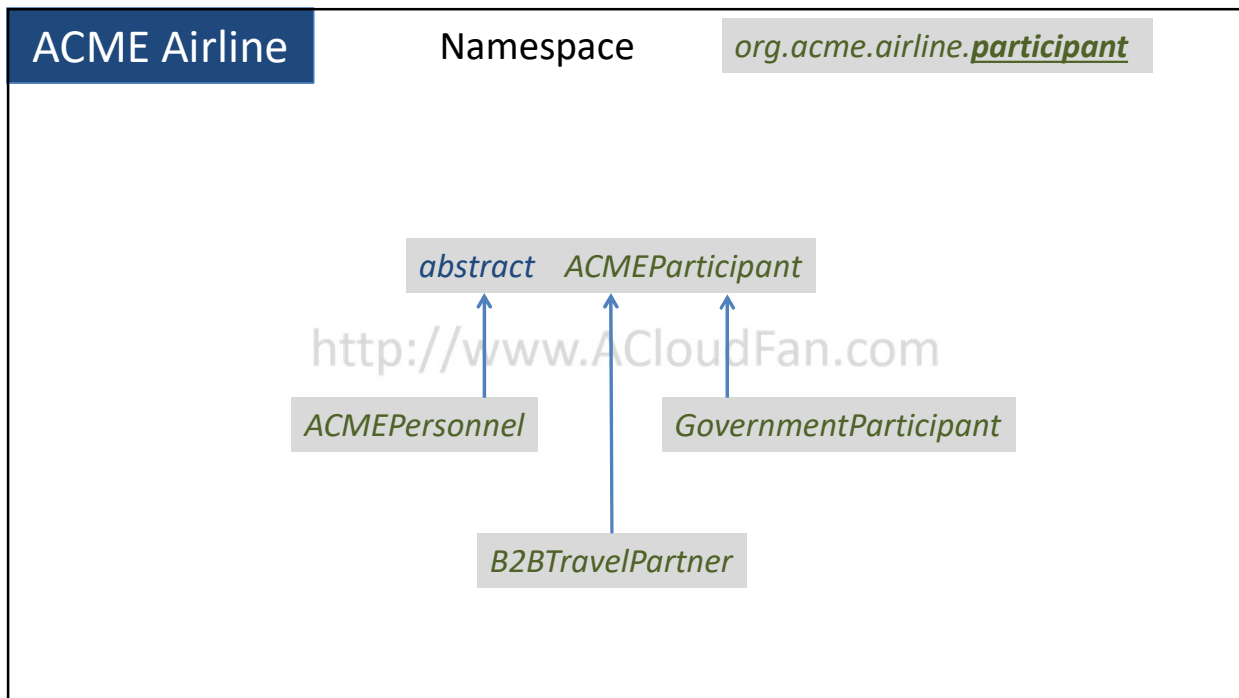
<http://ACloudFan.com>





## Business Network

Participants submit transactions



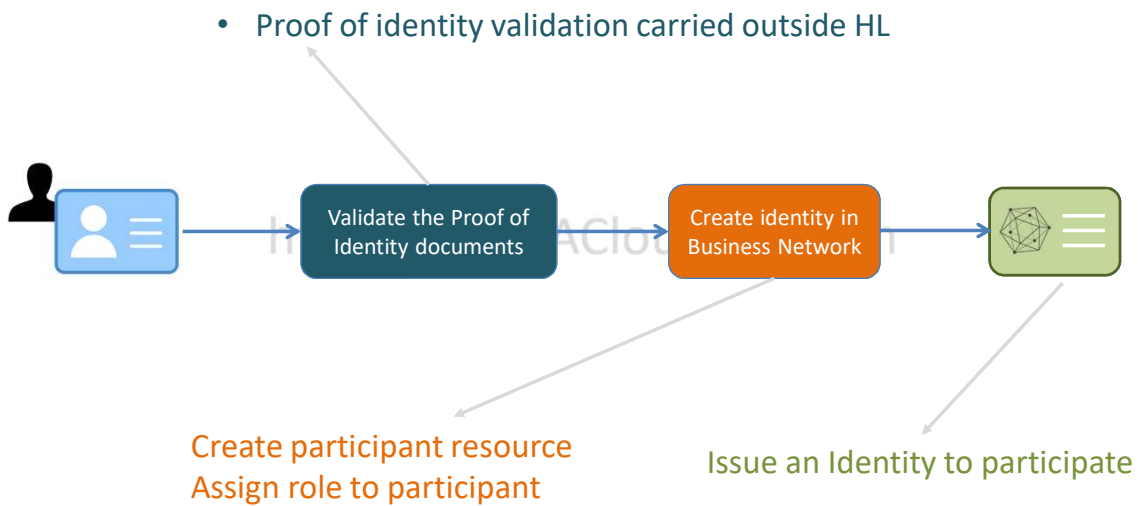


## Identity

- All participants are known
  - Passport
  - Driving license
  - Corp Certificate
- Participants needs **Identity document**
  - Well defined process for issuing Identity documents
  - Well defined process for issuing Identity documents

## Identity



## Resource Identity Requirement

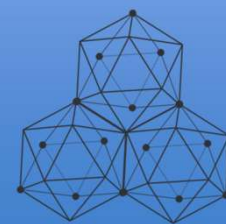
### Learning Objectives:

- ACME Airline **model flaw**
- Solution to the problem

raj@acloudfan.com

 @acloudfan

<http://ACloudFan.com>





## Incremental Creation of ACME Air Domain Model

<https://github.com/acloudfan/HLF-Course-Domain-Model>

```
airlinev1
airlinev2
airlinev3
airlinev4
airlinev5
airlinev6
airlinev7
airlinev8
airlinev9
```

Create a new project by copying to [airlinev6Exercise](#)

Solution

## Resource Identity

- All resources MUST have a unique identity

### Identified by

- Resources maintained in registries



ACME AIR

Each flight represent asset (s)



AE101

AE102

Mar 10<sup>th</sup> ...Mar 10<sup>th</sup> ...Mar 13<sup>th</sup> ...Mar 13<sup>th</sup> ...

Network will allow only 1 flight for each flight number !!!

## Flight Identity

Adjust the model so that same flight # can be used multiple days

Identified by flightId

Airline Flight #  
5 Characters

Fixed  
character "-"

Date  
MM-DD-YY

AE102

-

05-26-18

AE102-05-26-18

AE102-05-31-18