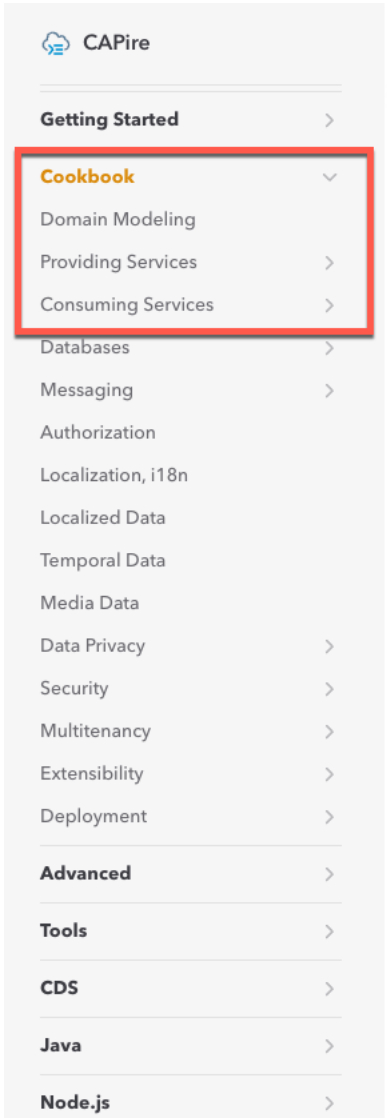
Cookbook 소개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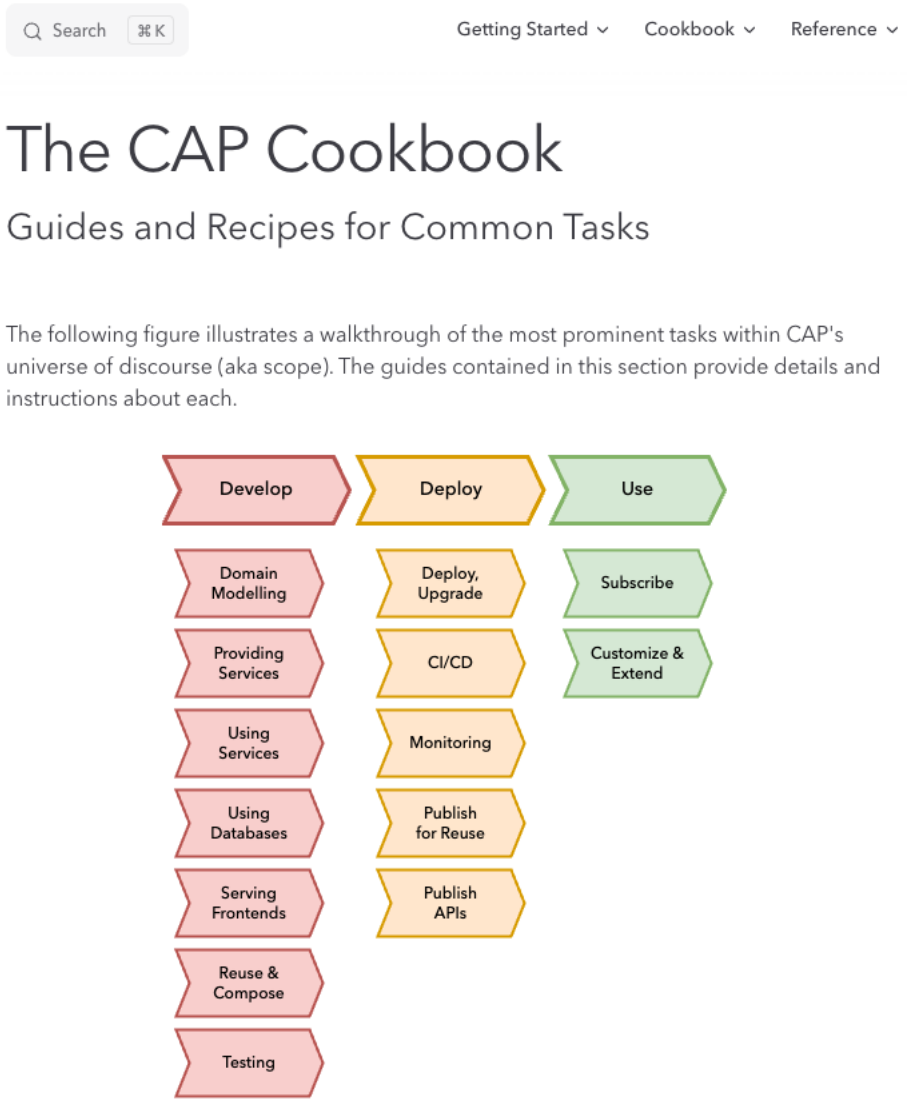
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The CAP Cookbook
Guides and Recipes for Common Tasks
The following figure illustrates a walkthrough of the most prominent tasks within CAP's universe of discourse (aka scope). The guides contained in this section provide details and instructions about each.
Develop
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Domain Modelling
Providing Services
Using Services
Using Databases
Serving Frontends
Reuse & Compose
Testing
Deploy, Upgrade
CI/CD
Monitoring
Publish for Reuse
Publish APIs
Subscribe
Customize & Extend

Domain Modeling & Providing Service Hands-on

Capture intent → What, not How

```
using { cuid, managed } from '@sap/cds/common’;
entity Books : cuid, managed
{
  title : localized String;
  descr : localized String;
  author : Association to Authors;
}
```

Entity-Relationship Modeling

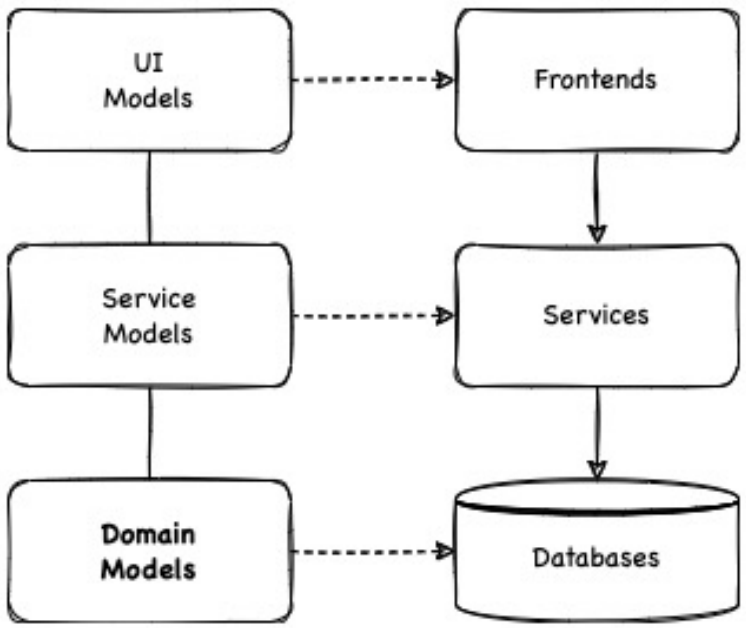
```
using { cuid } from '@sap/cds/common';

entity Books : cuid {
  title  : String;
  descr  : String;
  genre  : Genre;
  author : Association to Authors;
}

entity Authors : cuid {
  name   : String;
  books  : Association to many Books on books.author = $self;
}

type Genre : String enum {
  Mystery; Fiction; Drama;
}
```

Fueling Generic Providers, Domain-Driven Design Keep it Simple, Stupid Aspect-oriented Modeling



CAP shares these goals and approaches with Domain-driven Design:

- Placing projects' primary focus on the core domain
- Close collaboration of developers and domain experts
- Iteratively refining domain knowledge

CAP Composition of many

CDS – Data modeling

Schema.cds

```
entity XTBL003 {
       key FLOWUUID : UUID @(Core.Computed : true);
       key FLOWCODE : String(5);
       key STATUS : String(2);
       DETAIL : Composition of many XTBL004
         on DETAIL.FLOWUUID = FLOWUUID
         and DETAIL.FLOWCODE = FLOWCODE
         and DETAIL.STATUS = STATUS;
       FIELD01 : String(100);
       FIELD02 : String(100);
}

entity XTBL004 {
       key FLOWUUID : UUID @(Core.Computed : true);
       key FLOWCODE : String(5);
       key NO1 : String(2);
       STATUS : String(2);
       APPROVAL_NAME : String(100);
}
```

Postman - POST

/hkmc/XTBL003


```
{
 "FLOWCODE": "MH001",
 "STATUS": "01",
 "FIELD01": "07199782",
 "FIELD02": "K0121120",
 "DETAIL" : [
  {
   "FLOWCODE": "MH001",
   "NO1": "2",
   "STATUS": "01",
   "APPROVAL_NAME": "JHAN"
  },{
   "FLOWCODE": "MH001",
   "NO1": "3",
   "STATUS": "01",
   "APPROVAL_NAME": "JHAN"
  }]
}
```


Postman – GET

/hkmc/XTBL003(FLOWUUID=50a79a4e-834f-4294-9d4c-c415fbc572c4,FLOWCODE='MH001',STATUS='01')?$expand=DETAIL


```
{
 "@odata.context": "$metadata#XTBL003(DETAIL())/$entity",
 "FLOWUUID": "79e8d3e8-ef0d-401f-a586-a15f59789b62",
 "FLOWCODE": "MH001",
 "STATUS": "01",
 "DETAIL": [
  {
   "FLOWUUID": "79e8d3e8-ef0d-401f-a586-a15f59789b62",
   "FLOWCODE": "MH001",
   "NO1": "2",
   "STATUS": "01",
   "APPROVAL_NAME": "JHAN"
  },
  {
   "FLOWUUID": "79e8d3e8-ef0d-401f-a586-a15f59789b62",
   "FLOWCODE": "MH001",
   "NO1": "3",
   "STATUS": "01",
   "APPROVAL_NAME": "JHAN"
  }
 ],
 "FIELD01": "07199782",
 "FIELD02": "K0121120"
}
```

CAP Composition

OData Metadata

```
<EntityType Name="XTBL003">
 <Key>
  <PropertyRef Name="FLOWUUID"/>
  <PropertyRef Name="FLOWCODE"/>
  <PropertyRef Name="STATUS"/>
 </Key>
 <Property Name="FLOWUUID" Type="Edm.Guid" Nullable="false"/>
 <Property Name="FLOWCODE" Type="Edm.String" MaxLength="5" Nullable="false"/>
 <Property Name="STATUS" Type="Edm.String" MaxLength="2" Nullable="false"/>
 <NavigationProperty Name="DETAIL" Type="Collection(hkmc.XTBL004)">
   <OnDelete Action="Cascade"/>
 </NavigationProperty>
 <Property Name="FIELD01" Type="Edm.String" MaxLength="100"/>
 <Property Name="FIELD02" Type="Edm.String" MaxLength="100"/>
</EntityType>

<EntityType Name="XTBL004">
 <Key>
   <PropertyRef Name="FLOWUUID"/>
   <PropertyRef Name="FLOWCODE"/>
   <PropertyRef Name="NO1"/>
 </Key>
 <Property Name="FLOWUUID" Type="Edm.Guid" Nullable="false"/>
 <Property Name="FLOWCODE" Type="Edm.String" MaxLength="5" Nullable="false"/>
 <Property Name="NO1" Type="Edm.String" MaxLength="2" Nullable="false"/>
 <Property Name="STATUS" Type="Edm.String" MaxLength="2"/>
 <Property Name="APPROVAL_NAME" Type="Edm.String" MaxLength="100"/>
</EntityType>
```

Postman – PUT

/hkmc/XTBL003(FLOWUUID=79e8d3e8-ef0d-401f-a586-a15f59789b62,FLOWCODE='MH001',STATUS='01')


```
{
"FLOWUUID": "79e8d3e8-ef0d-401f-a586-a15f59789b62",
"FLOWCODE": "MH001",
"STATUS": "01",
"FIELD01": "VVV",
"FIELD02": "SSS",
"DETAIL" : [{
"FLOWUUID": "79e8d3e8-ef0d-401f-a586-a15f59789b62",
"FLOWCODE": "MH001",
"NO1": "2",
"STATUS": "01",
"APPROVAL_NAME": "JHANS"
},{
"FLOWUUID": "79e8d3e8-ef0d-401f-a586-a15f59789b62",
"FLOWCODE": "MH001",
"NO1": "3",
"STATUS": "01",
"APPROVAL_NAME": "JHANQ"
}]
}
```


Postman – DELETE

/hkmc/XTBL003(FLOWUUID=79e8d3e8-ef0d-401f-a586-a15f59789b62,FLOWCODE='MH001',STATUS='01')

CAP Composition of one

CDS – Data modeling

Schema.cds

```
entity XTBL0030 {
       key FLOWUUID : UUID @(Core.Computed : true);
       key FLOWCODE : String(5);
       key STATUS : String(2);
       DETAIL : Composition of one XTBL004
         on DETAIL.FLOWUUID = FLOWUUID
         and DETAIL.FLOWCODE = FLOWCODE
         and DETAIL.STATUS = STATUS;
       FIELD01 : String(100);
       FIELD02 : String(100);
}

entity XTBL0040 {
       key FLOWUUID : UUID @(Core.Computed : true);
       key FLOWCODE : String(5);
       key NO1 : String(2);
       STATUS : String(2);
       APPROVAL_NAME : String(100);
}
```

Postman - POST

/hkmc/XTBL0030

```
{
 "FLOWCODE": "MH001",
 "STATUS": "01",
 "FIELD01": "07199782",
 "FIELD02": "K0121120",
 "DETAIL" :
  {
   "FLOWCODE": "MH001",
   "NO1": "2",
   "STATUS": "01",
   "APPROVAL_NAME": "JHAN"
  }
}
```

Postman – GET

XTBL0030(FLOWUUID=3f96b199-6f98-4160-844d-06795360e697,FLOWCODE='MH001',STATUS='01')?$expand=DETAIL


```
{
"@odata.context": "$metadata#XTBL0030(DETAIL())/$entity",
"FLOWUUID": "3f96b199-6f98-4160-844d-06795360e697",
"FLOWCODE": "MH001",
"STATUS": "01",
"FIELD01": "07199782",
"FIELD02": "K0121120",
"DETAIL": {
 "FLOWUUID": "3f96b199-6f98-4160-844d-06795360e697",
 "FLOWCODE": "MH001",
 "NO1": "2",
 "STATUS": "01",
 "APPROVAL_NAME": "JHAN"
 }
}
```

CAP Composition

```
<EntityType Name="XTBL0030">
<Key>
<PropertyRef Name="FLOWUUID"/>
<PropertyRef Name="FLOWCODE"/>
<PropertyRef Name="STATUS"/>
</Key>
<Property Name="FLOWUUID" Type="Edm.Guid" Nullable="false"/>
<Property Name="FLOWCODE" Type="Edm.String" MaxLength="5" Nullable="false"/>
<Property Name="STATUS" Type="Edm.String" MaxLength="2" Nullable="false"/>
<NavigationProperty Name="DETAIL" Type="hkmc.XTBL0040">
  <OnDelete Action="Cascade"/>
  <ReferentialConstraint Property="FLOWUUID" ReferencedProperty="FLOWUUID"/>
  <ReferentialConstraint Property="FLOWCODE" ReferencedProperty="FLOWCODE"/>
  <ReferentialConstraint Property="STATUS" ReferencedProperty="STATUS"/>
</NavigationProperty>
<Property Name="FIELD01" Type="Edm.String" MaxLength="100"/>
<Property Name="FIELD02" Type="Edm.String" MaxLength="100"/>
</EntityType>
<EntityType Name="XTBL0040">
<Key>
<PropertyRef Name="FLOWUUID"/>
<PropertyRef Name="FLOWCODE"/>
<PropertyRef Name="NO1"/>
</Key>
<Property Name="FLOWUUID" Type="Edm.Guid" Nullable="false"/>
<Property Name="FLOWCODE" Type="Edm.String" MaxLength="5" Nullable="false"/>
<Property Name="NO1" Type="Edm.String" MaxLength="2" Nullable="false"/>
<Property Name="STATUS" Type="Edm.String" MaxLength="2"/>
<Property Name="APPROVAL_NAME" Type="Edm.String" MaxLength="100"/>
</EntityType>
```

CAP Association(to one)

CDS – Data modeling

Schema.cds

```
entity XYTBL003 {
key FLOWUUID : UUID @(Core.Computed : true);
key FLOWCODE : String(5);
key STATUS : String(2);
DETAIL : Association to XYTBL004
  on DETAIL.FLOWUUID = FLOWUUID
  and DETAIL.FLOWCODE = FLOWCODE
  and DETAIL.STATUS = STATUS;
FIELD01 : String(100);
FIELD02 : String(100);
}

entity XYTBL004 {
key FLOWUUID : UUID @(Core.Computed : true);
key FLOWCODE : String(5);
key NO1 : String(2);
STATUS : String(2);
APPROVAL_NAME : String(100);
}
```

Postman - POST

/hkmc/XYTBL003

```
{
"FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-
bf68f971d8d9",
"FLOWCODE": "MH001",
"STATUS": "02",
"FIELD01": "07199782",
"FIELD02": "K0121120"
}
```

/hkmc/XYTBL004

```
{
"FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9",
"FLOWCODE": "MH001",
"NO1": "2",
"STATUS": "02",
"APPROVAL_NAME": "JHAN"
}
```

```
{
"FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9",
"FLOWCODE": "MH001",
"NO1": "2",
"STATUS": "02",
"APPROVAL_NAME": "JHAN9"
}
```

Postman – GET

/hkmc/XYTBL003(FLOWUUID= 170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9,FLOWCODE='MH001',STATUS='02')?$expand=DETAIL

```
{
"@odata.context": "$metadata#XYTBL003(DETAIL())/$entity",
"FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9",
"FLOWCODE": "MH001",
"STATUS": "02",
"FIELD01": "07199782",
"FIELD02": "K0121120",
"DETAIL": {
 "FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9",
 "FLOWCODE": "MH001",
 "NO1": "2",
 "STATUS": "02",
 "APPROVAL_NAME": "JHAN"
}
}
```

Detail이 한건만 나옴

CAP Association to many

CDS – Data modeling

Schema.cds

```
entity XYZTBL003 {
key FLOWUUID : UUID @(Core.Computed : true);
key FLOWCODE : String(5);
key STATUS : String(2);
DETAIL : Association to many XYTBL004
  on DETAIL.FLOWUUID = FLOWUUID
  and DETAIL.FLOWCODE = FLOWCODE
  and DETAIL.STATUS = STATUS;
FIELD01 : String(100);
FIELD02 : String(100);
}

entity XYZTBL004 {
key FLOWUUID : UUID @(Core.Computed : true);
key FLOWCODE : String(5);
key NO1 : String(2);
STATUS : String(2);
APPROVAL_NAME : String(100);
}
```

Postman - POST

/hkmc/XYZTBL003

```
{
"FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-
bf68f971d8d9",
"FLOWCODE": "MH001",
"STATUS": "02",
"FIELD01": "07199782",
"FIELD02": "K0121120"
}
```

/hkmc/XYZTBL004

```
{
"FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9",
"FLOWCODE": "MH001",
"NO1": "2",
"STATUS": "02",
"APPROVAL_NAME": "JHAN"
}
```

```
{
"FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9",
"FLOWCODE": "MH001",
"NO1": "2",
"STATUS": "02",
"APPROVAL_NAME": "JHAN9"
}
```

Postman – GET

/hkmc/XYZTBL003(FLOWUUID= 170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9,FLOWCODE='MH001',STATUS='02')?$expand=DETAIL

```
{
"@odata.context": "$metadata#XYZTBL003(DETAIL())/$entity",
"FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9",
"FLOWCODE": "MH001",
"STATUS": "02",
"FIELD01": "07199782",
"FIELD02": "K0121120",
"DETAIL": [
 {
  "FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9",
  "FLOWCODE": "MH001",
  "NO1": "3",
  "STATUS": "02",
   "APPROVAL_NAME": "JHAN9"
 },
 {
  "FLOWUUID": "170e3c5e-d3cf-4f0a-97ee-bf68f971d8d9",
  "FLOWCODE": "MH001",
  "NO1": "4",
  "STATUS": "02",
  "APPROVAL_NAME": "JHAN90"
 }
]
}
```

Detail이 N건이 나옴

CAP Association

```
<EntityType Name="XYTBL003">
<Key>
<PropertyRef Name="FLOWUUID"/>
<PropertyRef Name="FLOWCODE"/>
<PropertyRef Name="STATUS"/>
</Key>
<Property Name="FLOWUUID" Type="Edm.Guid" Nullable="false"/>
<Property Name="FLOWCODE" Type="Edm.String" MaxLength="5" Nullable="false"/>
<Property Name="STATUS" Type="Edm.String" MaxLength="2" Nullable="false"/>
<NavigationProperty Name="DETAIL" Type="hkmc.XYTBL004">
<ReferentialConstraint Property="FLOWUUID" ReferencedProperty="FLOWUUID"/>
<ReferentialConstraint Property="FLOWCODE" ReferencedProperty="FLOWCODE"/>
</NavigationProperty>
<Property Name="FIELD01" Type="Edm.String" MaxLength="100"/>
<Property Name="FIELD02" Type="Edm.String" MaxLength="100"/>
</EntityType>

<EntityType Name="XYTBL004">
<Key>
<PropertyRef Name="FLOWUUID"/>
<PropertyRef Name="FLOWCODE"/>
<PropertyRef Name="NO1"/>
</Key>
<Property Name="FLOWUUID" Type="Edm.Guid" Nullable="false"/>
<Property Name="FLOWCODE" Type="Edm.String" MaxLength="5" Nullable="false"/>
<Property Name="NO1" Type="Edm.String" MaxLength="2" Nullable="false"/>
<Property Name="STATUS" Type="Edm.String" MaxLength="2"/>
<Property Name="APPROVAL_NAME" Type="Edm.String" MaxLength="100"/>
</EntityType>
```

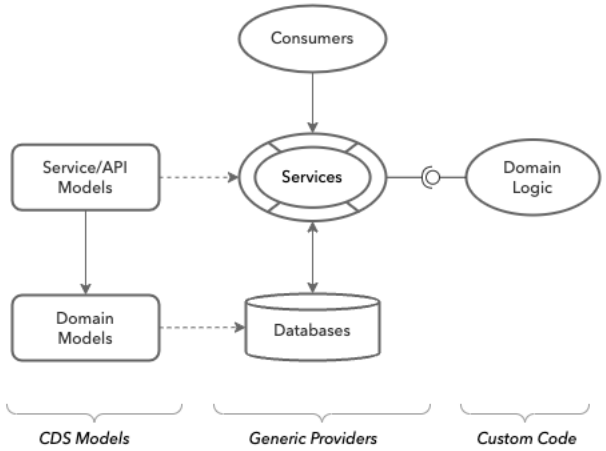
```
<EntityType Name="XYZTBL003">
<Key>
<PropertyRef Name="FLOWUUID"/>
<PropertyRef Name="FLOWCODE"/>
<PropertyRef Name="STATUS"/>
</Key>
<Property Name="FLOWUUID" Type="Edm.Guid" Nullable="false"/>
<Property Name="FLOWCODE" Type="Edm.String" MaxLength="5" Nullable="false"/>
<Property Name="STATUS" Type="Edm.String" MaxLength="2" Nullable="false"/>
<NavigationProperty Name="DETAIL" Type="Collection(hkmc.XYZTBL004)"/>
<Property Name="FIELD01" Type="Edm.String" MaxLength="100"/>
<Property Name="FIELD02" Type="Edm.String" MaxLength="100"/>
</EntityType>

<EntityType Name="XYZTBL004">
<Key>
<PropertyRef Name="FLOWUUID"/>
<PropertyRef Name="FLOWCODE"/>
<PropertyRef Name="NO1"/>
</Key>
<Property Name="FLOWUUID" Type="Edm.Guid" Nullable="false"/>
<Property Name="FLOWCODE" Type="Edm.String" MaxLength="5" Nullable="false"/>
<Property Name="NO1" Type="Edm.String" MaxLength="2" Nullable="false"/>
<Property Name="STATUS" Type="Edm.String" MaxLength="2"/>
<Property Name="APPROVAL_NAME" Type="Edm.String" MaxLength="100"/>
</EntityType>
```

Providing Services

Service-Centric Paradigm

A CAP application commonly provides services defined in CDS models and served by the CAP runtimes. Every active thing in CAP is a service. They embody the behavioral aspects of a domain in terms of exposed entities, actions, and events.

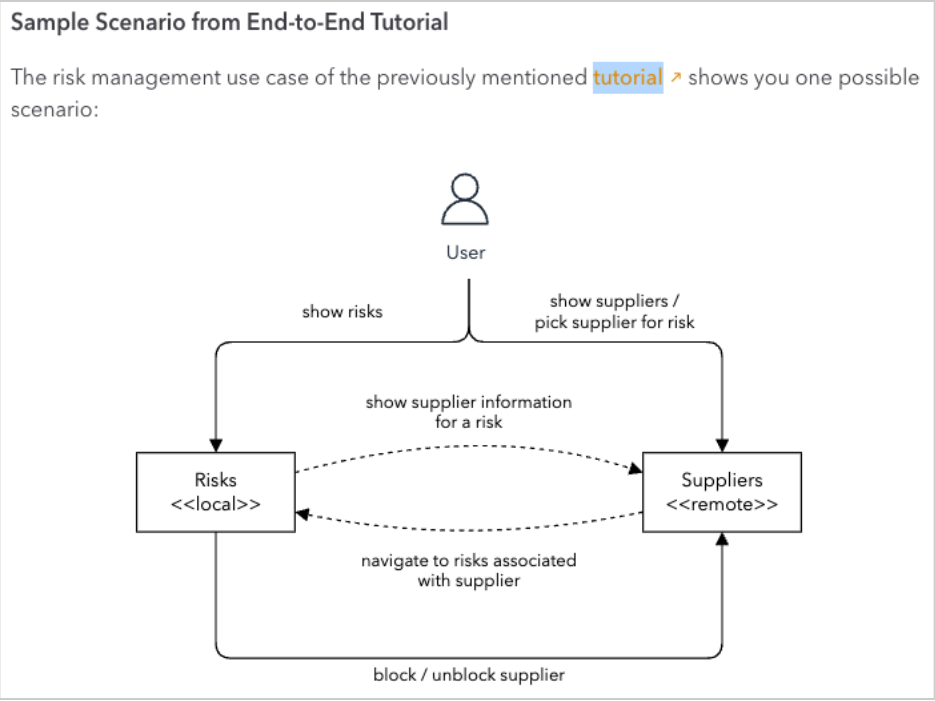


Ubiquitous Events

At runtime, everything happening is in response to events. CAP features a ubiquitous notion of events, which represent both, *requests* coming in through **synchronous** APIs, as well as **asynchronous** *event messages*, blurring the line between both worlds.

Modeling Services	Services Act as Facades
Generic Providers	Serve most requests automatically with OOTB solutions
Pagination & Sorting	Implicit Pagination & Reliable Pagination - @cds.query.xxxx
Input Validation	Implicit Pagination & Reliable Pagination - @mandatory, @assert
Managed Data	Using {managed} from '@sap/cds/common' $user, $now
Concurrency Control	Optimistic concurrency Etags - @odata.etag
Adding Custom Logic	Optimistic concurrency Etags - @odata.etag
Custom Actions & Functions	Action(input params) returns value Function (input params) returns value

Consuming Services



Import APIs	cds import <input file> --as cds Srv/external
Mocking	Srv/external/data cds watch
Querying	Cds.connect.to('cds_dest_in_pkg.json')
Mashups	Cds association between local and re /service/localsrv?$expand=remotesrv
Deployments	Create destination Dest_name in package.json

Databases

Messaging

Authorization

Localization, i18n

Temporal Data

Media Data

Security

Multitenancy

Extensibility

Deployment

CDS

Definition Language(CDL)

Define entity, define type…

Schema Notation(CSN)

…

Query Language(CQL)

CQL is based on standard SQL

```
SELECT from Authors { name, address.street }
SELECT from Books { *, author.name as author }
```

Query Notation(CQN)

CQN is a canonical plain object representation of CDS queries.

```
// Parsing CQL
let query = cds.parse.cql (`SELECT from Foo`)

// Query building
let query = SELECT.from('Foo’)

// Constructing CQN objects in your code
let query = {SELECT:{from:[{ref:['Foo']}]}}

cds.run (query)
```

Binary type

```
entity HR0010 {
key FLOWUUID : UUID @(Core.Computed : true);
key FLOWCODE : String(5);
key DOCUMENTID : String(36);
FILENAME : String(100);
FILESIZE : String(100);
FILEUPLOADDATE: Date;
FILEUPLOADTIME: Time;
URL: String(500);
@Core.MediaType: mimeType
CONTENT: LargeBinary @stream;
@Core.IsMediaType : true
mimeType : String(200);
}
```