# CCL: A Lightweight ORM Embedding in Clean

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# A little about me


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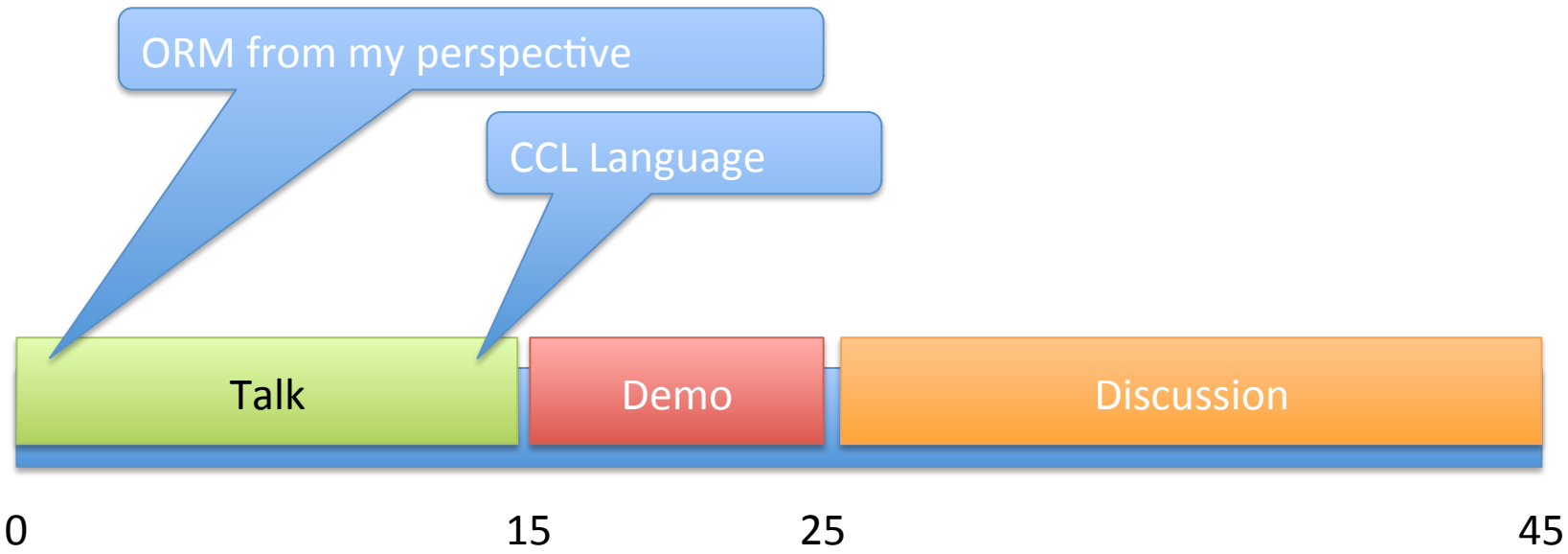
# Plan for Today



# My Day Job

**Generally**

Software Development Tools

- Methods, Languages, Libraries, Frameworks

Application Domains

- Crisis Management, Command and Control

**Specifically**

Functional Programming with Clean

Task-Oriented Programming with iTasks

# Functional Programming
# with
# Clean


- Pure lazy functional language
- Developed at Radboud University (since 1984)
- Similar to Haskell (and caml,lisp,scheme,f# etc)
- General purpose language
  - Based on Lamdba Calculus with graph reduction semantics
  - Statically Typed (with Hybrid Dynamic types)
  - Higher order functions
  - Algebraic Data Types (Burstall style)

# Task-Oriented Programming
# with
# iTasks

# Task-Oriented Programming

- Task is primary building block
- High-level basic tasks + composition operators
- Define process and data together
- Specify complete executable systems

A Task is a specified piece of work aiming to produce a result of known **type**.

When **executed** tasks produce (temporary) results which are **observed** in a **controlled** way.

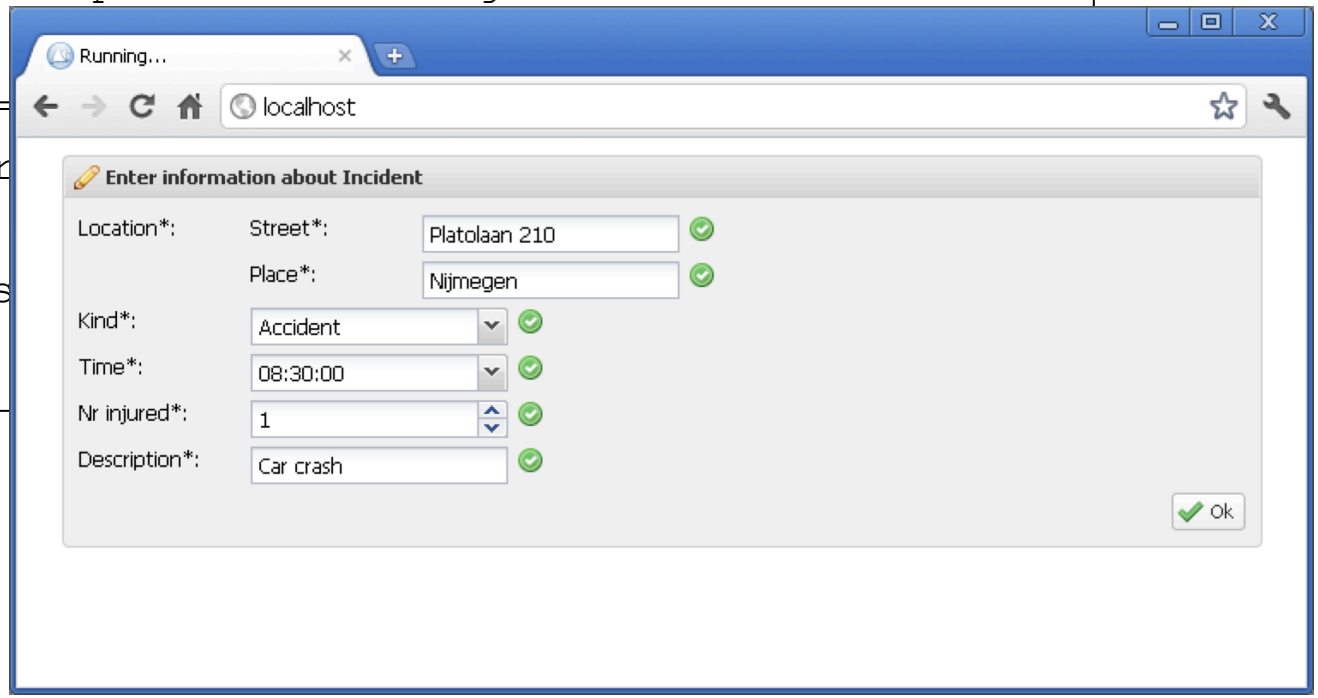
# itasks

dynamic workflow system

- Implementation of TOP
- Toolkit for building (prototypes of) TOP applications
- Buzzwords
  - Declaritive, Functional Programming in Clean
  - Domain specific language / library in Clean
  - Code generation, Generic Programming

# Example Basic Task

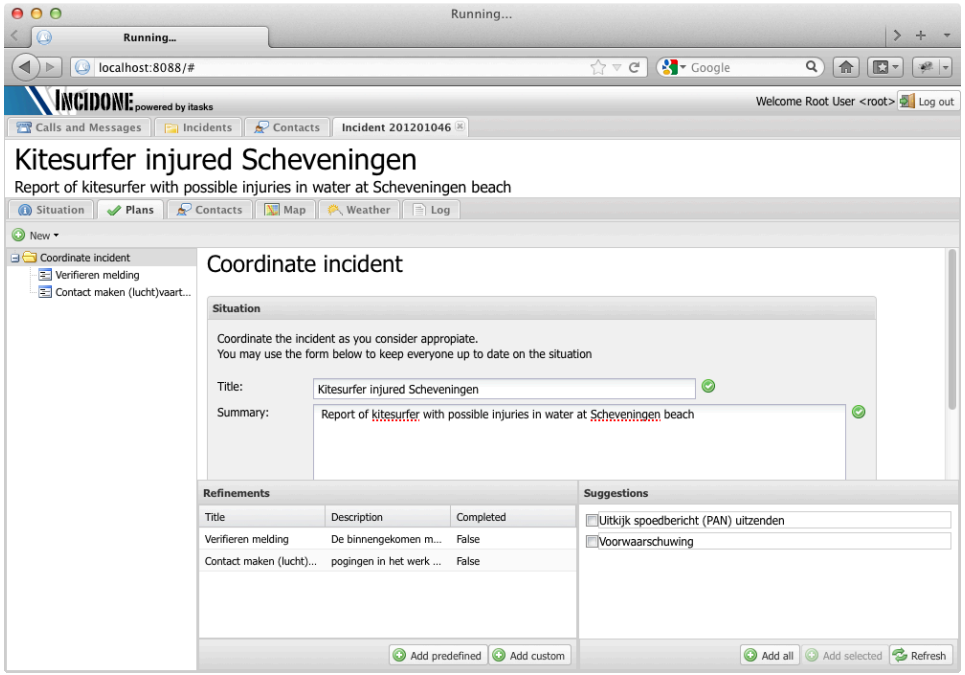
```
incidentvb :: Task Incident
incidentvb = enterInformation "Enter…Incident" []

::Incident = {location      :: Location
             ,kind          :: IncidentKind
             ,time          :: Time
             ,nrInjured     :: Int
             ,description   :: String
             }
::IncidentKind  =
::Location = {str

derive class iTas
```



# Use of TOP & iTasks

- Rapid Prototyping
- “Agile” development

- Task Analysis



# Types, Types and more Types

```
:: SongSummary =
 { song_id :: Int
 , title   :: String
 , appears_on [(TrackNo,AlbumName)]
 }
viewSongSummary :: SongId -> Task SongSummary
viewSongSummary id
 =   loadSongSummary id
 >>= viewInformation "Song info:" []
```

```
:: Album =
 { album_id :: Int
 , title    :: String
 , songs    :: [(TrackNo,SongName)]
 }
```

Inverse information

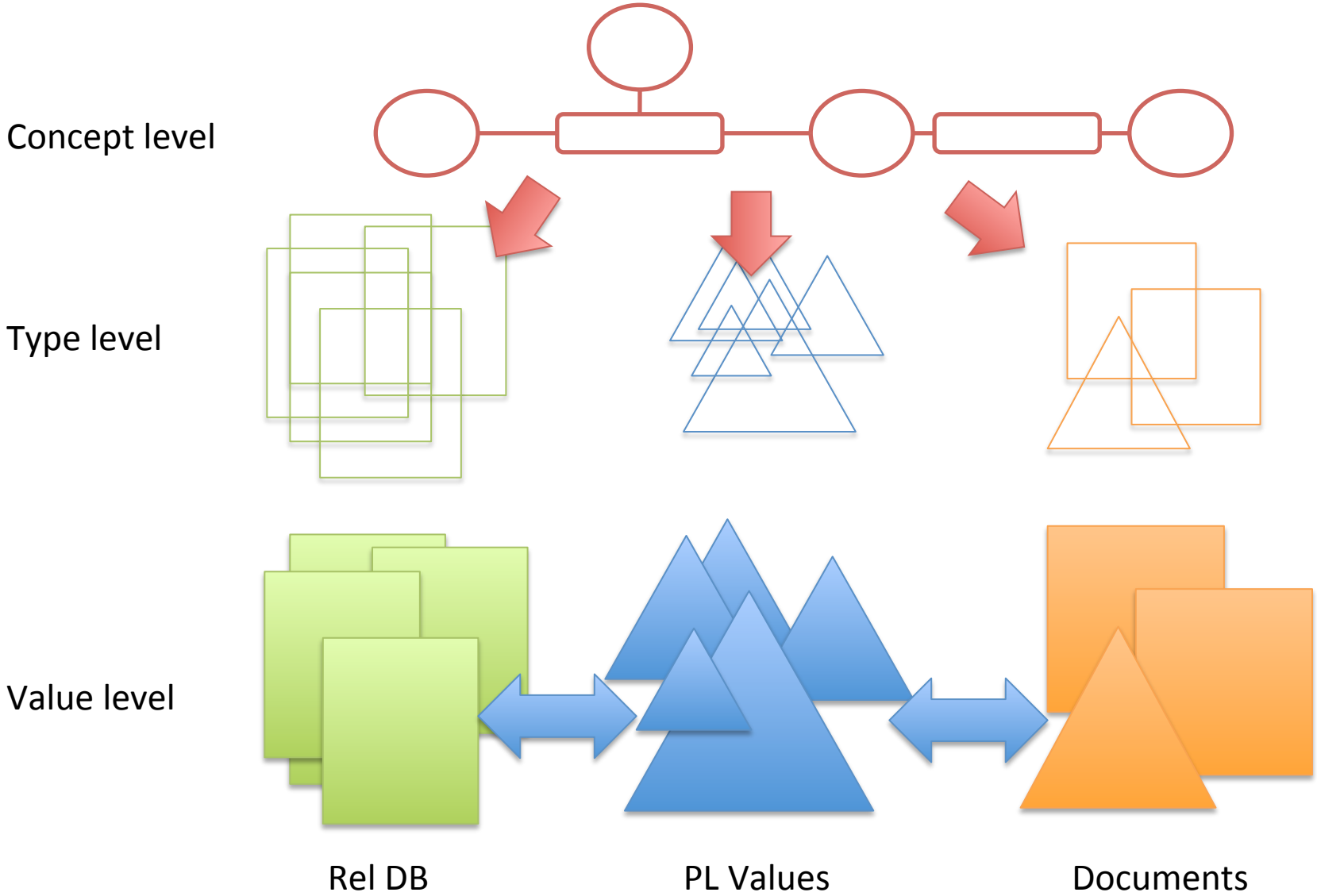
```
:: NewSong =
 { title      :: String
 , artist      :: String
 , appears_on :: [(TrackNo,AlbumName)]
 }
addSong :: Task NewSong
addSong
 =   enterInformation "New song…" []
 >>= storeSong
```

Same information

Slight variations needed for different tasks

Conceptually related, but compiler can not know

# ORM Above All



# ORM modeling
# with
# CCL

# ***C***oncepts in ***CL***ean

- Textual ORM language
- Extension to Clean
- Provides extra abstraction over Clean types
- Lightweight ORM subset

# Why CCL?

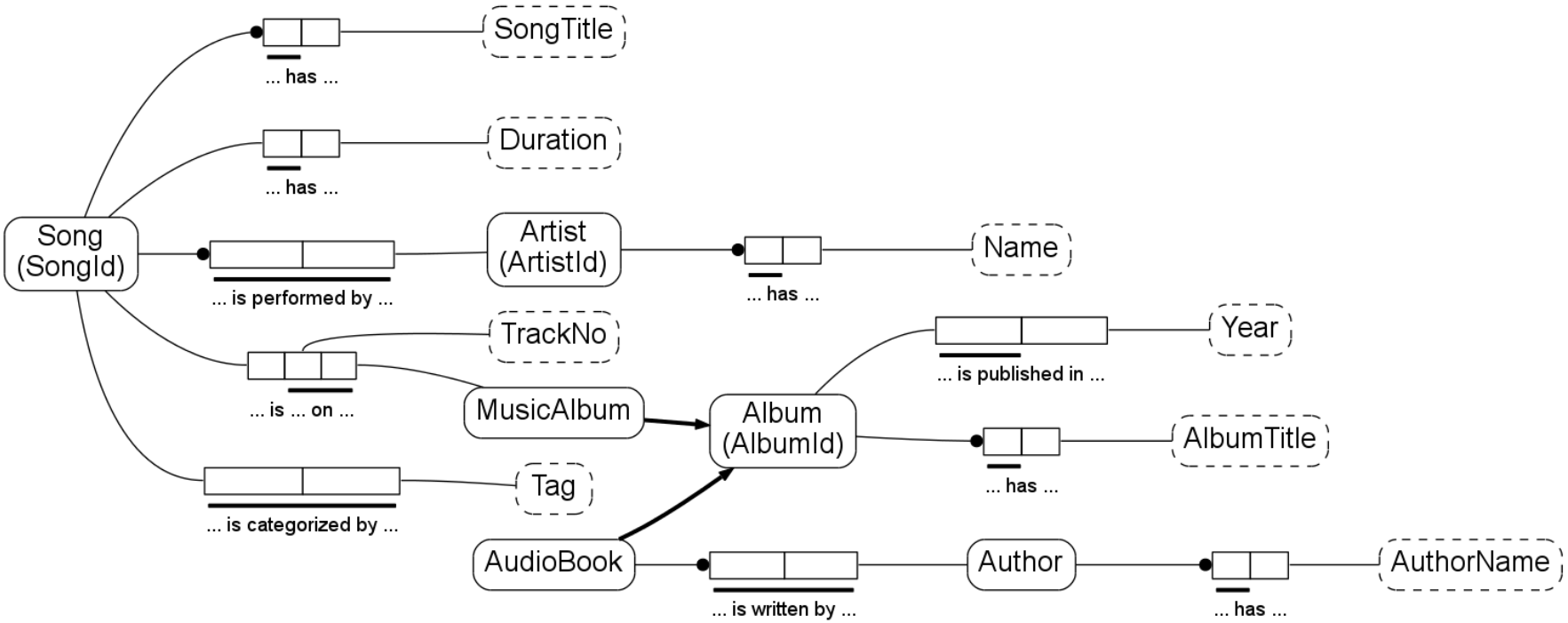
- More concise specification of ***conceptually related*** Clean types
- Make conceptual relations explicit
  - Enable more code generation
  - Enable more system visualization
- Drop in language extension (no extra tools)
- Mix conceptual specification with task specification

```
concept module Music
```

```
$$ Album
$$ AudioBook [A
$$ Author
$$ MusicAlbum [
$$ Artist
$$ Song
```

```
$$ Name = String
$$ SongId = Int
$$ SongTitle = String
$$ AlbumId = Int
$$ AlbumTitle = String
$$ ArtistId = Int
```

```
## album_id     = << !!Album >> has << AlbumId >>
## album_title  = << !Album >> has AlbumTitle
## album_year   = << Album >> is published in Year
## song_id      = << !!Song >> has << SongId >>
## title        = << !Song has >> SongTitle
## duration     = << Song >> has Duration
## songs        = Song is << TrackNo on MusicAlbum >>
## performed_by = << !Song is performed by Artist >>
## tags         = << Song is categorized by Tag >>
## artist_id    = << !!Artist >> has << ArtistId >>
## artist_name  = << !Artist >> has Name
## author_name  = << !Author >> has AuthorName
## author       = << !AudioBook is written by Author >>
```


SongTitle
... has ...
Duration
... has ...
Song
(SongId)
... is performed by ...
Artist
(ArtistId)
... has ...
Name
TrackNo
... is ... on ...
MusicAlbum
Album
(AlbumId)
... is published in ...
Year
... has ...
AlbumTitle
Tag
... is categorized by ...
AudioBook
... is written by ...
Author
... has ...
AuthorName

```
:: Song =
{song_id :: SongId
,title :: SongTitle
,duration :: Maybe Duration
,songs :: [(TrackNo,String)]
,performed_by :: [ArtistId]
,tags :: [Tag]
}
:: Artist =
{performed_by :: [SongId]
,artist_id :: ArtistId
,artist_name :: Name
}
:: Album =
{album_id :: AlbumId
,album_title :: AlbumTitle
,album_year :: Maybe Year
}
```

# CCL Language Constructs

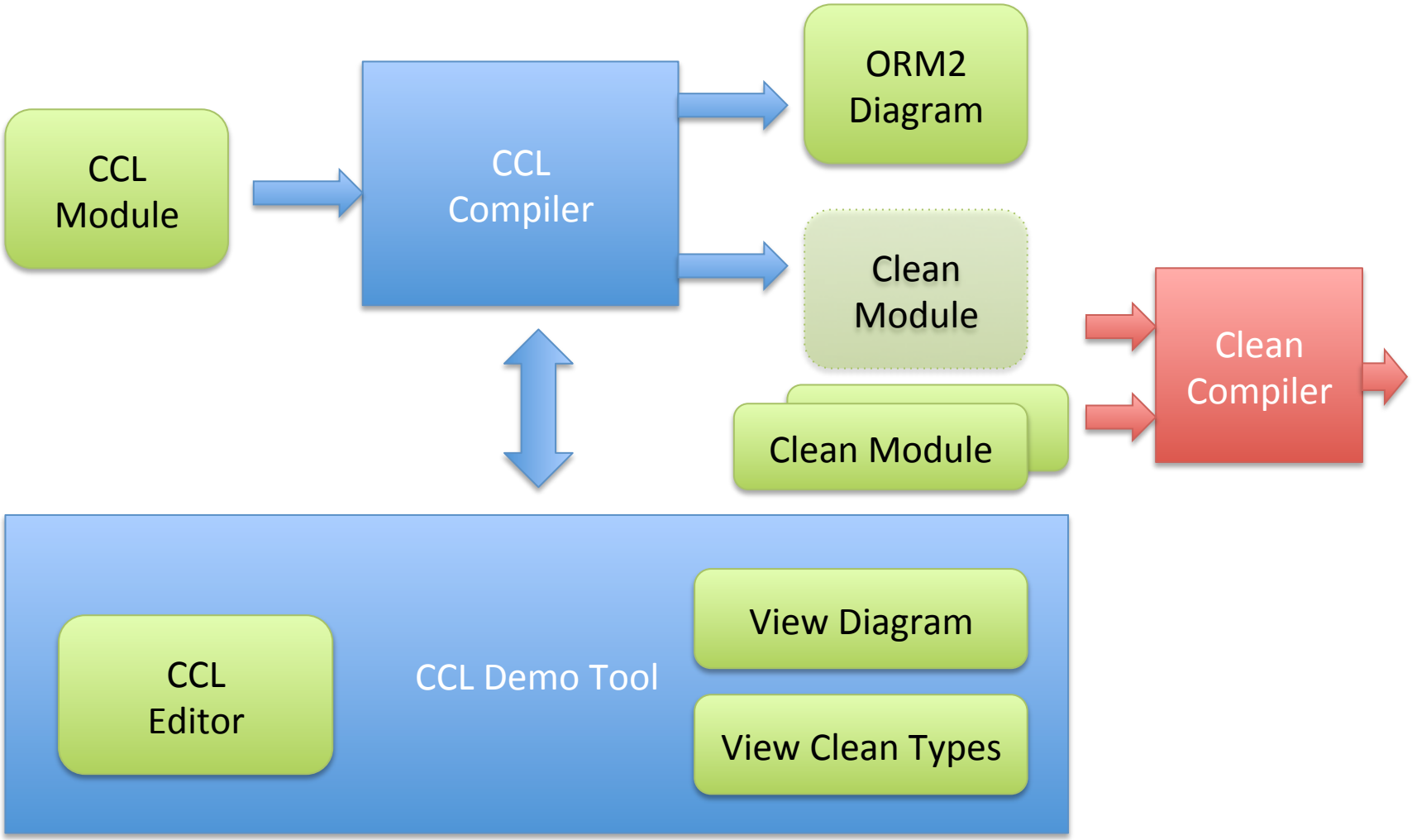
Fact Types
Entity Types
Value Types

Sub Types

Uniqueness Constraints
Total Roles
Primary Roles

Fact Container Types

# CCL Tools


CCL
Module
CCL
Compiler
ORM2
Diagram
Clean
Module
Clean
Compiler
Clean Module
CCL
Editor
CCL Demo Tool
View Diagram
View Clean Types