Stichting NIOC en de NIOC kennisbank

Stichting NIOC (www.nioc.nl) stelt zich conform zijn statuten tot doel: het realiseren van congressen over informatica onderwijs en voorts al hetgeen met een en ander rechtstreeks of zijdelings verband houdt of daartoe bevorderlijk kan zijn, alles in de ruimste zin des woords.

De stichting NIOC neemt de archivering van de resultaten van de congressen voor zijn rekening. De website www.nioc.nl ontsluit onder "Eerdere congressen" de gearchiveerde websites van eerdere congressen. De vele afzonderlijke congresbijdragen zijn opgenomen in een kennisbank die via dezelfde website onder "NIOC kennisbank" ontsloten wordt.

Op dit moment bevat de NIOC kennisbank alle bijdragen, incl. die van het laatste congres (NIOC2023, gehouden op donderdag 30 maart 2023 jl. en georganiseerd door NHL Stenden Hogeschool). Bij elkaar bijna 1500 bijdragen!

We roepen je op, na het lezen van het document dat door jou is gedownload, de auteur(s) feedback te geven. Dit kan door je te registreren als gebruiker van de NIOC kennisbank. Na registratie krijg je bericht hoe in te loggen op de NIOC kennisbank.

Het eerstvolgende NIOC vindt plaats op donderdag 27 maart 2025 in Zwolle en wordt dan georganiseerd door Hogeschool Windesheim. Kijk op www.nioc2025.nl voor meer informatie.

Wil je op de hoogte blijven van de ontwikkeling rond Stichting NIOC en de NIOC kennisbank, schrijf je dan in op de nieuwsbrief via

www.nioc.nl/nioc-kennisbank/aanmelden nieuwsbrief

Reacties over de NIOC kennisbank en de inhoud daarvan kun je richten aan de beheerder:

R. Smedinga kennisbank@nioc.nl.

Vermeld bij reacties jouw naam en telefoonnummer voor nader contact.

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Graphity

IS-ontwikkeltools

NIOC 2013

Eddy Luursema, Arnoud van Bers, Misja Nabben

Research Group Model Based Information Systems

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Presentation

- Introduction M-BIS
- FCO-IM history
- Meta & meta - meta
- Graphical representation
- Requirements of graphical meta-meta tool
- FCO – IMAGine tool using Graphity
- Integrated tool
- Future developments

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Introduction MBIS

- HAN University of Applied Sciences
- Information & Communication Academy
- Lecturers bachelor & master:
  - Information modeling
  - Databases
  - Web technology
- Research group: Model Based Information Systems
  - Education: ER/FCO-IM, Business Intelligence (DV, Anchor)
  - Tools: modeling & application generation
  - Projects: faculty information systems

FCO-IM history

- NIAM = Nijssen Information Analysis Method
  - Sjir Nijssen, Eckart Falkenberg, Robert Meersman & others, 1975 until 1989
  - www.pnagroup.nl
- ORM = Object Role Modeling
  - Terry Halpin, 1989 – now
  - www.orm.net
- FCO-IM = Fully Communication Oriented Information Modeling
  - Guido Bakema, Jan Pieter Zwart, Harm Van der Lek, 1991-now
  - www.fco-im.nl
- SBVR = Sementics of Business Vocabulary And Business Rules,
  - OMG, 2008 - now
  - http://www.omg.org/spec/SBVR/1.0/

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FCO-IM basics

FLOOR	#EXITS	ROOM	#SEATS	EQUIPMENT
1	2	1.1	20	BB BM
.	.	1.2	30	-
2	0	2.1	20	BB
3	2	3.2a	-	-
BB blackboard, BM beamer, PC personal computer				

- Example document with concrete example data

Verbalization

"Floor 1 exists."

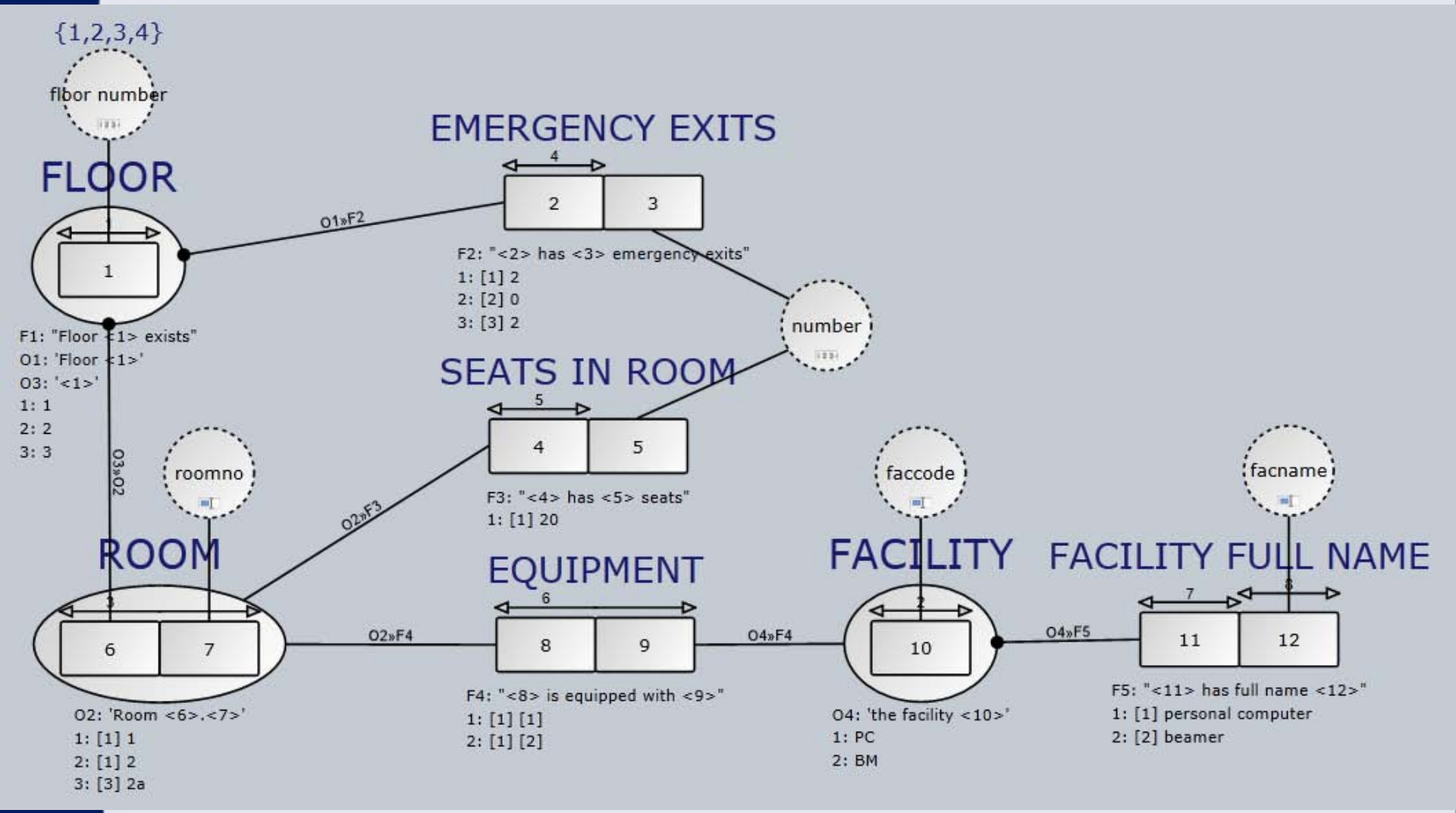
"Floor 1 has 2 emergency exits."

"Room 1.1 has 20 seats."

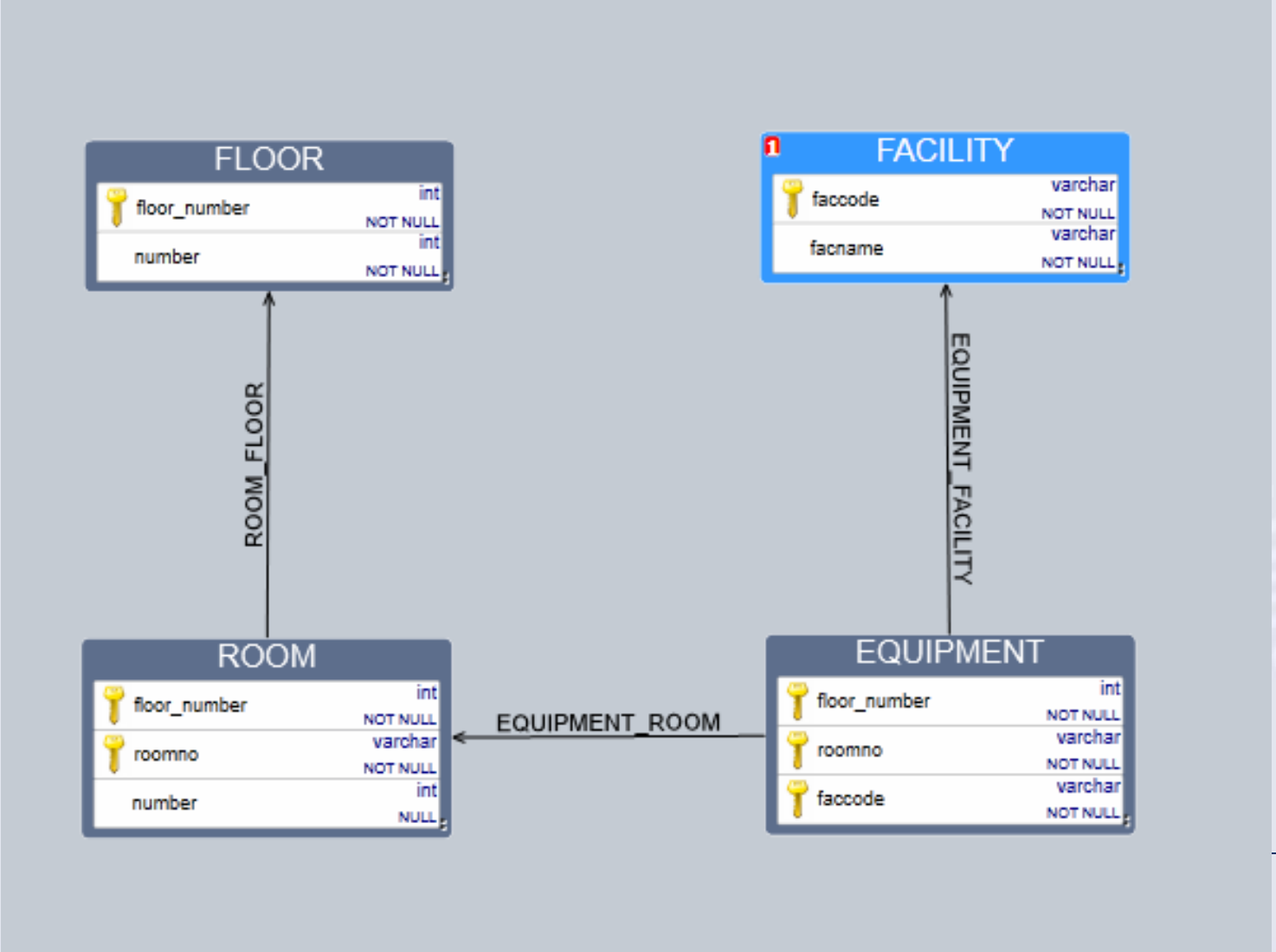
"Room 1.1 is equipped with PC."

- Elementary fact expressions

FCO-IM IGD


{1,2,3,4}
floor number
FLOOR
1
F1: "Floor <1> exists"
O1: 'Floor <1>'
O3: '<1>'
1: 1
2: 2
3: 3
O1»F2
EMERGENCY EXITS
4
2
3
F2: "<2> has <3> emergency exits"
1: [1] 2
2: [2] 0
3: [3] 2
number
SEATS IN ROOM
5
4
5
F3: "<4> has <5> seats"
1: [1] 20
O3»O2
roomno
O2»F3
ROOM
3
6
7
O2: 'Room <6>,<7>'
1: [1] 1
2: [1] 2
3: [3] 2a
O2»F4
EQUIPMENT
6
8
9
F4: "<8> is equipped with <9>"
1: [1] [1]
2: [1] [2]
O4»F4
faccode
FACILITY
2
10
O4: 'the facility <10>'
1: PC
2: BM
O4»F5
facname
FACILITY FULL NAME
7
8
11
12
F5: "<11> has full name <12>"
1: [1] personal computer
2: [2] beamer

Relational model



Output: CREATE script

```
CREATE TABLE [FLOOR] (
 [floor_number] varchar(100) NOT NULL,
 [number] varchar(100) NOT NULL,

 CONSTRAINT [PK_1] PRIMARY KEY ([floor_number])
)

CREATE TABLE [ROOM] (
 [floor_number] varchar(100) NOT NULL,
 [roomno] varchar(100) NOT NULL,
 [number] varchar(100) NULL,

 CONSTRAINT [PK_3] PRIMARY KEY ([floor_number],[roomno])
)
```

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Generated application

SAS

Welcome test, you are a member of the role: "Administrator"

Forms

Important Forms
- FACILITY
- FLOOR
- ROOM

Information

Since last login (unknown), following changes have been made:

1.0 Initial Deployment

Do not show information upto version 1.0 again

Forms ▸ **ROOM of: FLOOR (1) (1/2)**

Start ▸ FLOOR ▸ ROOM

Insert Update Delete Search

floor_number	roomno	number
1	1	20
	2	

Changed 2 minutes ago from :LSME-MACBOOK by:NT AUTHORITY\NETWORK SERVICE

EQUIPMENT (2)

Insert Options Close

faccode
BM-beamer
PC-personal computer

Insertform - EQUIPMENT

Ok Ok and again Cancel

Main information

Floor number*	Roomno*	Faccode*
floor_number of EQUIPMENT	roomno of EQUIPMENT	faccode of EQUIPMENT
1	1	BM-beamer

BM-beamer
PC-personal computer

Table or application level

Floor

Floor_number	number
1	2
3	2

Room

Floor_number	Roomno	Number
1	1	20
1	2	NULL
3	2a	NULL

Meta level

Tables

Table_name
Floor
Room

Columns

Table_name	Column_name	Datatype
Floor	Floorumber	int
Floor	Number	int
Room	Floornumber	int
Room	Roomnumber	varchar

Meta – meta level

Tables

Table_name
Tables
Columns

Columns

Table_name	Column_name	Datatype
Tables	Table_name	varchar
Columns	Table_name	varchar
Columns	Column_name	varchar
Columns	Datatype	varchar

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Overview

Meta – meta automodel

Tables

Table_name
Tables
Columns

Meta

Tables

Table_name
Floor
Room

Table

Floor

Floor_number	number
1	2
3	2

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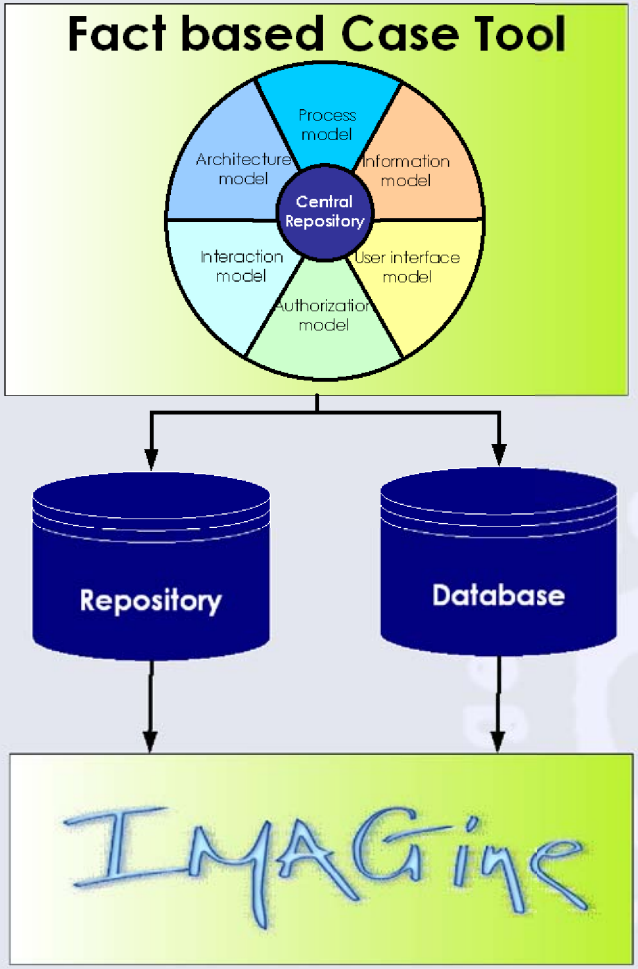
Future: Integrated (fact based) modeling



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Graphical representation

- Why?
- Take a look at some examples
- Make an ‘information analysis’ of graphical models

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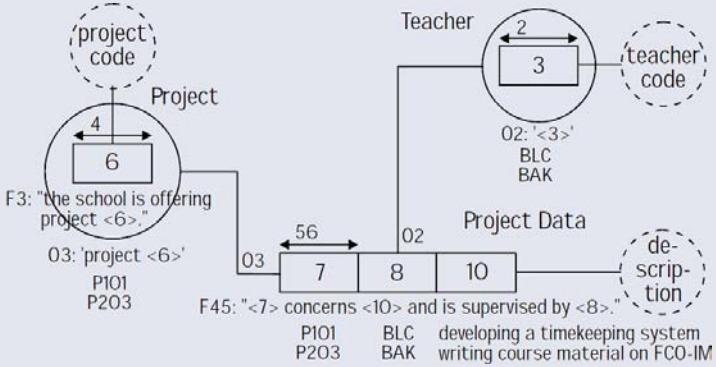
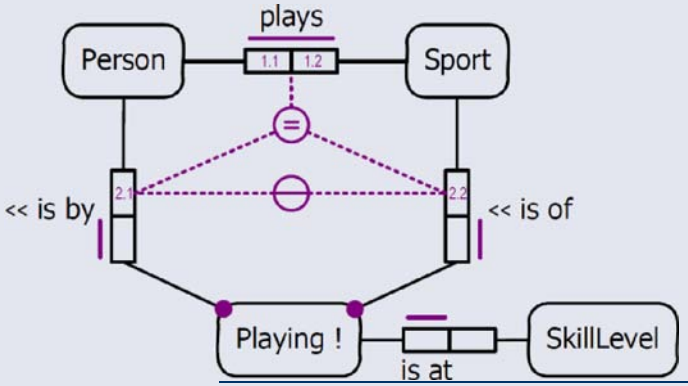
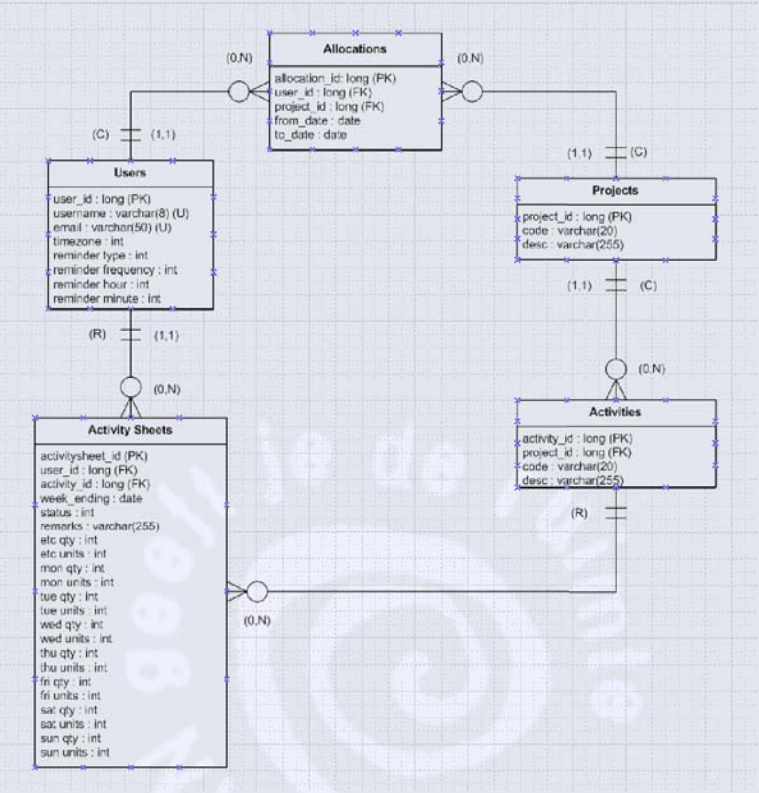
Tools for information modelling

- Objects
- Relations

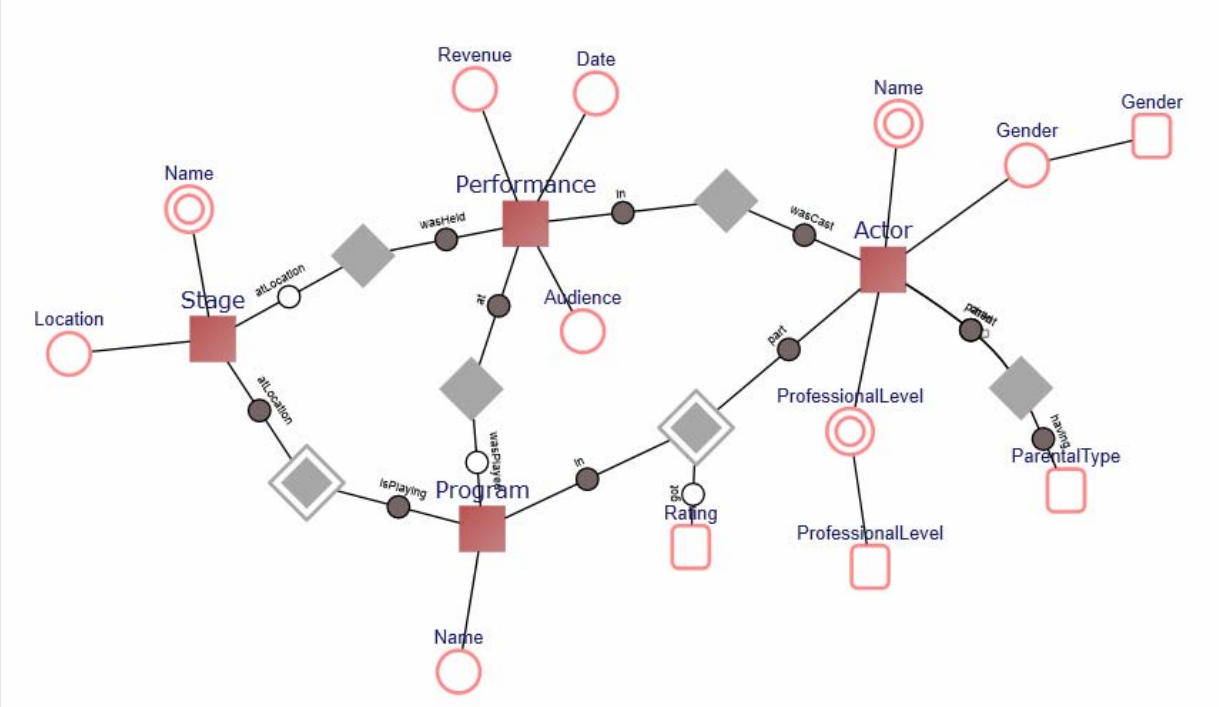






BI tools

- Anchor modeling



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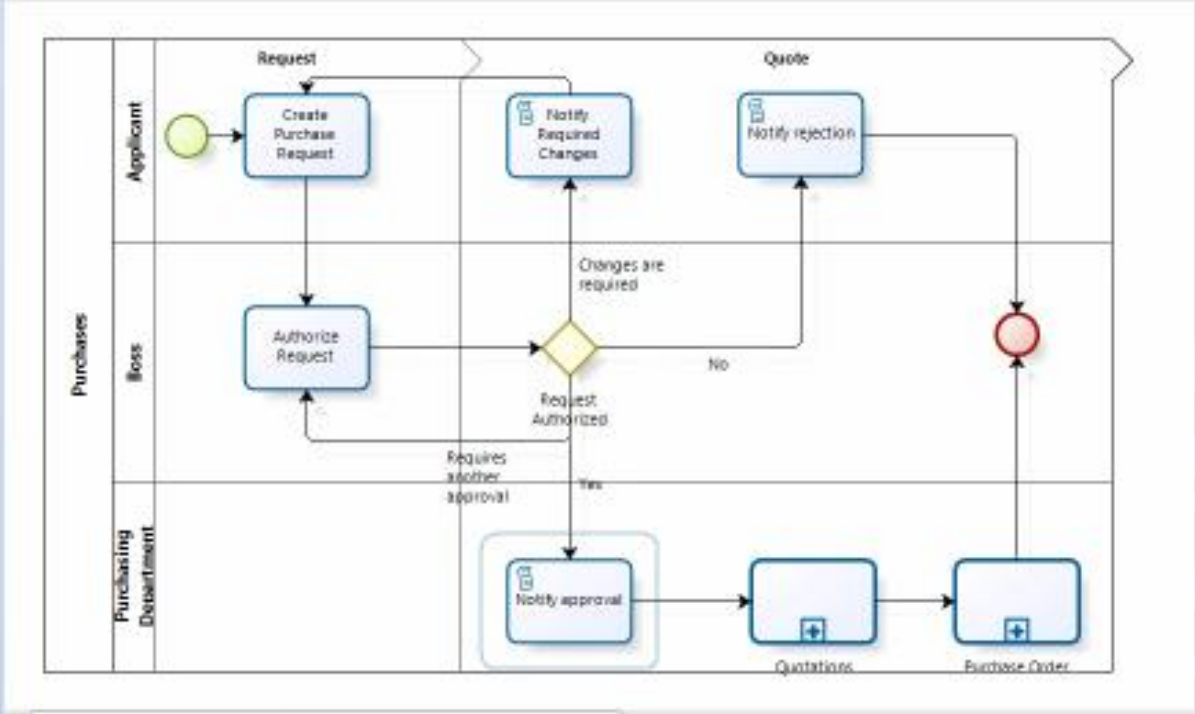
Process modeling tools

- BPMN



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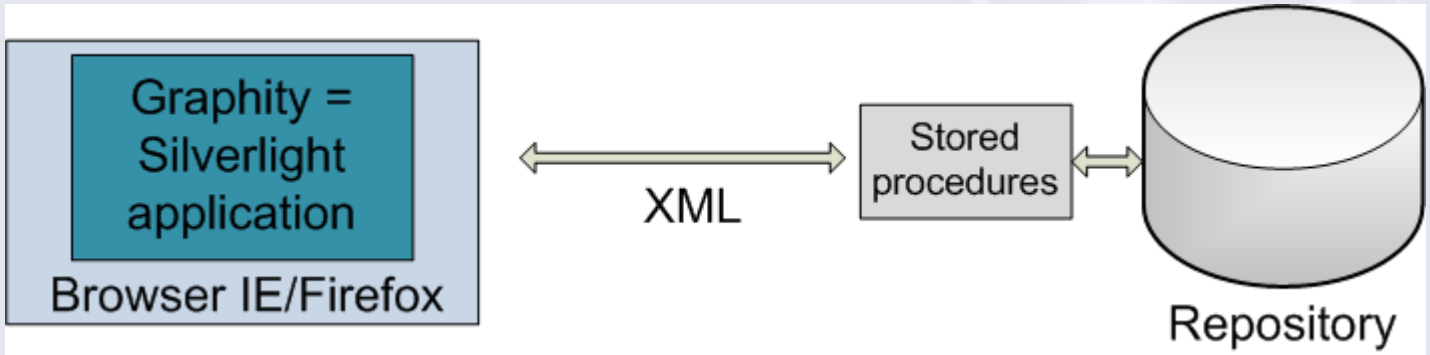
Requirements of graphical meta-meta tool

- Shapes: (rounded) rectangles, ellipses
- Nested shapes
- Connectors, configurable end points
- Bound text
- ‘Rubber banding’
- Web enabled
- Menu actions
- Repository independent
- **SQL only**, but MSSQLServer 2005 or higher
- No knowledge of C#, Ajax, ASP.NET, Silverlight, Webservices

Graphity

- Silverlight 5 MB
- Graphity = small Silverlight application, 1.5 MB
- Starts within browser
- Communicates through web services with database
- XML as interchange format



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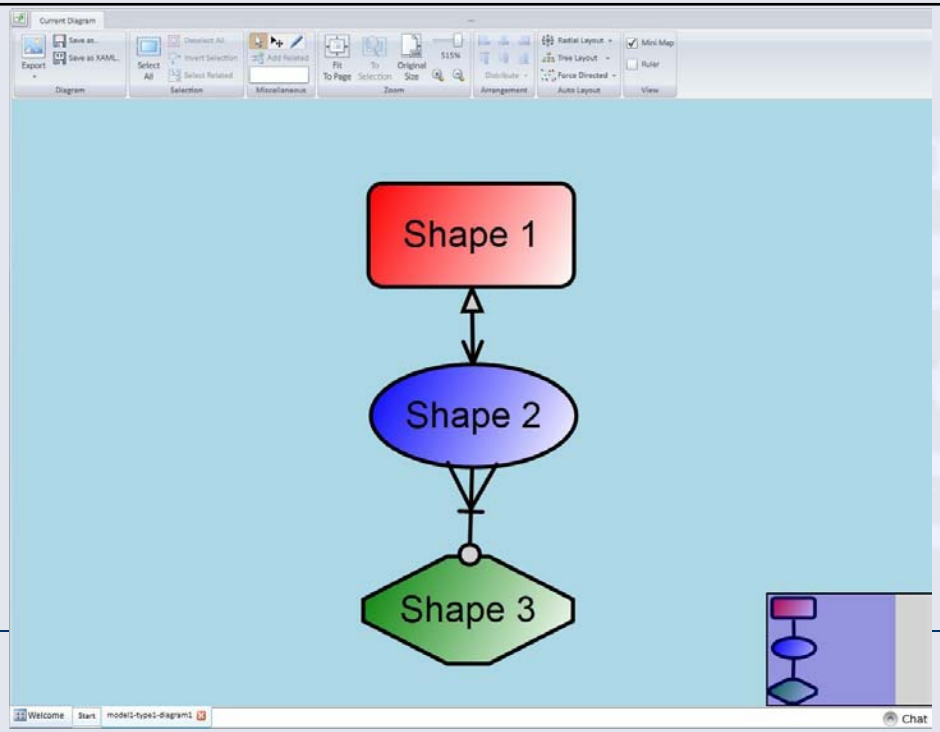
XML structure

```
<diagram name="diagram1" model="model1" type="type1">
  <shape id="Shape1" innertext="Shape 1" fillcolor="red"/>
  <shape id="Shape2" innertext="Shape 2" type="1" fillcolor="blue"/>
  <shape id="Shape3" innertext="Shape 3" type="2" fillcolor="green"/>
  <connector id="cnx1" from="Shape1" to="Shape2" headtype="1" tailtype="2"/>
  <connector id="cnx2" from="Shape2" to="Shape3" headtype="3" tailtype="4"/>
</diagram>
```



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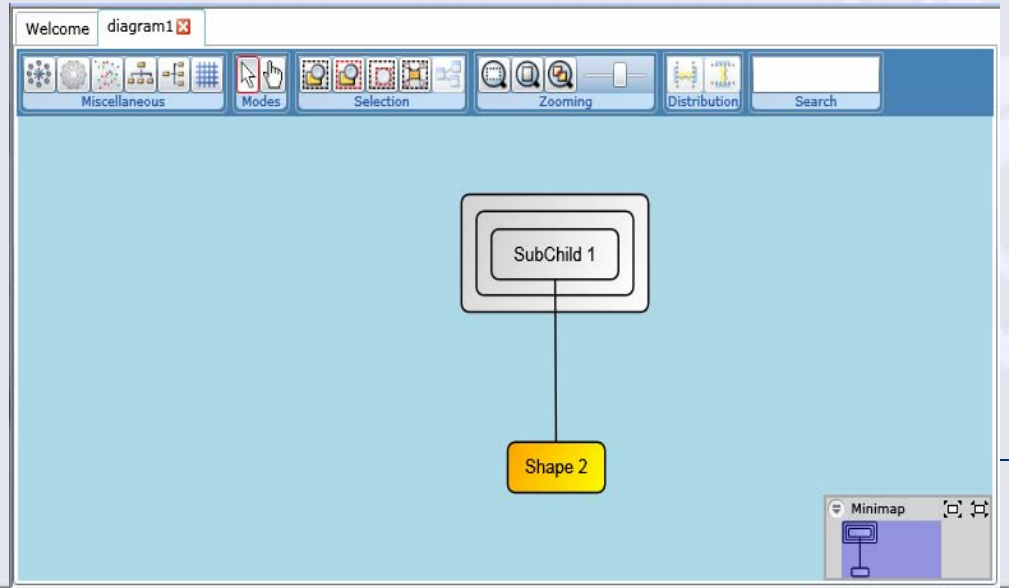
XML structure 2

```
<diagram name="diagram1" model="model1" type="type1">
  <shape id="Shape1" innertext="Shape 11" >
    <shape id="Child1" innertext="Child 1" >
      <shape id="SubcChild1" innertext="SubChild 1" >
      </shape>
    </shape>
  </shape>
  <shape id="Shape2" innertext="Shape 2"/>
  <connector id="cnx1" from="Shape2" to="SubcChild1" />
</diagram>
```



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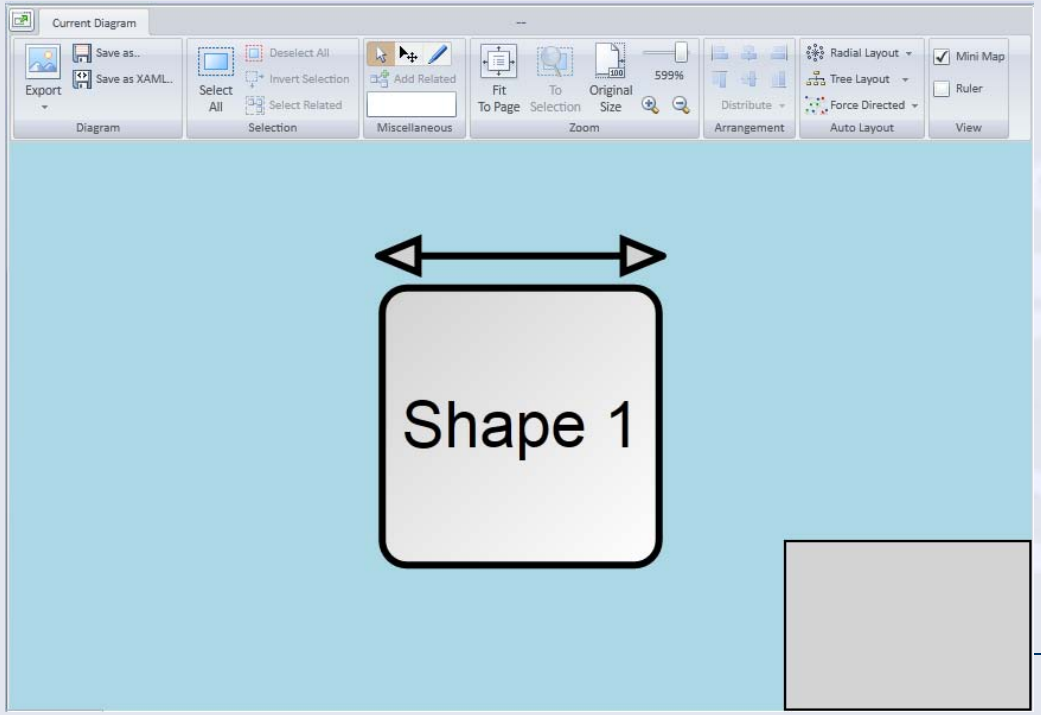
XML structure 3

```
<diagram name="diagram1" model="model1" type="type1">
  <shape id="Shape1" innertext="Shape 1" arrowdistance="4" h="40" w="40">
    <arrow id="Arrow1" headtype="2" tailtype="2"/>
  </shape>
</diagram>
```



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Shape/connector attributes

- Appearance, size, color, text, dash, positions, endpoints

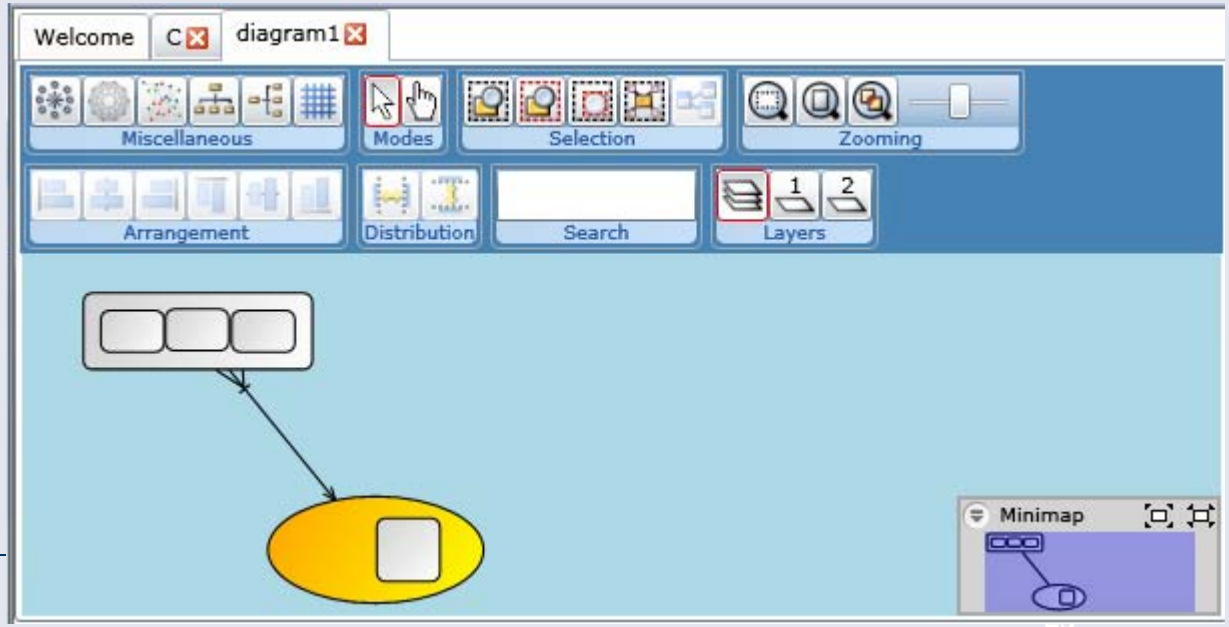
Upper

Higher

Inner

Lower

Under



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Graphity: Standard functions

- Mini map
- Zooming
- Selections
- Alignment
- Searching
- Property slider
- Object slider
- Auto layout
- Menu actions

Develop a tool

- Make meta model using e.g. FCO-IM
- Create database
- Create XML queries to show model graphically
- Create menu actions
- Create transformations

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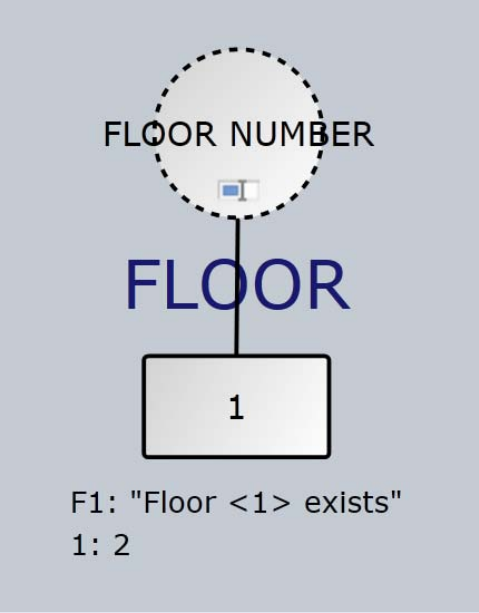
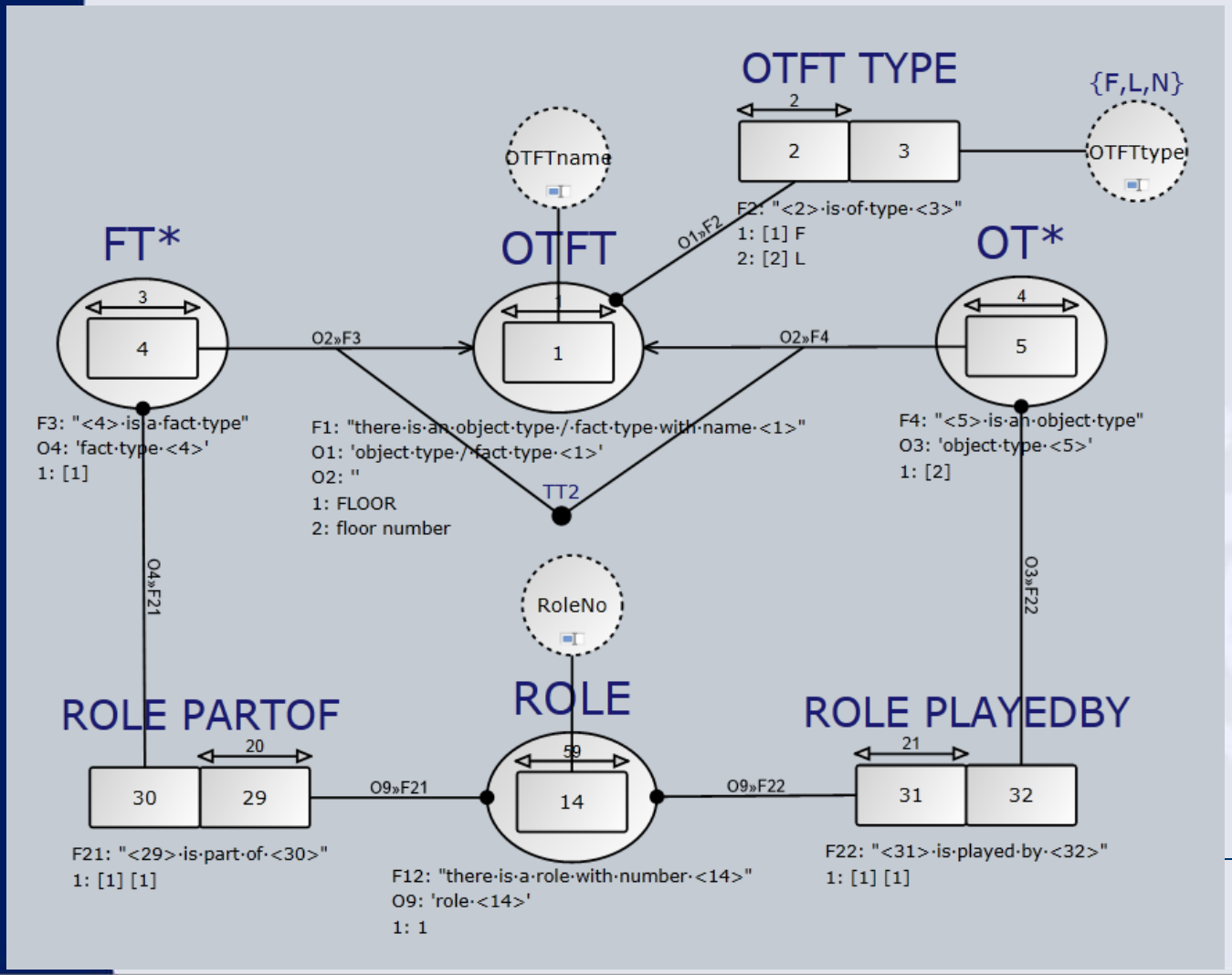
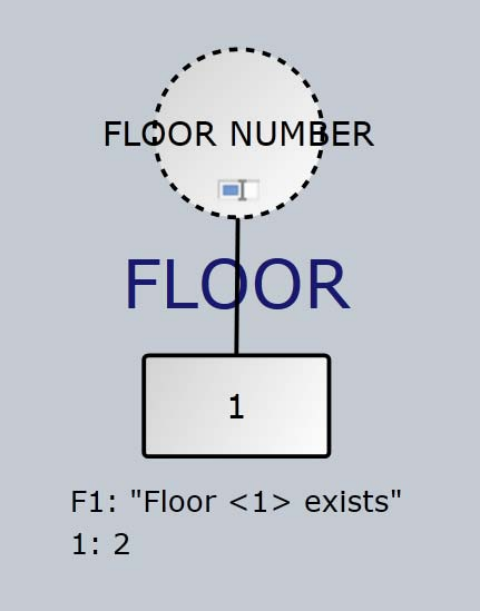
FCO – IM tool using Graphity

- FCO-IM repository
- How to create that?
- Apply FCO-IM on starting document e.g. IGD
- “Role ‘1’ is part of fact type ‘FLOOR’”.
- “Role ‘1’ is played by object type/label type ‘floor number’”.



Small automodel





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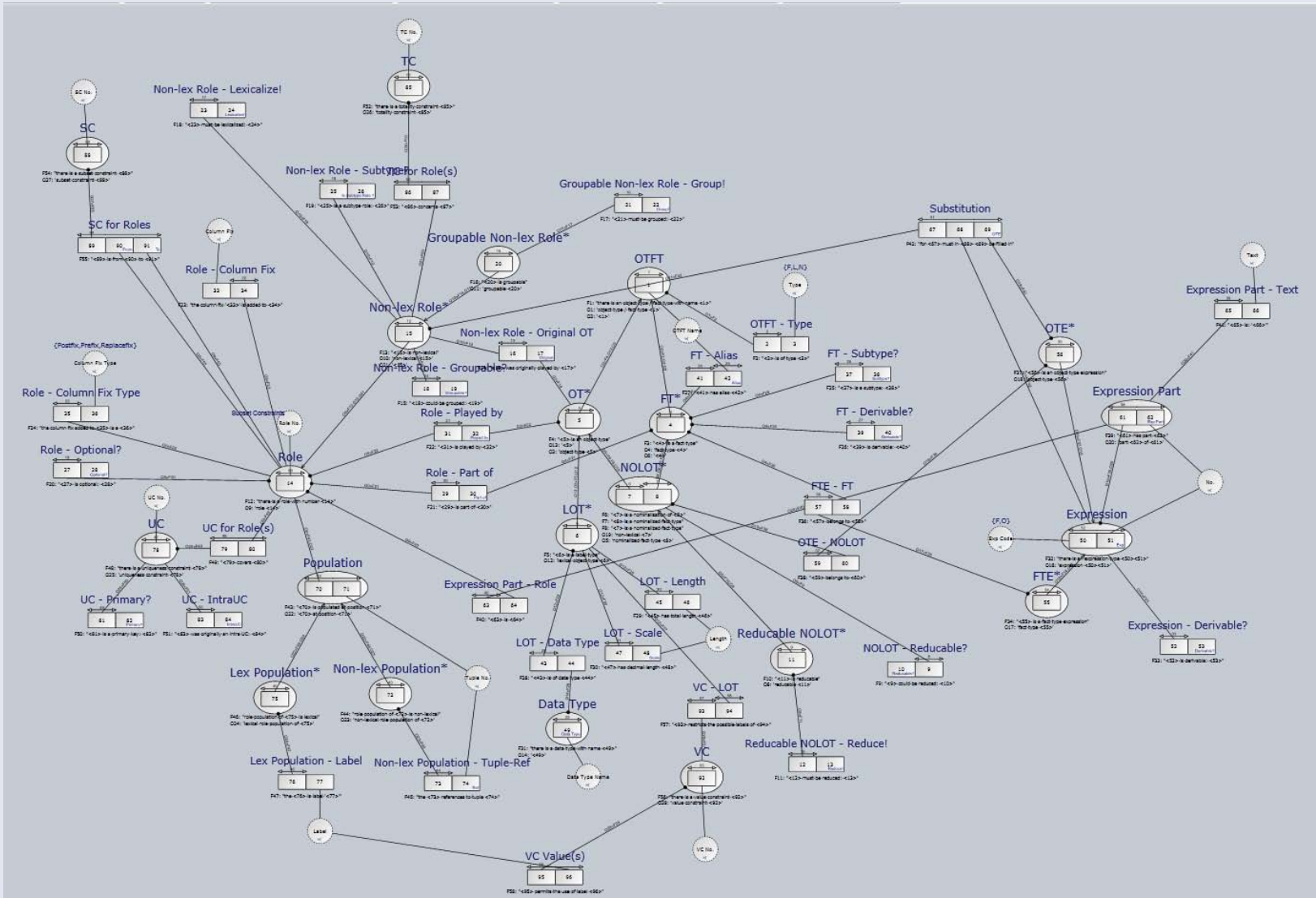
Automodel FCO-IM



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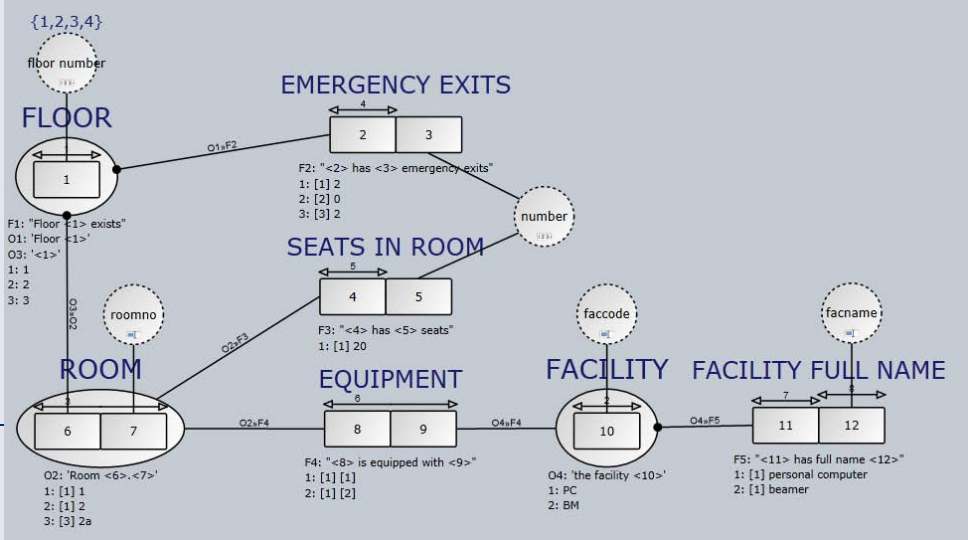
Example of populated FCO-IM repository

OTFT		
Name	Type	Data type
EMERGENCY EXISTS	F	-
EQUIPMENT	F	-
faccode	L	varchar
FACILITY	N	-
FACILITY FULL NAME	F	-
facname	L	varchar
FLOOR	N	-
floor number	L	varchar
number	L	varchar
ROOM	N	-
roomno	L	varchar
SEATS IN ROOM	F	-

Roles		
Nr	Part of OTFT	Played By OTFT
1	FLOOR	floor number
2	EMERGENCY EXISTS	FLOOR
3	EMERGENCY EXISTS	number
4	SEATS IN ROOM	ROOM
5	SEATS IN ROOM	number
6	ROOM	FLOOR
7	ROOM	roomno
8	EQUIPMENT	ROOM
9	EQUIPMENT	FACILITY
10	FACILITY	faccode
11	FACILITY FULL NAME	FACILITY
12	FACILITY FULL NAME	facname

Expressions		
Type	Code	OTFT
F	1	FLOOR
F	2	EMERGENCY EXISTS
F	3	SEATS IN ROOM
F	4	EQUIPMENT
F	5	FACILITY FULL NAME
O	1	FLOOR
O	2	ROOM
O	3	FLOOR
O	4	FACILITY



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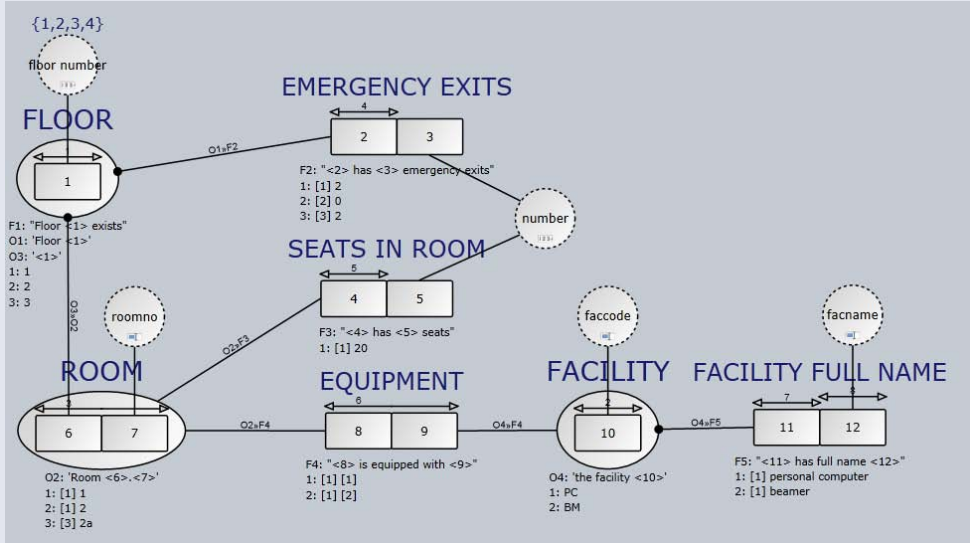
Example part 2

Expression parts				
Expression	Code	Nr	Role	text
F	1	1	-	Floor
F	1	2	1	-
F	1	3	-	exists
F	2	1	2	-
F	2	2	-	has
F	2	3	3	-
F	2	4	-	emergency exists
F	3	1	4	-
F	3	2	-	has
F	3	3	5	-
F	3	4	-	seats
F	4	1	8	-
F	4	2	-	is equipped with
F	4	3	9	-
F	5	1	11	-
F	5	2	-	has full name
F	5	3	12	-
O	1	1	-	Floor
O	1	2	1	-
O	2	1	-	Room
O	2	2	6	-
O	2	3	-	.
O	2	4	7	-
O	3	1	1	-
O	4	1	-	the facility
O	4	2	10	-



Population			
Role	Tupel	ReferenceTupelNumber	Label
1	1	-	1
1	2	-	2
1	3	-	3
2	1	1	-
2	2	2	-
2	3	3	-
3	1	-	2
3	2	-	0
3	3	-	2

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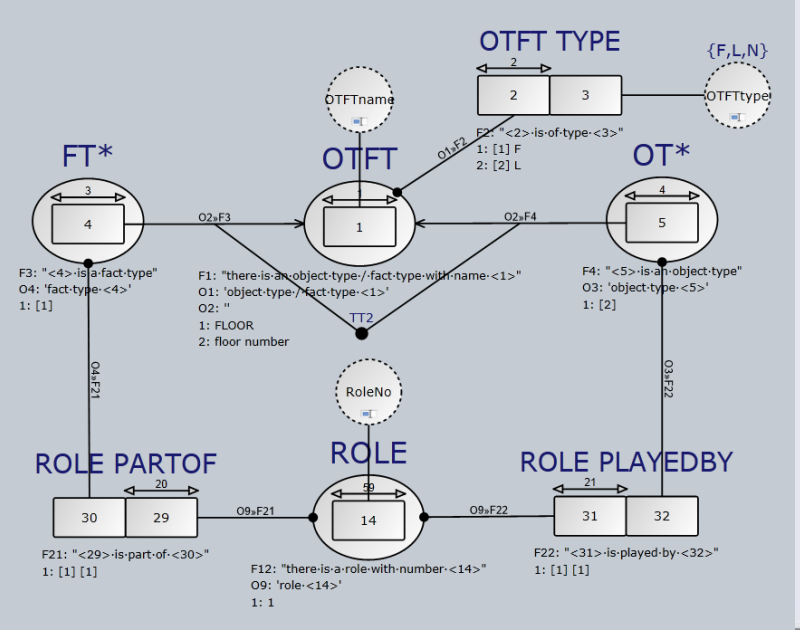
Example of FCO-IM auto repository

OTFT		
Name	OTFTType	DataType
FT	N	NULL
OT	N	NULL
OTFT	N	NULL
OTFT TYPE	F	NULL
OTFTname	L	varchar
OTFTtype	L	varchar
ROLE	N	NULL
ROLE PARTOF	F	varchar
ROLE PLAYEDBY	F	varchar
RoleNo	L	varchar

Roles		
Number	PartOf	PlayedBy
1	OTFT	OTFTname
2	OTFT TYPE	OTFT
3	OTFT TYPE	OTFTtype
4	FT	OTFT
5	OT	OTFT
14	ROLE	RoleNo
29	ROLE PARTOF	ROLE
30	ROLE PARTOF	FT
31	ROLE PLAYEDBY	ROLE
32	ROLE PLAYEDBY	OT



Transformations of repository

- FCO-IM EL-IGD = XML structure for Graphity
- GLR = repository -> repository transformation
- SQL script = text transformation
- Research: all repository transformations
  - Entity Relationship Modeling
  - UML
  - Data vault
  - Anchor modelig
  - Stars & snowflakes for DWH

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Example of XML generation

```
SELECT
'@id'                    = REPLACE(otf_OTFTName,' ','_'),
'@innertext'             = otf_OTFTName
FROM tblFCO_OTFT
WHERE otf_Modelname = 'Rooms and floors'
AND otf_ModelType = 'EL-IGD'
AND otf_OTFTType IN ('F','N')
FOR XML PATH('shape'), TYPE
```

```
<shape id="AVAILABLE_FACILITIES" innertext="AVAILABLE FACILITIES" />
<shape id="EMERCENCY_EXISTS" innertext="EMERCENCY EXISTS" />
<shape id="EQUIPMENT" innertext="EQUIPMENT" />
<shape id="FACILITY" innertext="FACILITY" />
<shape id="FACILITY_FULL_NAME" innertext="FACILITY FULL NAME" />
<shape id="FLOOR" innertext="FLOOR" />
<shape id="INSTALLED_FACILITIES" innertext="INSTALLED FACILITIES" />
<shape id="ROOM" innertext="ROOM" />
<shape id="SEATS_IN_ROOM" innertext="SEATS IN ROOM" />
```

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Example of SQL generation

```
SELECT 'CREATE TABLE ' + otf_OTFTName + '( )'
FROM tblFCO_OTFT
WHERE otf_Modelname = 'Rooms and floors'
AND otf_ModelType = 'EL-IGD'
AND otf_OTFTType IN ('F','N')
```

CREATE TABLE EMERCENCY EXISTS ( )
CREATE TABLE EQUIPMENT ( )
CREATE TABLE FACILITY ( )
CREATE TABLE FACILITY FULL NAME ( )
CREATE TABLE FLOOR ( )
CREATE TABLE ROOM ( )
CREATE TABLE SEATS IN ROOM ( )

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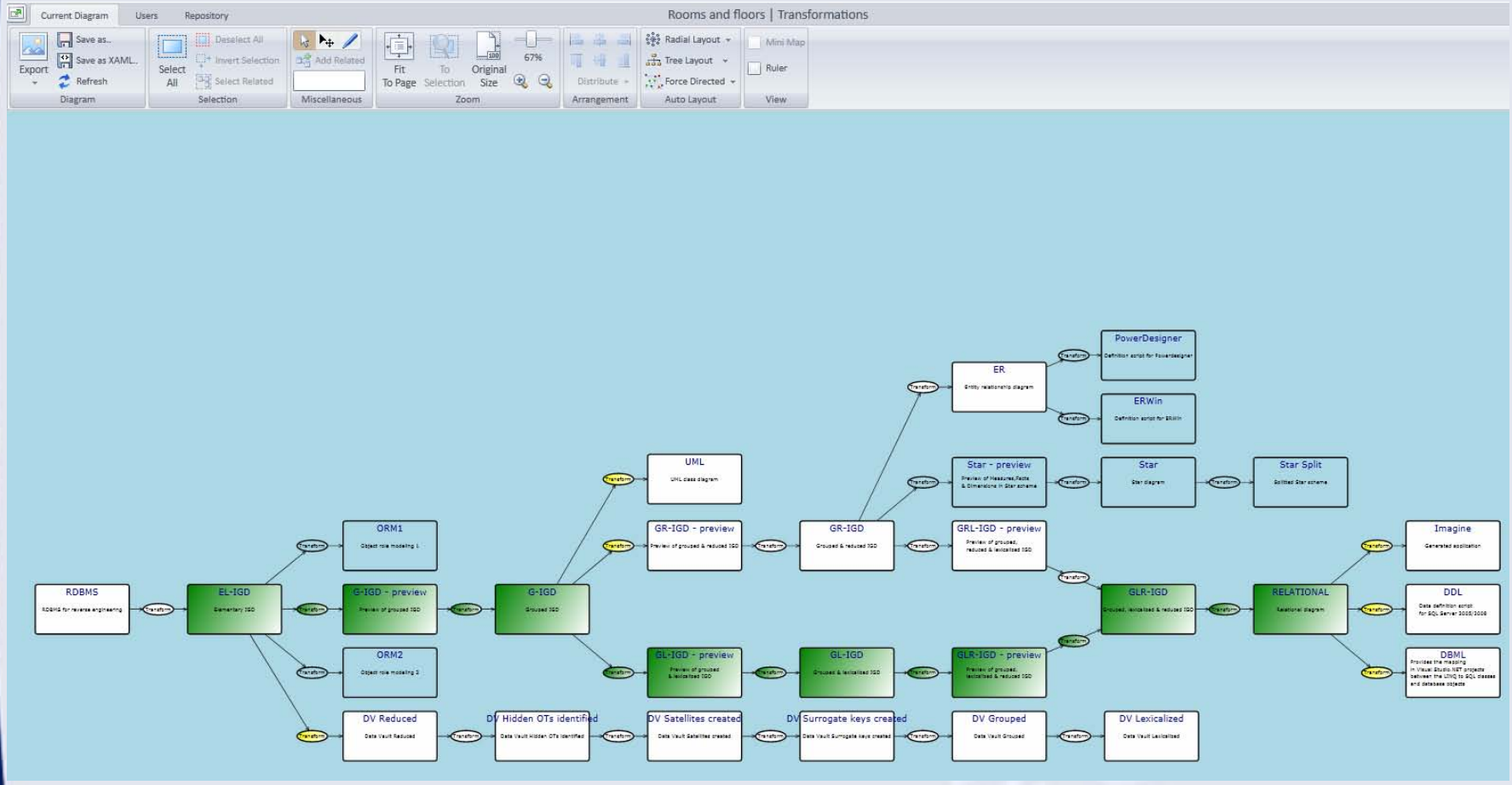
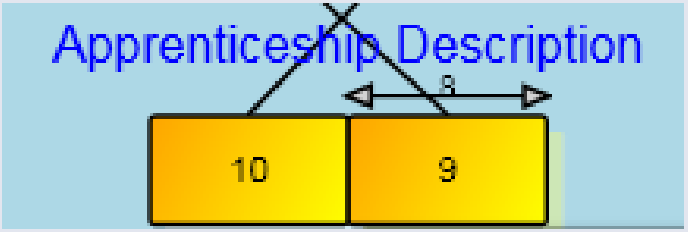
Integrated tool



‘Programmed functions’

- Flipping



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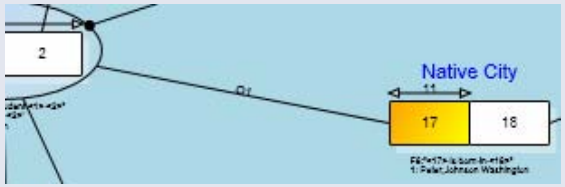
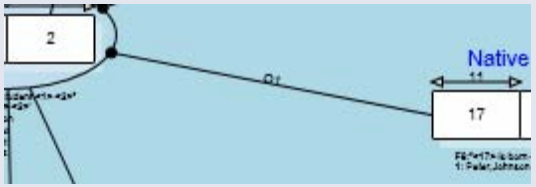
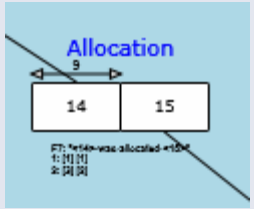
‘Programmed functions’

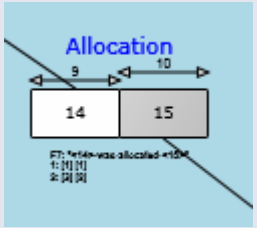
- Totality constraints





- Unicity constraints





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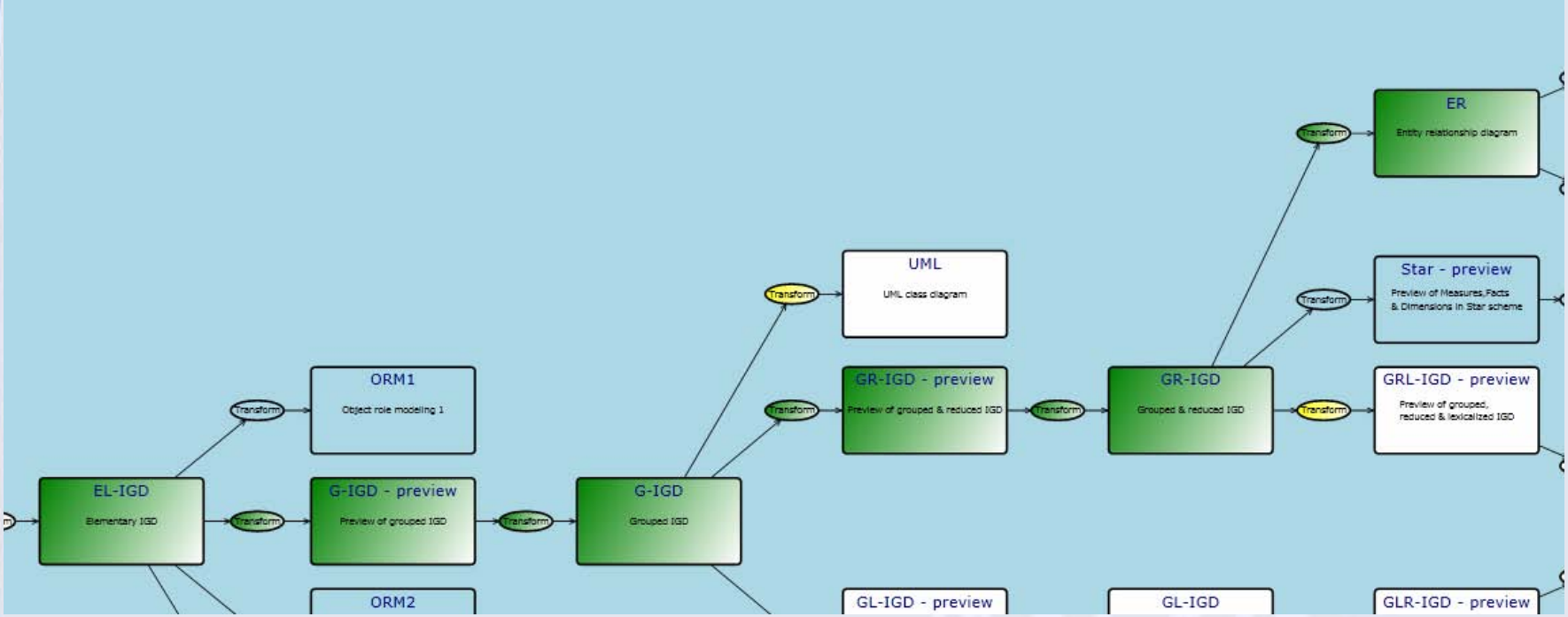
ER transformation



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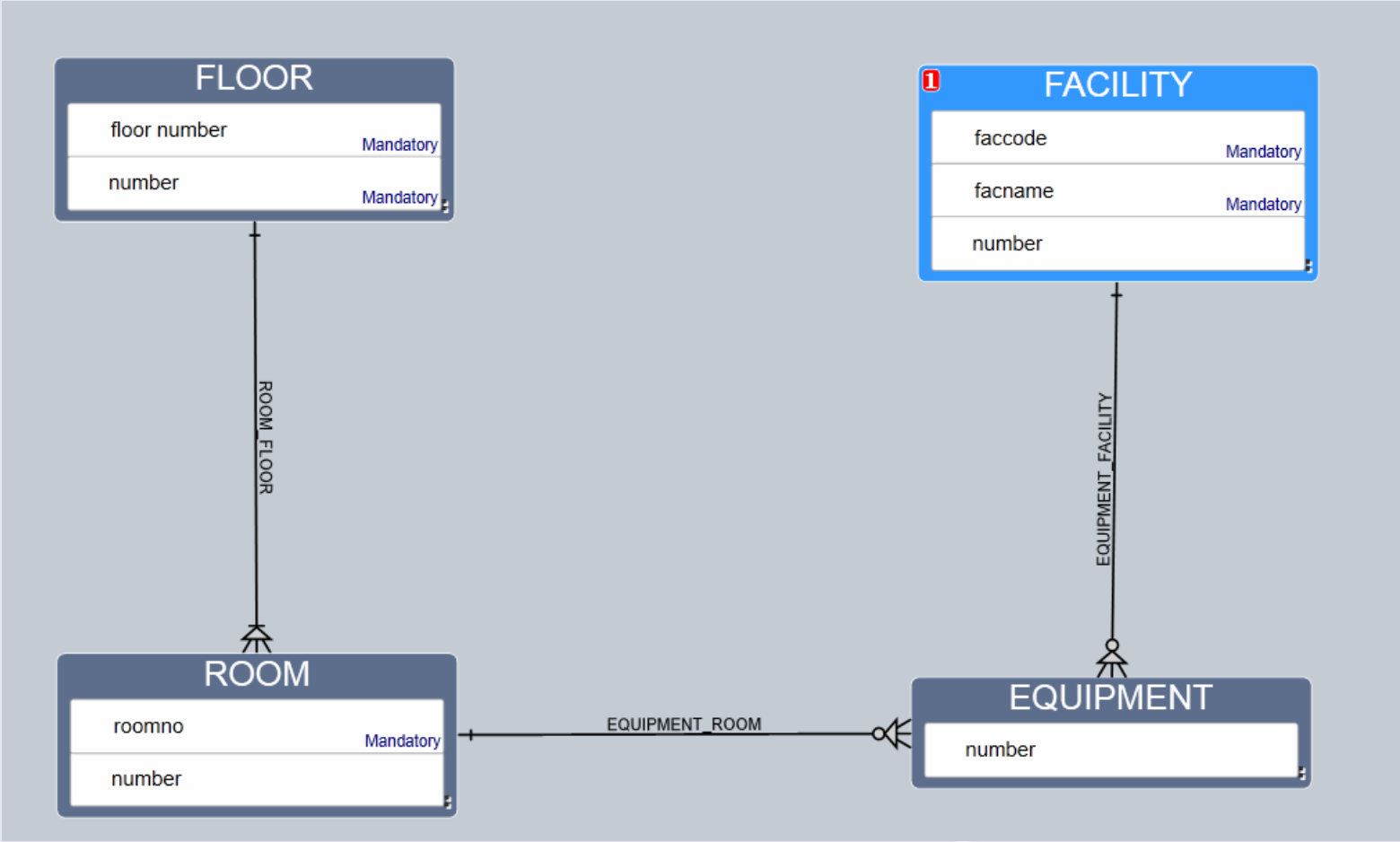
ER transformation



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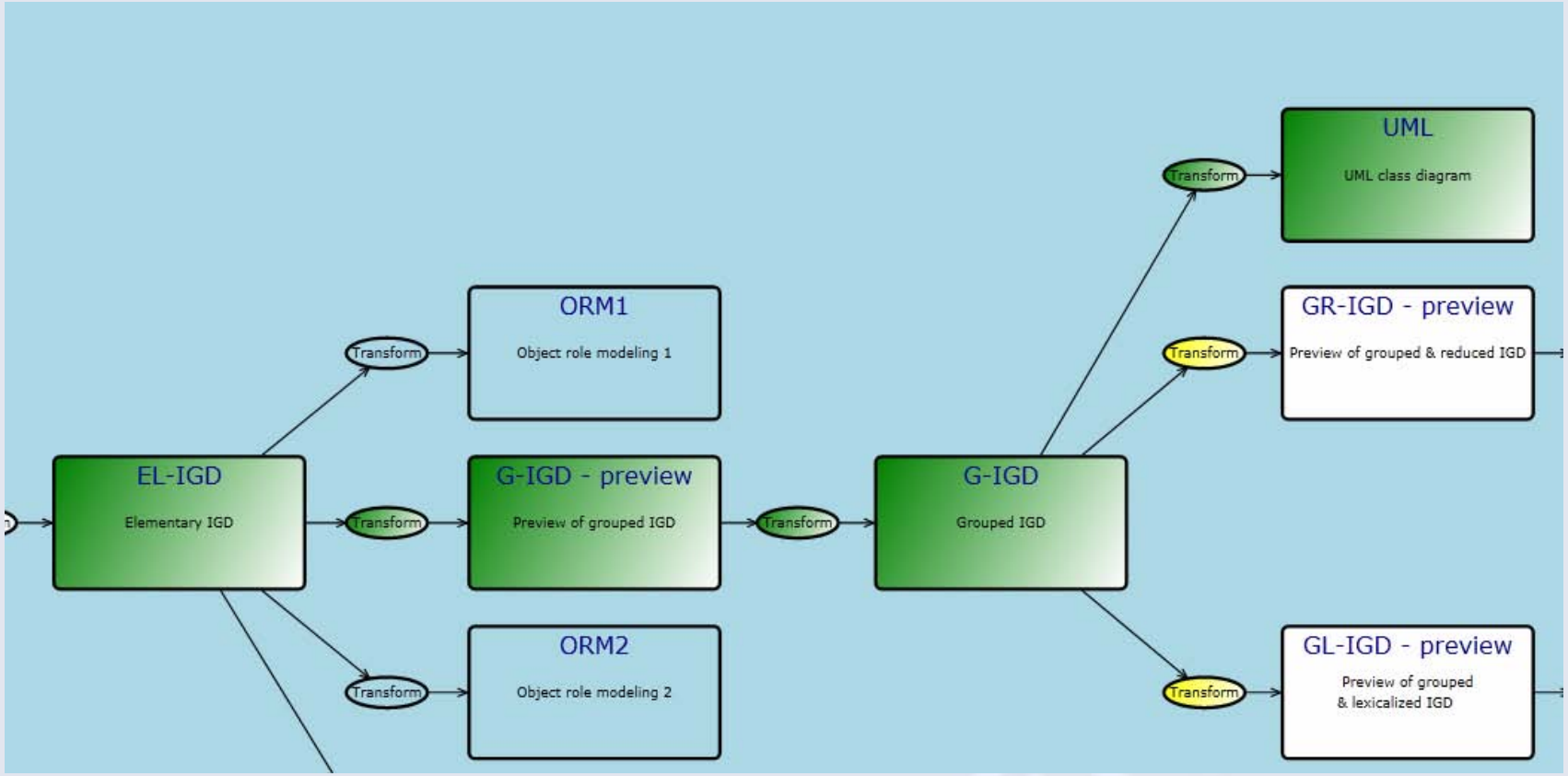
UML transformation



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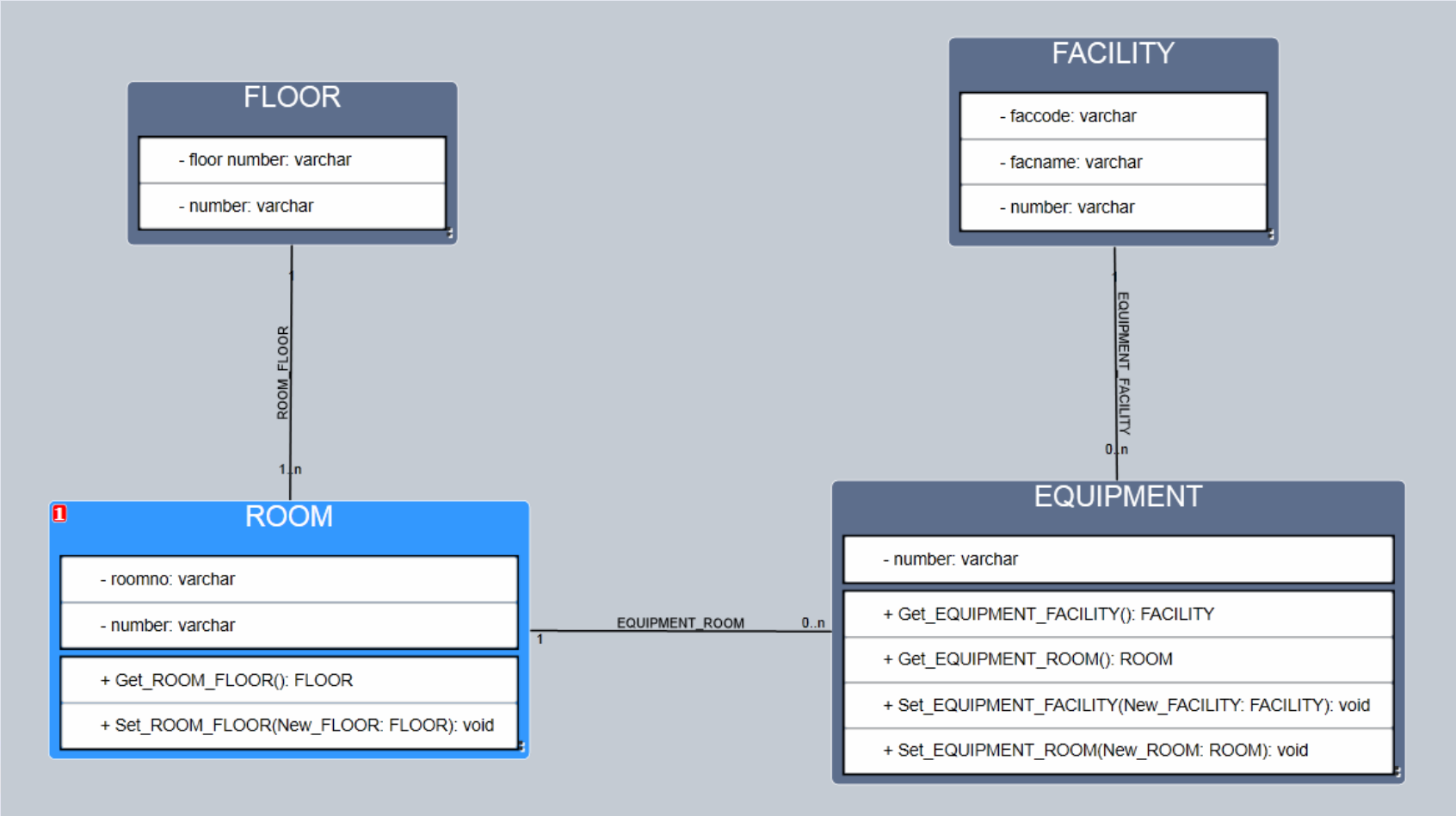
UML Transformation



Final projects by students

- BPMN editor/comparison in Graphity (Centric)
- Claqua as interactive conversation (RU)
- Data vault algorithm
- Anchor modeling – 3rd NF comparison speed
- Generating testcases for GLR
- SBVR application generation (Usoft)
- BPMN generation of batch processes (Usoft)
- ORM Anchor modeling transformation

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Future FCO – IM tool

- Remove ‘has …’from diagram
- More constraints, constraint language?
- Generalization
- Recursive identification
- Overlapping fact type expressions
- New input from theoretical research
- Better SQL script (constraints, subtype, triggers)
- Sub types in application
- Better RE with dirty data, missing PK & FK
- ER entry with immediate transformation to FCO-IM
- FCO ER
- More application meta data

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Docenten (Technische) Informatica

- 2 FTE
- U hebt een relevante wo- of hbo-masteropleiding. U bent een ervaren informaticaspecialist met relevante werkervaring, opgedaan in het bedrijfsleven. We zoeken collega's die flexibel inzetbaar zijn voor onderwijs in zowel technische als niet-technische informatica en goed thuis zijn op zoveel mogelijk van deze terreinen: (Embedded) Software Engineering, kennis van OO-programmeertalen bijvoorbeeld Java, C#, C++, UML voor analyse en ontwerp van systemen en embedded media objects. U hebt visie en een verfrissende kijk op uw vakgebied. U bent creatief en ondernemend en hebt uitstekende didactische, sociale en communicatieve vaardigheden. Omdat van hogeschooldocenten tevens verwacht wordt dat zij onderzoek verrichten, is affiniteit met en/of ervaring in het uitvoeren van onderzoek een pre.