UML OR DSML?

ERICSSON

YOU CAN NOW HAVE BOTH WITH PAPYRUS 1.0!

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NWADSL@EclipseConEurope2104

OUTLINE

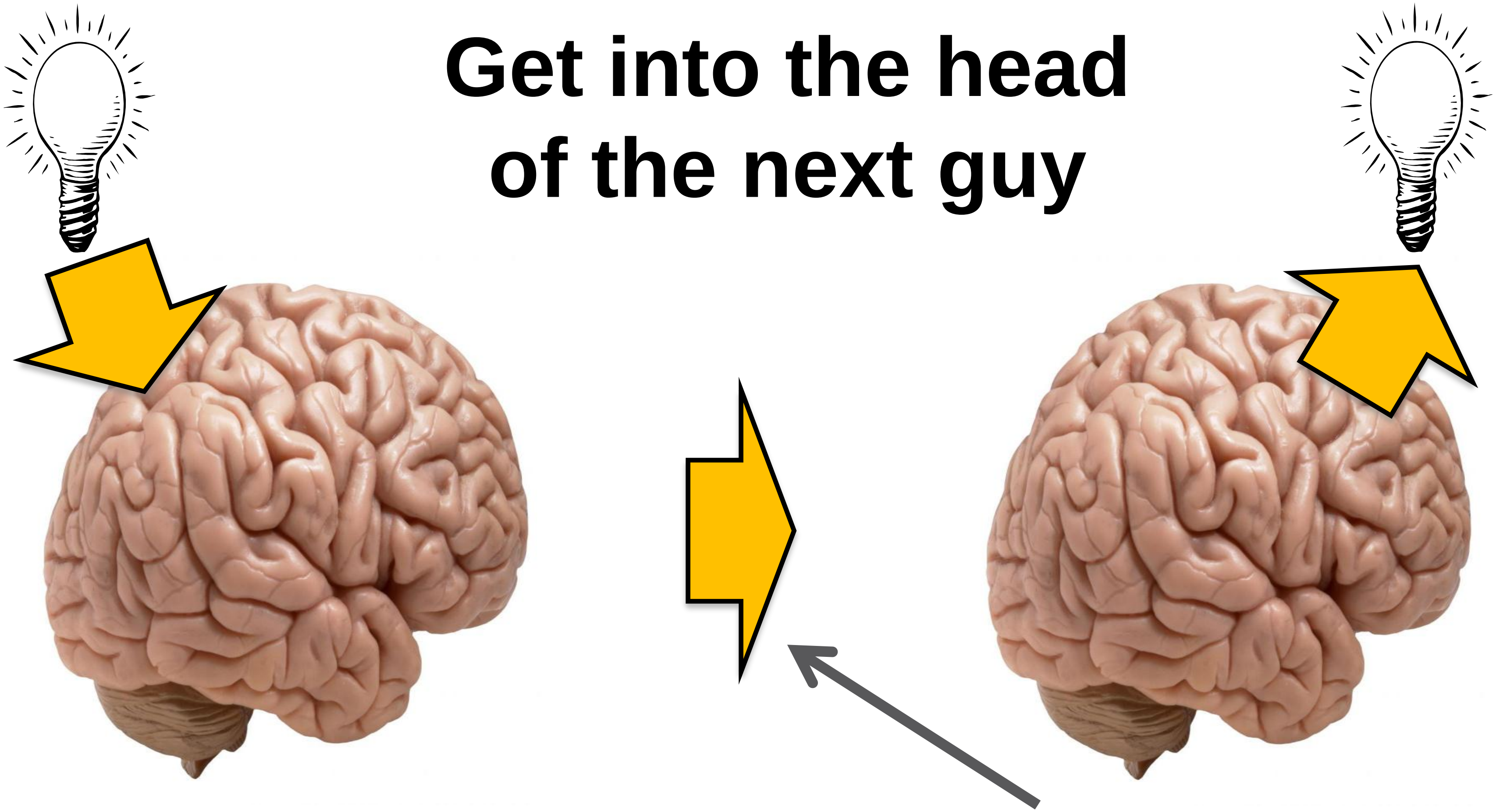
- What’s the problem?
- How did we go about solving it?
- Experiences
- Conclusions

WHAT IS THE PROBLEM?

- Large development organization
  - 25000 R&D personnel out of 114000 world wide
- Wide range of products
  - Radio, IP, transport, mobility, communications, OSS/BSS, cloud infrastructure, …
- Continuity and compatibility
  - Modeling support
    - Language, validation, transformation
  - Collaboration support
  - Stakeholder support
    - Portfolio, design, implementation, marketing
- Efficient tool development
  - Leverage community development momentum

THE GOAL:

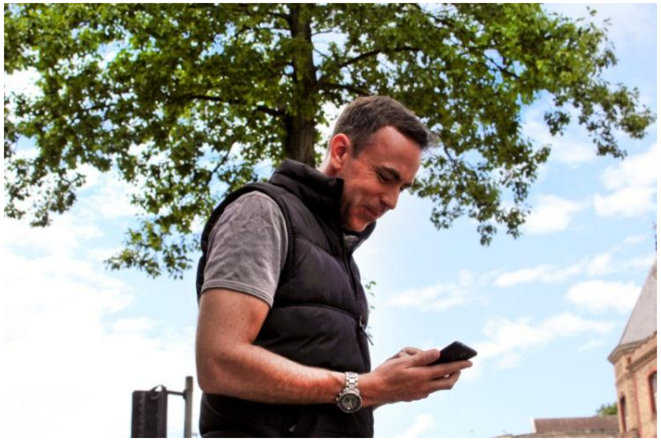
Get into the head of the next guy



Find the tools to bridge this gap.
And the gap to the machine!

NETWORK ARCHITECTURE

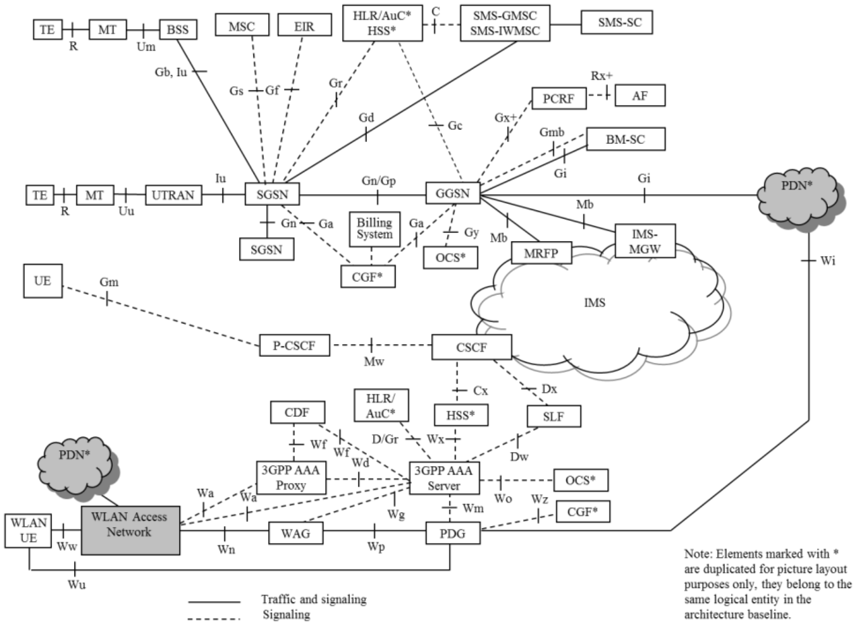
Behind this:



Old method: 3GPP standardization by telco industry consensus

You find this:

Logical baseline architecture for 3GPP



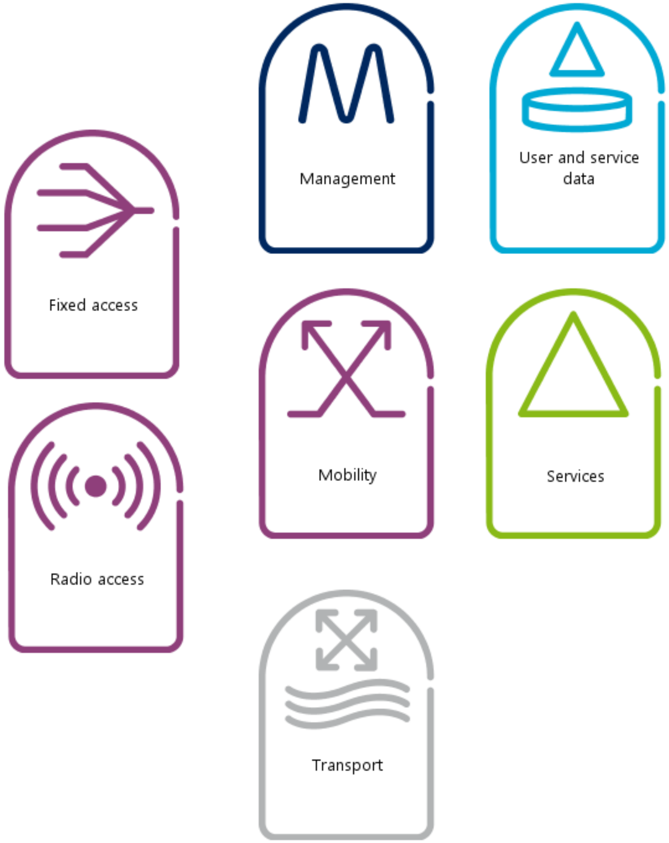
Traffic and signaling
Signaling

Note: Elements marked with * are duplicated for picture layout purposes only, they belong to the same logical entity in the architecture baseline.

Problem: this only a part of our scope, and the world moves faster now…
So, what do we do instead of paper and drawing tools?

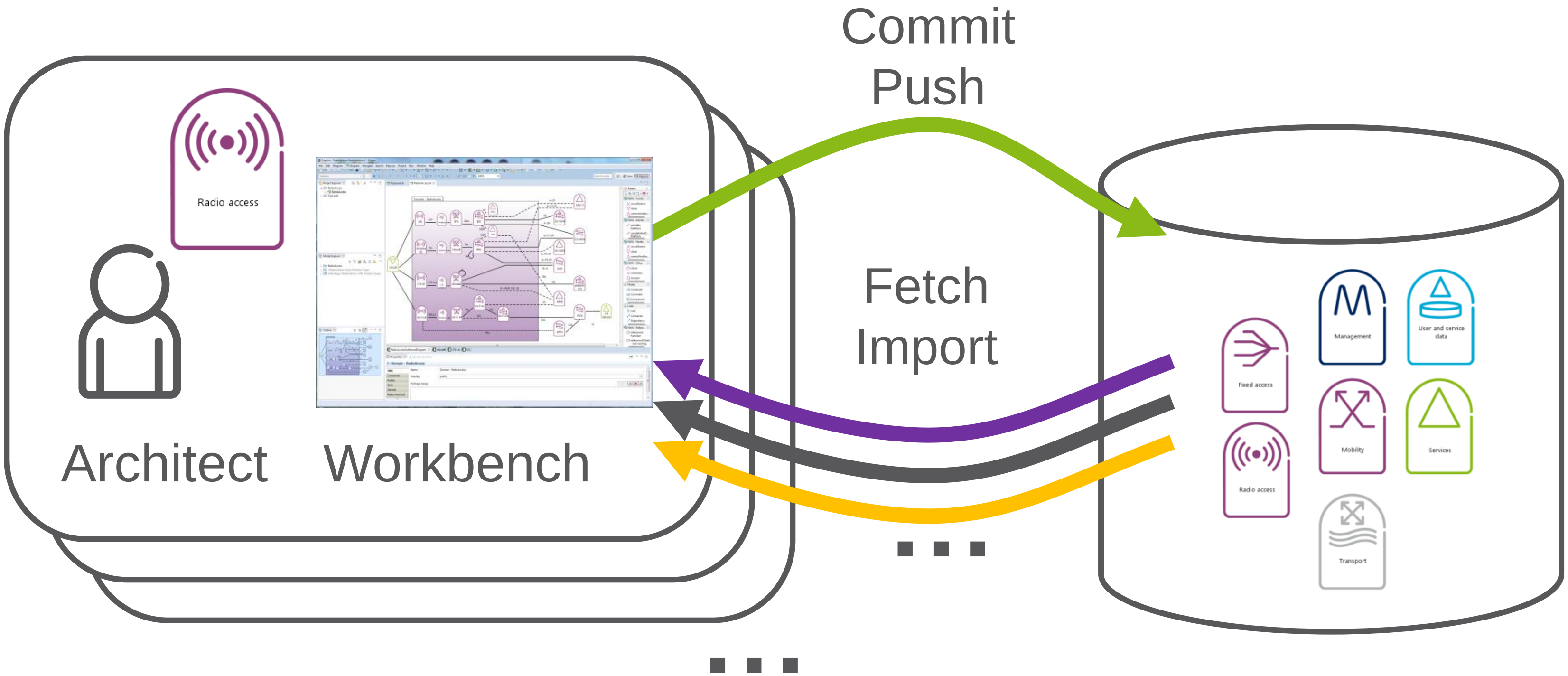
MODELING APPROACH

- Functional modeling with interfaces works well to discuss and agree end-to-end behavior
  - Hierarchy of logical functions
  - Expandable logical interfaces
  - Information elements
  - Use-cases, signal flows
  - Complemented with topological models



COLLABORATION APPROACH

Central coordination, distributed way of working



Commit
Push

Fetch
Import

Architect

Workbench

…

…

Git repository
managed by
Gerrit Central

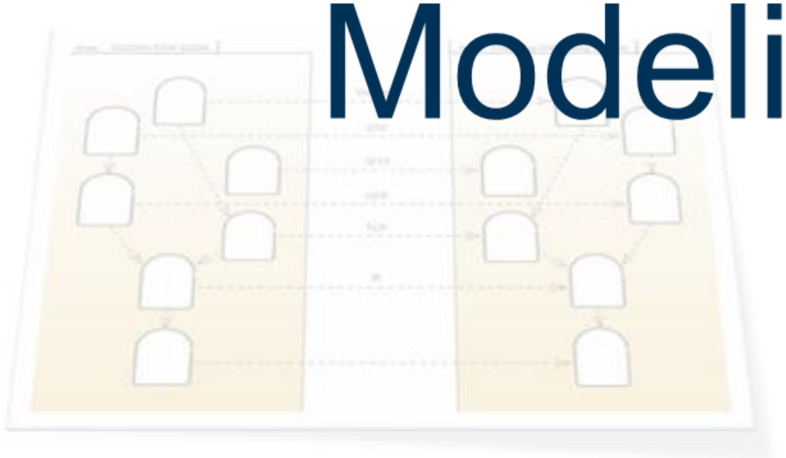
All workbenches hold the complete model(s)

Cycle: evolve/propose/commit/distribute
Supports studies based on stable architecture

CTO MARCHING ORDERS

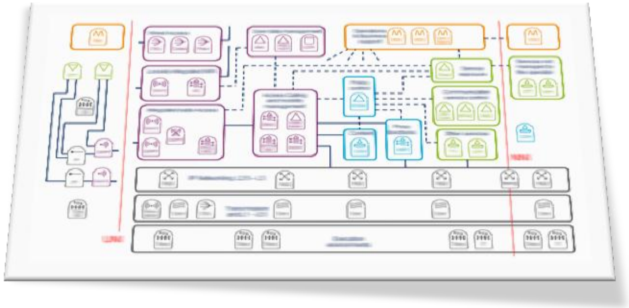
“We need to ensure architecture and product consistency across the company”

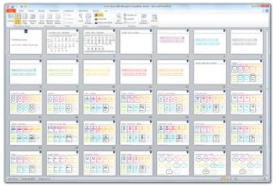
Network Architecture Modeling DSL



NWADSL – Short Background

- NWADSL – Short Background
  - Very Domain Specific Language – Modeling of Network Architectures
  - Guiding document: Network Architecture Evolution Strategy
  - Defining the NWA language – Concepts, Modeling Elements, Colors
  - Modeling Rules, WoW, Guidelines, Wiki
  - Example Models (PowerPoint slide-kit)
  - Technical Icons Library



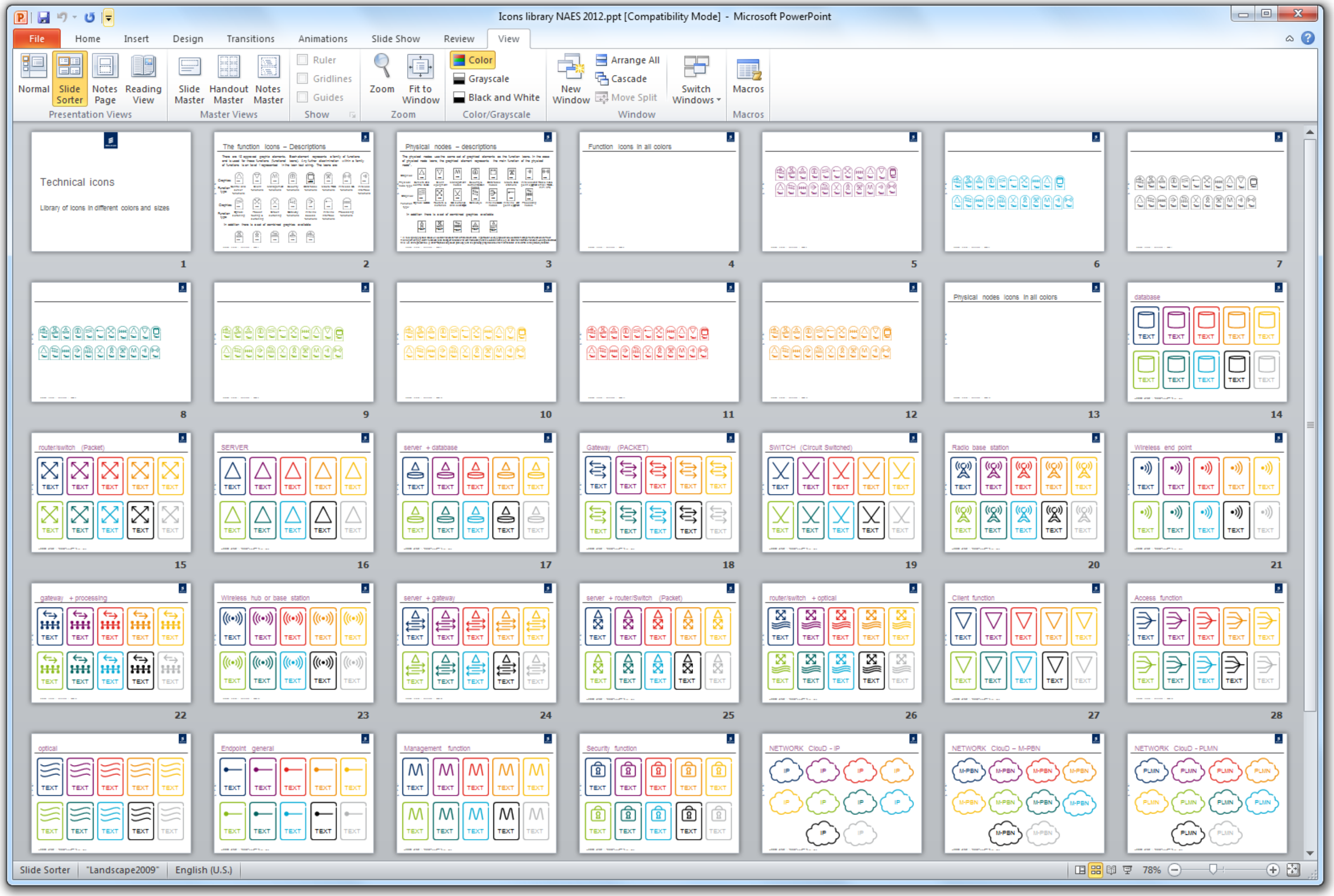


- NWADSL – Start Modeling

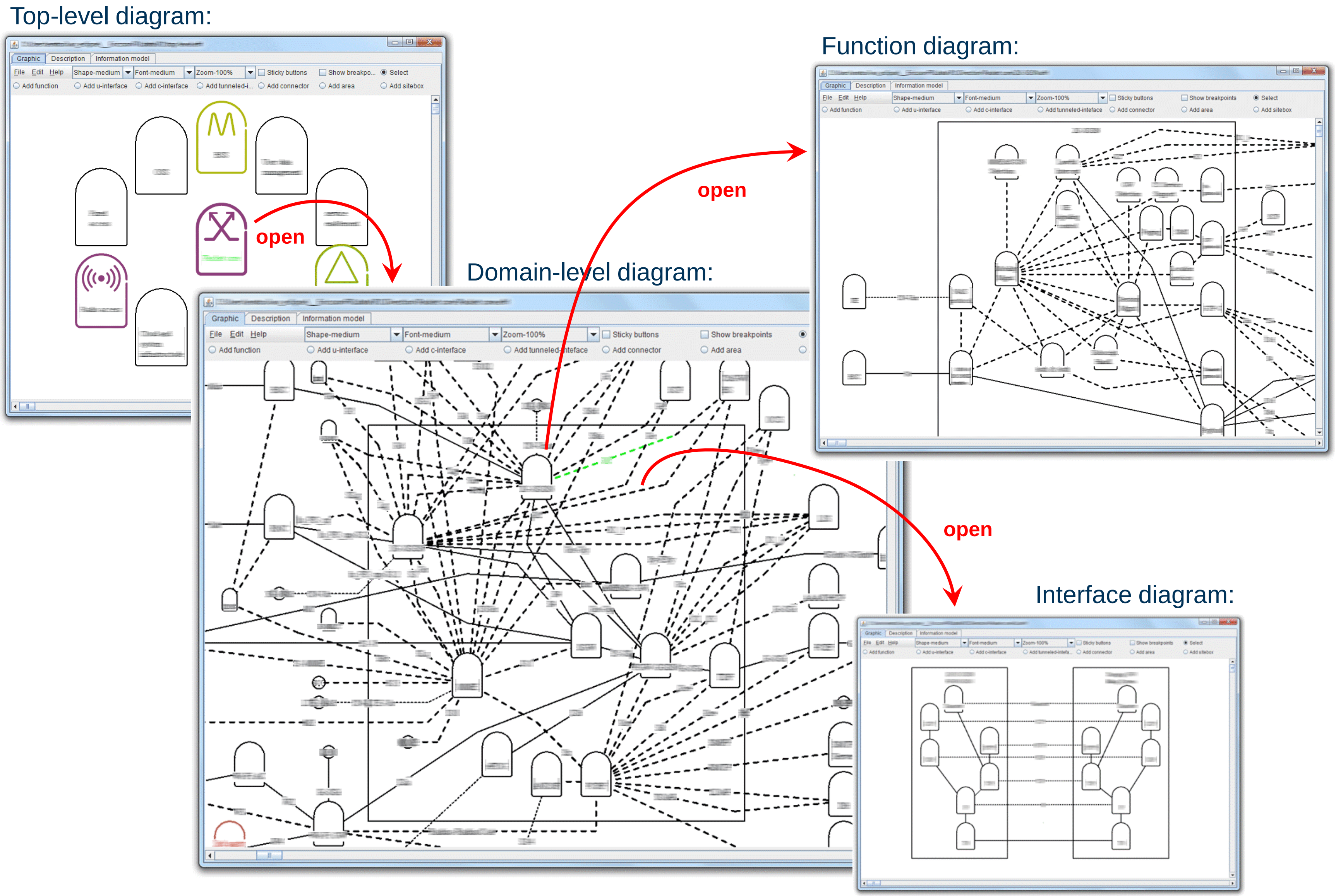
(tool independent DSL)

  - PowerPoint Modeling
  - Modeling in Visio
  - Whiteboard

Technical Icons Library



The first NWADSL tooling (1)


Top-level diagram:

Function diagram:

Domain-level diagram:

Interface diagram:

open

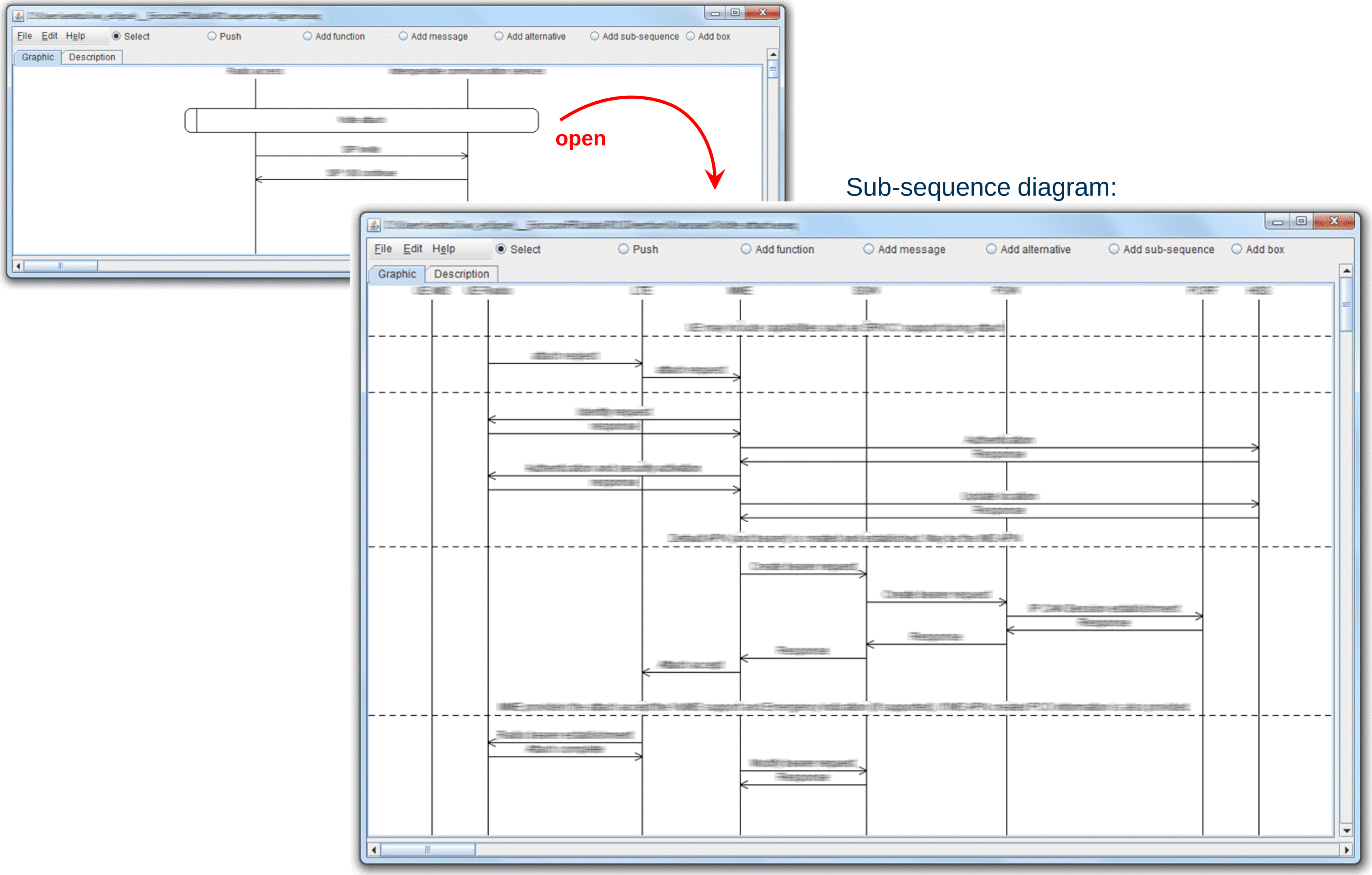
open

open

The first NWADSL tooling (2)

Sequence diagram:

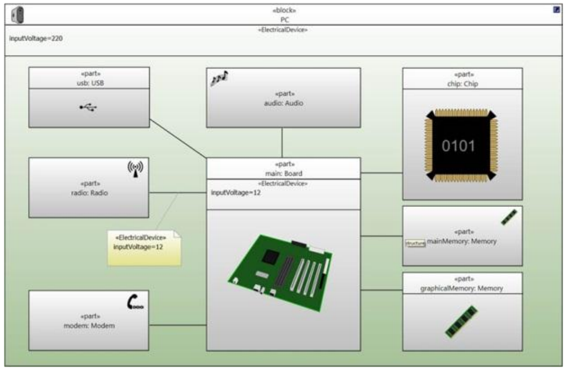
Sub-sequence diagram:



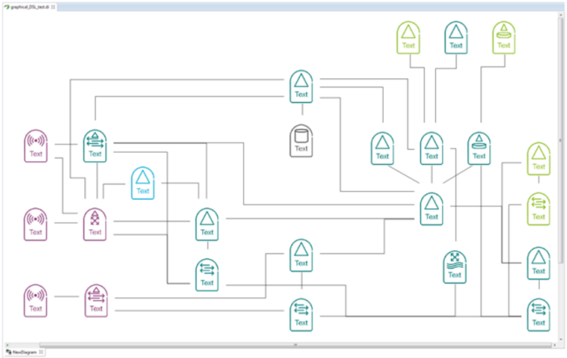
Question: Why Not UML ???

- Why not Open Source UML tools for NWADSL instead of in-house tools?
  - Evaluation of Ericsson DSL’s and tooling on Papyrus was ongoing.
  - **Why not create an NWADSL in Papyrus UML?**
  - (an EMF-based NWADSL was also discussed, but we like to reuse capabilities of UML and open source tooling, not reinventing them)

- Initial discussions with the Papyrus vendor CEA
  - Example graphics in Papyrus by CEA
  - Testing stereotypes, SVG shapes, stylesheets
  - …showing that it could be done in Papyrus ☺

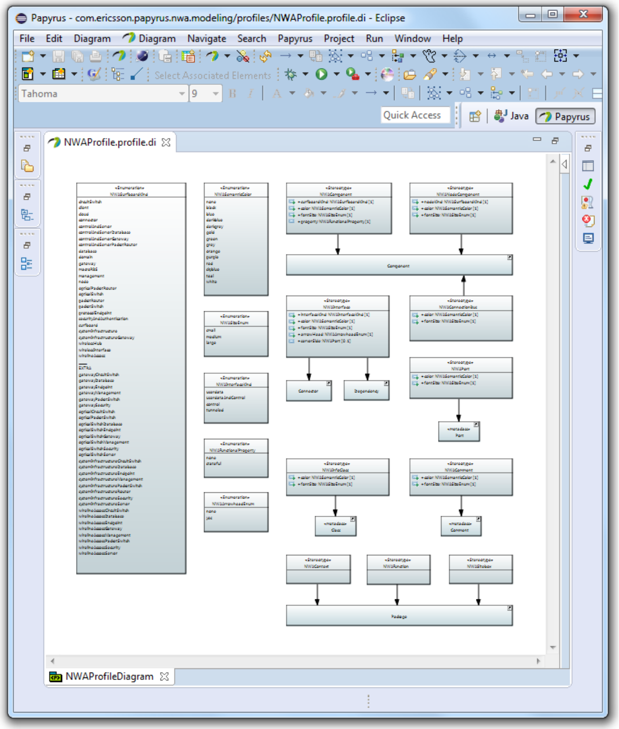


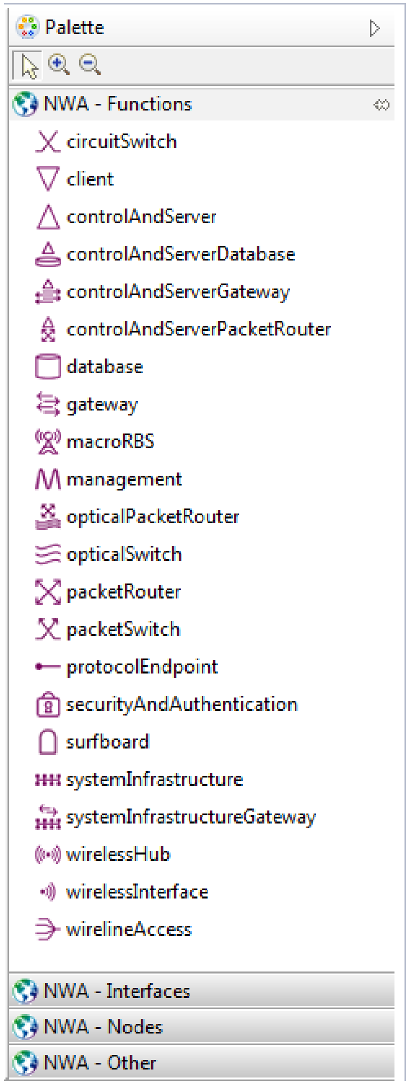
- First pilot: Test Papyrus Graphics Capabilities
  - **Problem:** Replace UML elements with SVG’s
  - The initial support in Papyrus was primitive...
  - …but the first pilot project was successful.
  - …showing GREAT potential for improvements.



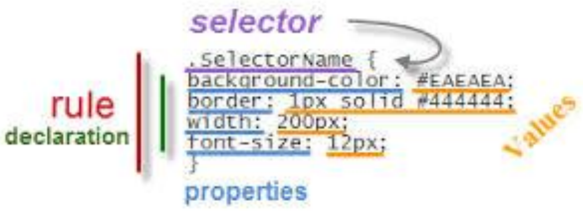
Customized NWADSL in Papyrus

- NWADSL - Main Parts
  - NWA Profile
  - Customized Palette
  - SVG Graphics Library
  - CSS stylesheet rules for graphics rendering


Papyrus - com.ericsson.papyrus.nwa.modeling/profiles/NWAProfile.profile.di - Eclipse
File Edit Diagram Diagram Navigate Search Papyrus Project Run Window Help
Select Associated Elements
Tahoma
9
Quick Access
Java
Papyrus
NWAProfile.profile.di
NWAProfileDiagram



RBS
Wi-Fi
GW
Server
Mgmt



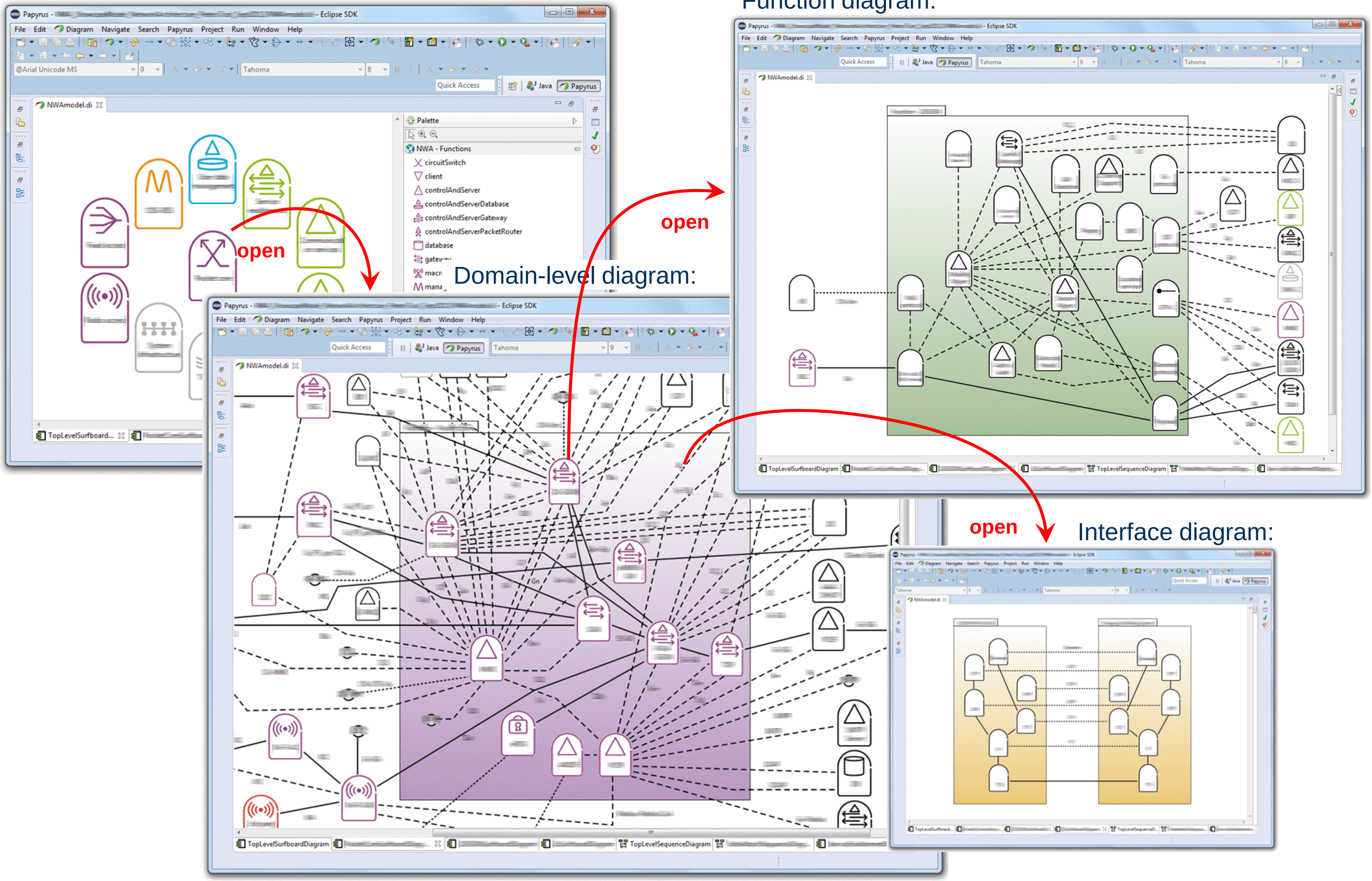
```
.selectorName {
background-color: #EAEAEA;
border: 1px solid #444444;
width: 200px;
font-size: 12px;
}
```

(rules based on stereotypes and property values)

NWADSL Modeling in Papyrus (1)

Top-level diagram:

Function diagram:

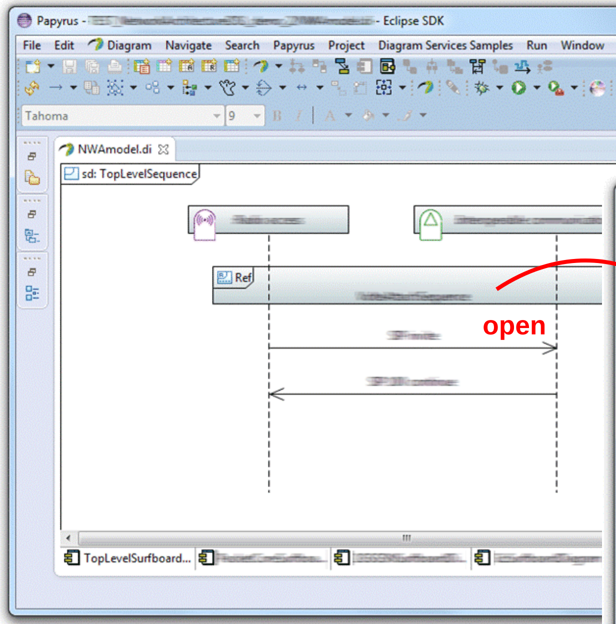


Domain-level diagram:

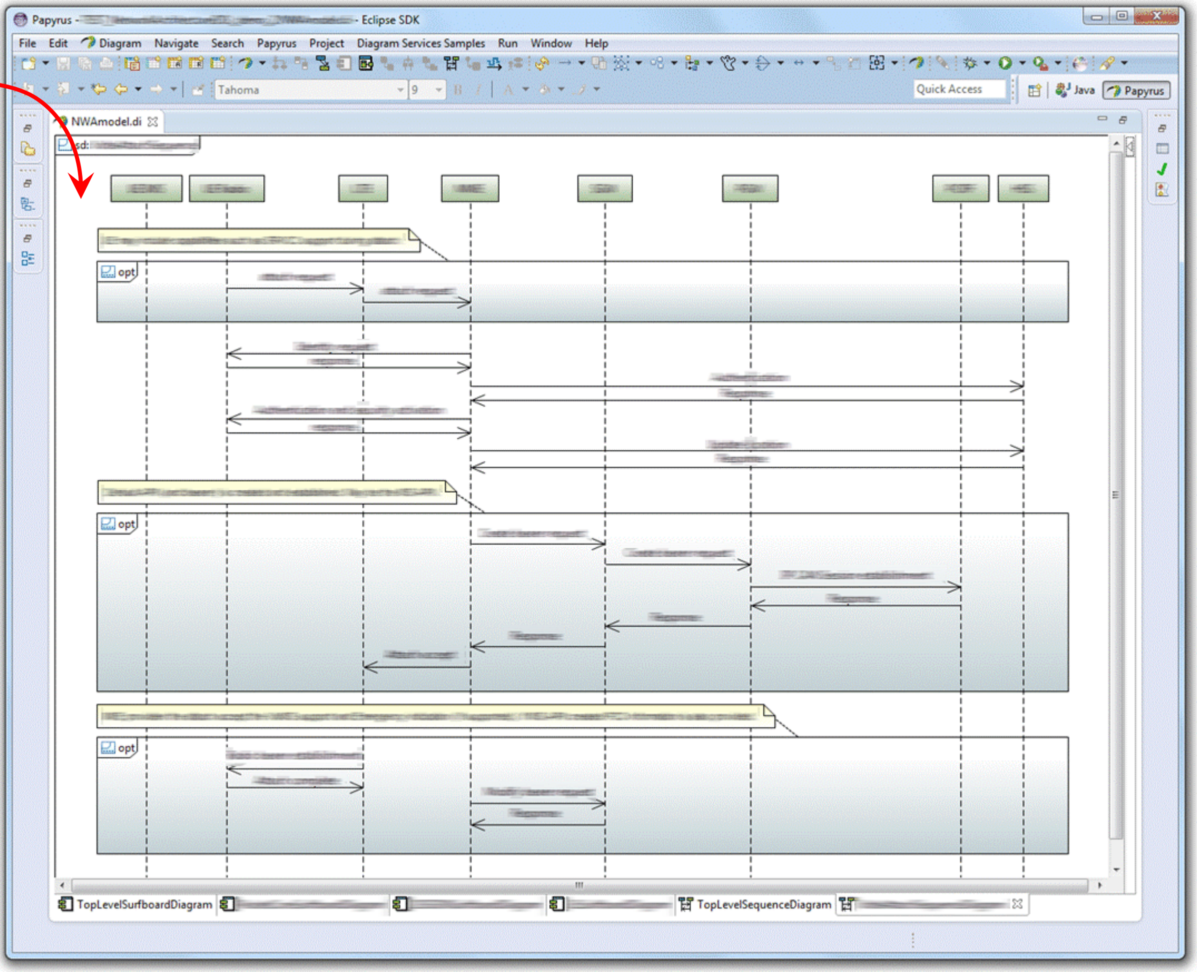
Interface diagram:

NWADSL Modeling in Papyrus (2)

Sequence diagram:

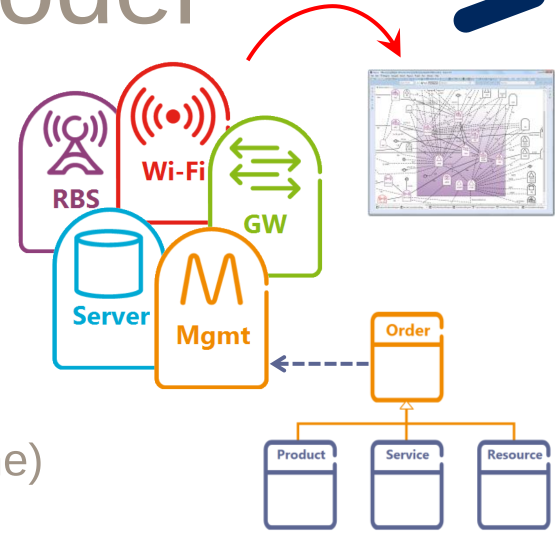


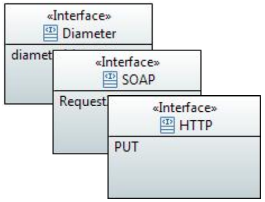
Sub-sequence diagram:

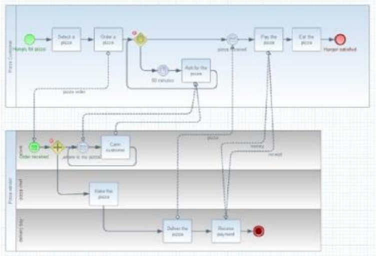


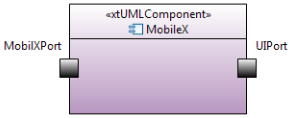
Multiple DSL’s in Same Model

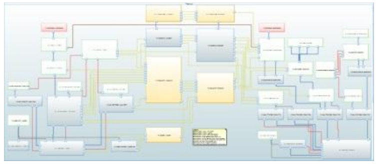
- NWA Vision:
  - Integrate NWADSL with other DSLs and plain UML.
- Some NWA Use Cases:
  - De-compose into finer-grained NWA Functions. (done)
  - Combine with NWA Info Modeling. (done)
  - Combine with plain UML modeling. (done)
  - Combine NWA modelling with BPM.
  - De-compose NWA Functions into ”design” models, like Executable UML.









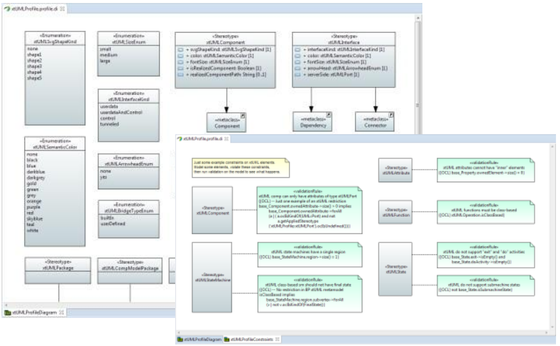


- Proof-of-concept showcase models needed:
  - Combine NWADSL with another Ericsson DSL in the same model.
  - Combine NWADSL with a ”design language”, like Executable UML.

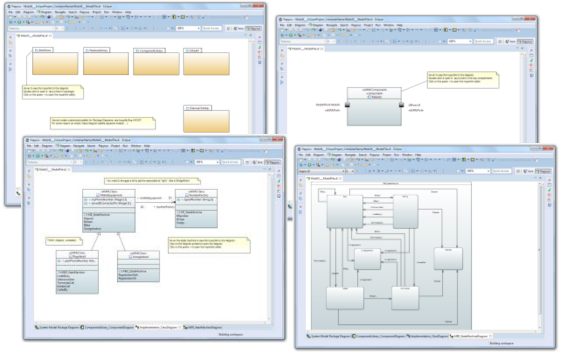
ExecutableUML DSL Prototype

- Quick DSL Prototyping:
  - Develop an Executable UML Profile (basic OCL restrictions)
  - Develop Customized UI Palettes
  - Then migrate an existing model...
- Model Compiler Prototyping:
  - M2M + M2T capabilities required
  - Template capability is also required
  - **QVTo and blackboxing using StringTemplates <u>can</u> solve this ☺**
- NWA Modeling showcase thinking:
  - When linking these technologies to NWADSL we prove we can go from Network Modeling downto code.

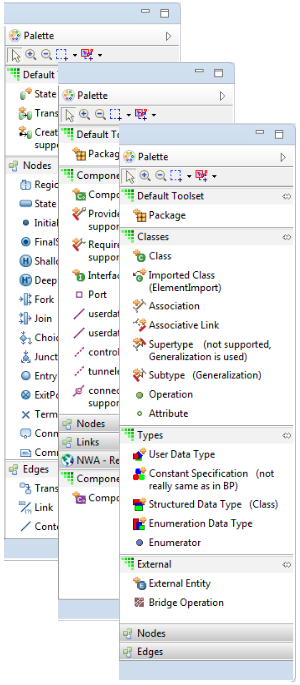
Profile + DSL restrictions in OCL:



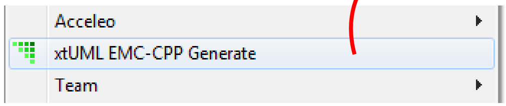
Migrated Executable UML model:

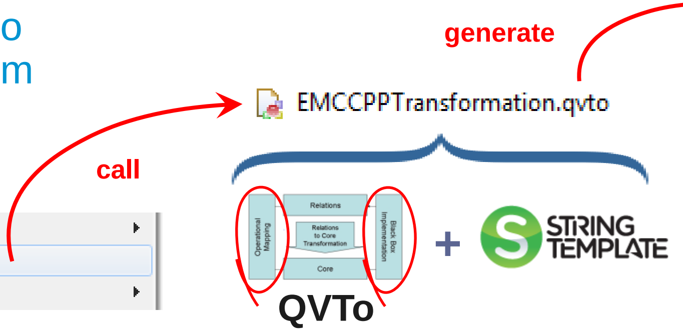


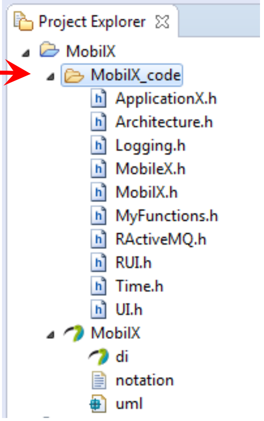
Customized Palettes:



Model Compiler:

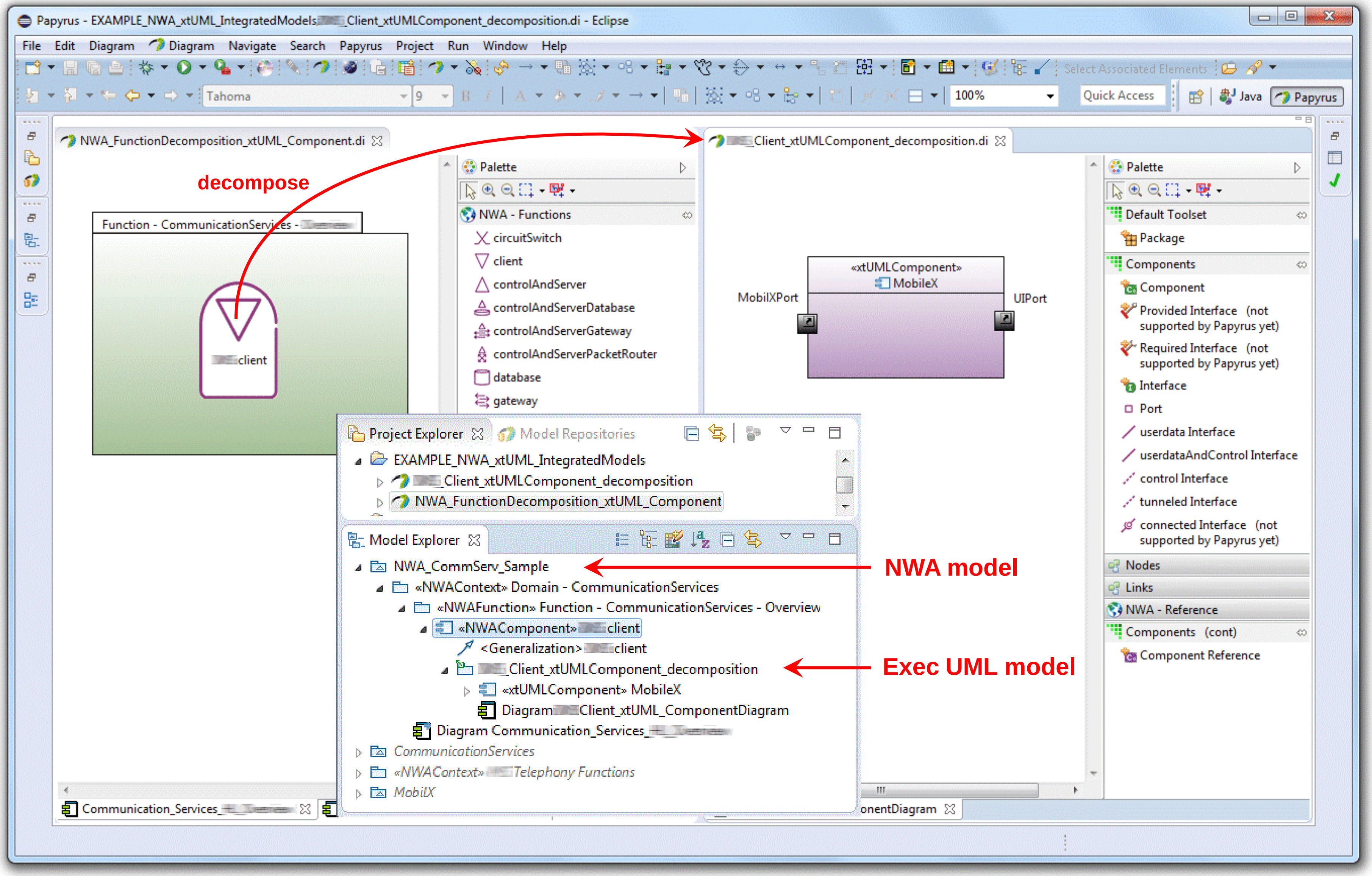






Project Explorer
- MobilX
  - MobilX_code
    - ApplicationX.h
    - Architecture.h
    - Logging.h
    - MobileX.h
    - MobilX.h
    - MyFunctions.h
    - RActiveMQ.h
    - RUI.h
    - Time.h
    - UI.h
  - MobilX
    - di
    - notation
    - uml

Integrate NWA + ExecUML DSL’s



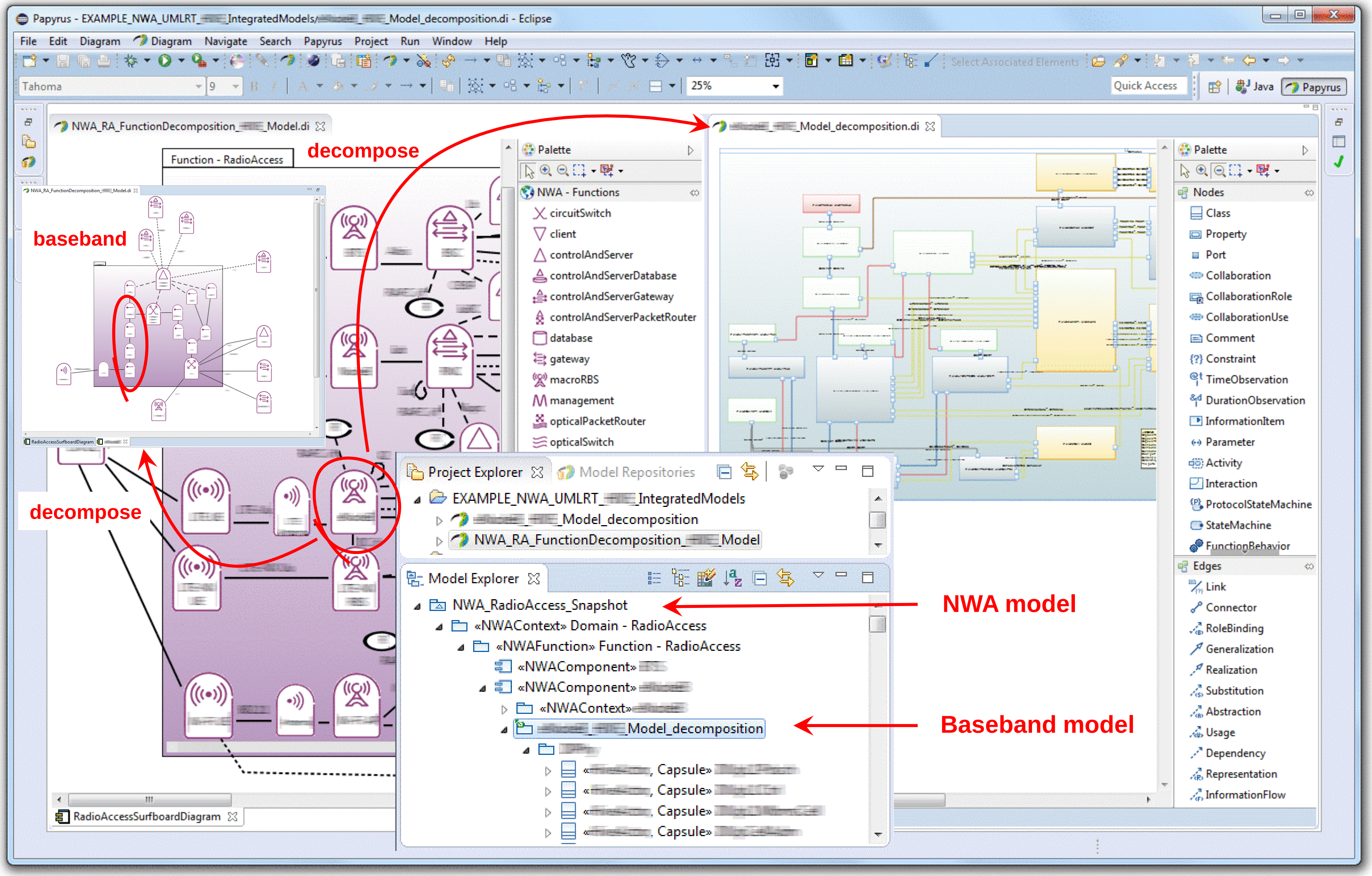
decompose

NWA model

Exec UML model

Papyrus - EXAMPLE_NWA_xtUML_IntegratedModels[redacted]Client_xtUMLComponent_decomposition.di - Eclipse
File Edit Diagram Diagram Navigate Search Papyrus Project Run Window Help
Select Associated Elements
Tahoma
9
100%
Quick Access
Java
Papyrus
NWA_FunctionDecomposition_xtUML_Component.di
[redacted]Client_xtUMLComponent_decomposition.di
Function - CommunicationServices - [redacted]
[redacted]client
Palette
NWA - Functions
circuitSwitch
client
controlAndServer
controlAndServerDatabase
controlAndServerGateway
controlAndServerPacketRouter
database
gateway
«xtUMLComponent»
MobileX
MobilXPort
UIPort
Palette
Default Toolset
Package
Components
Component
Provided Interface (not supported by Papyrus yet)
Required Interface (not supported by Papyrus yet)
Interface
Port
userdata Interface
userdataAndControl Interface
control Interface
tunneled Interface
connected Interface (not supported by Papyrus yet)
Nodes
Links
NWA - Reference
Components (cont)
Component Reference
Project Explorer
Model Repositories
EXAMPLE_NWA_xtUML_IntegratedModels
[redacted]Client_xtUMLComponent_decomposition
NWA_FunctionDecomposition_xtUML_Component
Model Explorer
NWA_CommServ_Sample
«NWAContext» Domain - CommunicationServices
«NWAFunction» Function - CommunicationServices - Overview
«NWAComponent» [redacted]client
<Generalization> [redacted]client
[redacted]Client_xtUMLComponent_decomposition
«xtUMLComponent» MobileX
Diagram [redacted]Client_xtUML_ComponentDiagram
Diagram Communication_Services_[redacted]
CommunicationServices
«NWAContext» [redacted]Telephony Functions
MobilX
Communication_Services_[redacted]
onentDiagram

Integrate NWA + Baseband DSL’s


Papyrus - EXAMPLE_NWA_UMLRT_[redacted]IntegratedModels/[redacted]_Model_decomposition.di - Eclipse
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Select Associated Elements
Tahoma
9
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Quick Access
Java
Papyrus
NWA_RA_FunctionDecomposition_[redacted]Model.di
Function - RadioAccess
decompose
baseband
decompose
RadioAccessSurfboardDiagram
[redacted]_Model_decomposition.di
Palette
NWA - Functions
circuitSwitch
client
controlAndServer
controlAndServerDatabase
controlAndServerGateway
controlAndServerPacketRouter
database
gateway
macroRBS
management
opticalPacketRouter
opticalSwitch
Project Explorer
Model Repositories
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Model Explorer
NWA_RadioAccess_Snapshot
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«NWAFunction» Function - RadioAccess
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«NWAComponent» [redacted]
«NWAContext» [redacted]
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«[redacted], Capsule» [redacted]
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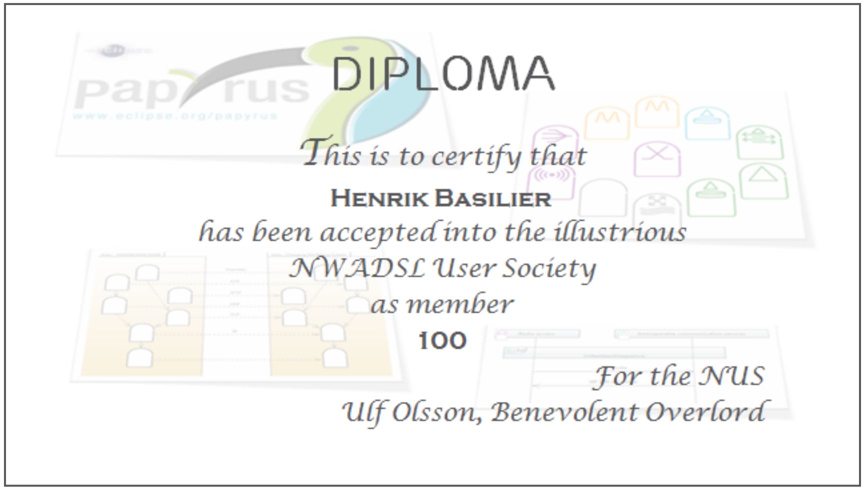
«[redacted], Capsule» [redacted]
«[redacted], Capsule» [redacted]
NWA model
Baseband model
Palette
Nodes
Class
Property
Port
Collaboration
CollaborationRole
CollaborationUse
Comment
Constraint
TimeObservation
DurationObservation
InformationItem
Parameter
Activity
Interaction
ProtocolStateMachine
StateMachine
FunctionBehavior
Edges
Link
Connector
RoleBinding
Generalization
Realization
Substitution
Abstraction
Usage
Dependency
Representation
InformationFlow

Short Demo

LIFE AT THE COALFRONT

- The good
  - 103 people on the mailing list
  - 16 active architects
  - …and this is just the beginning!
- The bad
  - Our goal is to work on a model-based level of abstraction, therefore <u>all</u> tools must work on the same level
    - Luna 1.0 had text-based compare only, which caused corrupt models. Very off-putting…
    - The EMFCompare project (Obeo, EclipseSource) has made major progress in the past months
  - Possible to create corrupt models if upstream commits are not synchronized
  - Pushback from the users: too complex, “looks like programming”


Papyrus
www.eclipse.org/papyrus

DIPLOMA

This is to certify that

HENRIK BASILIER

has been accepted into the illustrious

NWADSL User Society

as member

100

For the NUS

Ulf Olsson, Benevolent Overlord

WISH LIST (EXCERPTS)

- Simple UI
  - As few irrelevant items as possible
- Scripting
  - For local adaptation
- Creation of navigation-enabled HTML
  - For information sharing with non-modelers
- Improved focus on graphical interaction
  - Example: UI for EMFCompare is on the right track, but not intuitive enough
  - Things done in the diagrams sometimes has unintended effects on the model
- …

CONCLUSIONS

We need:

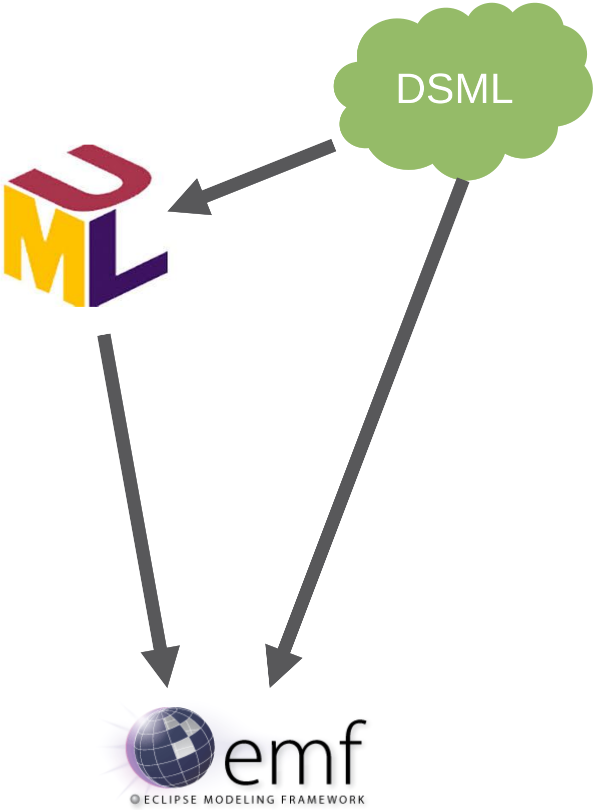
- Flexibility
  - To achieve the right abstraction
- Integration
  - For efficiency in the whole development and integration chain
- Ease of use
  - To lower the threshold for architecture-level users
- Efficient collaboration
  - To support the entire organization

…and a community approach

- To leverage innovation and creativity inside and outside the company

UML OR DSML?

- **Not a question of “OR”, we have both!**
- Presents a DSML to the user:
  - Adapted to the problem space (actually, spaces!)
  - Customized: no UML expertise required
- Based on UML:
  - Leverages years of work of top modeling and tool implementation experts
  - Builds on the semantic richness of UML
- Benefits:
  - Facilitates integration with other languages
  - Accommodates other UML-based technologies (present and future)
  - Provides a full language support infrastructure (editors, renderers, compilers, debuggers etc.)
- Drawbacks:
  - More complex to define that “pure” (built from scratch) DSML – UML expertise required



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