



STF 476: TD-LTE Phase 2

Status Report

Document History

- 2014-10-10: Document submitted for MTS #62
 - long form for SG #3 / Technical Session
 - short form for MTS #62
- 2014-03-19: Document submitted for SG #2

From the Terms of Reference...

TDL Phase 2: Goal and Objectives

- Goal
 - Supporting ETSI and industrial users in using TDL
- Objectives
 - Extended TDL meta-model for supporting test automation
 - Standardised concrete syntaxes
 - Graphical syntax for end-users
 - Textual exchange syntax for tool interoperability
 - Analysis on the needs for a concrete syntax to support ETSI use cases

TDL Phase 2: Deliverables

Del.	Work Item Code / Standard Number	Working Title / Scope
D1	RES/ES 203 119-1 V1.2.1	Test Description Language; Meta-Model and Semantics Scope: common concepts, meta-model, semantics
D2	DES/ ES 203 119-2 V1.1.1	Test Description Language; Graphical Syntax Scope: TDL graphical concrete syntax for end users
D3	DES/ ES 203 119-3 V1.1.1	Test Description Language; Exchange Format Scope: TDL exchange format for tool interoperability

Optionally: ES Part 4 on TDL textual concrete syntax (no WI created yet)

TDL Phase 2: Organisation of Work

- Start: 02/2014
 - Task 0: Project management
 - Task 1: Extension of TDL meta-model (02-12/2014)
 - Task 2: Graphical concrete syntax (02-12/2014)
 - Task 3: Exchange syntax (06-12/2014)
 - Task 4a: Analysis on ETSI concrete syntax (02-05/2014)
- Potential STF extension: 06/2014 (decision at MTS#62)
 - Task 4b: ETSI concrete syntax (06-12/2014)
- End: 12/2014
 - WI: updated meta-model description + semantics
 - WI: concrete syntax + meta-model mapping
 - WI: exchange syntax + meta-model mapping

TDL Phase 2: Milestones

- M0: 02/2014
 - Start of work of Tasks 0, 1, 2, 4
- M1: 05/2014 <- Discussion at MTS#62 (05/2014)
 - (T1) Early draft: updated meta-model, (T2) Early draft: graphical syntax,
 - (T4) Decision paper on textual syntax
 - (T3) Start of Task 3
- M2: 09/2014 <- Discussion at MTS#63 (10/2014)
 - (T1) Stable draft: updated meta-model, (T2) Stable draft: graphical syntax, (T3) Early draft: exchange syntax
- M3: 12/2014 <- Approval at MTS#64 (02/2015)
 - (T1) Final draft: updated meta-model, (T2) Final draft: graphical syntax, (T3) Final draft: exchange syntax

Status Report

Task 0: Session Overview

- WK09 Feb 24-28 - Session 1 @ETSI
- WK15 Apr 07-11 - Session 2 @ETSI
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- WK42 Oct 13-17 - Session 5 @Siemens
- WK49 Dec 01-05 - Session 6 @ETSI

Task 1: Extended TDL Meta-Model

- Targeted for M1
 - specification of sub-test configurations
 - types and data refinement (initial proposal)
- Open for M2 and M3
 - types and data (finalised)
 - time
 - behaviour
 - editorial clarifications and refinements

Task 2: Graphical Concrete Syntax

- Different specification approaches studied
- OMG Diagram Definition (DD) selected “in principle”
- Means for user-accessible specification under study
- Decision on description and mapping structure pending

Task 4: TDL Textual Syntax Analysis

- Understanding ETSI’s requirements for a textual syntax
 - review and discussion of notes and input collected during STF 454
 - discussion of CTI proposal based on ITS and GeoNetworking examples
 - initial focus on provided examples, (TPLan-like) format pushed within ETSI

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Task 0: Session Planning

- 6 sessions in total
- 2 sessions per milestone
 - 1 preparatory / debriefing
 - 1 finalising
- Homework and remote coordinated work in between

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Task 0: Milestone 1 Timeline

- WK09 Feb 24-28 - Session 1 @ETSI
 - 4 experts, 16 days, define roadmaps, prepare early drafts
- WK15 Apr 07-11 - Session 2 @ETSI
 - 4 experts, 16 days, finalise early drafts, analysis report, ToR if applicable
 - deadline for requests to move sessions, contracts extension
- WK18 Apr 28-May 01 - Deliverables **submitted**
- WK20 May 14-15 - MTS #62 @Siemens

Task 0: Milestone 2 Timeline

- WK23 Jun 02-06 - Session 3 @FOKUS
 - 5 experts, 25 days, review feedback, define roadmaps, prep. stable drafts
- WK36 Sep 01-05 - Session 4 @ETSI
 - 5 experts, 20-25 days, finalise stable drafts
- WK37 Sep 08-12 - Deliverables ready
- WK39 Sep 22-26 - MTS #63 TBD

Task 0: Milestone 3 Timeline

- WK42 Oct 13-17 - Session 5 @Siemens
 - 5 experts, 20-25 days, define roadmaps, prepare final drafts
- WK49 Dec 01-05 - Session 6 @ETSI
 - 5 experts, 20-25 days, finalise final drafts
- WK50 Dec 15-19 - Deliverables ready
- WKXX Jan/Feb 2015 - MTS #64 TBD

Task 0: Milestone Resources

- ~15 days/expert per milestone
 - assuming roughly equal resource allocation per expert
 - 2x4 days sessions, ~7 days homework
- Milestone 1: ~60 days planned, 44.5 used so far (4 experts)
- Milestone 2: ~75 days (5 experts)
- Milestone 3: ~75 days (5 experts)

Session 1 Summary

- Goal: Prepare and define roadmaps for Milestone 1
 - created initial pool of tasks
 - selected targets for Milestone 1
 - performed first analysis tasks
 - proposed conceptual solutions for analysed targets
- Targeted for Session 2
 - implementation and validation of analysed targets, progress on remaining targets

Session 2 Summary (1/2)

- Goal: Implement targets for Milestone 1
 - Task 1: Meta-model
 - implemented sub-configurations
 - conceptualised data and action refinements (WIP)
 - Task 2: Graphical syntax
 - laid out document foundations and structure
 - drafted graphical symbols proposals for selected elements

Session 2 Summary (2/2)

- Goal: Implement targets for Milestone 1
 - Task 4: Concrete syntax for ETSI
 - outlined different mapping and formalisation options
 - prepared examples for syntax
 - discussed preliminary results with CTI
 - clarified role of proposed syntax
 - finalised analysis report

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Task 2: Graphical Concrete Syntax

- Targeted for M1:
 - initial syntax proposals for majority of meta-model elements
 - initial draft structure proposal
 - identification of elements that can or shall not be graphically represented
- Open for M2 and M3
 - refinement and completion of graphical syntax elements, draft contents
 - study and application of graphical syntax on real-world examples

Task 2: Graphical Concrete Syntax

- Table of contents and general structure based on Part 1
- Notational conventions
 - *text* - nonterminal element, type indicated by the italic *text*, substituted
 - | - represents a choice, in **bold**
 - [*]* - optional concrete syntax element, in ***bold and italic***
 - [] - terminal symbol, mandatory concrete syntax element, non-bold, non-italic

Task 2: Graphical Concrete Syntax

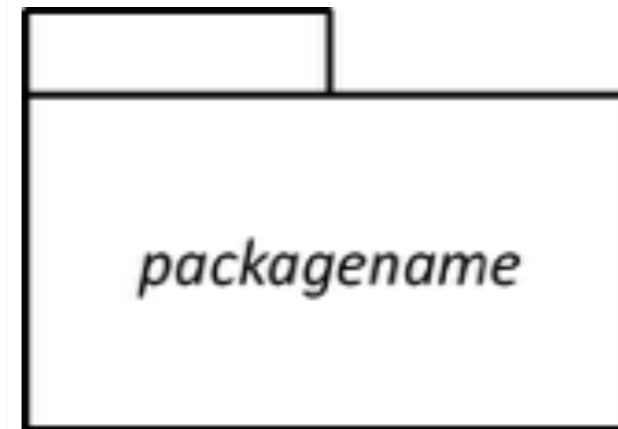
- Structure
 - Meta-Model Reference
 - Concrete Graphical Notation
 - Formal Description
 - Constraints
 - Comments
 - Example

5.1.3 Package

Meta-Model Reference

The definition of 'Package' can be found in chapter 5.3.3 in [1].

Concrete Graphical Notation



Formal Description

<to be added later>

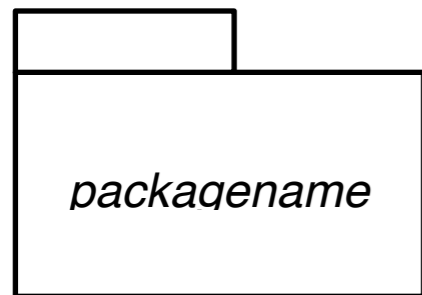
Constraints

Comments

The *packagename* refers to the name of the 'Package'.

Example

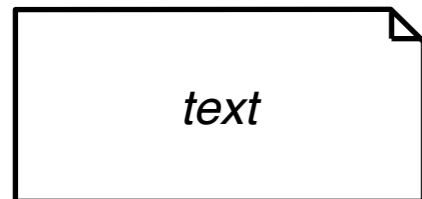
Task 2: Graphical Syntax Elements



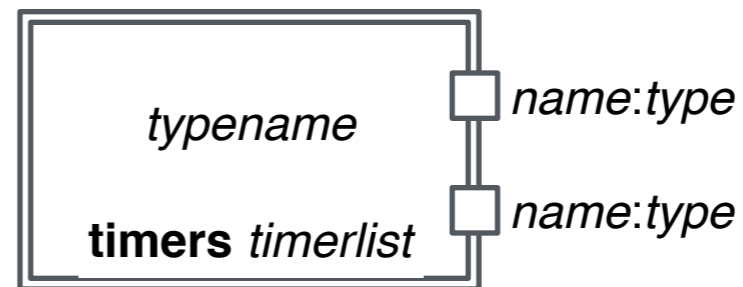
Package



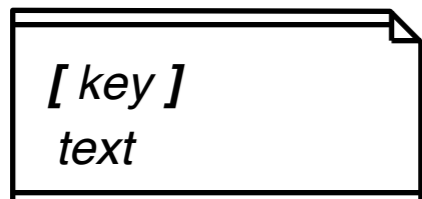
Gate Type



Comment



Component Type



Annotation

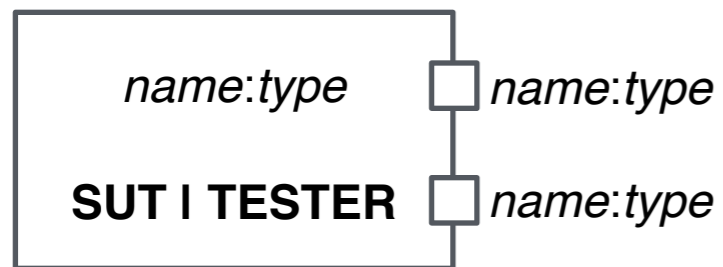
SUTITESTER

Component Role

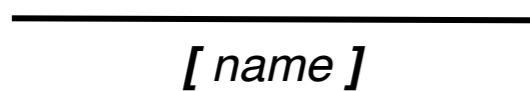
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Gate Instance



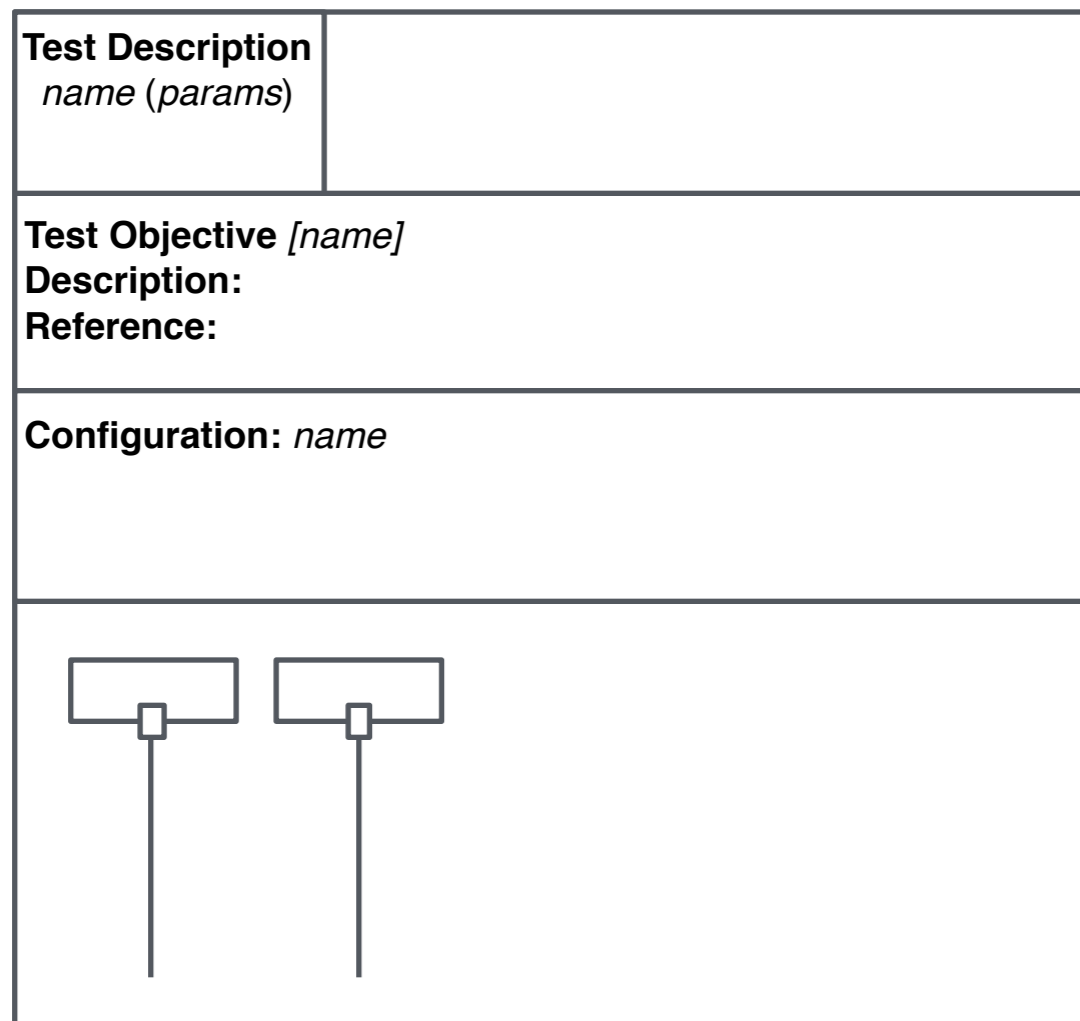
Component Instance



Connection

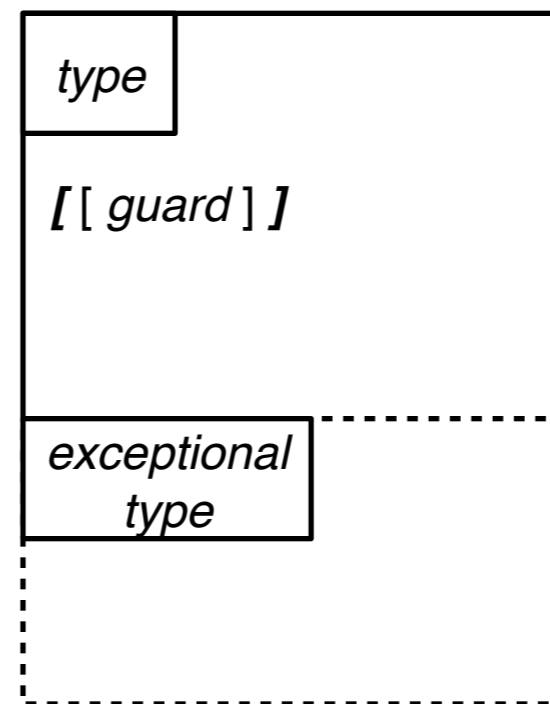
Task 2: Graphical Syntax Elements

Test Descriptions

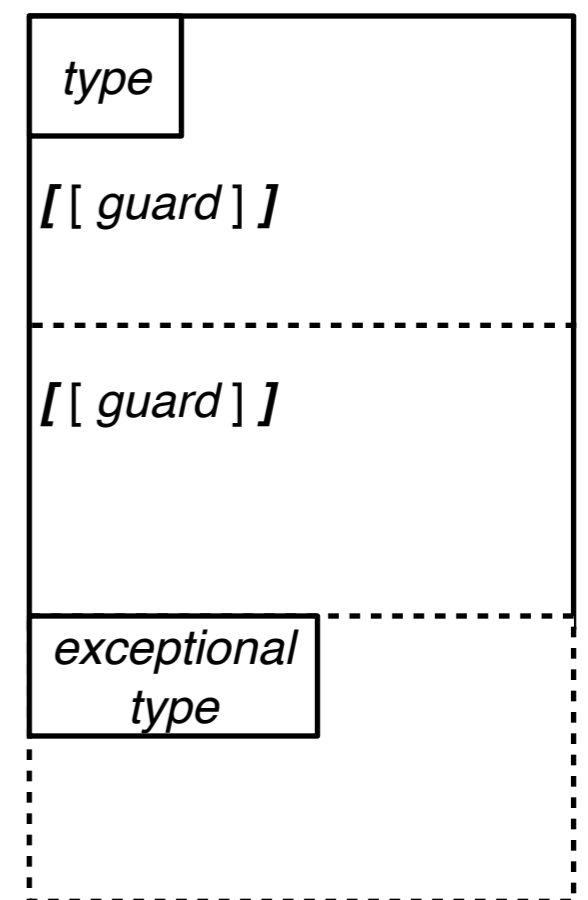


Combined Behaviour

Single

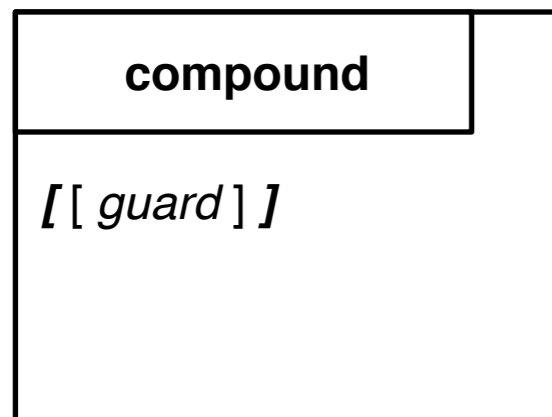


Multiple

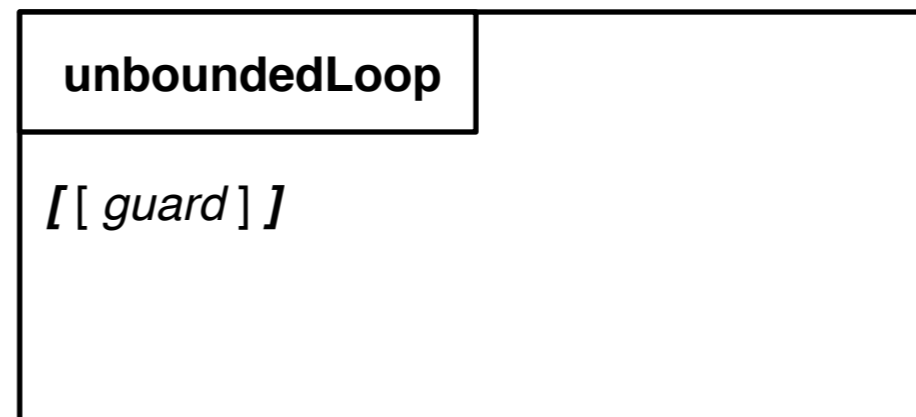


Task 2: Graphical Syntax Elements

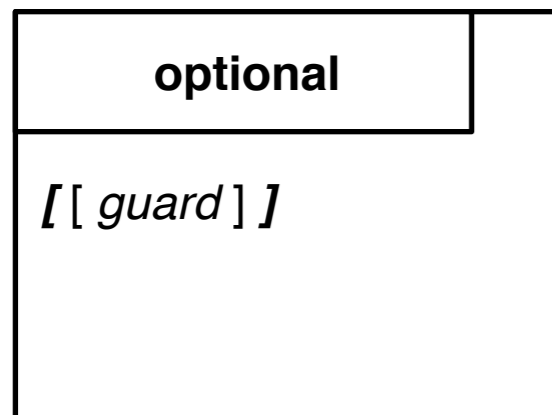
Compound



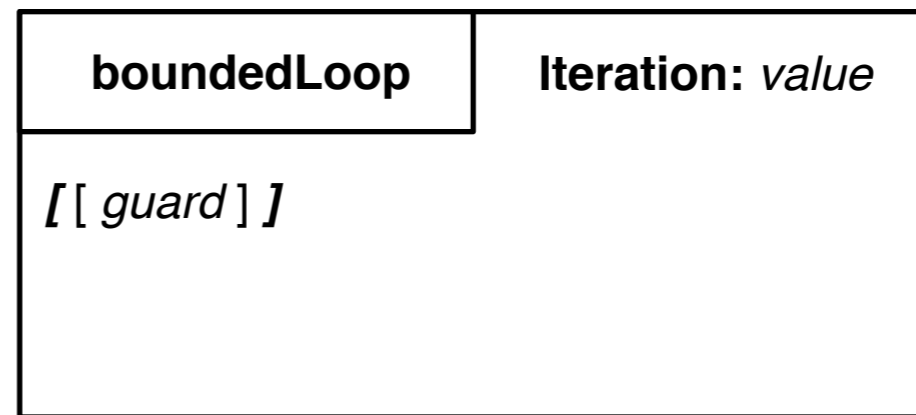
Unbounded Loop



Optional

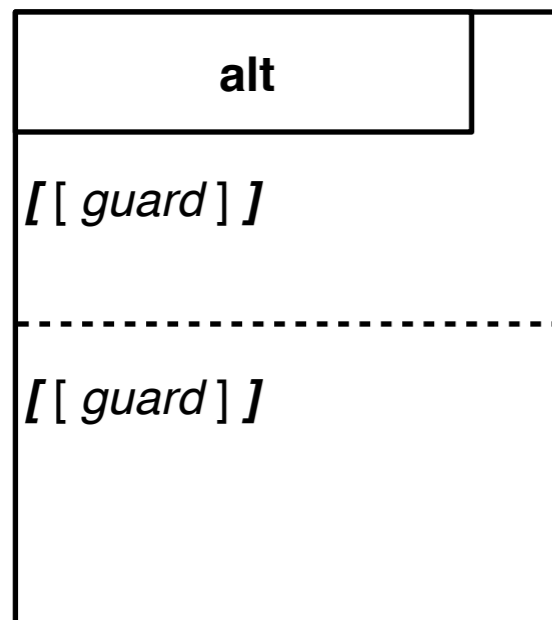


Bounded Loop

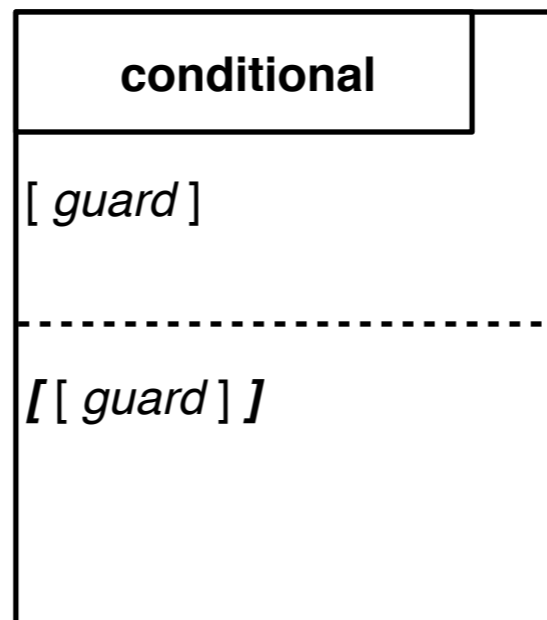


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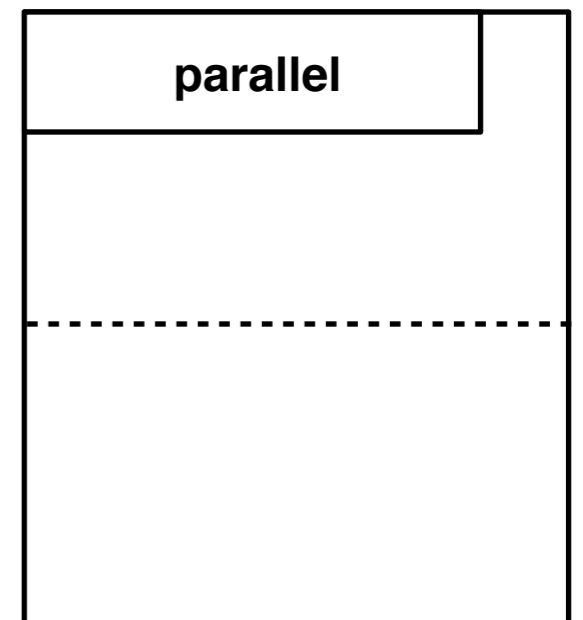
Alternative



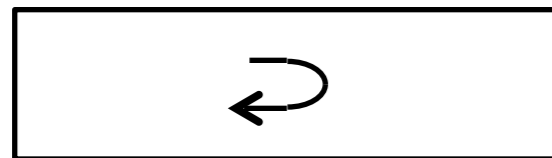
Conditional



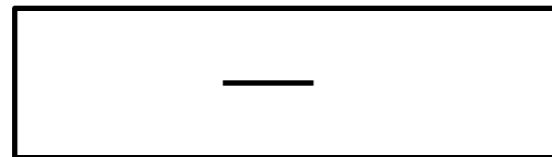
Parallel



Task 2: Graphical Syntax Elements



Break



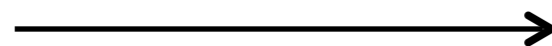
Stop



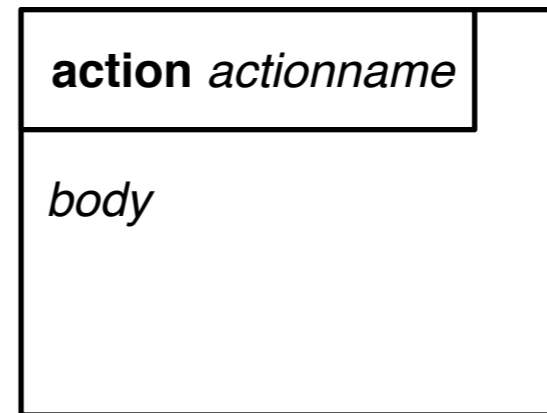
Verdict Assignment

pass | fail | inconc

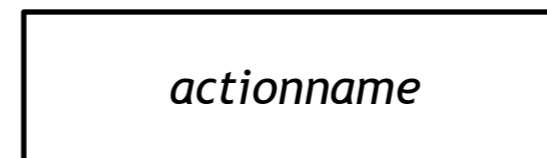
Verdict Type



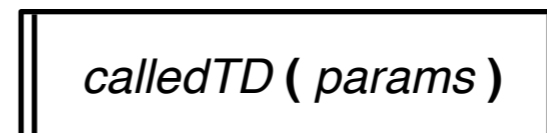
Interaction



Action



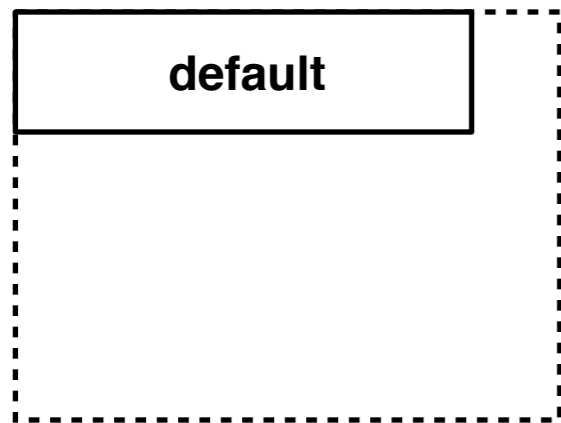
Action Reference



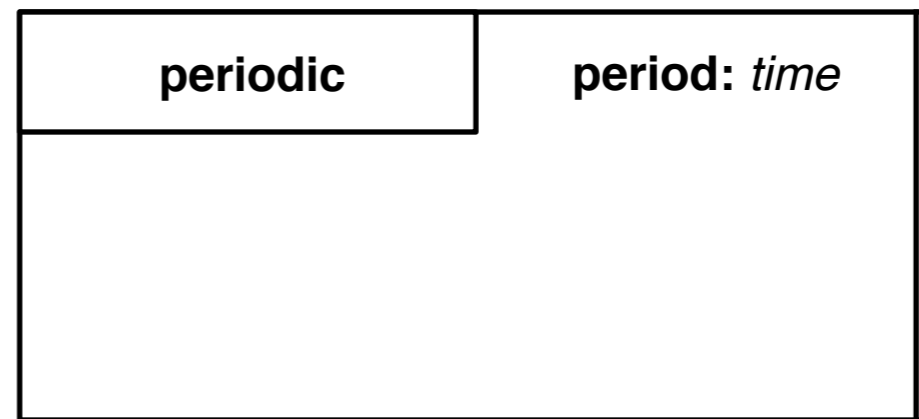
TD Reference

Task 2: Graphical Syntax Elements

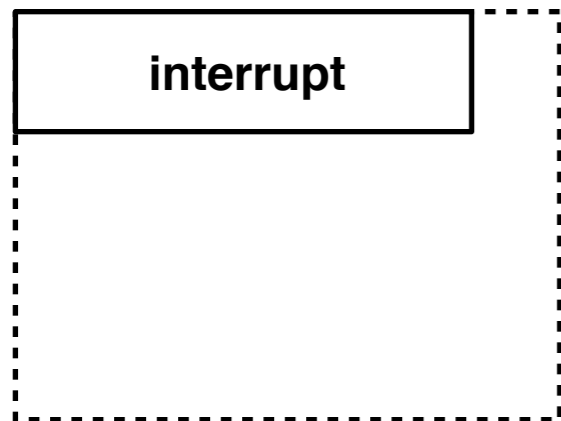
Default



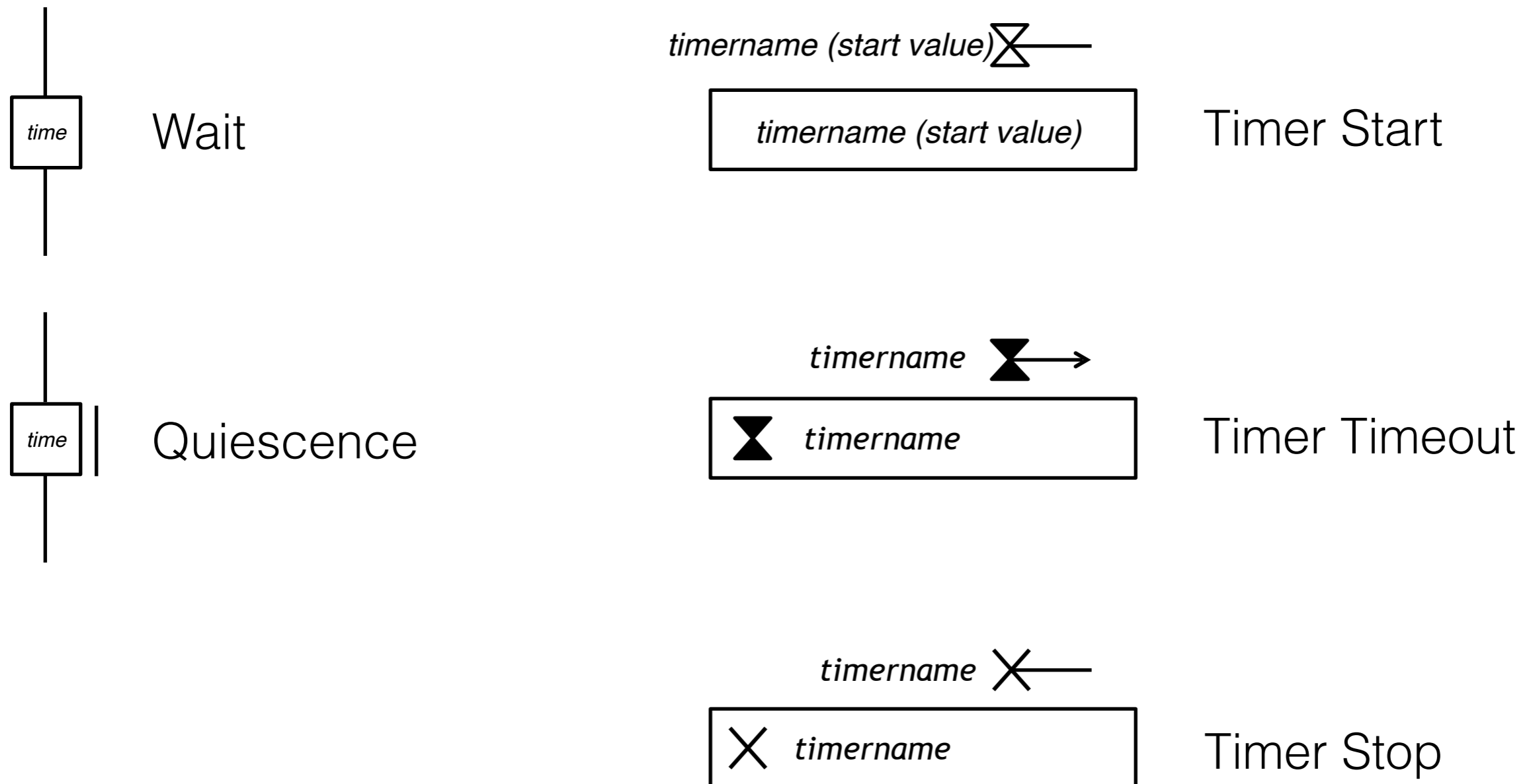
Periodic



Interrupt



Task 2: Graphical Syntax Elements



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 - focus initial analysis on provided examples, TPLan-like format pushed within ETSI
 - target a full syntax rather than an output format

Task 4: TDL Textual Syntax Analysis

- Evaluate options for mapping to TDL
 - study applicability and constraints of graphical syntax
 - study examples and possible mapping means (direct vs indirect)
 - preliminary analysis indicates indirect mapping as a better, more flexible solution with fewer compromises
 - assess impact and implications of potential restrictions of mappings
 - level of formalisation (and by extension scope of mapping to TDL)
- Propose a mapping approach (report, ToR if applicable)

Task 4: Use Cases

- Documentation and communication
 - used in high-level discussions at meetings (often 80-100 participants)
 - reduce level of unnecessary technical detail as much as possible
 - primary constituent of documents
 - central role in ETSI processes

Task 4: Use Cases

- Basis for implementation
 - high-level designs on which executable test specifications are based
 - previously done based on test purpose description (1-2 sentence description of objectives), or on requirements directly
 - current format is considered an improvement over these earlier approaches, has high acceptance among test engineers
 - additional technical details may be beneficial
 - consistency and lack of ambiguity are essential

Task 4: Input

- ETSI ES 202 553 V1.2.1 (2009-06), Methods for Testing and Specification (MTS); *TPLan: A notation for expressing Test Purposes*, ETSI 2009
- ETSI TS 102 868-2 V1.1.1 (2011-03), *Intelligent Transport Systems (ITS); Testing; Conformance test specification for Co-operative Awareness Messages (CAM); Part 2: Test Suite Structure and Test Purposes (TSS&TP)*, ETSI, 2011
- ETSI TS 102 859-2 V1.1.1 (2011-03), *Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 2: Test Suite Structure and Test Purposes (TSS&TP)*, ETSI, 2011

Task 4: Examples

5.1.1 TP definition conventions

The TPs are defined by the rules shown in table 2.

Table 2: TP definition rules

TP Header	
TP ID	The TP ID is a unique identifier. It shall be specified according to the TP naming conventions defined in clause 5.1.2.
Test objective	Short description of test purpose objective according to the requirements from the base standard.
Reference	The reference indicates the sub-clauses of the reference standard specifications in which the conformance requirement is expressed.
PICS Selection	Reference to the PICS statement involved for selection of the TP. Contains a Boolean expression.
TP Behaviour	
Initial conditions	The initial conditions defines in which initial state the IUT has to be to apply the actual TP. In the corresponding Test Case, when the execution of the initial condition does not succeed, it leads to the assignment of an Inconclusive verdict.
Expected behaviour (TP body)	Definition of the events, which are parts of the TP objective, and the IUT are expected to perform in order to conform to the base specification. In the corresponding Test Case, Pass or Fail verdicts can be assigned there.
Final conditions	Definition of the events that the IUT is expected to perform or shall not perform, according to the base standard and following the correct execution of the actions in the expected behaviour above. In the corresponding Test Case, the execution of the final conditions is evaluated for the assignment of the final verdict.

Task 4: Examples

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ETSI TS 102 868-2 V1.1.1 (2011-03)

TP Id	TP/CAM/INA/DOP/BV/02
Test objective	Checks that CAM message includes DoorOpen information 30s after closed
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	
with { the IUT being in the "initial state" and the IUT having sent a valid CAM message containing DoorOpen TaggedValue }	
Expected behaviour	
ensure that { when { the door is closed } then { the IUT sends CAM messages containing DoorOpen TaggedValue during the 30s following the door closing event } }	

Task 4: TDL Textual Syntax Analysis

- Current notation based on TPLan
 - tabular instead of textual
 - few explicit definitions in advance (PICS only)
 - flexible, but largely informal, consistency and ambiguity issues possible
 - poor or no tool support
 - emergence of different “dialects”
 - no explicit reference to the notation being used

Task 4: TDL Textual Syntax Analysis

- Graphical syntax concerns
 - level of completeness inherent in TDL, test configurations, behaviour, etc.
 - corresponding tooling is necessary and needs to be available
 - all stakeholders need to be familiar and fluent in the syntax
- May have negative impact on acceptance among users that have established process and practices in place, especially in early stages of deployment

Task 4: Strategic Outlook

- Early simplified access to TDL tailored for ETSI's processes
 - foster early adoption based on notation already in use
- Unified and suitable means for both
 - specifying concise and better structured test purposes, and
 - transitioning to more detailed and refined test descriptions
- Relying on the same underlying meta-model
- 3GPP involved at a later stage

Task 4: Proposed Approach

- Determine level of formalisation
- Capture relevant concepts and relationships in a domain-specific meta-model
 - partially derived from TPLan
 - additional explicit structural patterns
- Define standardised mappings to textual and tabular elements
- Define standardised mappings to and from TDL

Task 4: Levels of Formalisation

Level of Formalisation	Advantages	Disadvantages
Highly structured	<ul style="list-style-type: none"> + comprehensive tool support + consistency + translation and mapping + explicit relationships 	<ul style="list-style-type: none"> - many definitions in advance - rigid structure - verbosity - convenience of use
Loosely structured	<ul style="list-style-type: none"> + freedom of expression + few or no definitions in advance 	<ul style="list-style-type: none"> - limited tooling - limited mapping and translation - ambiguities - inconsistencies - manual mark-up or definitions in advance - implicit relationships
Mixed	<ul style="list-style-type: none"> + sufficient freedom of expression within well-defined patterns and conventions + explicit relationships + flexible translation and mapping + few or no definitions in advance + comprehensive tool support + consistency 	<ul style="list-style-type: none"> - some restrictions on how expressions are structured - some syntactical sugar may be necessary

Task 4: Mixed?

16

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with { the IUT being in the "initial state" and the IUT having sent a valid CAM message containing DoorOpen TaggedValue }	
Expected behaviour	
ensure that { when { the door is closed } then { the IUT sends CAM messages containing DoorOpen TaggedValue during the 30s following the door closing event } }	

Task 4: Actions

- Source of complexity, ambiguity, and lack of consistency

- Loosely based on TPLan

Test objective	Checks that CAM message includes DoorOpen information 30s after closed
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
	<ul style="list-style-type: none"> • stimuli, responses, user actions - not always reflected
	<p>with { the IUT being in the "initial state" and the IUT having sent a valid CAM message containing DoorOpen TaggedValue }</p>
	Expected behaviour
	<p>ensure that { when { the door is closed } then { the IUT sends CAM messages containing DoorOpen TaggedValue during the 30s following the door closing event } }</p>

Task 4: Actions

- A pattern capturing the structure with minor or no modifications

• TP U	expressed in BNF terms
Test objective	Checks that CAM message includes DoorOpen information 30s after closed
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	• further constructs for content, timing, and other constraints
with { the IUT being in the "initial state" and the IUT having sent a valid CAM message containing DoorOpen TaggedValue }	
Action	::= SubjectReference PredicateReference OriginReference?
SubjectReference	::= InlineArticleQualifier SubjectID
PredicateReference	::= InlineQualifier* PredicateID Argument?
OriginReference	::= 'from' SubjectReference
Argument	::= InlineArticleQualifier? InlineQualifier* NAME Content?
InlineQualifier	::= NAME
InlineArticleQualifier	::= 'a' 'an' 'the'
Content	::= ...

Task 4: Direct vs Indirect Mapping

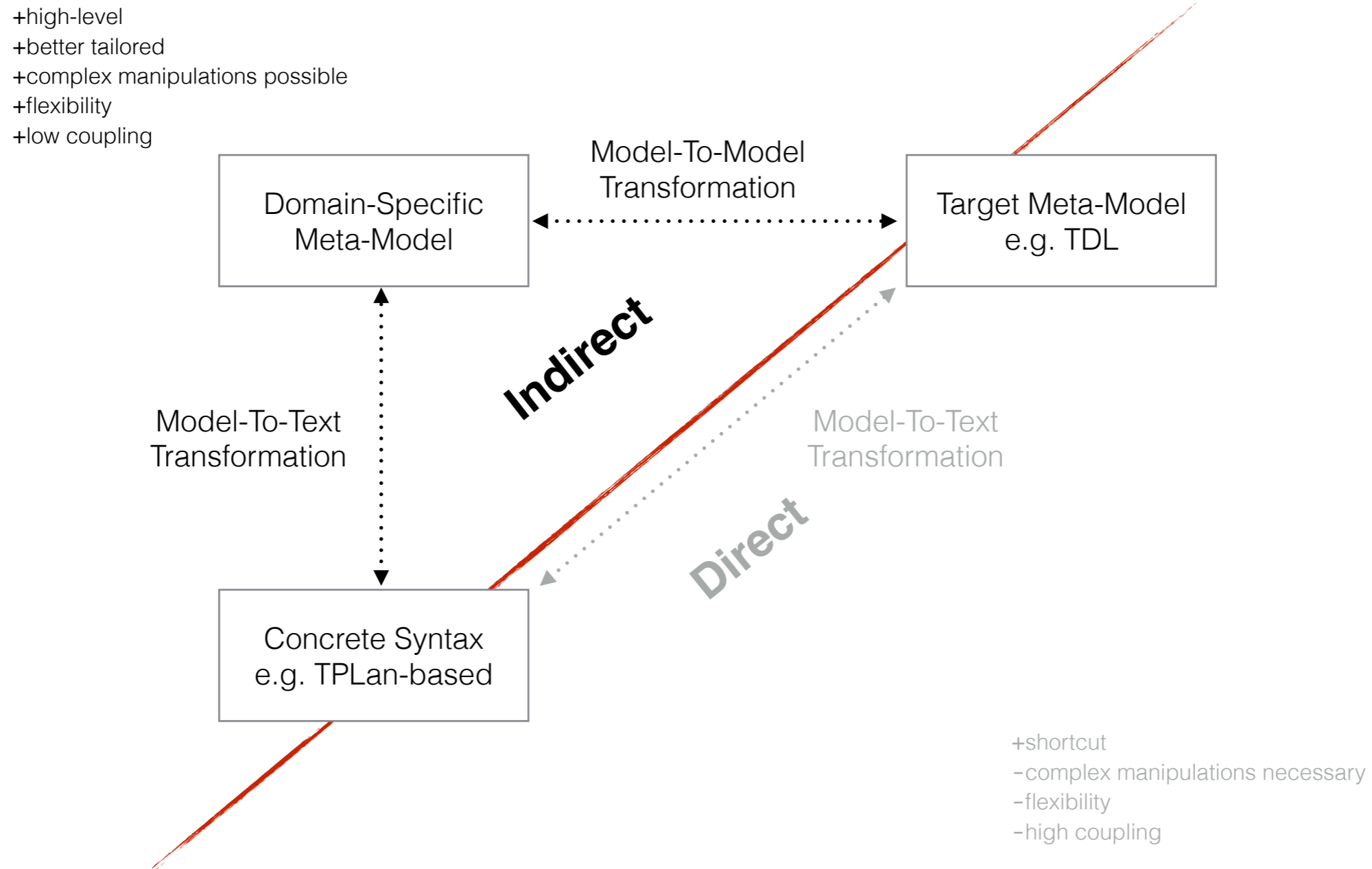


Figure 3: Differences between direct and indirect mapping approaches

Task 4: Examples

16

ETSI TS 102 868-2 V1.1.1 (2011-03)

TP Id	TP/CAM/INA/DOP/BV/02
Test objective	Checks that CAM message includes DoorOpen information 30s after closed
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	
with { the IUT being in the "initial state" and the IUT having sent a valid CAM message containing DoorOpen TaggedValue }	
Expected behaviour	
ensure that { when { the door is closed } then { the IUT sends CAM messages containing DoorOpen TaggedValue during the 30s following the door closing event } }	

TP Id	TP/CAM/INA/DOP/BV/02
Test objective	Checks that CAM message includes DoorOpen information 30s after closed
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	
with { the IUT being in the "initial state" and the IUT having sent a valid CAM message containing DoorOpen TaggedValue }	
Expected behaviour	
ensure that { when { the door is closed } then { the IUT sends CAM messages containing DoorOpen TaggedValue during the 30s following the door closing event } }	

```

1. Package CAM {
2.
3.     //reusable definitions that can be shared among related test purposes
4.     pics :
5.         - PICS_PUBTRANSVEH ( "A.2/3 [2]" )
6.     ;
7.
8.     subjects :
9.         - IUT
10.        - door
11.    ;
12.
13.    //may be used to describe predicates in order to specify target mappings
14.    predicate types :
15.        - state
16.        - interaction
17.    ;
18.
19.    predicates :
20.        - in (state)
21.        - is (interaction)
22.        - sent (interaction)
23.        - sends (interaction)
24.    ;
25.
26.    //actual test purposes
27.    Group "Message Generation" {
28.
29.        TestPurpose "TP/CAM/INA/DOP/BV/02" {
30.            TP Id "TP/CAM/INA/DOP/BV/02"
31.            Test objective "Checks that CAM message includes DoorOpen information 30s after closed"
32.            Reference "TS 102 637-2 [1], clauses 7.1 and 7.2"
33.            PICS Selection PICS_PUBTRANSVEH
34.            Initial conditions
35.            with {
36.                the IUT being in: the initial state and
37.                the IUT having sent: a valid CAM message
38.                    containing DoorOpen TaggedValue
39.            }
40.            Expected behaviour
41.            ensure that {
42.                when {
43.                    the door is: closed
44.                }
45.                then {
46.                    the IUT sends: a CAM message
47.                        containing DoorOpen TaggedValue during the 30.5s following the door is closed event
48.                }
49.            }
50.        }
51.    }
52.}

```

Task 4: Examples

TP Id	TP/CAM/INA/DOP/BV/02
Test objective	Checks that CAM message includes DoorOpen information 30s after closed
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	
<pre>with { the IUT being in: the initial state and the IUT having sent: a valid CAM message containing DoorOpen TaggedValue }</pre>	
Expected behaviour	
<pre>ensure that { when { the door is: closed } then { the IUT sends: a CAM message containing DoorOpen TaggedValue during the 30.5s following the door is closed event } }</pre>	

ETSI TS 102 868-2 V1.1.1 (2011-03)

Open information 30s after closed

ions

aviour

Following the door closing event

Open information 30s after closed"

30.5s following the door is closed event

```

1. TDLan Specification GlobalPackage {
2.   Annotation SOURCE ;
3.   Annotation BLOCK ;
4.   Data Set defaultSet {
5.     instance closed ;
6.   }
7.   Data Set state {
8.     instance initial ;
9.   }
10.  Data Set message {
11.   instance CAM ;
12. }
13. Gate Type defaultGate accepts defaultSet, state, message ;
14. Component Type defaultComponent {
15.   gate types : defaultGate ;
16. }
17. Test Configuration defaultConfiguration {
18.   component c_TESTER as Tester of type defaultComponent having {
19.     gate TESTER of type defaultGate ;
20.   }
21.   component c_IUT as SUT of type defaultComponent having {
22.     gate IUT of type defaultGate ;
23.   }
24.   component c_door as SUT of type defaultComponent having {
25.     gate door of type defaultGate ;
26.   }
27.   connect IUT to TESTER ;
28.   connect door to TESTER ;
29. }
30. Package CAM {
31.   Package Message_Generation {
32.     Test Description TP_CAM_INA_DOP_BV_02 {
33.       use configuration : defaultConfiguration ;
34.       {
35.         {
36.           IUT sends instance CAM to TESTER ;
37.         } with {
38.           BLOCK "InitialConditions" ;
39.           SOURCE
40.             "
41.               Initial conditions
42.               with {
43.                 the IUT being in: the initial state and
44.                 the IUT having sent: a valid CAM message
45.                 containing DoorOpen TaggedValue
46.               }
47.             " ;
48.           }
49.         {
50.           door sends instance closed to TESTER ;
51.           IUT sends instance CAM to TESTER ;
52.         } with {
53.           BLOCK "ExpectedBehaviour" ;
54.           SOURCE
55.             "
56.               Expected behaviour
57.               ensure that {
58.                 when {
59.                   the door is: closed
60.                 }
61.                 then {

```

ES

16

ETSI TS 102 868-2 V1.1.1 (2011-03)

TP/CAM/INA/DOP/BV/02
Checks that CAM message includes DoorOpen information 30s after closed
TS 102 637-2 [1], clauses 7.1 and 7.2
PICS_PUBTRANSVEH
Initial conditions
the "initial state" and sent a valid CAM message DoorOpen TaggedValue
Expected behaviour
closed
s CAM messages DoorOpen TaggedValue during the 30s following the door closing event

Interaction

TP Id	TP/CAM/INA/DOP/BV/02
Test objective	Checks that CAM message includes DoorOpen information 30s
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	with { the IUT being in: the initial state and the IUT having sent: a valid CAM message containing DoorOpen TaggedValue }
Expected behaviour	ensure that { when { the door is: closed } then { the IUT sends: a CAM message containing DoorOpen TaggedValue during the 30.5s following the door i } }

ES

TP/CAM/INA/DOP/BV/02
Checks that CAM message includes DoorOpen information 30s after closed
TS 102 637-2 [1], clauses 7.1 and 7.2
PICS_PUBTRANSVEH
Initial conditions
the "initial state" and sent a valid CAM message DoorOpen TaggedValue
Expected behaviour
closed
s CAM messages DoorOpen TaggedValue during the 30s following the door closing event

TP Id	TP/CAM/INA/DOP/BV/02
Test objective	Checks that CAM message includes DoorOpen information 30s
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	with { the IUT being in: the initial state and the IUT having sent: a valid CAM message containing DoorOpen TaggedValue }
Expected behaviour	ensure that { when { the door is: closed } then { the IUT sends: a CAM message containing DoorOpen TaggedValue during the 30.5s following the door i } }

```

1. TDLan Specification GlobalPackage {
2.   Annotation SOURCE ;
3.   Annotation BLOCK ;
4.   Data Set defaultSet {
5.     instance closed ;
6.   }
7.   Data Set state {
8.     instance initial ;
9.   }
10.  Data Set message {
11.   instance CAM ;
12. }
13. Gate Type defaultGate accepts defaultSet, state, message ;
14. Component Type defaultComponent {
15.   gate types : defaultGate ;
16. }
17. Test Configuration defaultConfiguration {
18.   component c_TESTER as Tester of type defaultComponent having {
19.     gate TESTER of type defaultGate ;
20.   }
21.   component c_IUT as SUT of type defaultComponent having {
22.     gate IUT of type defaultGate ;
23.   }
24.   component c_door as SUT of type defaultComponent having {
25.     gate door of type defaultGate ;
26.   }
27.   connect IUT to TESTER ;
28.   connect door to TESTER ;
29. }
30. Package CAM {
31.   Package Message_Generation {
32.     Test Description TP_CAM_INA_DOP_BV_02 {
33.       use configuration : defaultConfiguration ;
34.       {
35.         {
36.           IUT sends instance CAM to TESTER ;
37.         } with {
38.           BLOCK "InitialConditions" ;
39.           SOURCE
40.             "
41.               Initial conditions
42.               with {
43.                 the IUT being in: the initial state and
44.                 the IUT having sent: a valid CAM message
45.                 containing DoorOpen TaggedValue
46.               }
47.             " ;
48.         }
49.         {
50.           door sends instance closed to TESTER ;
51.           IUT sends instance CAM to TESTER ;
52.         } with {
53.           BLOCK "ExpectedBehaviour" ;
54.           SOURCE
55.             "
56.               Expected behaviour
57.               ensure that {
58.                 when {
59.                   the door is: closed
60.                 }
61.                 then {

```


Task 4: Examples

- Indirect mapping
 - mapping at a high level of abstraction
 - flexible tailoring to a specific purpose
 - fewer compromises
 - no impact on the user
- Mixed level of formalisation
 - explicit relationships
 - freedom of expression

16
ETSI TS 102 868-2 V1.1.1 (2011-03)

TP Id	TP/CAM/INA/DOP/BV/02
Test objective	Checks that CAM message in
Reference	TS 102 637-2 [1], clauses 7.1
PICS Selection	PICS_PUBTRANSVEH

Initial conditions

```
with {
  the IUT being in the "initial state" and
  the IUT having sent a valid CAM message
  containing DoorOpen TaggedValue
}
```

Expected behaviour

```
ensure that {
  when {
    the door is closed
  }
  then {
    the IUT sends CAM messages
    containing DoorOpen TaggedValue during
  }
}
```

```
16. - interaction
17. ;
18.
19. predicates :
20. - in (st
21. - is (i
22. - sent (
23. - sends
24. ;
25.
26. //actual te
27. Group "Mess
28.
29. TestPurp
30. TP ]
31. Test
32. Refr
33. PICS
34. Init
35. with
36.
37.
38.
39.
40. }
41. Expt
42. enst
43.
44.
45.
46.
47.
48.
49. }
50. }
51. }
52. }
```

```
1. TDLan Specification GlobalPackage {
2. Annotation SOURCE ;
3. Annotation BLOCK ;
4. Data Set defaultSet {
5. instance closed ;
6. }
7. Data Set state {
8. instance initial ;
9. }
10. Data Set message {
11. instance CAM ;
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13. Gate Type defaultGate accepts defaultSet, state, message ;
14. Component Type defaultComponent {
15. gate types : defaultGate ;
16. }
17. Test Configuration defaultConfiguration {
18. component c_TESTER as Tester of type defaultComponent having {
19. gate TESTER of type defaultGate ;
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21. component c_IUT as SUT of type defaultComponent having {
22. gate IUT of type defaultGate ;
23. }
24. component c_door as SUT of type defaultComponent having {
25. gate door of type defaultGate ;
26. }
27. connect IUT to TESTER ;
28. connect door to TESTER ;
29. }
30. Package CAM {
31. Package Message_Generation {
32. Test Description TP_CAM_INA_DOP_BV_02 {
33. use configuration : defaultConfiguration ;
34. {
35. {
36. IUT sends instance CAM to TESTER ;
37. } with {
38. BLOCK "InitialConditions" ;
39. SOURCE
40. "
41. Initial conditions
42. with {
43. the IUT being in: the initial state and
44. the IUT having sent: a valid CAM message
45. containing DoorOpen TaggedValue
46. }
47. " ;
48. }
49. {
50. door sends instance closed to TESTER ;
51. IUT sends instance CAM to TESTER ;
52. } with {
53. BLOCK "ExpectedBehaviour" ;
54. SOURCE
55. "
56. Expected behaviour
57. ensure that {
58. when {
59. the door is: closed
60. }
61. then {
62. the IUT sends: a CAM message
63. containing DoorOpen TaggedValue during the 30.5s
64. }
65. }
66. " ;
67. }
68. }
69. }
70. }
```

Task 4: Recommendations

Task 4: Use Cases

- Documentation and communication
 - used in high-level discussions at meetings (often 80-100 participants)
 - reduced complexity
 - primary focus
 - central role

Task 4: Use Cases

- Basis for implementation
 - high-level designs on which executable test specifications are based
 - previously done by hand
 - current format is complex and inconsistent, has many different approaches, has a lot of redundancy
 - additional technical requirements
 - consistency and clarity

Task 4: Direct vs Indirect Mapping

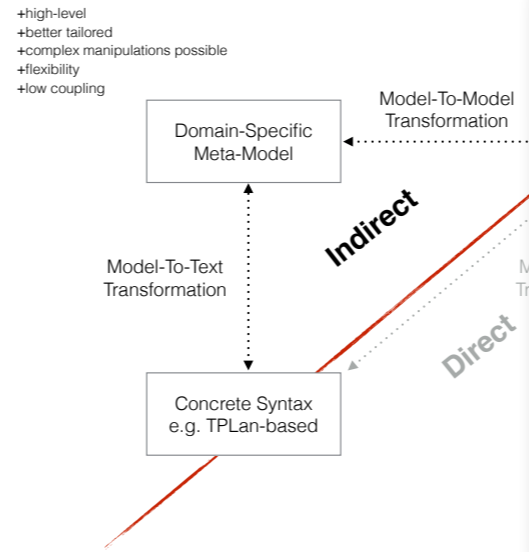


Figure 3: Differences between direct and indirect mapping approaches

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Task 4: Levels of Formalisation

Level of Formalisation	Advantages	Disadvantages
Highly structured	+ comprehensive tool support + consistency + translation and mapping + explicit relationships	- many definitions in advance - rigid structure - verbosity - convenience of use
Loosely structured	+ freedom of expression + few or no definitions in advance	- limited tooling - limited mapping and translation - ambiguities - inconsistencies - manual mark-up or definitions in advance - implicit relationships
Mixed	+ sufficient freedom of expression within well-defined patterns and conventions + explicit relationships + flexible translation and mapping + few or no definitions in advance	- some restrictions on how they are structured - some syntactical sugar may be necessary

Task 4: Examples

16

ETSI TS 102 86

TP Id	TP/CAM/INA/DOP/BV/02
Test objective	Checks that CAM message includes DoorOpen information 30s after closed
Reference	TS 102 637-2 [1], clauses 7.1 and 7.2
PICS Selection	PICS_PUBTRANSVEH
Initial conditions	
with { the IUT being in the "initial state" and the IUT having sent a valid CAM message containing DoorOpen TaggedValue }	
Expected behaviour	
ensure that { when { the door is closed }	

Task 4: Strategic Outlook

- Early simplified access to TDL tailored for ETSI's processes
 - foster early adoption based on notation already in use
- Unified and suitable means for both
 - specifying concise and better structured test purposes, and

Task 4: Next Steps

Task	Description	Start	End	Days
1	Identification of relevant concepts and implementation into a domain-specific meta-model	07/2014	10/2014	7
2	Mapping of domain-specific meta-model elements to a concrete syntax notation	08/2014	10/2014	8
3	Definition of bi-directional mapping between the domain-specific meta-model the TDL meta-model	09/2014	12/2014	10
Total resources:				25

Description	Days	Rate	Cost
Contracted experts (remunerated)	20	€ 600	€ 12.000
Contracted experts (voluntary, 20% from total)	5	€ 0	€ 0
CTI staff (voluntary)	10	€ 0	€ 0
Total manpower cost	35	€	12.000
Total cost		€	12.000

Task 4: Next Steps

- Early Draft in September, 2014 (aligned with stable drafts for STF 476)
 - Stable domain-specific meta-model
 - Stable concrete syntax notation specification
 - Early mapping definitions
- Stable Draft in December, 2014 (aligned with final drafts for STF 476, submitted for approval at MTS #64)
 - Final domain-specific meta-model (normative)
 - Final concrete syntax notation specification (normative)
 - Final mapping definitions (normative)

Task 0: Session Overview

- WK09 Feb 24-28 - Session 1 @ETSI
- WK15 Apr 07-11 - Session 2 @ETSI
- WK23 Jun 02-06 - Session 3 @FOKUS
- WK36 Sep 01-05 - Session 4 @ETSI
- WK42 Oct 13-17 - Session 5 @Siemens
- WK49 Dec 01-05 - Session 6 @ETSI

Task 1: Extended TDL Meta-Model

- Targeted for M1
 - specification of sub-test configurations
 - types and data refinement (initial proposal)
- Open for M2 and M3
 - types and data (finalised)
 - time
 - behaviour
 - editorial clarifications and refinements

Task 2: Graphical Concrete Syntax

- Different specification approaches studied
- OMG Diagram Definition (DD) selected “in principle”
- Means for user-accessible specification under study
- Decision on description and mapping structure pending

Task 4: TDL Textual Syntax Analysis

- Understanding ETSI’s requirements for a textual syntax
 - review and discussion of notes and input collected during STF 454
 - discussion of CTI proposal based on ITS and GeoNetworking examples
 - initial focus on provided examples, (TPLan-like) format pushed within ETSI

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Task 1: Extended TDL Meta-Model

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 - time
 - behaviour
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Task 1: Extended TDL Meta-Model

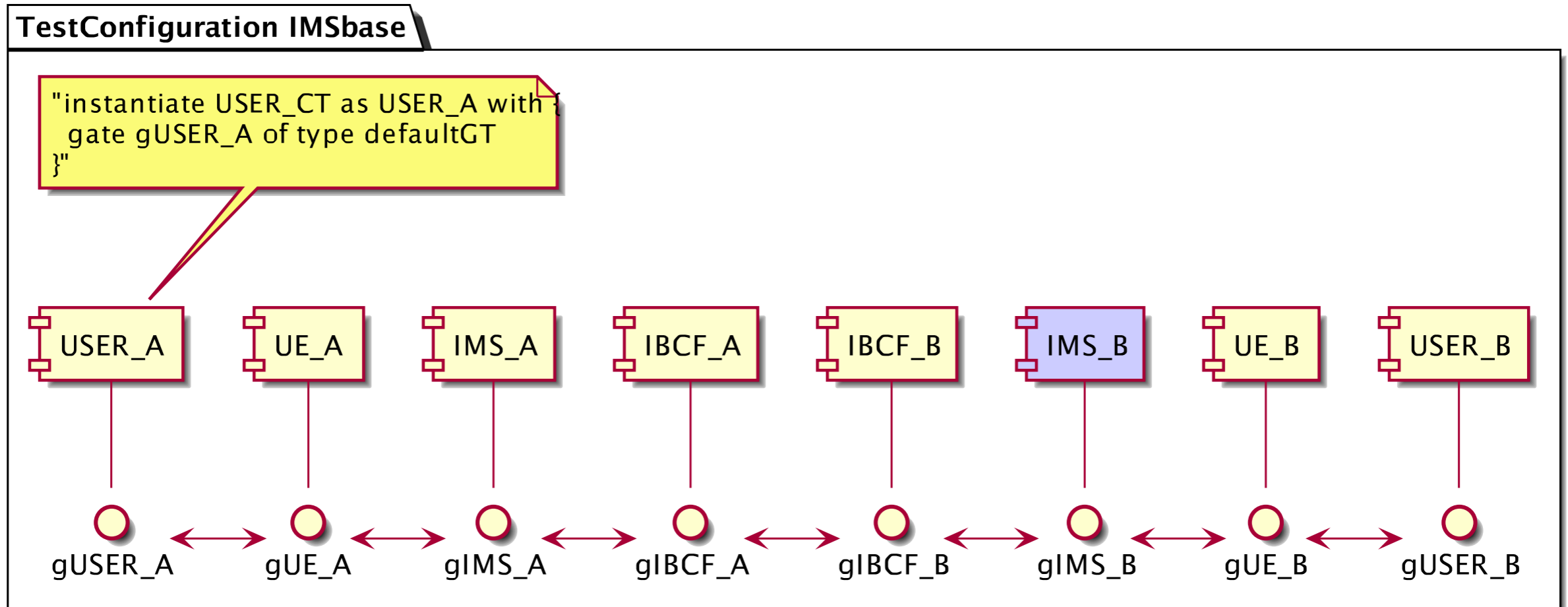
- Targeted for M1
 - specification of sub-test configurations
 - types and data refinement (initial proposal)
- Open for M2 and M3
 - types and data (finalised)
 - time
 - behaviour
 - editorial clarifications and refinements

Task 1: Sub-configurations

- Understanding of sub-configurations
- 2 core aspects
 - configuration composition
 - relationship between test configurations and test descriptions
 - three different approaches to binding
 - binding upon declaration (“global constant”), allows for 1 : n
 - binding upon reference (“formal parameters”), allows for m : n
 - combination of both (global configurations bound upon reference)

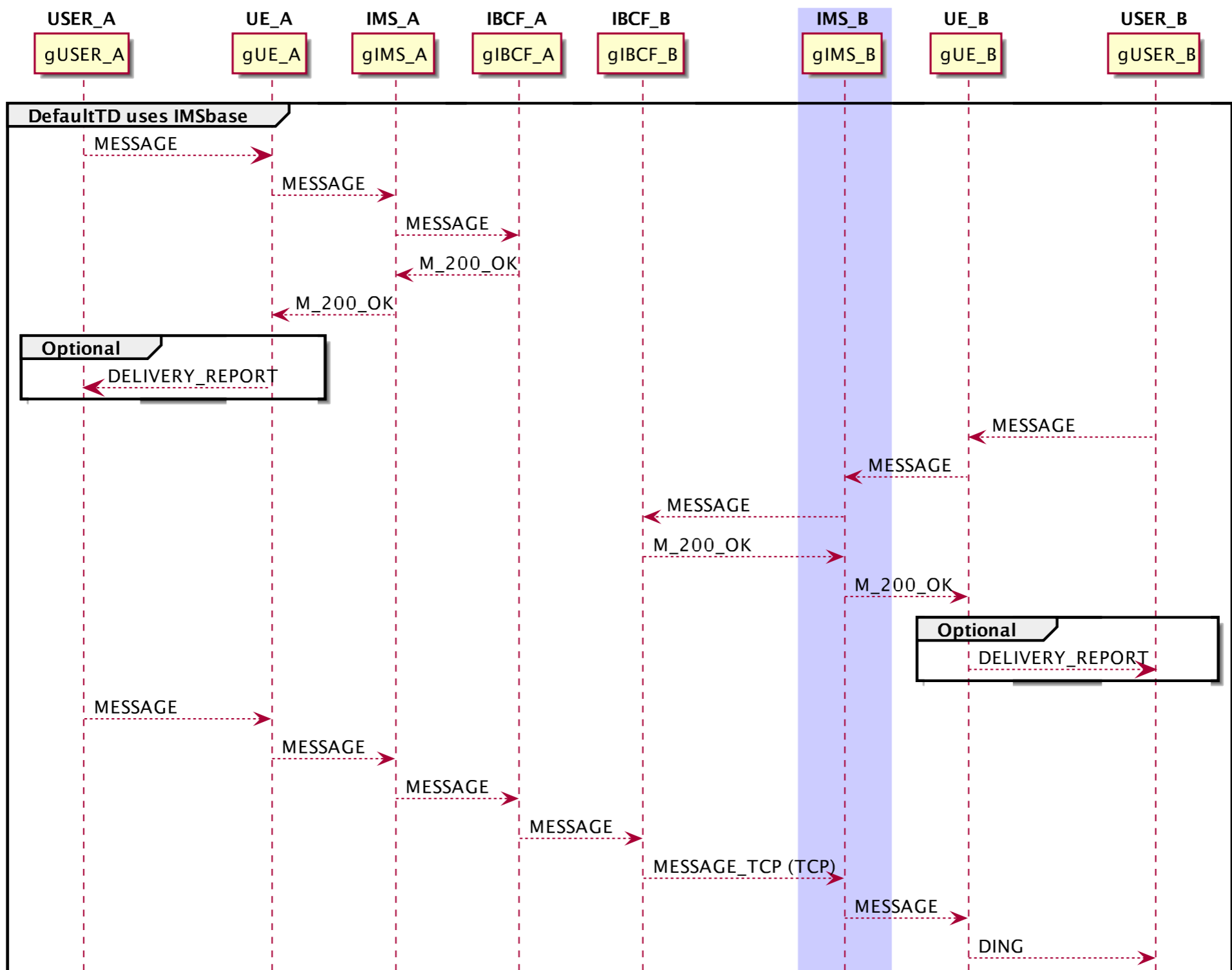
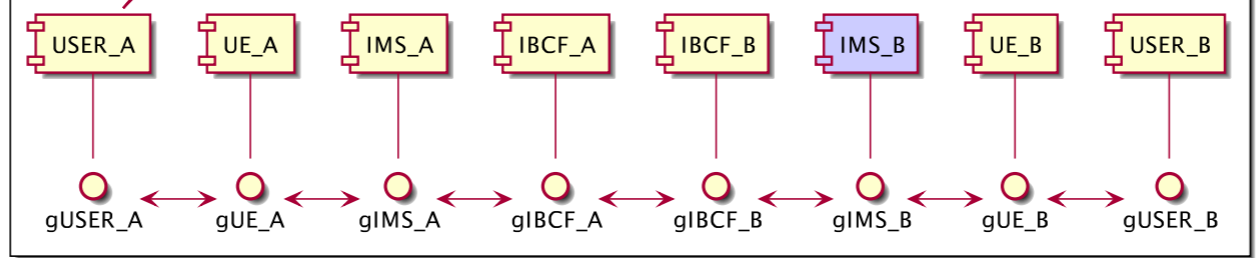
Task 1: Sub-configurations Example

- Base configuration



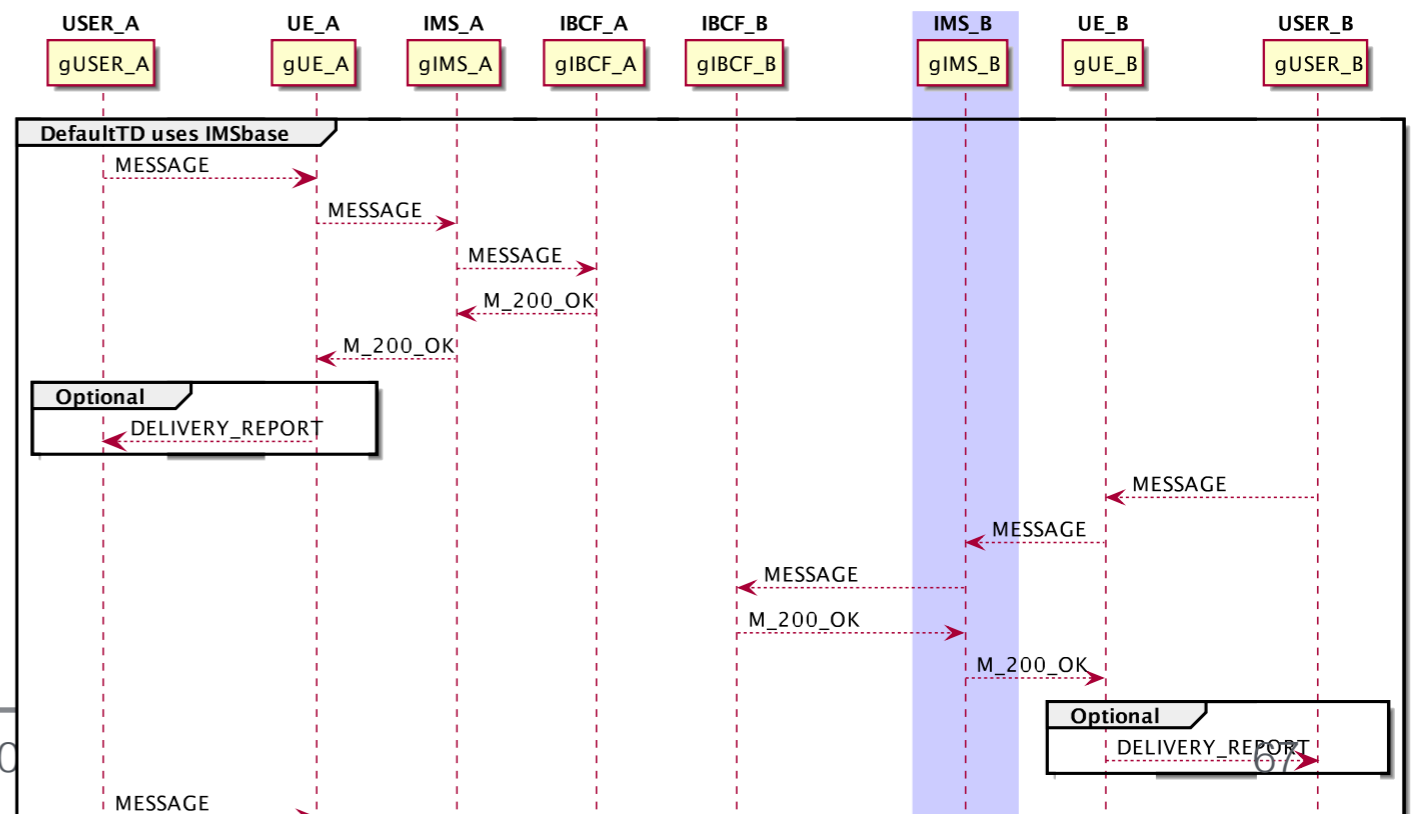
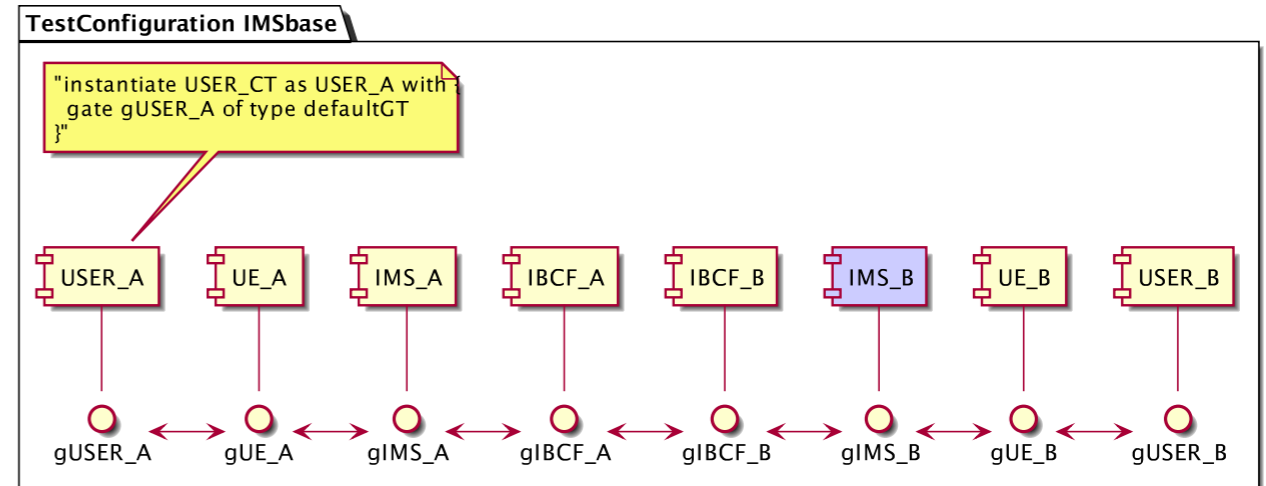
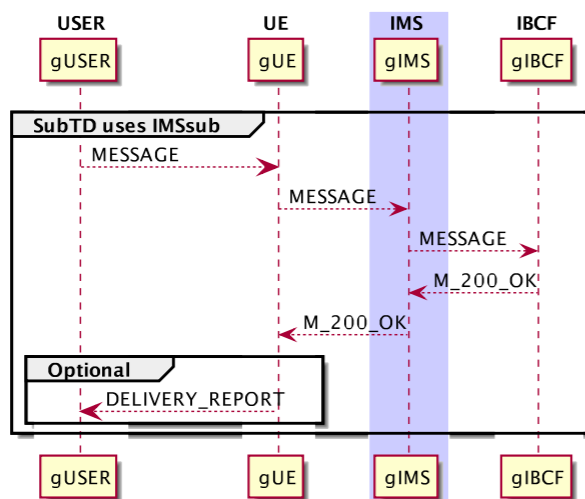
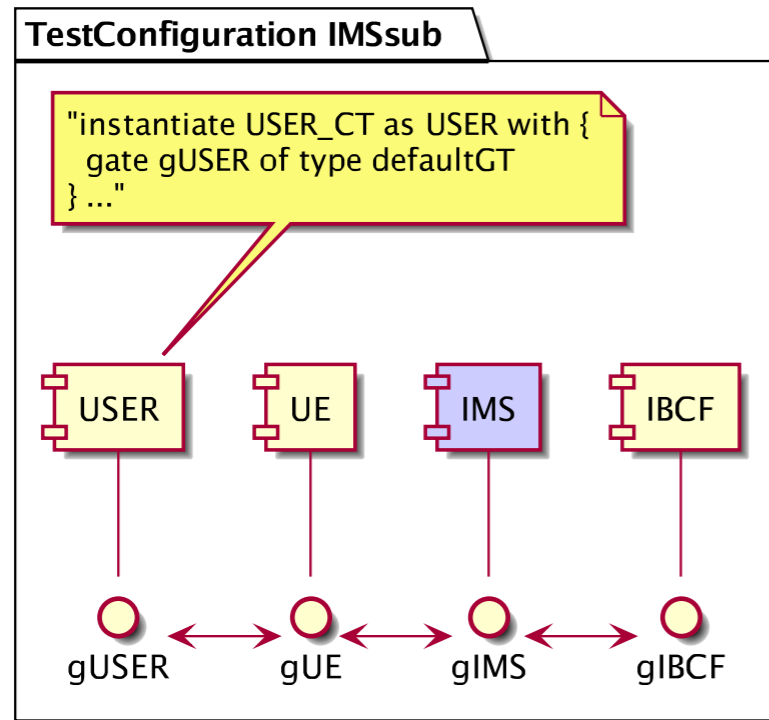
TestConfiguration IMSbase

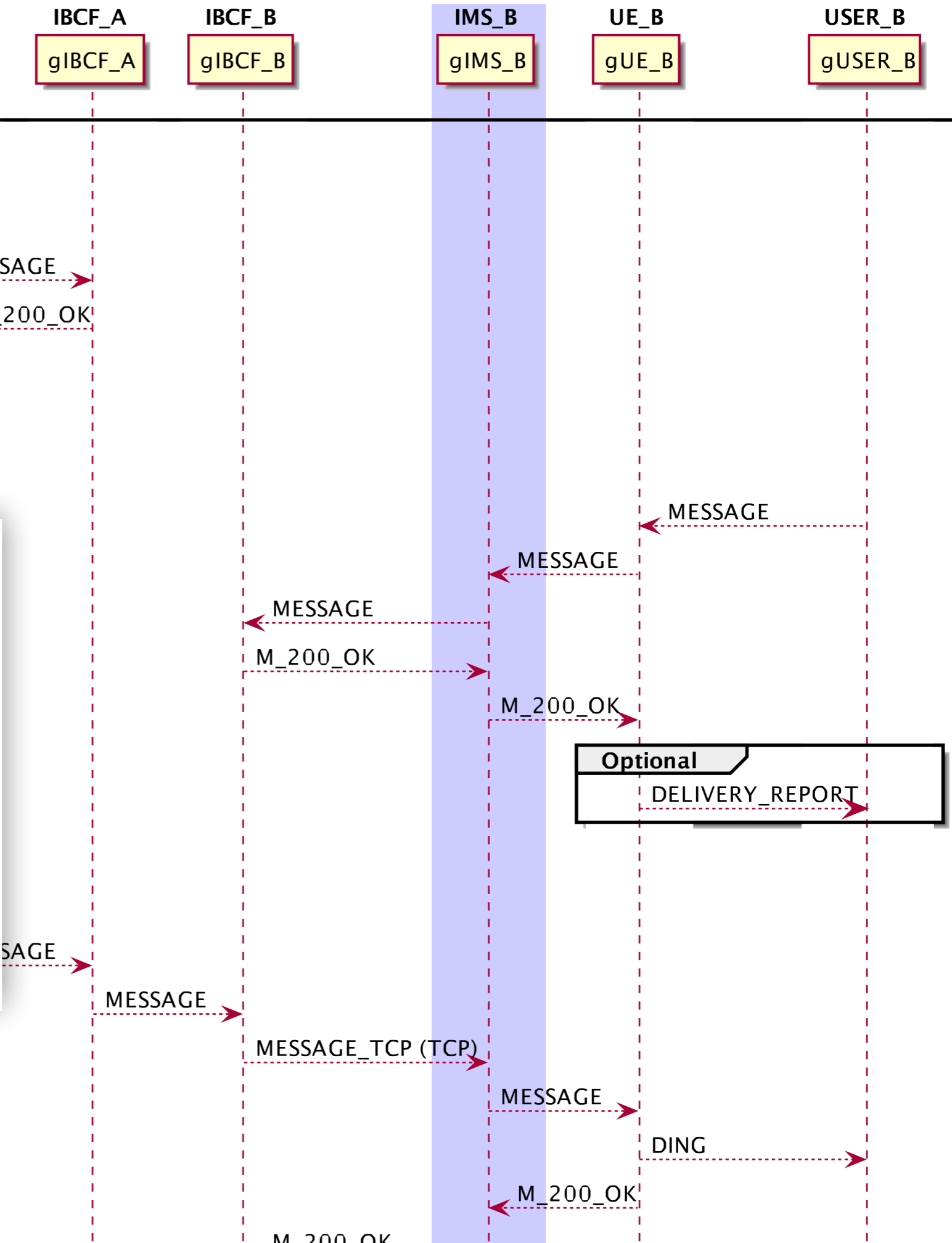
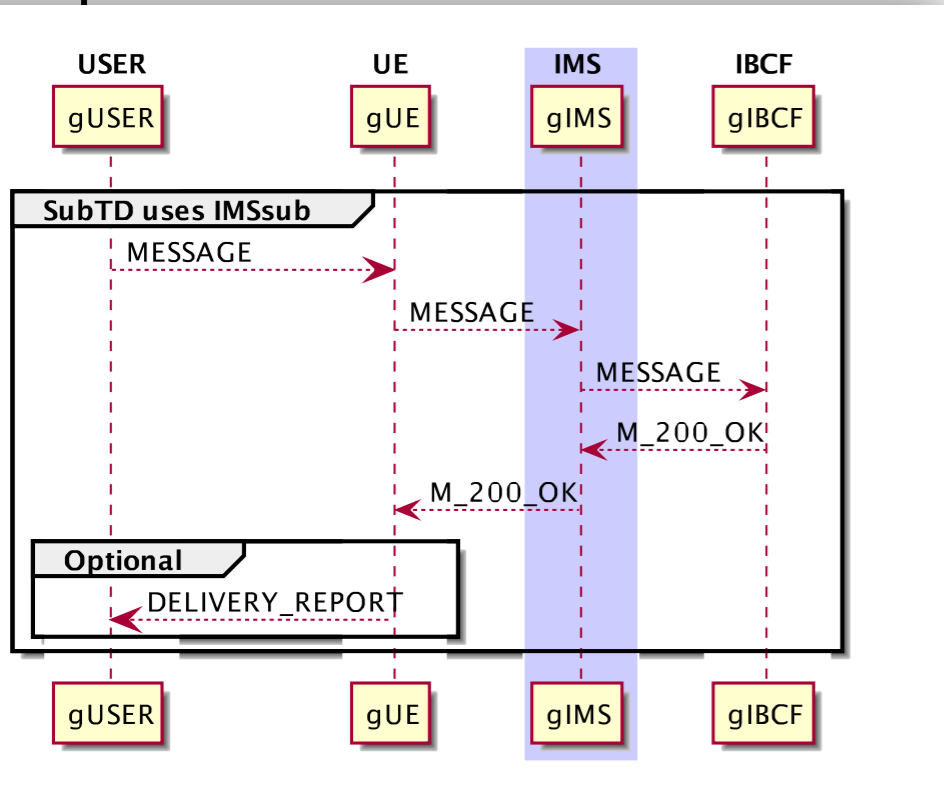
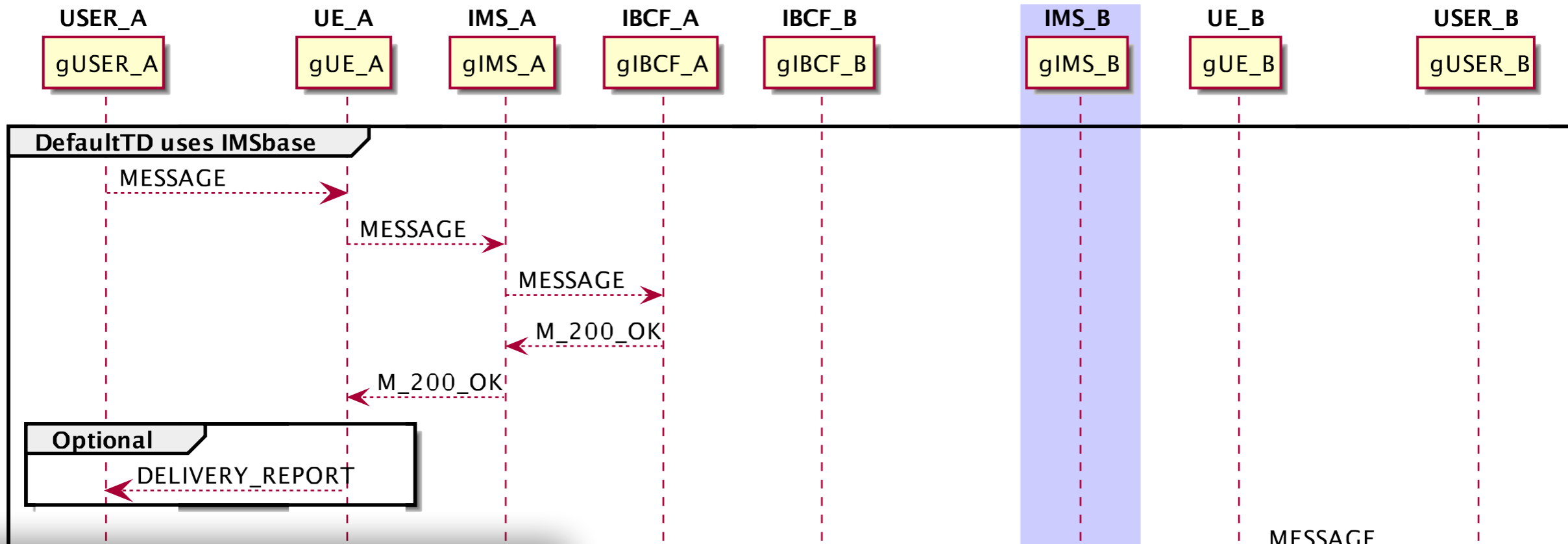
"instantiate USER_CT as USER_A with gate gUSER_A of type defaultGT"

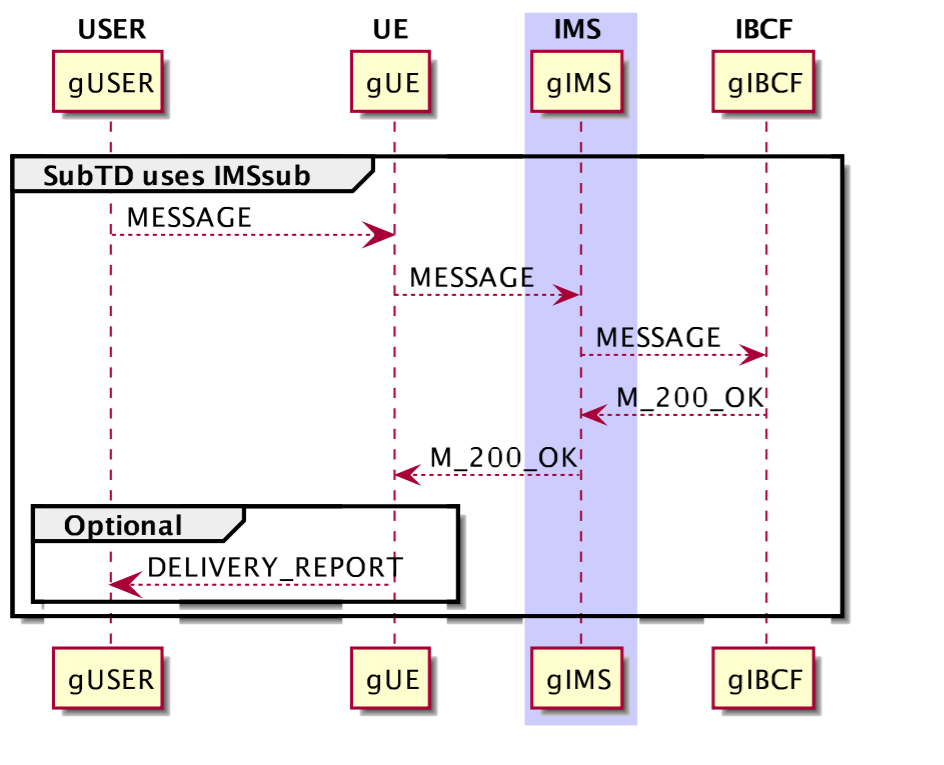
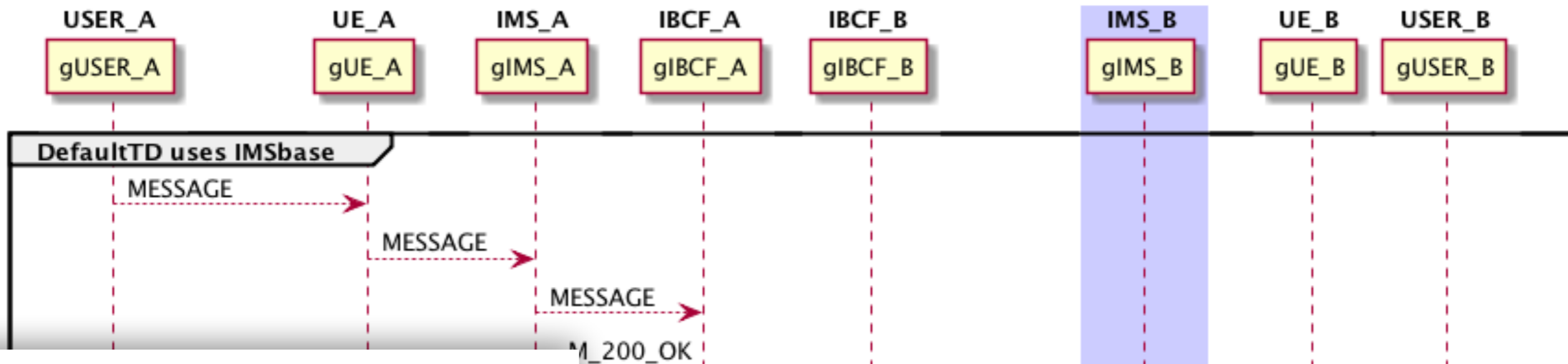
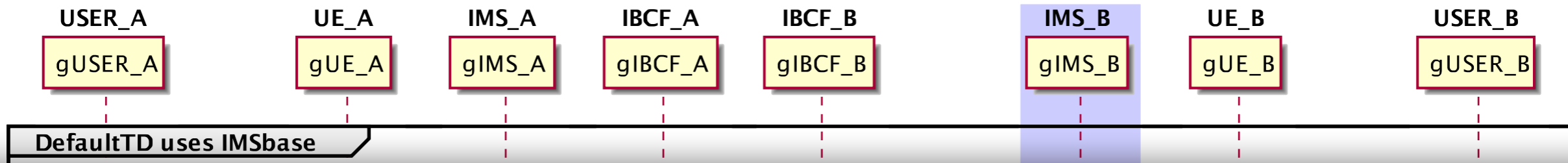


Task 1: Sub-configurations Example

- Extracted sub-configuration



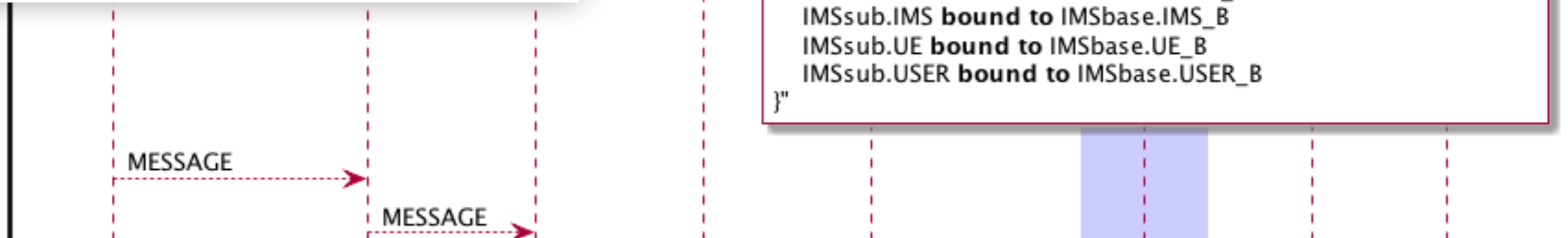




"binding to components of the test configuration of a referencing test description, where bindings are defined as
 <formal/referenced test description configuration component>
bound to
 <actual/referencing test description configuration component>
 e.g.:

```

execute SubTD with {
  IMSsub.IBCF bound to IMSbase.IBCF_B
  IMSsub.IMS bound to IMSbase.IMS_B
  IMSsub.UE bound to IMSbase.UE_B
  IMSsub.USER bound to IMSbase.USER_B
}
```



Any Other Business?

Backup Slides

Task 0: Resource Allocations

STF 476: Resource Allocation and Contracts for 2014

Initial contracts (15 Feb - 30 Sep) to be extended in May (MTS#62) (management/editing not accounted for)

	Gusztav	Andreas	Philip	Martti	Marc-Florian	Alloc.	Required	Conting.
Project management / Editing		3	3			6	6	0
Task 1: Extended TDL meta-model	15	15		15		45	60	15
Task 2: TDL graphical syntax	15	15	15	15		60	84	24
Task 4: Analysis TDL textual syntax			10			10	10	0
Task 3: TDL exchange format						0	48	48
Total	30	30	25	30	0	115	208	93

STF 476: Resource Allocation and Contracts for 2014

Initial contracts (15 Feb - 30 Sep) to be extended in May (MTS#62) (management/editing not accounted for)

		Gusztav	Andreas	Philip	Martti	Marc-Florian	Alloc.	Required	Conting.
	Project management / Editing		3	3			6	6	0
	Task 1: Extended TDL meta-model	15	15		15		45	60	15
	Task 2: TDL graphical syntax	15	15	15	15		60	84	24
	Task 4: Analysis TDL textual syntax			10			10	10	0
	Task 3: TDL exchange format						0	48	48
	Total	30	30	25	30	0	115	208	93

Complete contracts (15 Feb - 31 Jan) to be extended in May (MTS#62) (including management/editing allocations)

		Gusztav	Andreas	Philip	Martti	Marc-Florian	Alloc.	Required	Conting.
	Project management / Editing	1	1	4			6	6	0
	Task 1: Extended TDL meta-model	15	25	8	15	7	70	60	-10
	Task 2: TDL graphical syntax	28	18	15	23	10	94	84	-10
	Task 4: Analysis TDL textual syntax			10			10	10	0
	Task 3: TDL exchange format			10	5	13	28	48	20
	Total	44	44	47	43	30	208	208	0

STF 476: Resource Allocation and Contracts for 2014

Initial contracts (15 Feb - 30 Sep) to be extended in May (MTS#62) (management/editing not accounted for)

		Gusztav	Andreas	Philip	Martti	Marc-Florian	Alloc.	Required	Conting.
	Project management / Editing		3	3			6	6	0
	Task 1: Extended TDL meta-model	15	15		15		45	60	15
	Task 2: TDL graphical syntax	15	15	15	15		60	84	24
	Task 4: Analysis TDL textual syntax			10			10	10	0
	Task 3: TDL exchange format						0	48	48
	Total	30	30	25	30	0	115	208	93

Complete contracts (15 Feb - 31 Jan) to be extended in May (MTS#62) (including management/editing allocations)

		Gusztav	Andreas	Philip	Martti	Marc-Florian	Alloc.	Required	Conting.
	Project management / Editing	1	1	4			6	6	0
	Task 1: Extended TDL meta-model	15	25	8	15	7	70	60	-10
	Task 2: TDL graphical syntax	28	18	15	23	10	94	84	-10
	Task 4: Analysis TDL textual syntax			10			10	10	0
	Task 3: TDL exchange format			10	5	13	28	48	20
	Total	44	44	47	43	30	208	208	0

Extended contracts (01 May - 31 Jan) to be extended in May (MTS#62) (including management/editing allocations)

		Gusztav	Andreas	Philip	Martti	Marc-Florian	Alloc.	Required	Conting.
	Project management / Editing	1	1	4	0	0	6	6	0
	Task 1: Extended TDL meta-model	0	10	8	0	7	25	60	35
	Task 2: TDL graphical syntax	13	3	0	8	10	34	84	50
	Task 4: Analysis TDL textual syntax	0	0	0	0	0	0	10	10
	Task 3: TDL exchange format	0	0	10	5	13	28	48	20
	Total	14	14	22	13	30	93	208	115

STF 476: Preliminary Ressource Allocations During Preparatory Meeting

	Support		Edit coord	Leader			Days		
	Expert	Gusztav	Andreas	Philip	Martti	Marc-Florian	Alloc.	Required	Conting.
							0		0
M0	Start of work						0		0
T0	Project management			3			3	3	0
T0	Editing coordination	1	1	1			3	3	0
T1	Task 1: Extended TDL meta-model	20	20		20		60	60	0
T2	Task 2: TDL graphical syntax	25	25	15	15		80	84	4
T4	Task 4: Analysis TDL textual syntax			10			10	10	0
M1	Early draft for review						0		0
T3	Task 3: TDL exchange format			10	5	10	25	48	23
M2	Stable draft for review						0		0
M3	Final draft for TB approval						0		0
M4	Publication			0	0		0		0
Prog Rep	Progress Report MTS#62						0		0
Prog Rep	Progress Report MTS#63						0		0
Fin Rep	Final Report MTS#64						0		0
Total		45	48	38	40	10	181	208	27

STF 476: Rough Overall Resource Planning and Allocation for 2014

Description	Goals	4-day Sessions	5-day Sessions	Experts
First Session (Feb 2014)	Kick off, Post Phase 1, Prep M1	16	16	4
Homework and coordinated sessions				
Second Session (Apr 2014)	Finalise M1: Early Drafts	16	20	4
Finalisation homework if needed				
Third Session (Jun 2014)	Post M1, Prep M2, MFW available	20	25	5
Homework and coordinated sessions				
Fourth Session (Sep 2014)	Finalise M2: Stable Drafts	20	25	5
Finalisation homework if needed				
Fifth Session (Oct/Nov 2014)	Post M2, Prep M3	20	25	5
Homework and coordinated sessions				
Sixth Session (Dec 2014)	Finalise M3: Final Drafts	20	25	5
Finalisation homework if needed				
Milestone 1	April 2014	32	36	
Milestone 2	September 2014	40	50	
Milestone 3	December 2014	40	50	
Average resources per milestone		69,3	69,3	
Average contingency per milestone	For homework / session extension	32,0	24,0	
Contingency per milestone per expert	For homework / session extension	6,4	4,8	
Planned / used resources		112	136	
Total resources available		208	208	
Contingency		96	72	
Per homework session (all experts)		16	12	

Task 0: Risks

- Internal / Operational risks
 - Task (inter-)dependencies hinder progress due to distributed work
 - Misunderstandings and communication barriers hinder progress
 - Misalignment of expectations towards the STF
- External risks
 - Lack of essential tool support considered a limiting factor
 - Lack of user base and technical challenges raise barrier to entry

Task 0: Operational Risks

- Task (inter-)dependencies hinder progress due to distributed work
 - Severity: Medium, Likelihood: Low
 - Mitigation strategies
 - limit dependencies where possible
 - make dependencies explicit where these are inevitable in order to raise awareness
 - ensure communication and collaboration among experts working on inter-dependent tasks
 - reassign experts where applicable

Task 0: Operational Risks

- Misunderstandings and communication barriers hinder progress
 - Severity: Medium, Likelihood: Medium
 - Mitigation strategies
 - recognise and differentiate between misunderstandings and technical disagreements
 - emphasis on facts, substantiated with examples
 - identify fundamental differences between alternative proposals and their impact
 - resolve persistent disagreements with the steering group

Task 0: Operational Risks

- Misalignment of expectations towards the STF
 - Severity: Medium, Likelihood: Medium
 - Mitigation strategies
 - frequent reporting and technical discussions with the steering group
 - expectations perceived to be unrealistic communicated back to the steering group
 - concrete examples to support technical discussions and ensure aligned expectations

Task 0: User Acceptance Risks

- Lack of essential tool support considered a limiting factor
 - Severity: High, Likelihood: Medium
 - Mitigation strategies
 - means to use and access the language need to be provided early on
 - early drafts need to be discussed and aligned with users' needs
 - simplified initial interface to TDL may be favourable (Task 4)
 - integration in existing processes and awareness among potential users (board report, collaboration with CTI)

Task 0: Tool Vendor Adoption Risks

- Lack of user base and technical challenges raise barrier to entry
 - Severity: High, Likelihood: Medium
 - Mitigation strategies
 - awareness and collaboration with users seeks to create initial demand
 - early prototypical validation seeks to create a sound technical foundation and reduce inherent technical challenges
 - participating commercial and in-house tool vendors assure that their perspectives are considered in the design and execution of the standards

Task 2: Diagram Definition Summary

- Kinds of graphical syntax information
 - User can control Diagram Interchange (DI)
 - position of nodes, interconnections
 - interchangeable between tools
 - Defined by language standard Diagram Graphics (DG)
 - shape, style of symbol
 - not interchangeable, shall be identical and is known a priori
- Common basic elements, types Diagram Common (DC)

Task 2: Diagram Definition Architecture

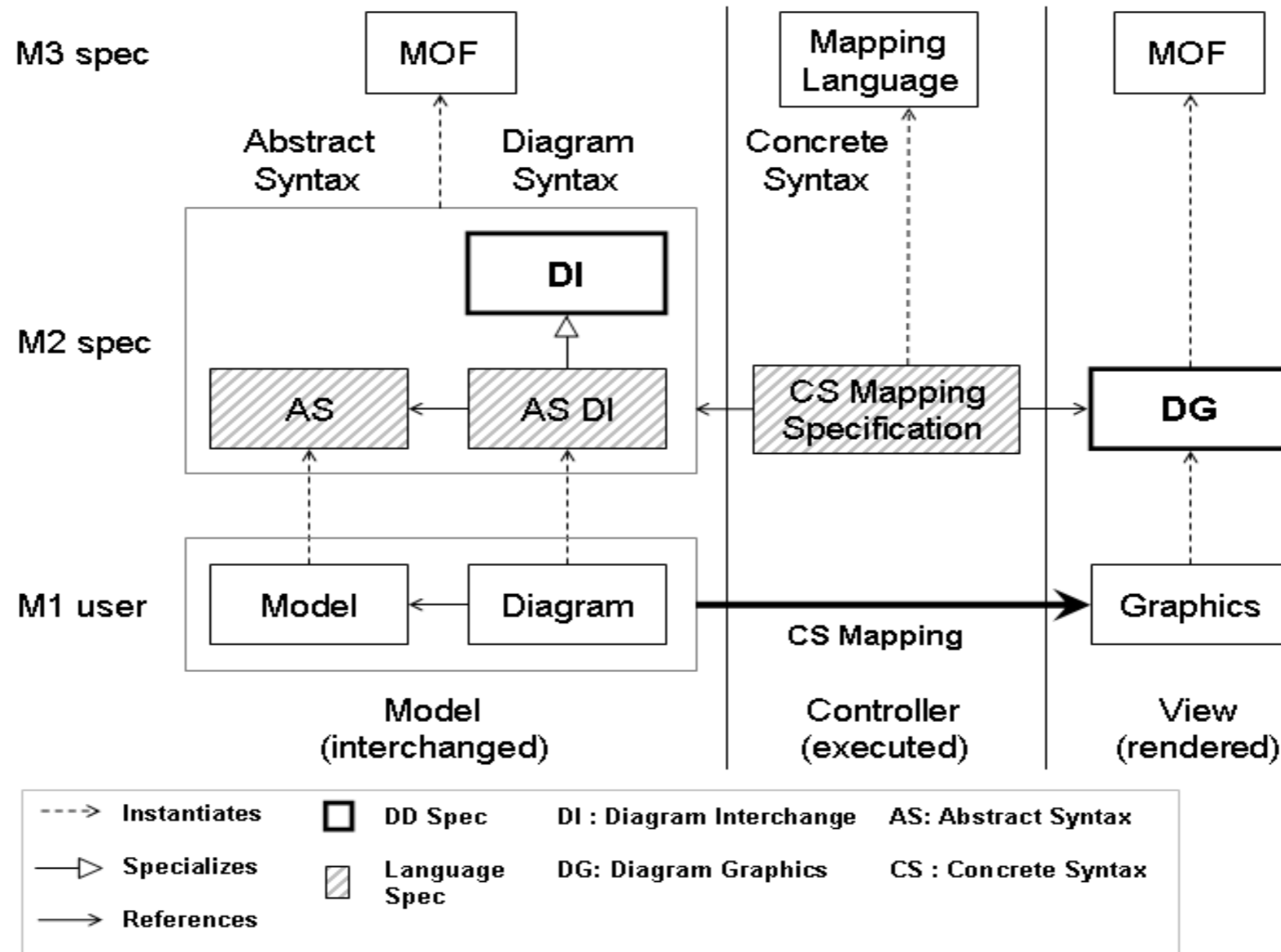


Figure 7.1 - Diagram Definition Architecture

Task 2: Diagram Definition Architecture

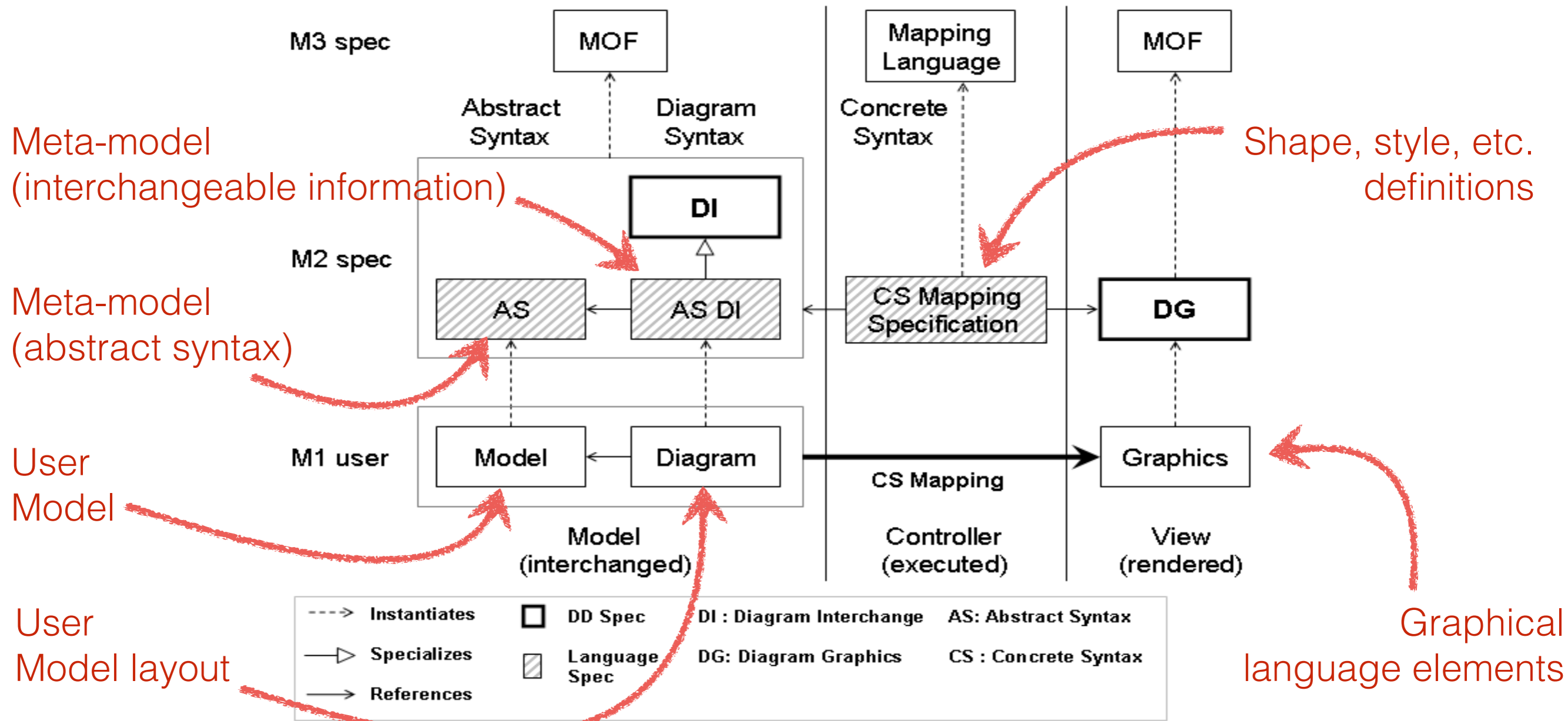


Figure 7.1 - Diagram Definition Architecture

Task 2: Diagram Definition UML

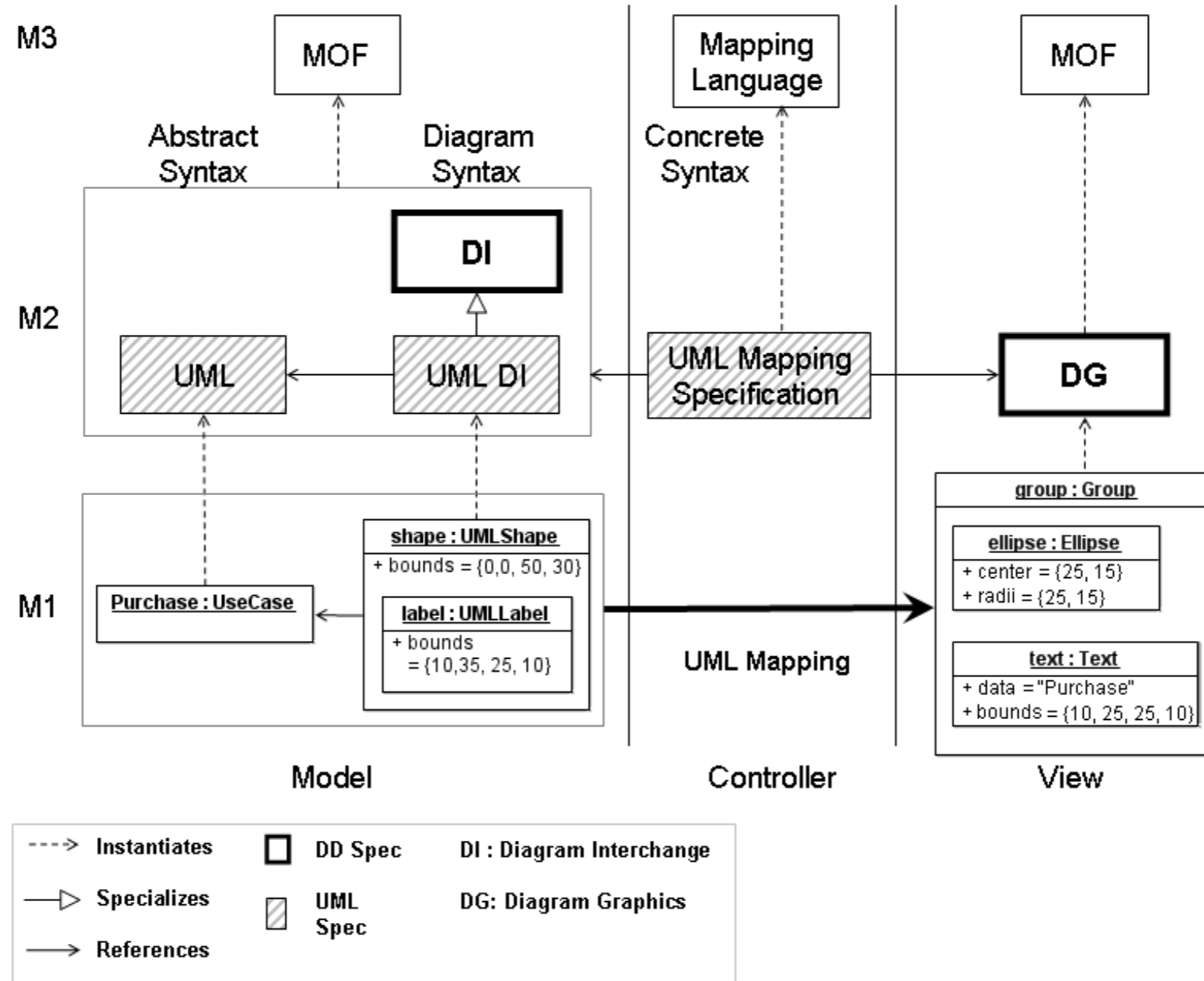


Figure 7.2 - Example of Diagram Definition Architecture For UML

Task 2: Diagram Definition TDL

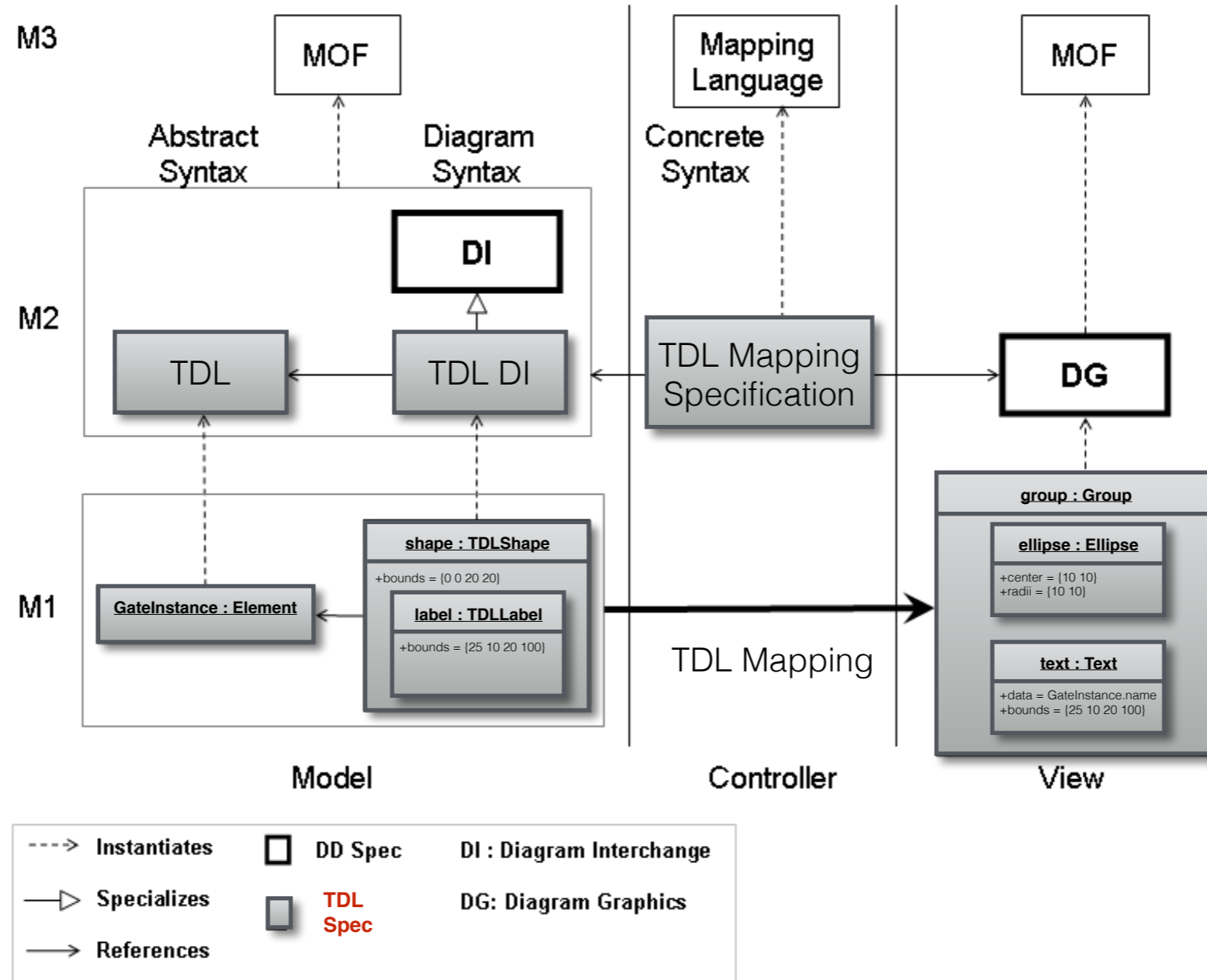


Figure 7.2 - Example of Diagram Definition Architecture For ~~UML~~ ^{TDL}

Task 2: Diagram Definition TDL

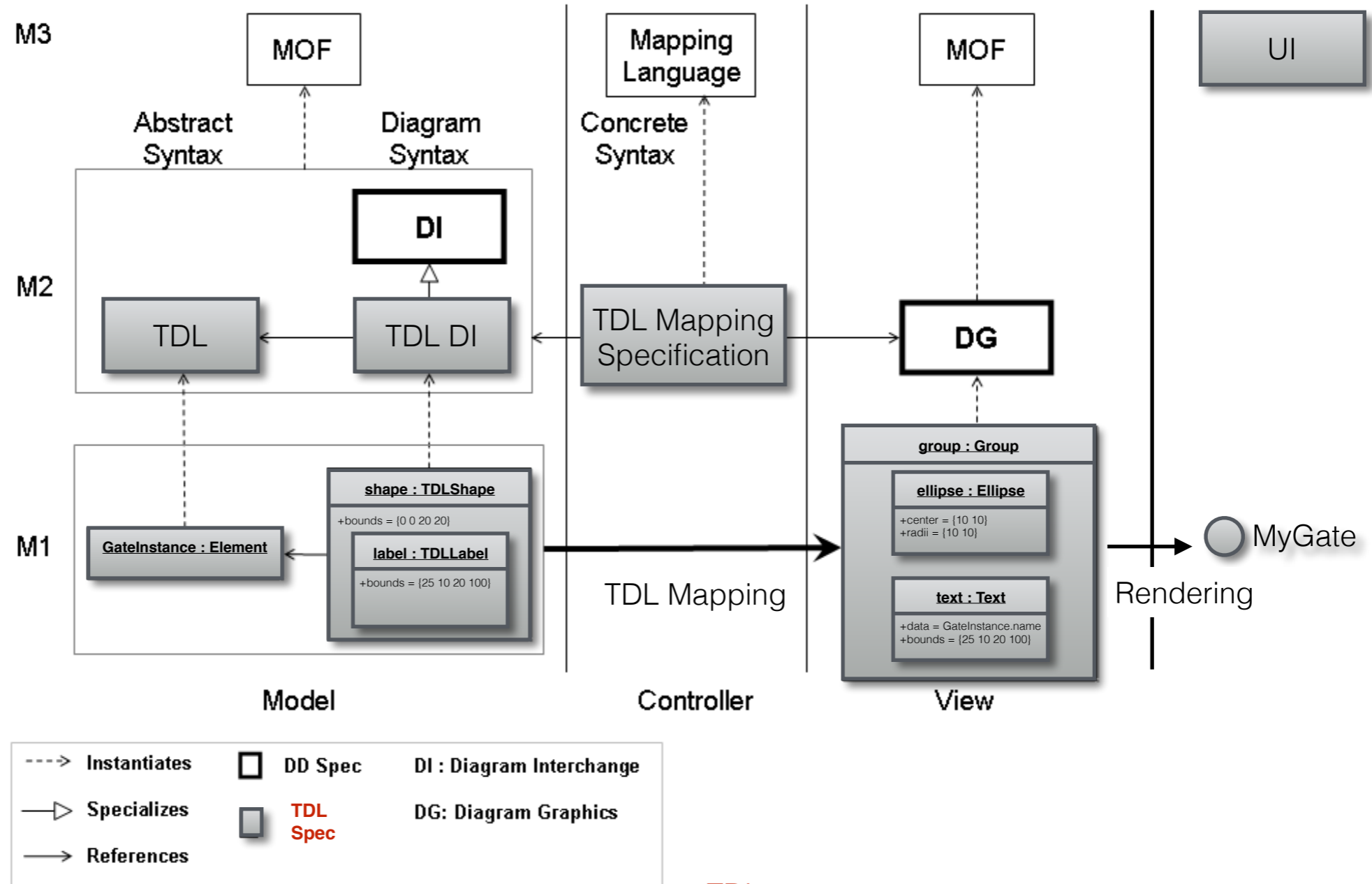


Figure 7.2 - Example of Diagram Definition Architecture For ~~UML~~ ^{TDL}

Task 0: STF Process

- Define and set target goals for milestone
 - distributed among experts based on task responsibilities
 - approved by STF
- Execute and refine goals
 - analysis
 - implementation
 - validation

Task 0: Execution

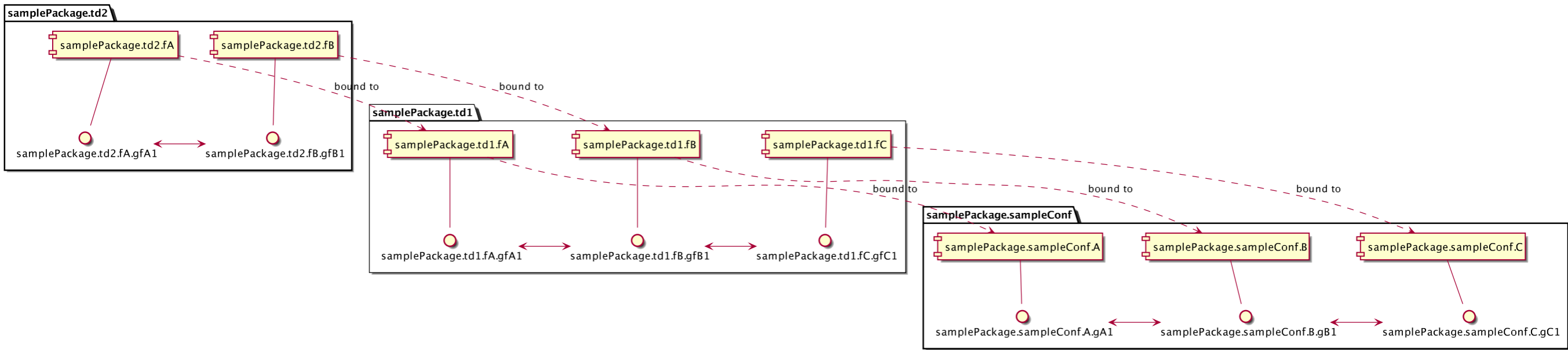
- Analysis
 - assigned expert understands goal and proposes a conceptual solution
 - STF approves conceptual solution
 - redo analysis and propose an improved conceptual solution in case of deficiencies
- Implementation
 - assigned expert implements the conceptual solution in the respective document

Task 0: Execution

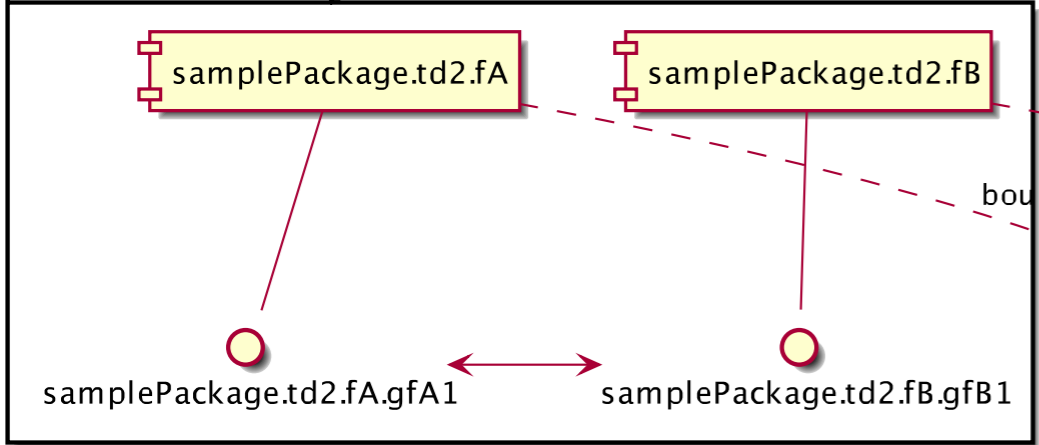
- Validation
 - STF reviews the implementation
 - prototypical realisation checks technical soundness where applicable
 - go back to implementation in case of minor deficiencies
 - go back to analysis in case of major deficiencies

Task 1: Sub-Configurations

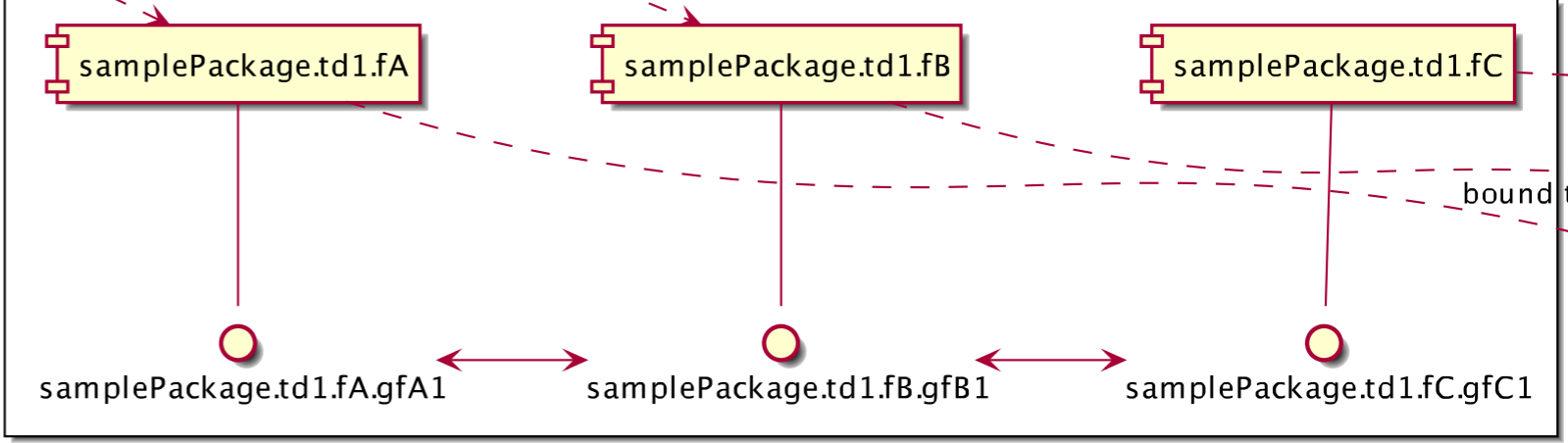
- Parameterisation-based approach (minor meta-model changes)
- Test Descriptions define their own local component instances
 - existing configurations and instances can be reused as copies
 - connections can be explicit (consistent) or implicit (convenient)
- Formal and actual component instances bound in references
 - binding concrete instances at reference time vs declaration time
 - $m : n$ vs $1 : n$ relationships (configuration : test description)



samplePackage.td2



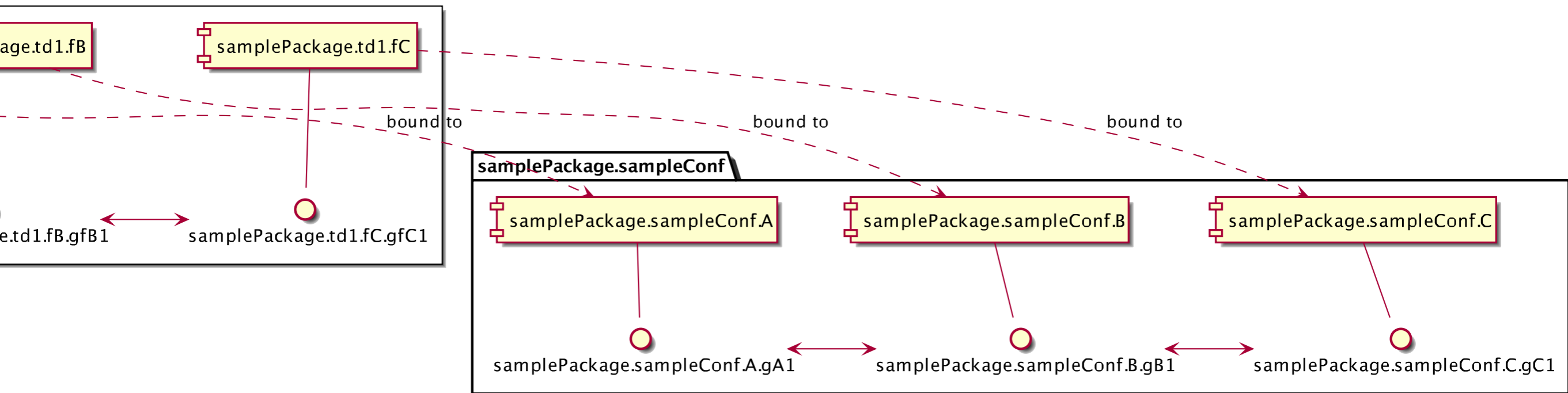
samplePackage.td1

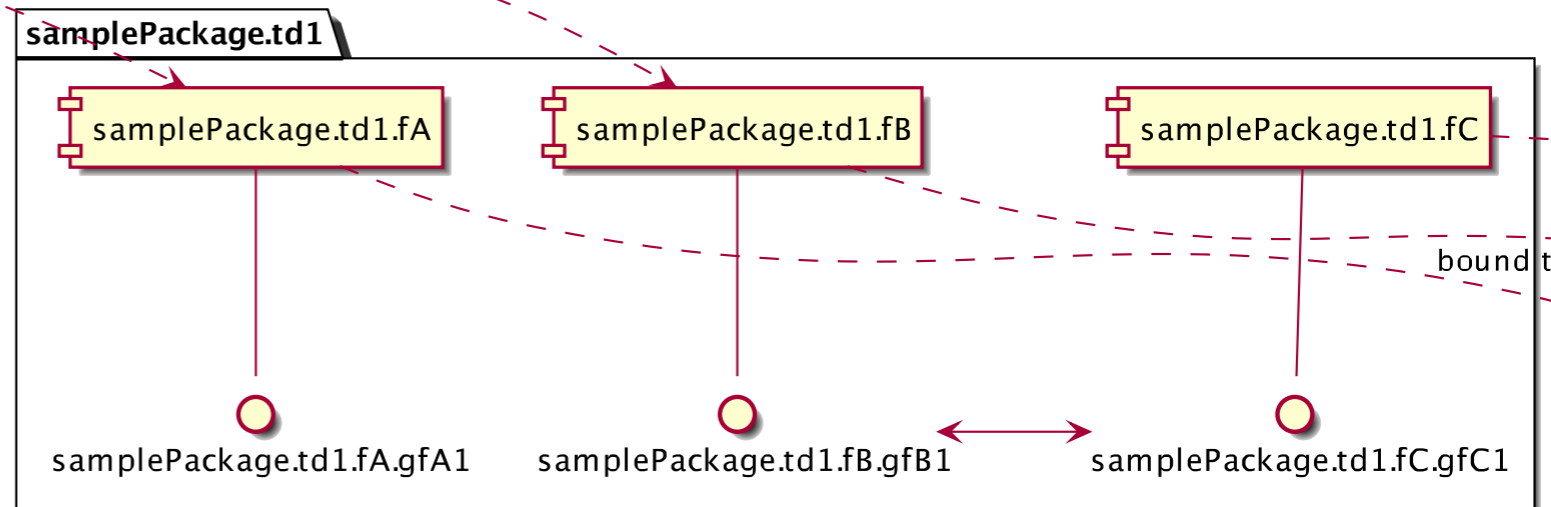
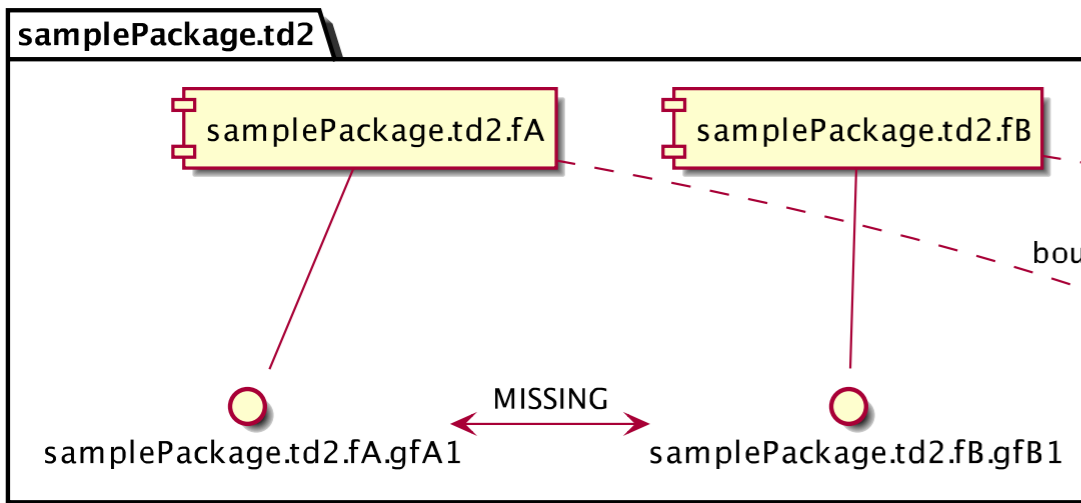
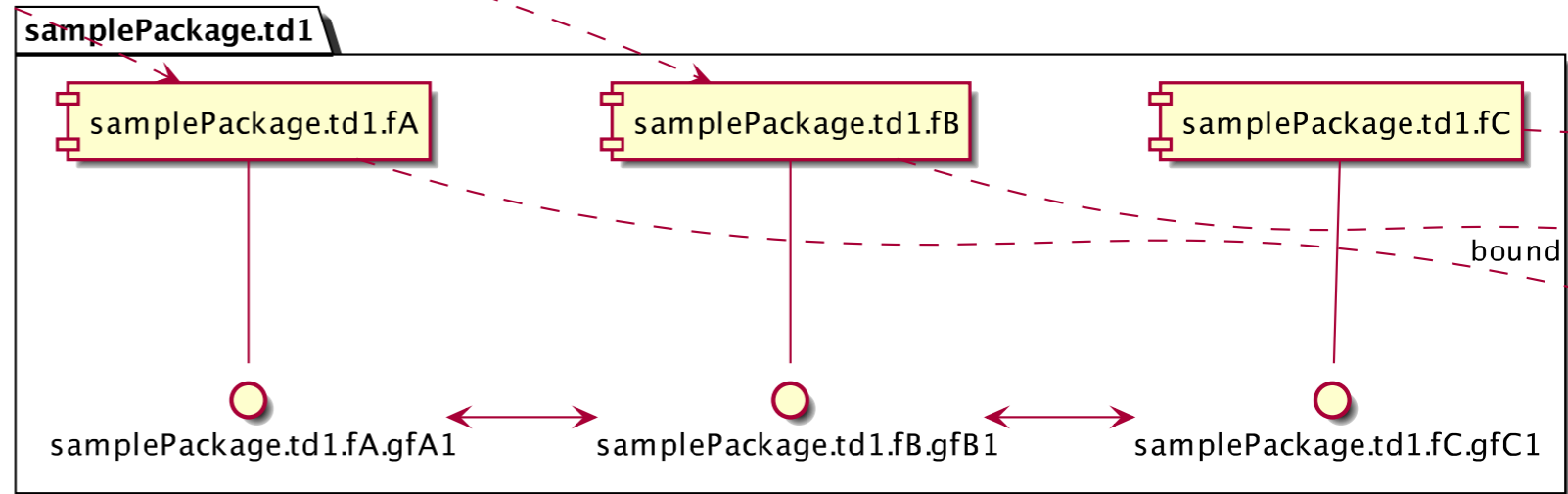
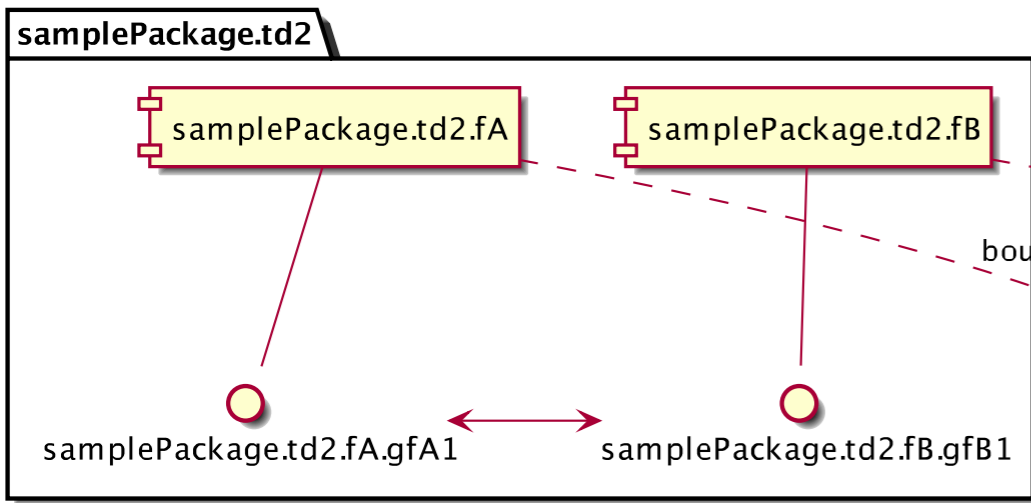


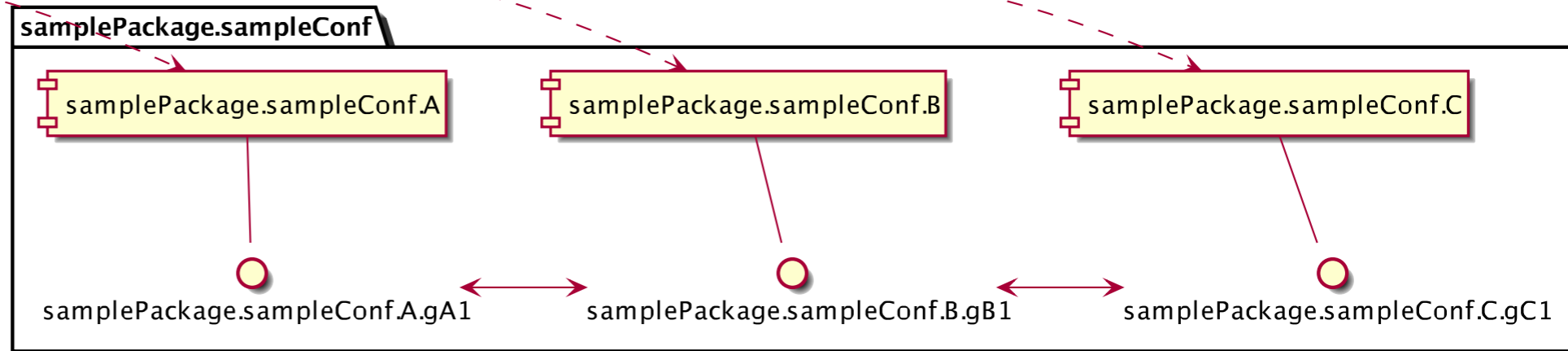
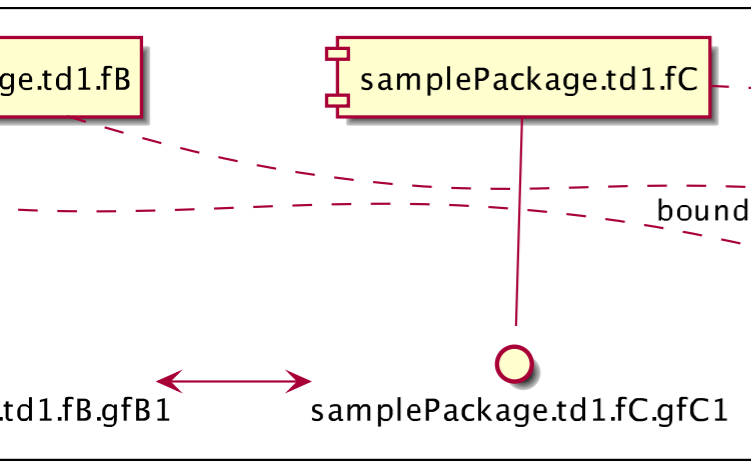
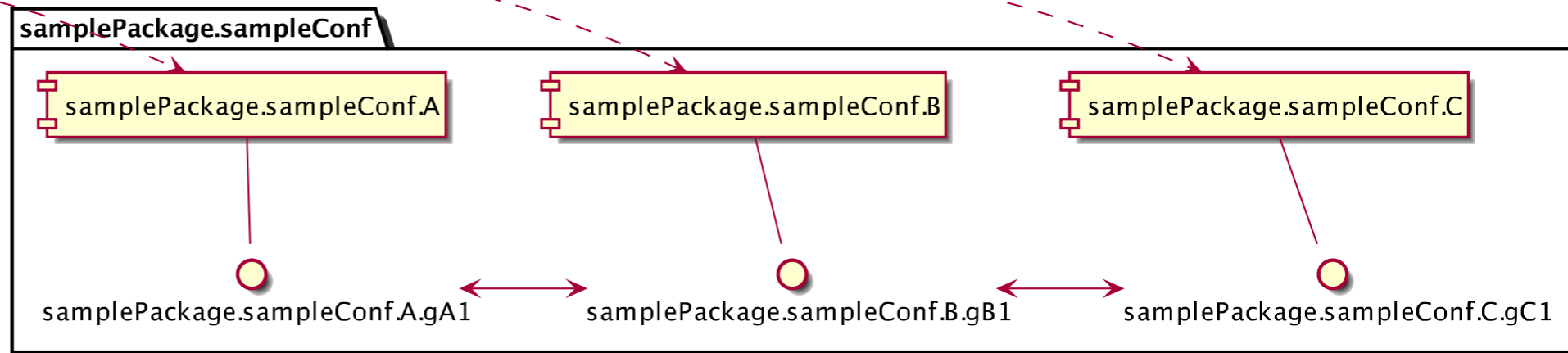
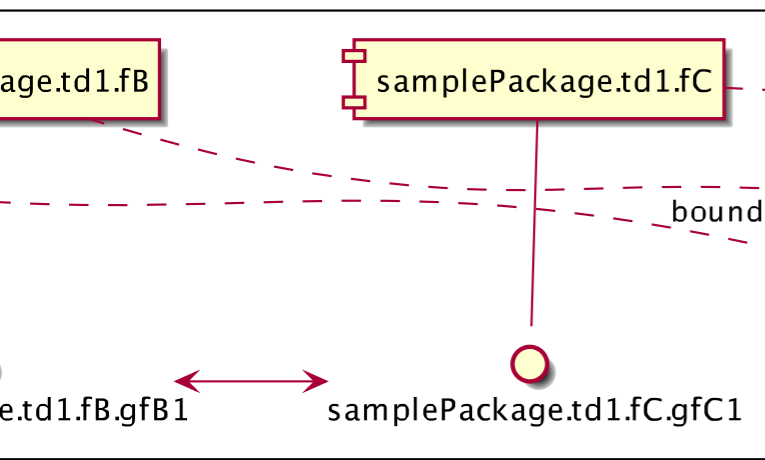
bound to

bound to

bound to







Communication STF – SG

- Ensure overall direction of TDL design is OK
- Resolve deadlocks in STF internal discussions by providing guidance and advice
- Assist in developing a roadmap for TDL

TDL Use Cases

U	Short Description	Example
A	TDL for documentation (incl. informal parts)	3GPP test specs
B	TDL for generation of tests that can be made executable (i.e. all parts are formal)	Automatic mapping of a TDL spec to partial TTCN-3 code
C	TDL for representation of generated tests (i.e. output from MBT tools)	Test cases generated from system models
D	TDL for representation of test logs	Test execution log of a TTCN-3 tool
E	TDL for test generation (i.e. input to MBT tools)	Test models as activity diagrams
F	TDL for performance testing	On-the-fly testing from a TDL spec
G	TDL for interoperability testing	Use case models, from which tests are derived

TDL Feature Description Structure

- TDL feature name (title of sub-clause)
- Overview (covered in early draft)
 - Free description of the feature
- Abstract syntax
 - Representation of the feature and its elements in the meta-model
- Semantics
 - Preferably formal description of the semantics of the feature
- Constraints
 - Constraints on the feature that can be statically analysed
- Classifier description
 - Description of all elements contained in the meta-classes