Model driven workflow

applied to an

IMS Application server

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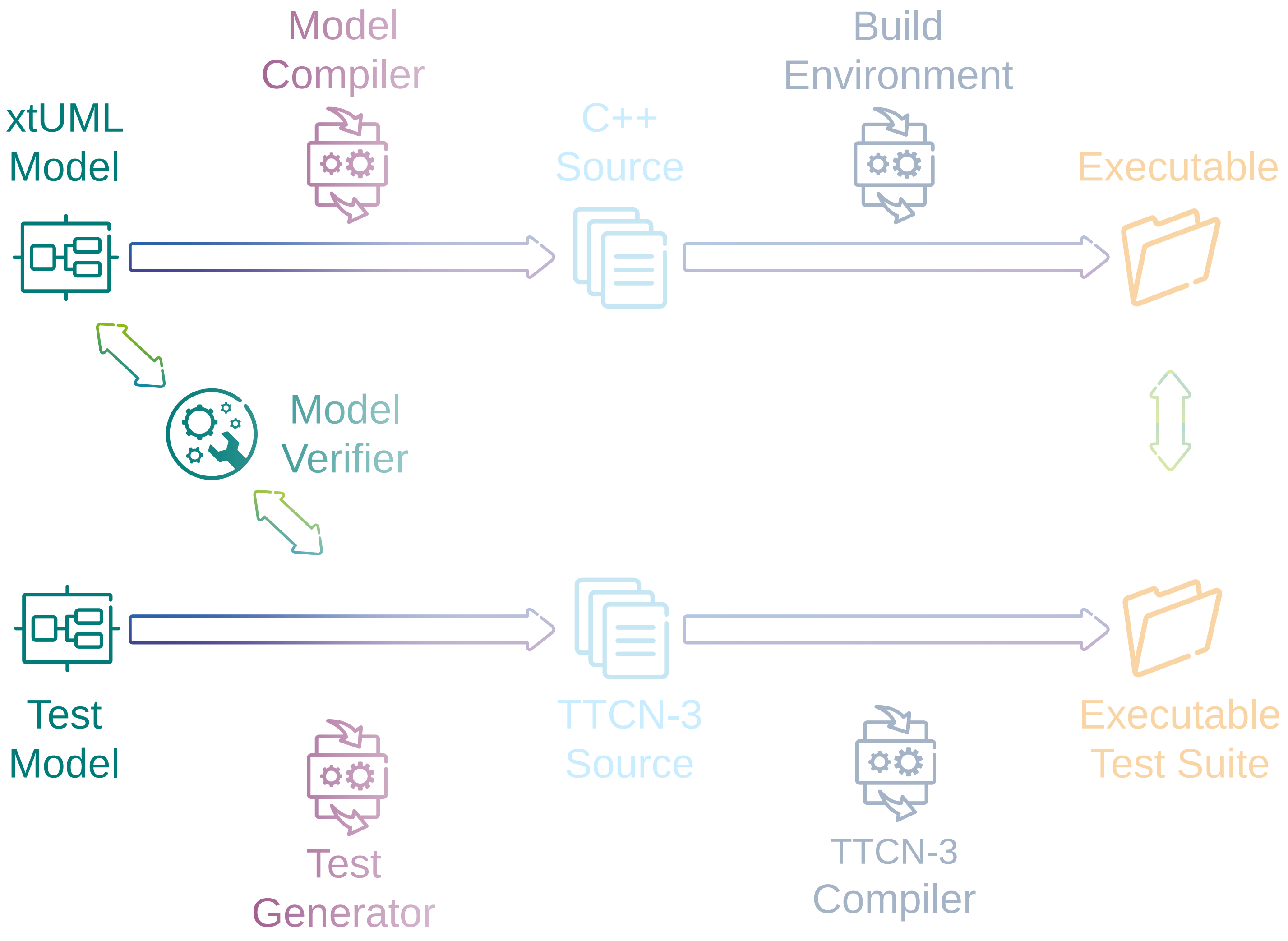
Agenda

- › Introduction
  - – Model-driven Design (MDD) and Model-based Testing (MBT) synergy
  - – IMS Application Server
- › Model-driven Workflow
  - – Workflow overview
  - – Service implementation example
- › Experiences
  - – Challenges and solutions
  - – Benefits

introduction

MDD and MBT synergy



Mission

Domain specific knowledge

Large scale development competence

Established WOW

Receiver org

Tool Chain

Modeling expertise

Methodology

MDW

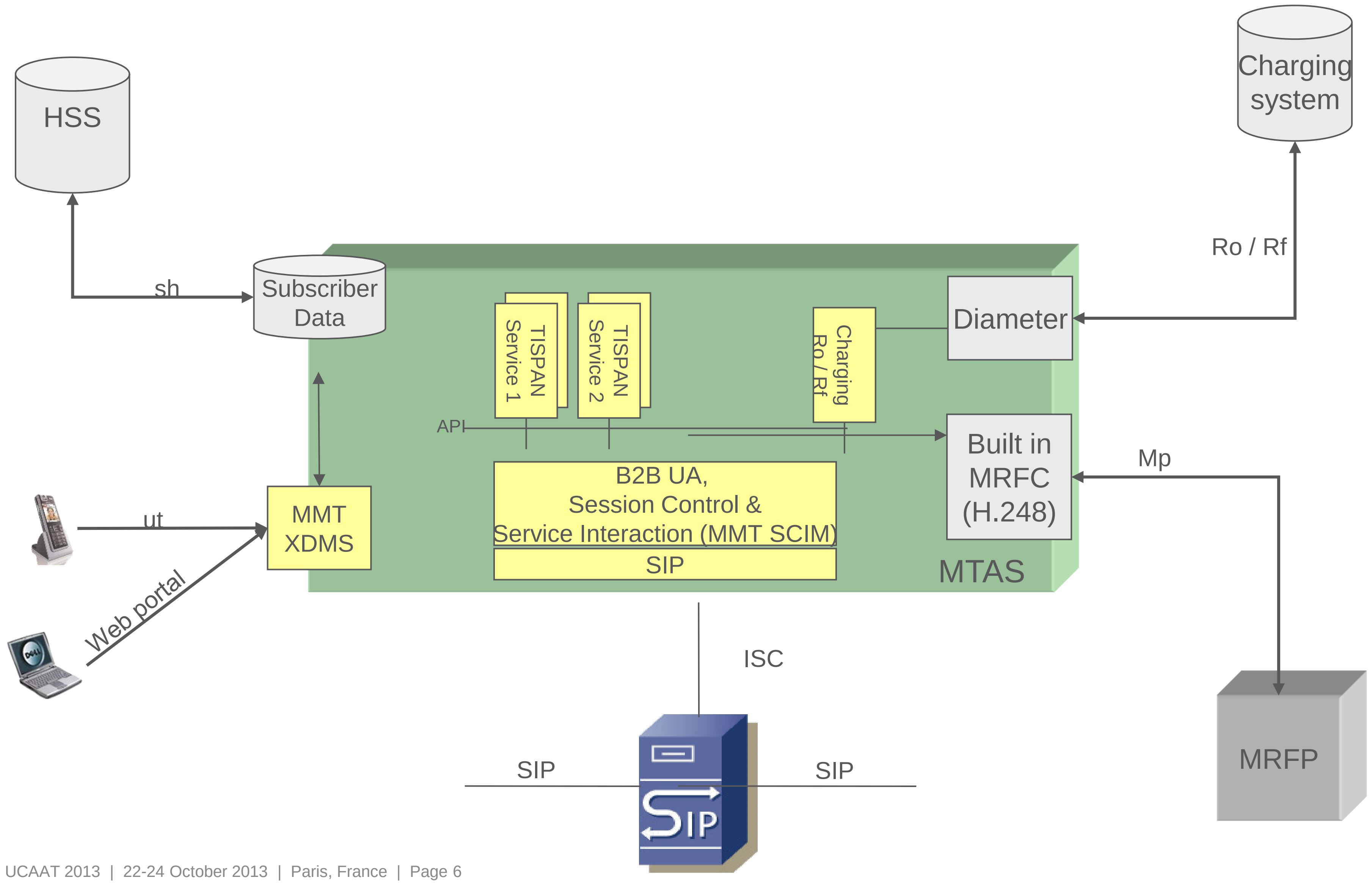
Result

Polished tool chain

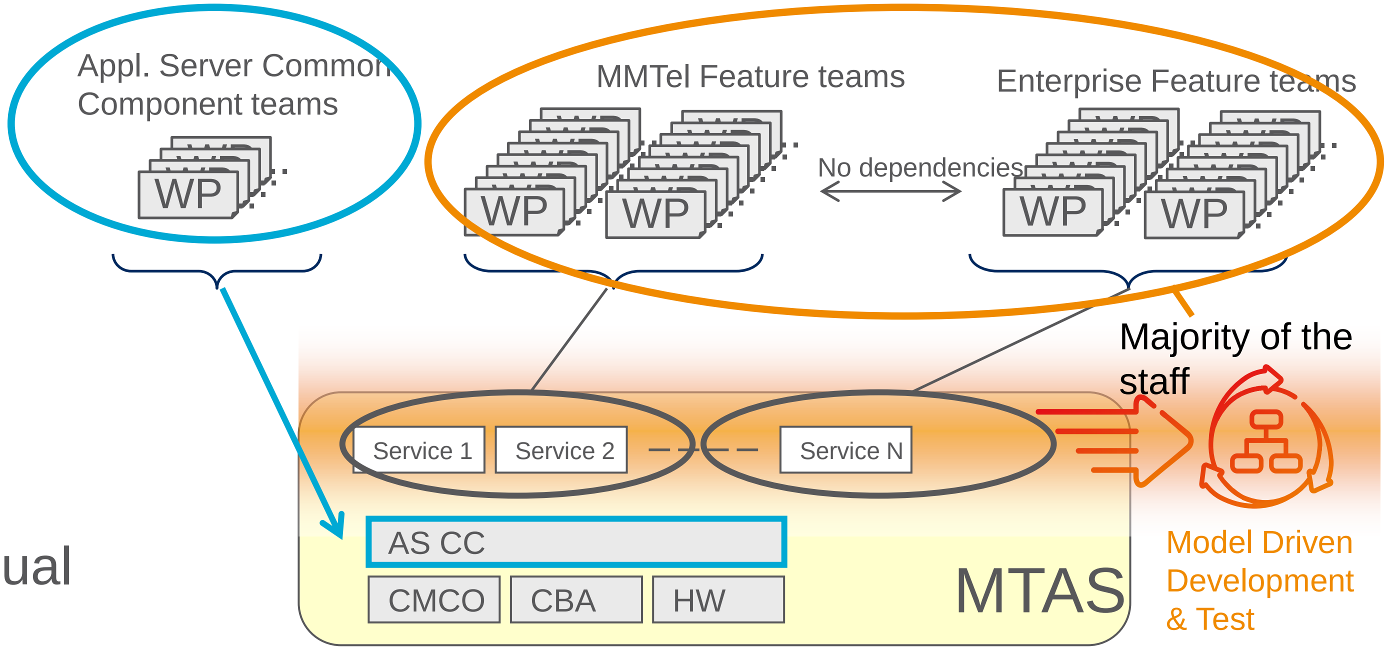
Proper methods

Wide scale deployment WOW

IMS application server



Workflow Introduction challenges

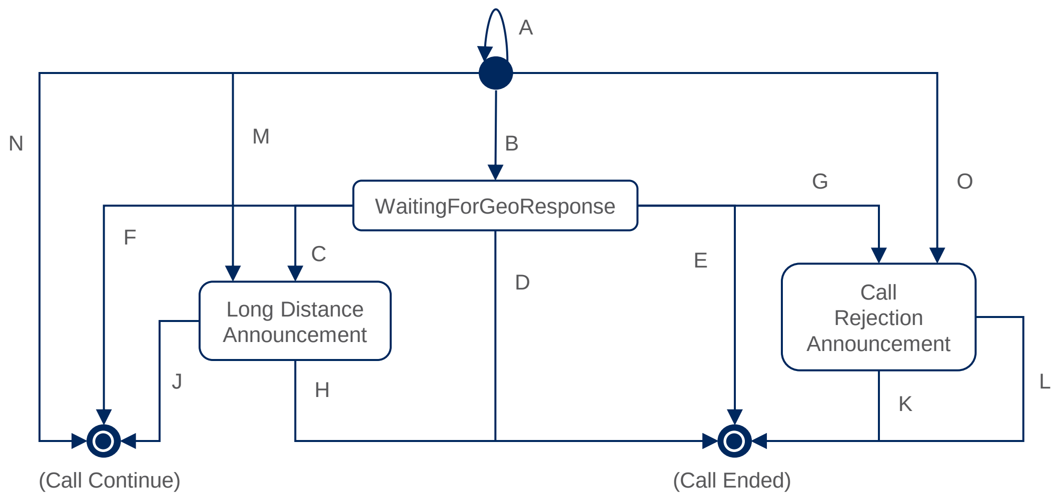


- Several teams
- Seamless gradual introduction
- Agile ways of working
- Huge handwritten legacy code
- Teams have no modeling knowledge

Model driven workflow

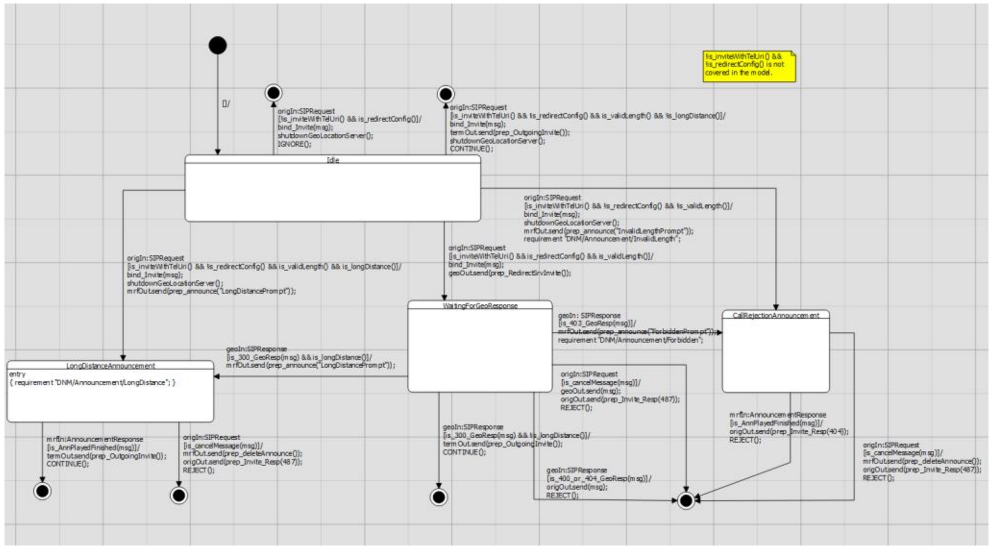
Service specification (original)

- New service requirement
- System architect designs the service logic in a natural language document
- Specification is given to the work package teams
- Parallel development of implementation and automated tests
- In the end of the sprints they can test their systems against each other



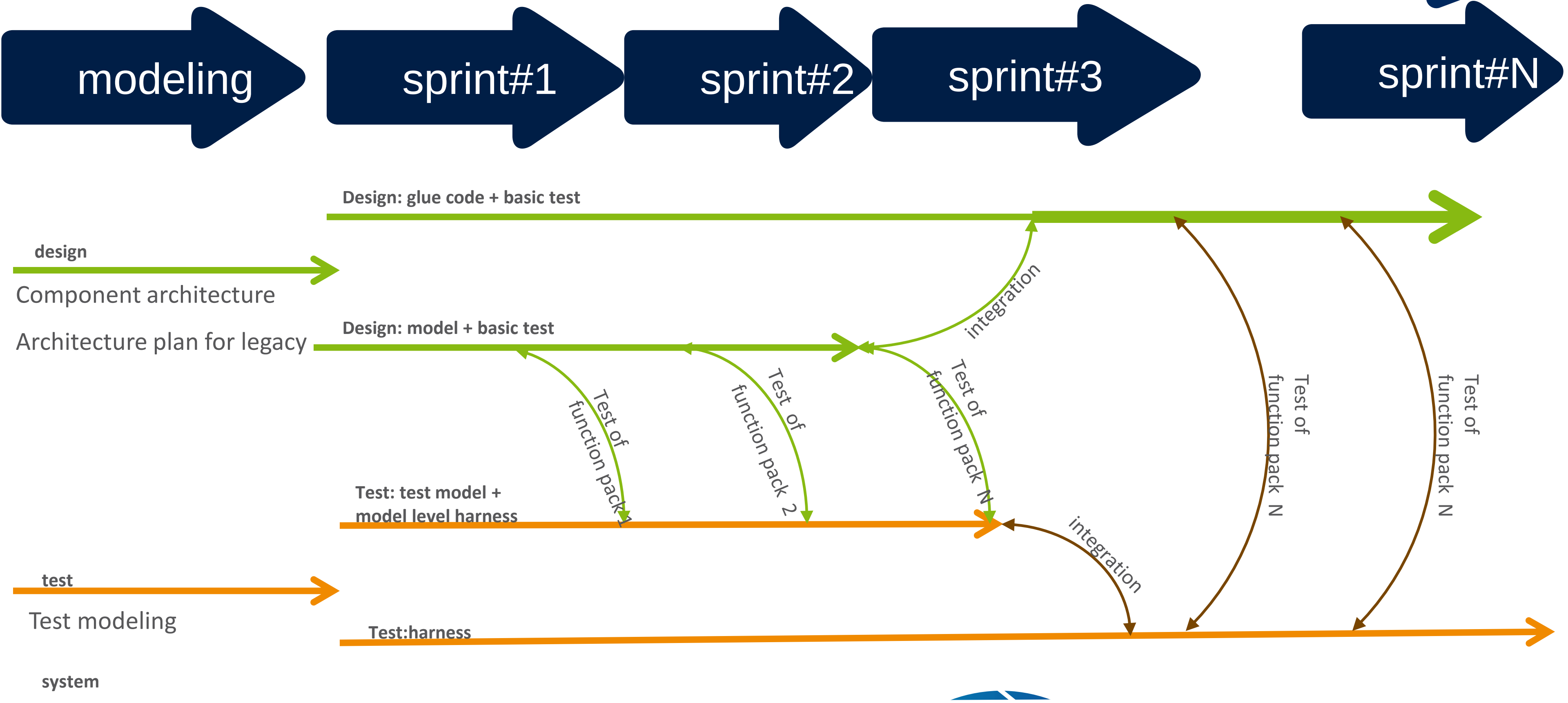
Service specification (modeled)

- New service requirement
- System architect designs the service logic in a **formal language**
- Specification is given to the work package teams
- Parallel development of implementation and automated tests
- **Early in the process** they can test their systems against each other



```
!is_inviteWithTelUri() &&
!is_redirectConfig() is not
covered in the model.

[]/

origIn:SIPRequest
[!is_inviteWithTelUri() && is_redirectConfig()]/
bind_Invite(msg);
shutdownGeoLocationServer();
IGNORE();

origIn:SIPRequest
[is_inviteWithTelUri() && !is_redirectConfig() && is_validLength() && !is_longDistance()]/
bind_Invite(msg);
termOut.send(prep_OutgoingInvite());
shutdownGeoLocationServer();
CONTINUE();

origIn:SIPRequest
[is_inviteWithTelUri() && !is_redirectConfig() && !is_validLength()]/
bind_Invite(msg);
shutdownGeoLocationServer();
mrfOut.send(prep_announce("InvalidLengthPrompt"));
requirement "DNM/Announcement/InvalidLength";

origIn:SIPRequest
[is_inviteWithTelUri() && is_redirectConfig() && is_validLength()]/
bind_Invite(msg);
geoOut.send(prep_RedirectSrvInvite());

origIn:SIPRequest
[is_inviteWithTelUri() && !is_redirectConfig() && is_validLength() && is_longDistance()]/
bind_Invite(msg);
shutdownGeoLocationServer();
mrfOut.send(prep_announce("LongDistancePrompt"));

LongDistanceAnnouncement
entry
{ requirement "DNM/Announcement/LongDistance"; }

geoIn:SIPResponse
[is_403_GeoResp(msg)]/
mrfOut.send(prep_announce("ForbiddenPrompt"));
requirement "DNM/Announcement/Forbidden";

geoIn:SIPResponse
[is_300_GeoResp(msg) && is_longDistance()]/
mrfOut.send(prep_announce("LongDistancePrompt"));

origIn:SIPRequest
[is_cancelMessage(msg)]/
geoOut.send(msg);
origOut.send(prep_Invite_Resp(487));
REJECT();

mrfIn:AnnouncementResponse
[is_AnnPlayedFinished(msg)]/
origOut.send(prep_Invite_Resp(404));
REJECT();

origIn:SIPRequest
[is_cancelMessage(msg)]/
mrfOut.send(prep_deleteAnnounce());
origOut.send(prep_Invite_Resp(487));
REJECT();

mrfIn:AnnouncementResponse
[is_AnnPlayedFinished(msg)]/
termOut.send(prep_OutgoingInvite());
CONTINUE();

origIn:SIPRequest
[is_cancelMessage(msg)]/
mrfOut.send(prep_deleteAnnounce());
origOut.send(prep_Invite_Resp(487));
REJECT();

geoIn:SIPResponse
[is_300_GeoResp(msg) && !is_longDistance()]/
termOut.send(prep_OutgoingInvite());
CONTINUE();

geoIn:SIPResponse
[is_400_or_404_GeoResp(msg)]/
origOut.send(msg);
REJECT();
```

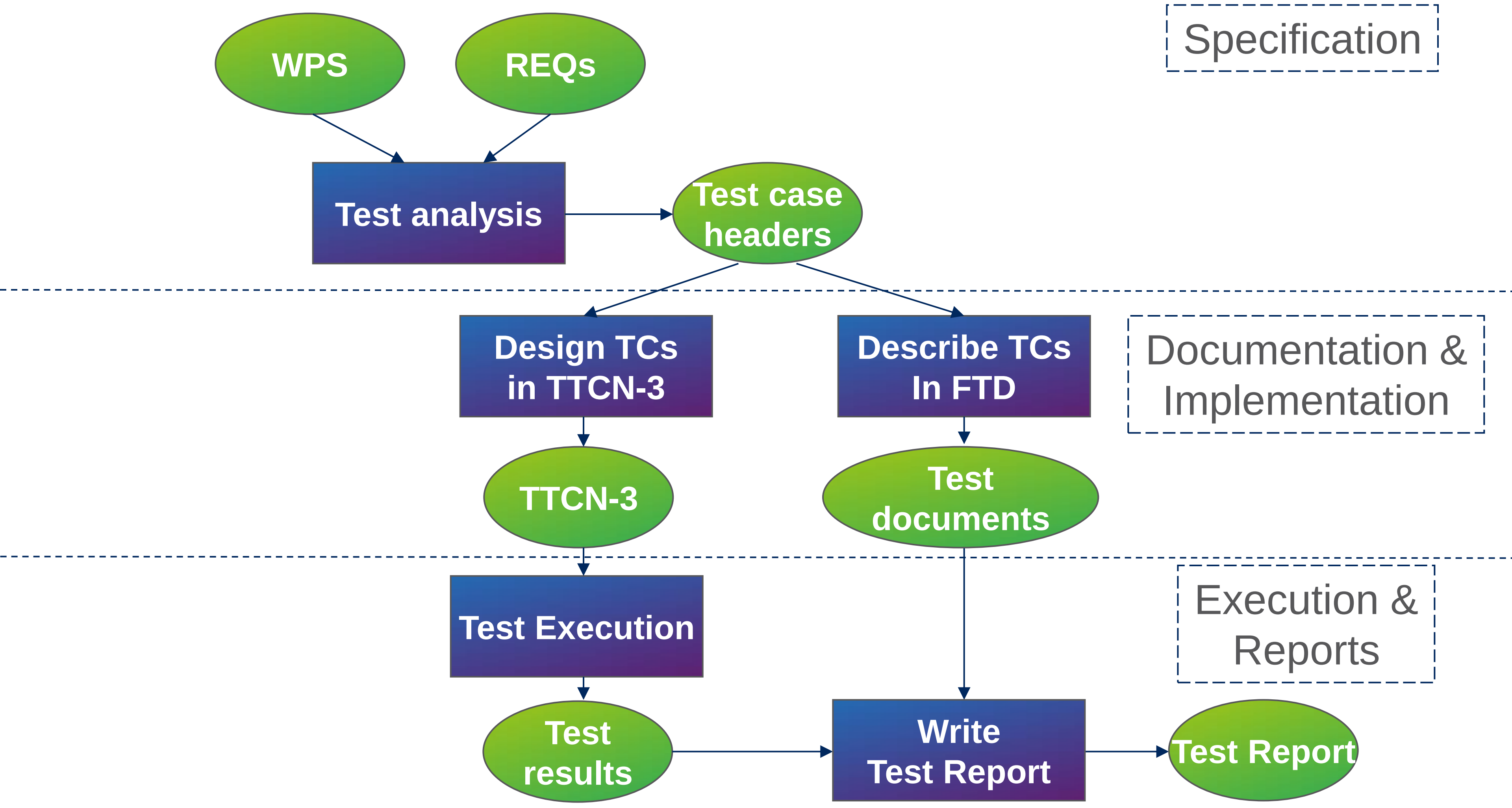
Agile way of working



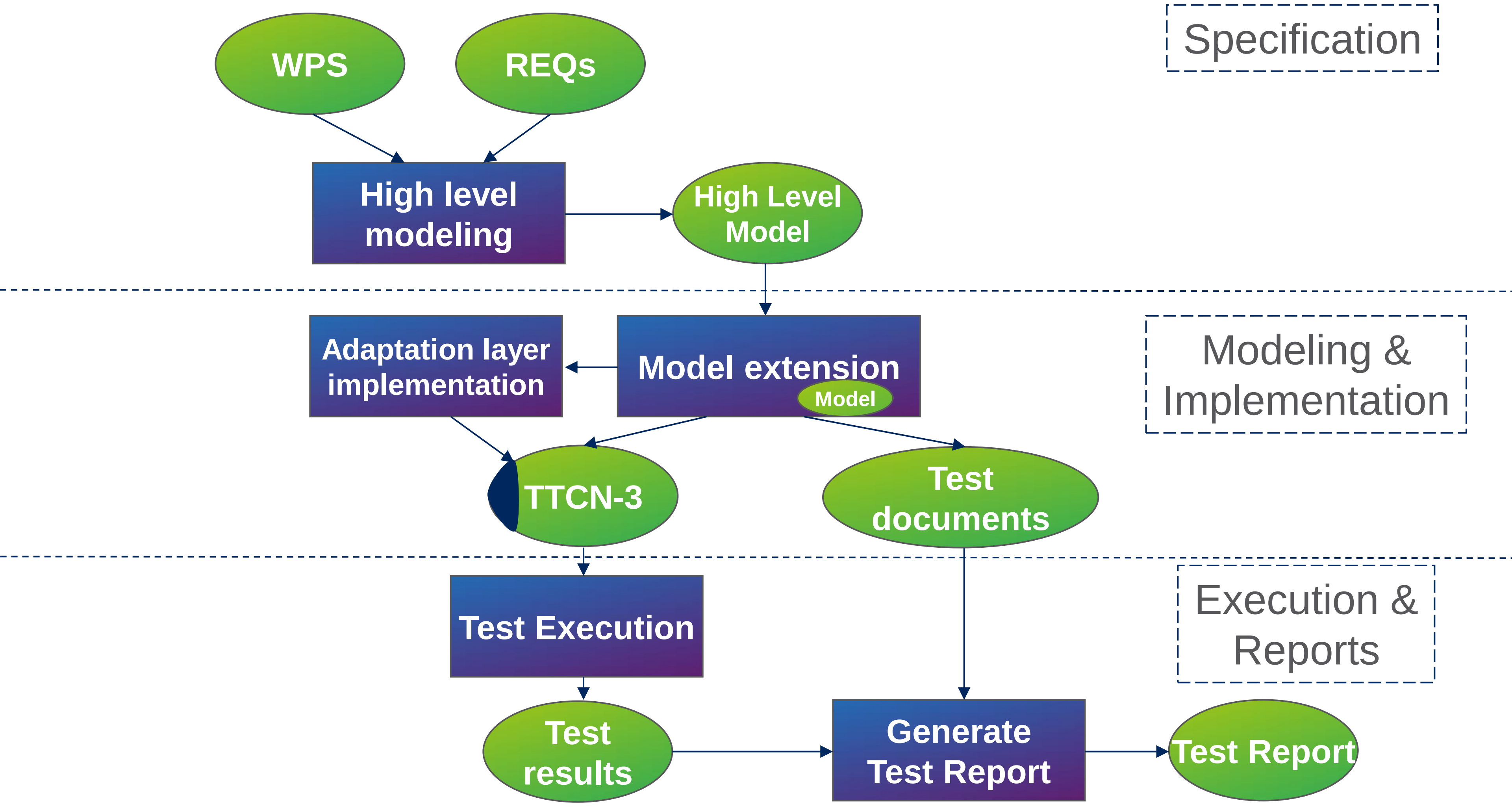
- Starting point: high level black box model
- Test driven development
- Continuous integration: nightly builds

CSCF	MDW
3 designers	4 designers
3 testers	1 tester
1 system	2 MC

Original TEST workflow



Model based Test workflow



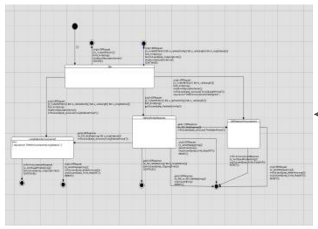
Model in the spec

Service Logic

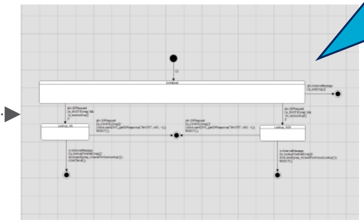
•Top down modeling

• Some of the signaling is pushed down

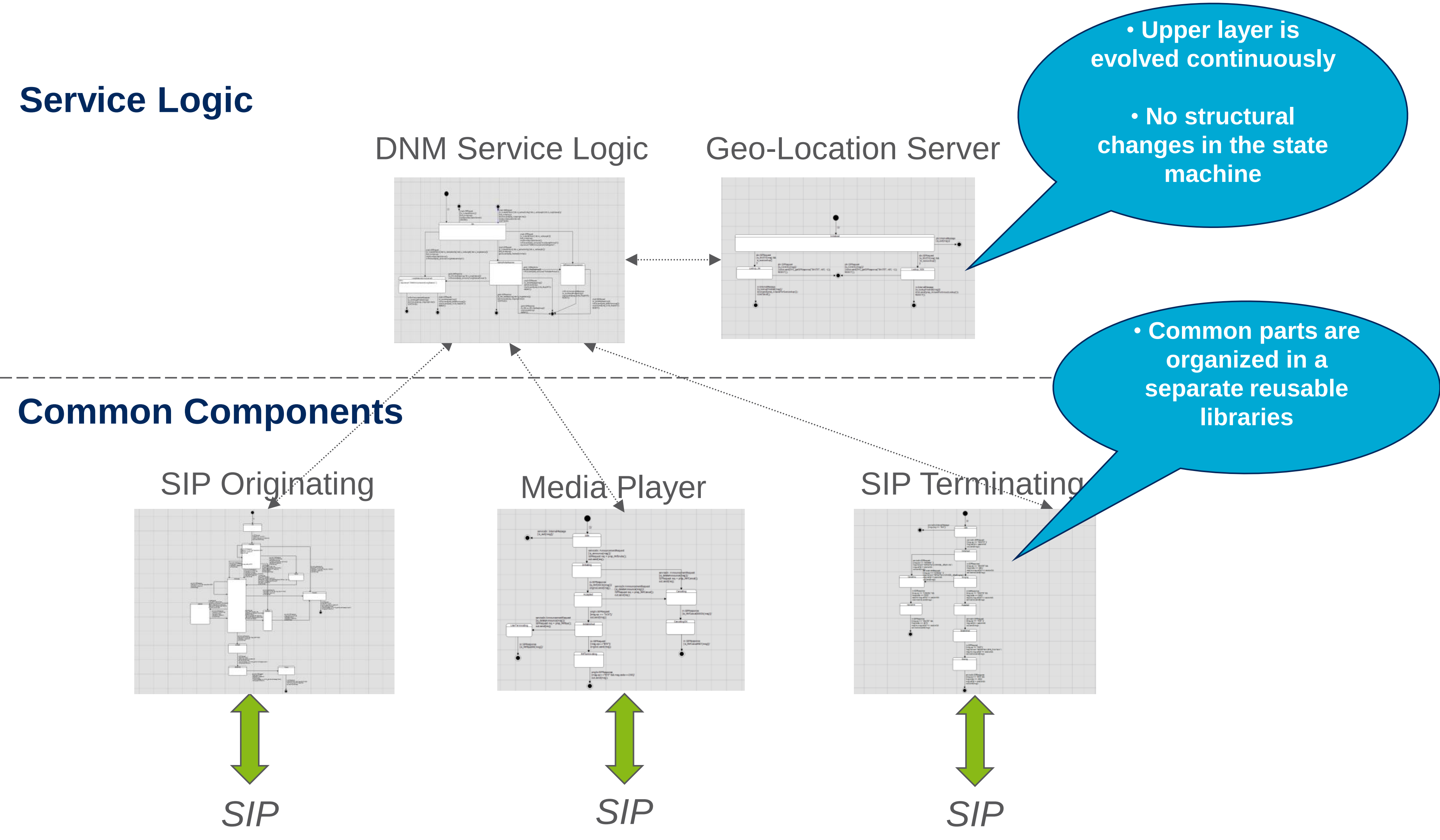
DNM Service Logic



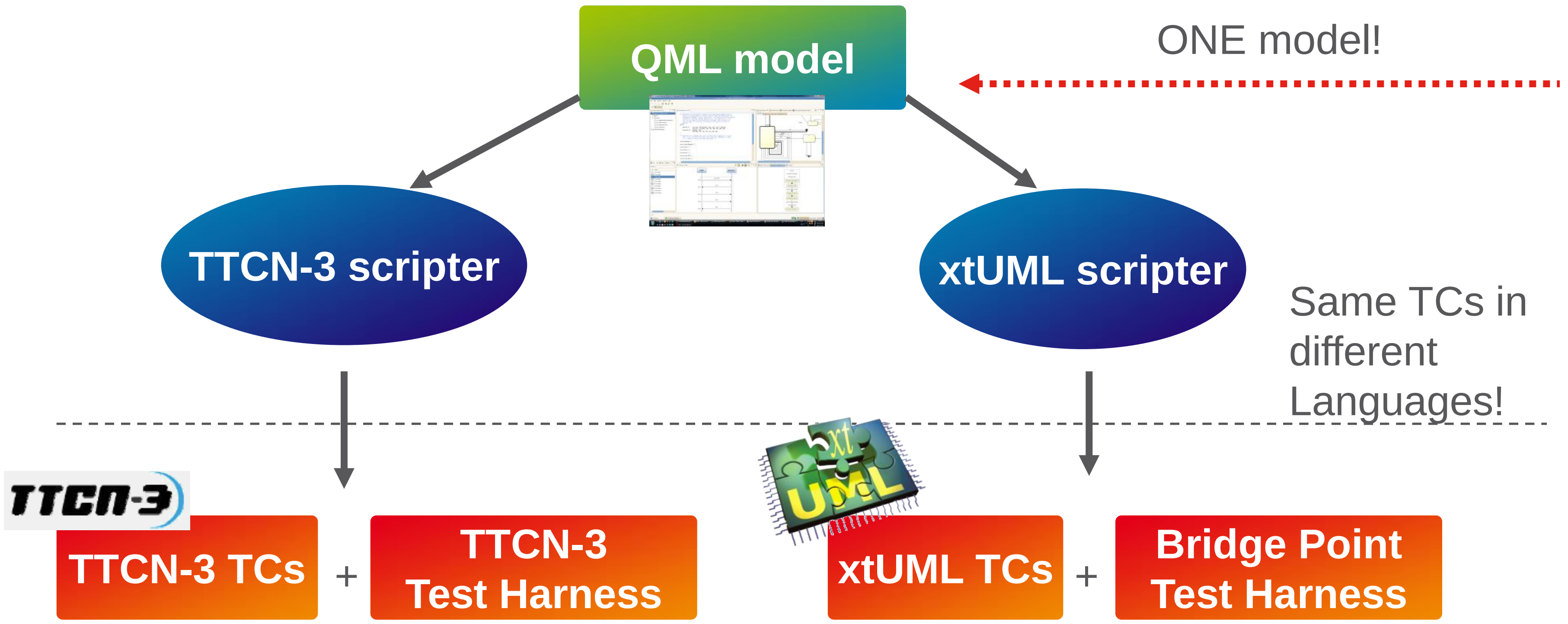
Geo-Location Server



Model in the spec


Service Logic
DNM Service Logic
Geo-Location Server
• Upper layer is evolved continuously
• No structural changes in the state machine
Common Components
• Common parts are organized in a separate reusable libraries
SIP Originating
Media Player
SIP Terminating
SIP
SIP
SIP

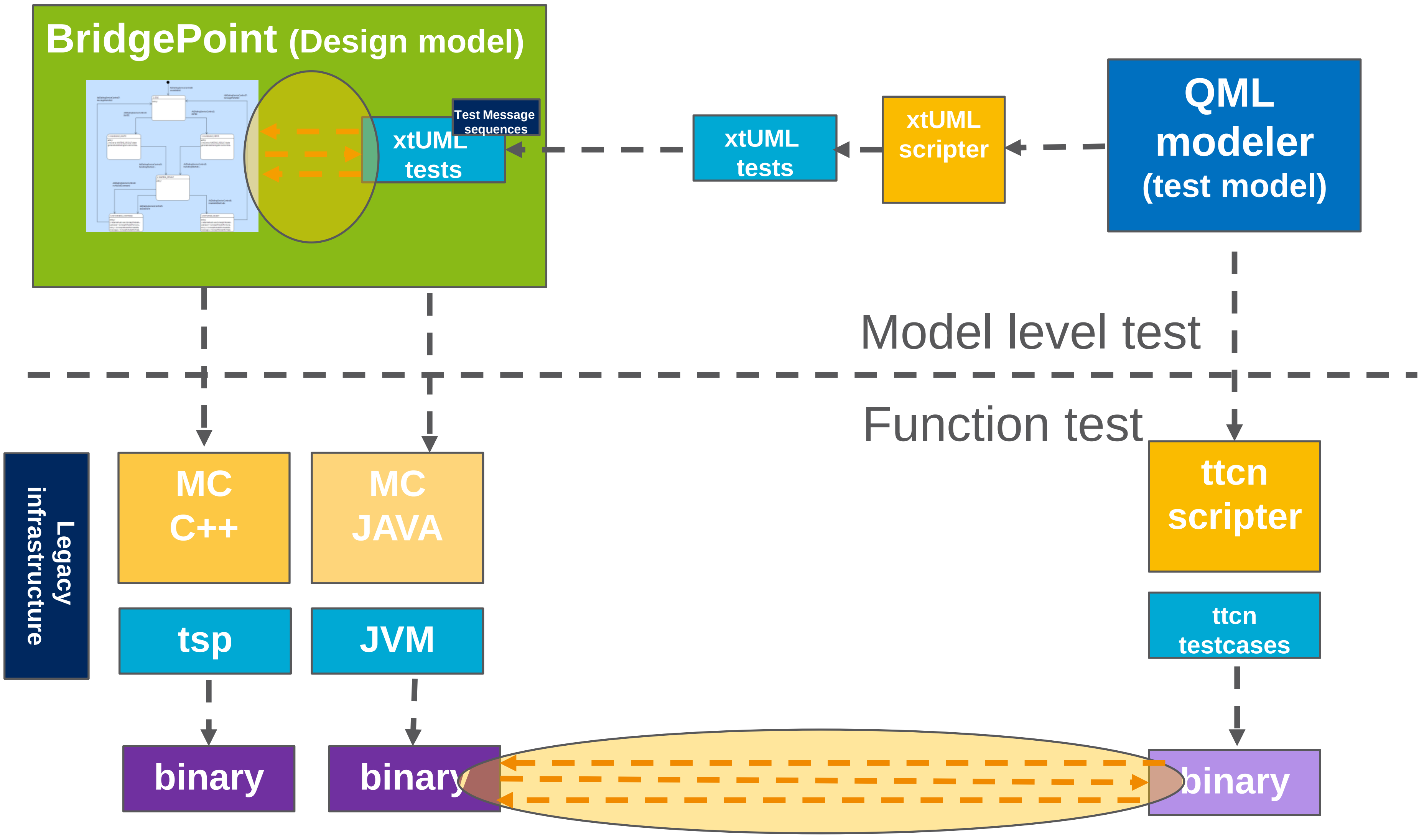
Function Testing with MBT



› Test Model
  – Test goal specific
  – High level
› Test Harnesses
  – Provides adaptation towards the SUT

› Scripters
  – Used to generate the code that realize the tests
  – TTCN-3 scripter, OAL (xtUML) scripter

Tool chain Synergy



Challenges and solutions

- Integration
  - Deciding the model boundary
  - Adaptation to legacy frameworks' APIs
- Version control and collaborative development
  - Model merging problems
    - Graphical conflicts
    - Not resolvable conflicts: e.g. structural changes
  - Solutions
    - Tools for automated merge
    - Work separation

Challenges and solutions

- Resistance at the receiver organization
  - Remain enthusiastic
  - Working examples are the best evidences
  - Be patient, let them do it themselves
  - If one turns, the rest will follow
  - Expect slow start, they have to learn
- Consultancy
  - Orthogonal knowledge areas
  - Tailoring for the different needs
  - Providing guidelines (e.g. Do not touch the generated code)
- Tools are expensive
  - Work separation

benefits

- Modeling
  - Raising the abstraction level
  - Thinking before coding
    - Use-cases -> Test strategy
    - Fixing it on the drawing board or fixing it on-site
  - Early testing
  - Enables automation
- Test driven development
  - Builds confidence
  - Facilitates discussion

ERICSSON