ZSM-3GPP discussions

ZSM011 and ZSM016

Presented by: Magnus Buhrgard and Andrey Silva

03/08/2023

ETSI ZSM workplan on Intents

ETSI GR ZSM 005

Zero-touch network and Service Management (ZSM); Means of Automation

- Intent principles and concepts
- Intent-based service orchestration
- Preliminary discussions in the group

Published May/2020

ETSI GR ZSM 011

Zero-touch network and Service Management (ZSM); Intent-driven autonomous networks

- (Redefined) intent principles and concepts
- Intent lifecycle and operations
- Intent modelling

Published Feb/2023

ETSI GS ZSM 016

Zero Touch Network and Service Management (ZSM); Intent-driven Closed Loops

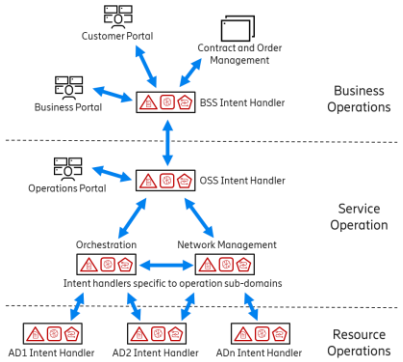
work in progress

- Combination of closed-loop automation and intents
- Focus on (intent-driven) governance and coordination of closed loops

Draft 0.0.3

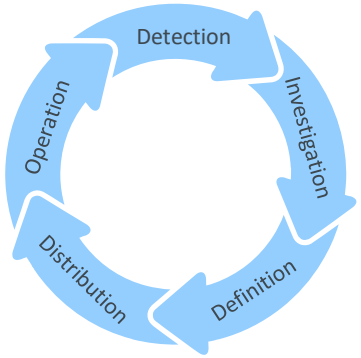
ZSM011 Intent-driven autonomous networks

ZSM011 scope for intent-driven automation



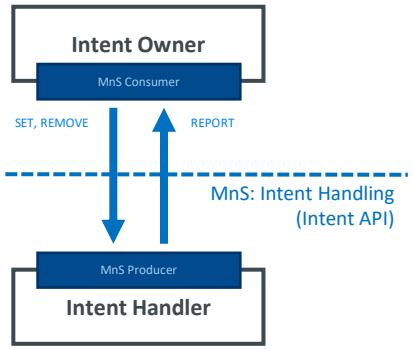
Concepts around intent

- Definition of intent
- Principles of intent
- Use cases



Intent life-cycle

- The role of Intent Management Entity
- Intent owner, intent handler and relation to MnS
- Phases in the life-cycle



Intent interface/API

- Life cycle management of intent objects
- Operations for a domain-agnostic intent API
- Intent negotiation and feasibility
- Trust on intent-driven autonomy

```
@prefix imm:  https://tmforum.org/2020/07/intent/
@prefix tel:  http://sdo1.org/TelecomConcepts/
@prefix met:  http://sdo1.org/metrics/version2/
@prefix sli:  http://sdo2.org/2021/03/SliceIntent/
@prefix slk:  http://sdo2.org/2019/SliceKPI/
@prefix slm:  http://sdo3.org/v1.1/SliceManagment/
@prefix tim:  http://sdo4.org/time/
@prefix geo:  http://sdo4.org/geography/
@prefix cat:  http://operator.com/Catalog/
@prefix ope:  http://operator.com/Inventory/

ope:ExampleIntent2021031100002
   a imm:Intent ;

   imm:hasExpectation
   [ a imm:DeliveryExpectation ;
     imm:target _:function ;
     imm:params [ cat:amf ]
   ] ,
   [ a imm:DeliveryExpectation ;
     imm:target _:slice ;
     imm:params [ cat:SliceTypeA ]
   ] ,
   [ a imm:MinMetricExpectation ;
     imm:target _:function ;
     imm:params [ tel:subscribers 1000 ;
                  met:availablility 99.9 ]
   ] ,
```

Intent Modelling

- Formal definition of intent and reports
- Model federation allowing domain specific extensions by SDOs and vendors

Definition of Intent

"Intent is the formal specification of the expectations, including requirements, goals, and constraints, given to a technical system"

From ETSI ZSM011

(also 3GPP and TM Forum)

- Intent based operation changes the traditional **interaction paradigm**
- **Subsystems no longer expose actions and processes**, but instead accept intents that contains the requirements they must meet in their operations
- The system receiving the intent can **itself choose the actions and processes** that need to be executed
- It requires **formal modelling** and common semantics to be understandable
- It is not only used on the human-machine interface, but also in machine-machine interfaces between sub-systems
- Natural language and other domain-specific languages can be used but it requires context-aware local interpretation and translation into the common intent model.
- The intent has its life cycle actively managed by the intent owner/creator/sender through the intent API

Intent principles

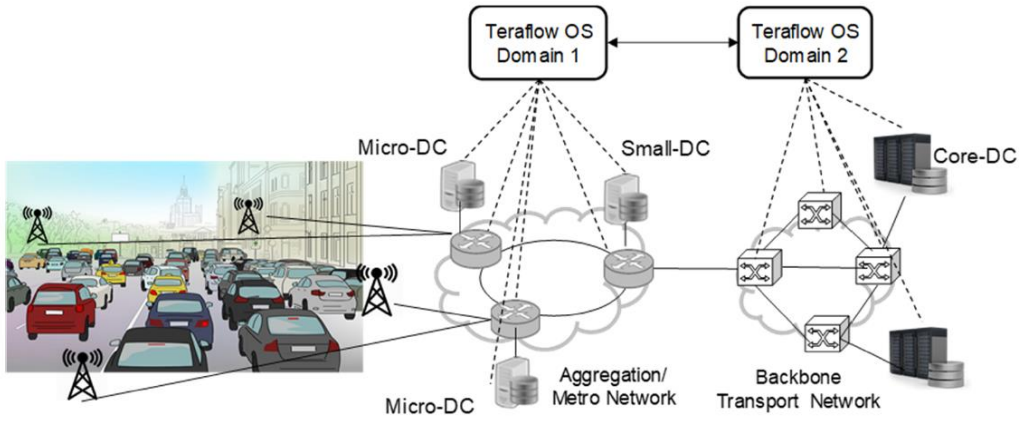
1. Intent establishes machine-processable knowledge
2. Intent is declarative, so it leaves any implementation detail internal to the solution provider
3. Intent is focused on expectations of the results for the consumer
4. Intent is formally expressed so it is machine-processable and readable for human
5. Intent supports complete automation of intent owner-intent handler interactions as well as of intent-defined service delivery

Ensuring trust in intent-driven autonomy

1. Intent handlers offer optional insight to the intent handling process
2. Intent handlers offer optional explicit intent verification

Discussed use cases

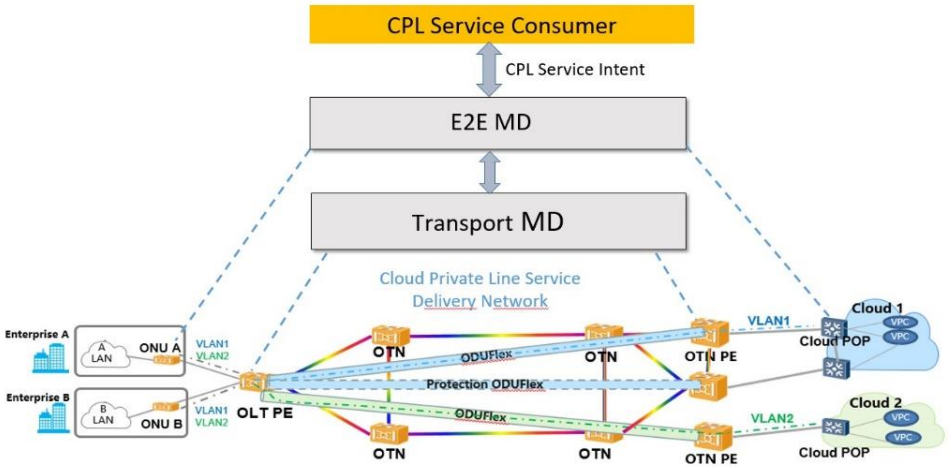
Automotive use case



Parameters (KPIs): resource efficiency, multi-tenancy, latency, positioning, trust, opex, etc.

Intents: RAN, CN, MEC, TN

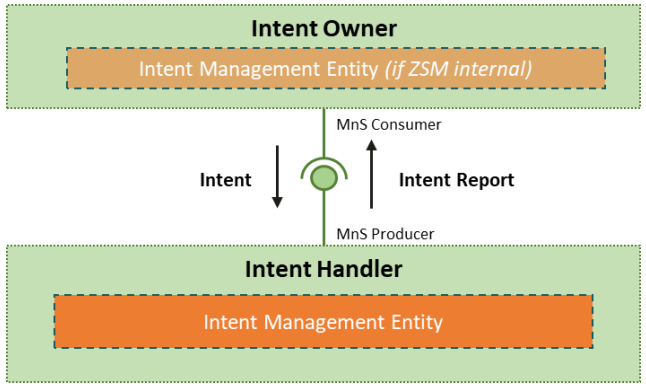
Cloud private line services

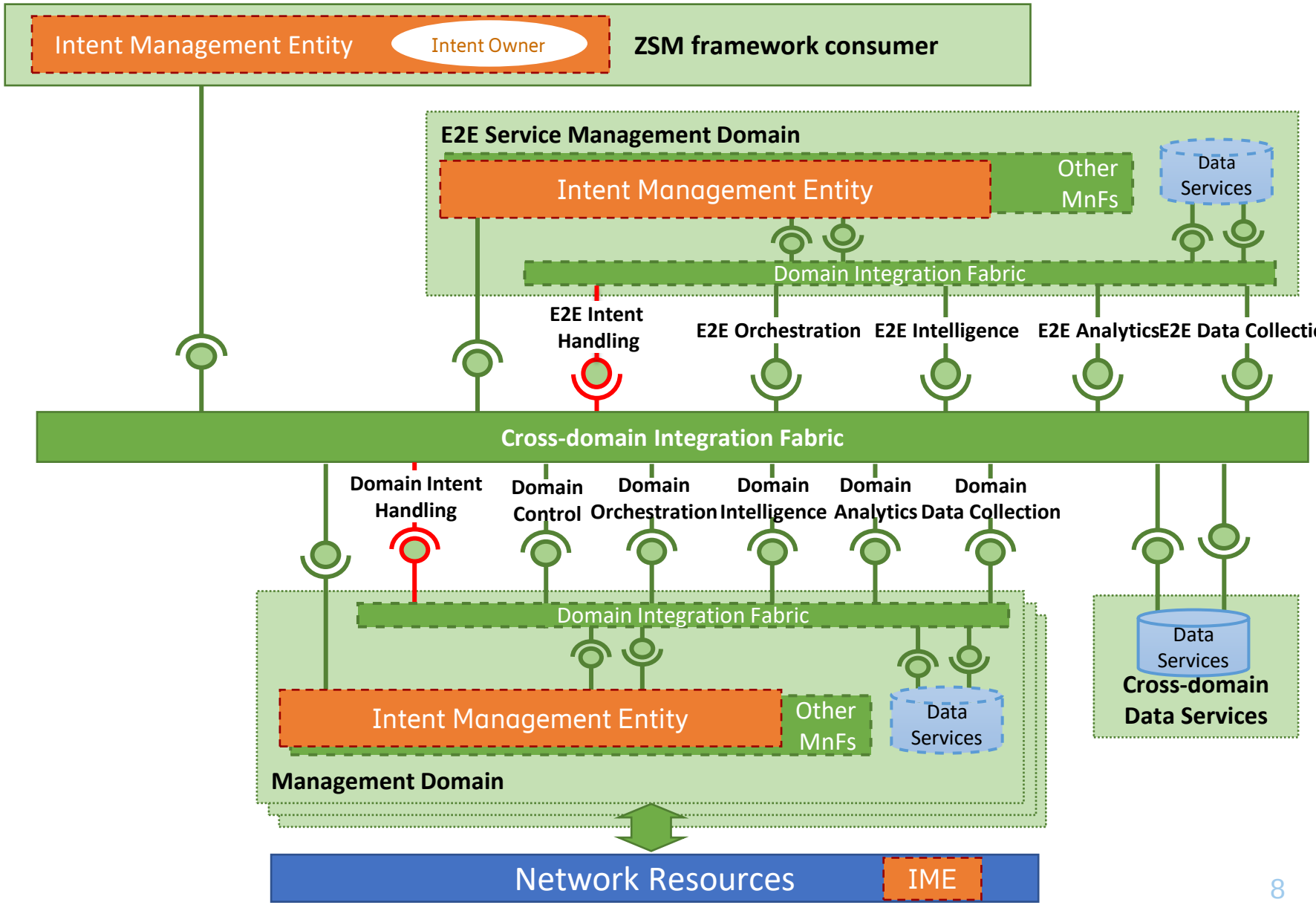


Parameters (KPIs): service end-points, topology type, flow ids, bandwidth, latency, availability, etc.

Intents: TN (multiple)

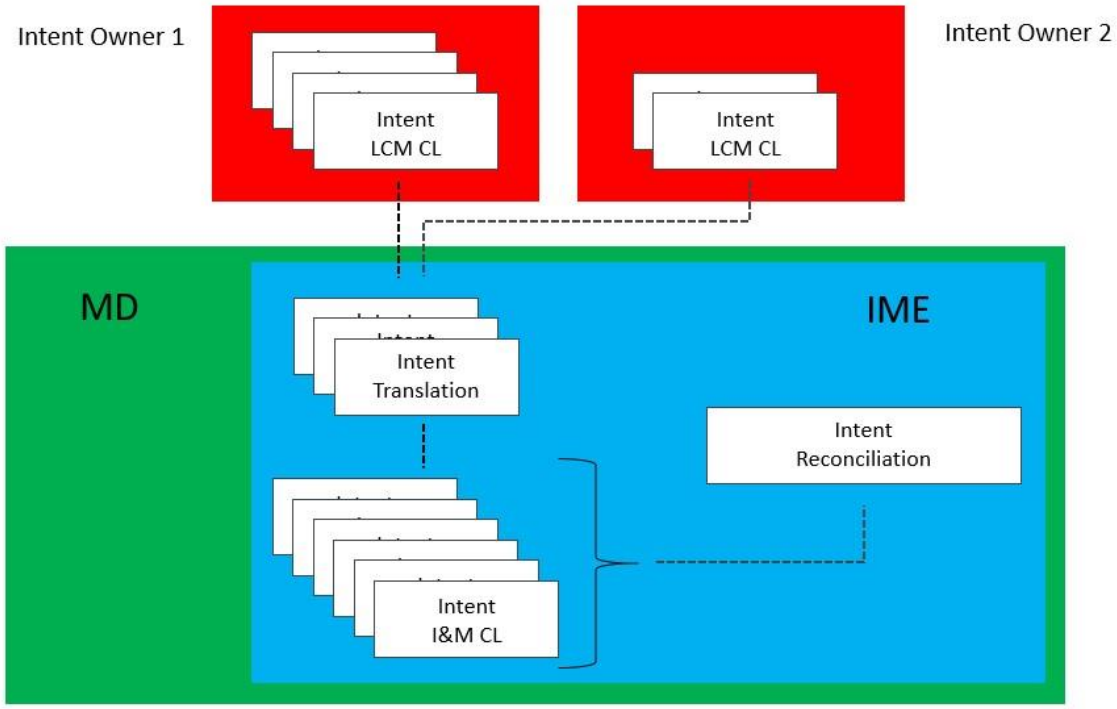
Intent handling in the ZSM framework





Mapping of ZSM closed loop concepts to Intent Management Entity operations

- An intent owner operates its own closed loop for life cycle management of the intent and its related service
- An intent handler operates its own closed loop driving actions to deliver on the intent expectations and reports the result back to the intent owner.



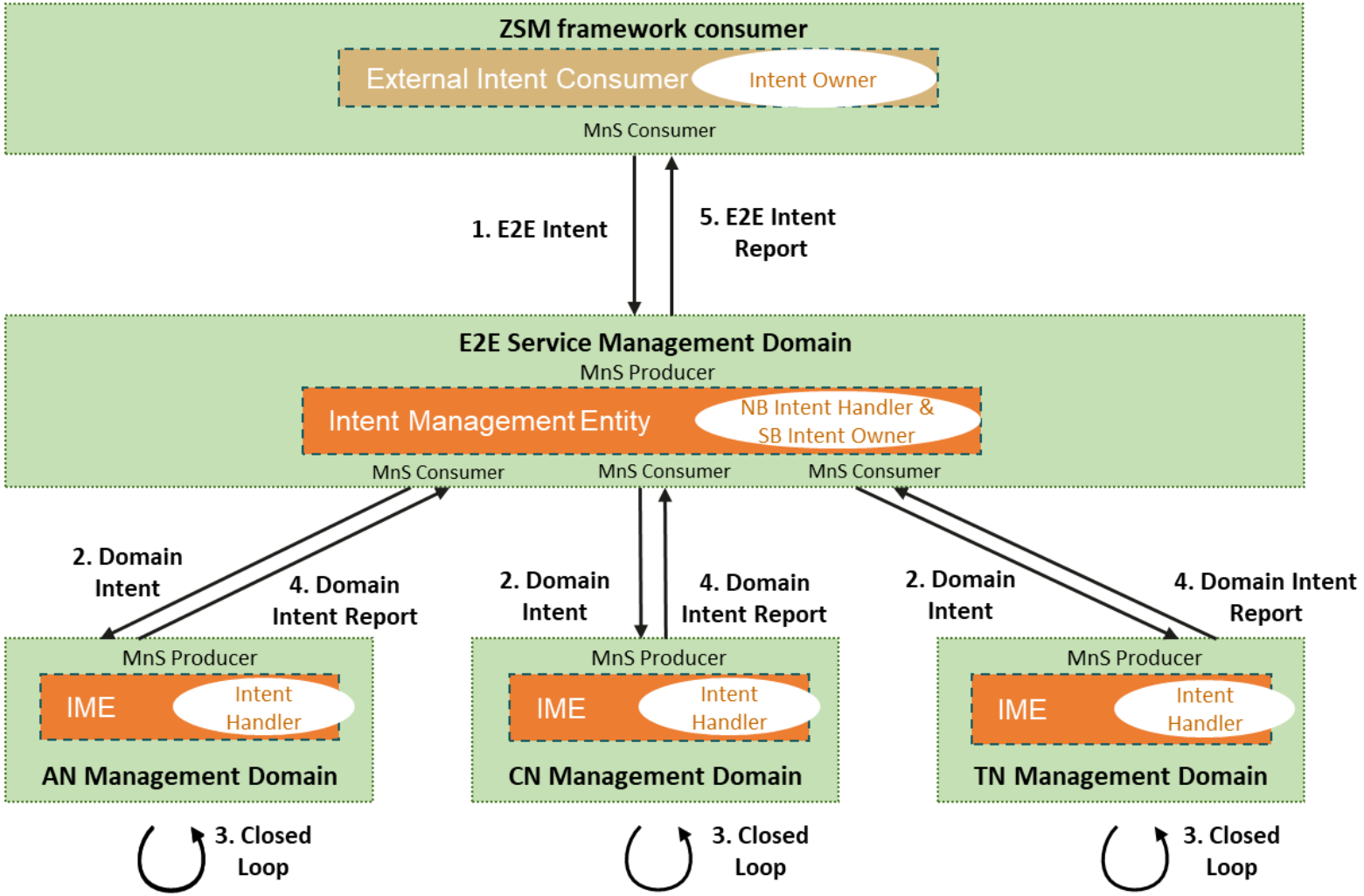
Intent Instantiation & Maintenance Closed Loops (I&M CLs)

Ephemeral managed entities - e.g. made-to-order closed loops per ETSI GS ZSM 009-1 associated on a 1:1 basis with service intents generated by intent owners

Intent Translation Functions (ITFs)

Close information "gaps" between intent owner and handler, such that Intent I&M CLs have targets comprehensible to them, and intent owners receive performance or status feedback in terms comprehensible to them

Intent interactions between different management domains



Intent models studied

Intent meta-model from TM Forum

- Intent common model (common structure and semantics for all intents)
- Intent extension models (domain-specific semantics)
- Based on ontologies
- ZSM could extend the intent models for E2E use cases (define E2E KPIs, metrics, etc.)

Declarative Intent Model

- Intent classes following 3GPP modelling

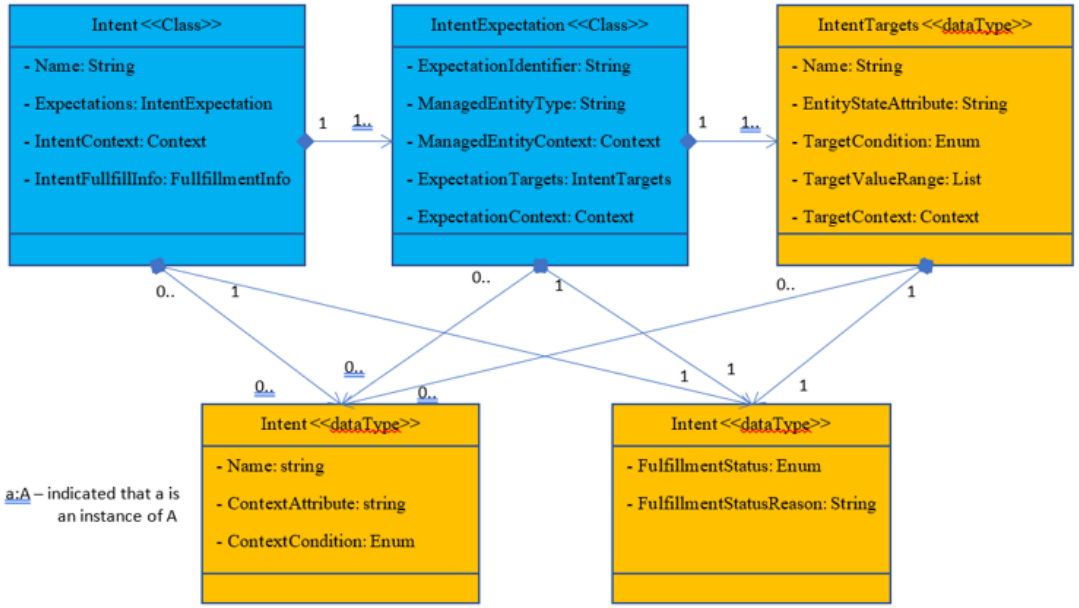
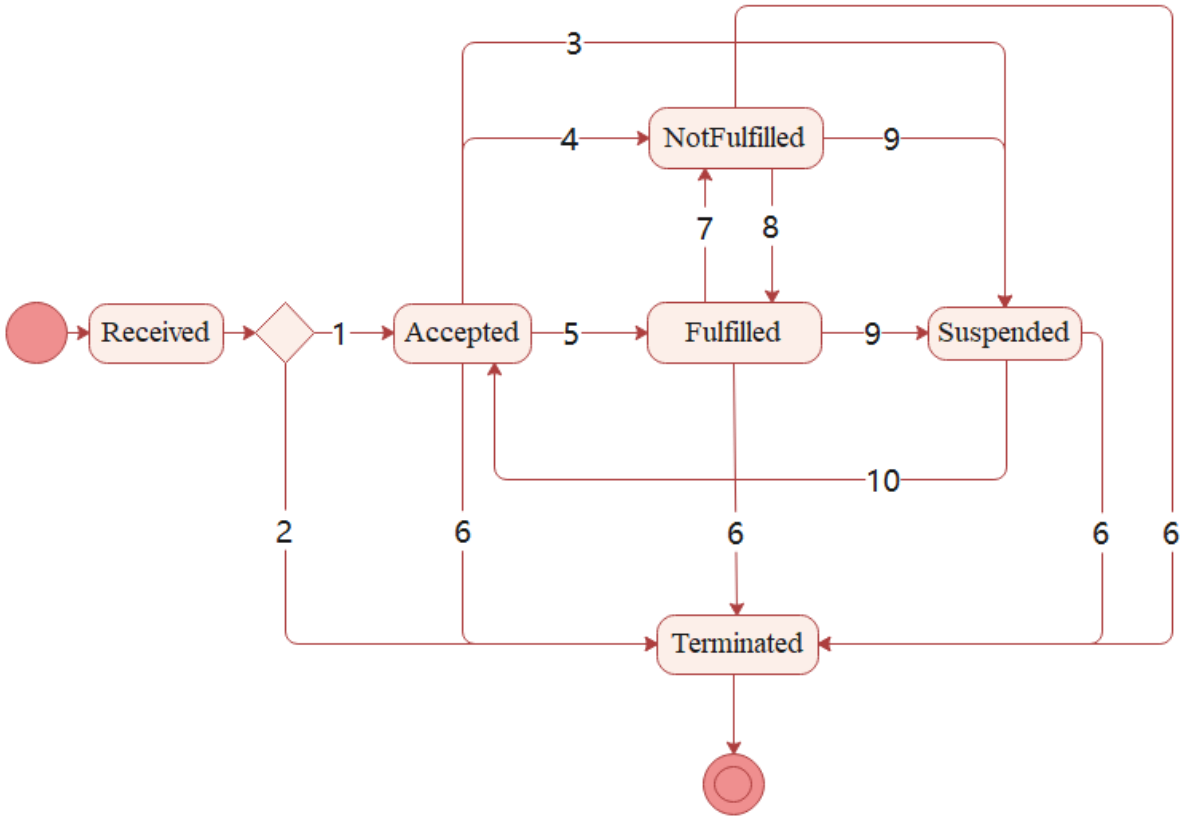


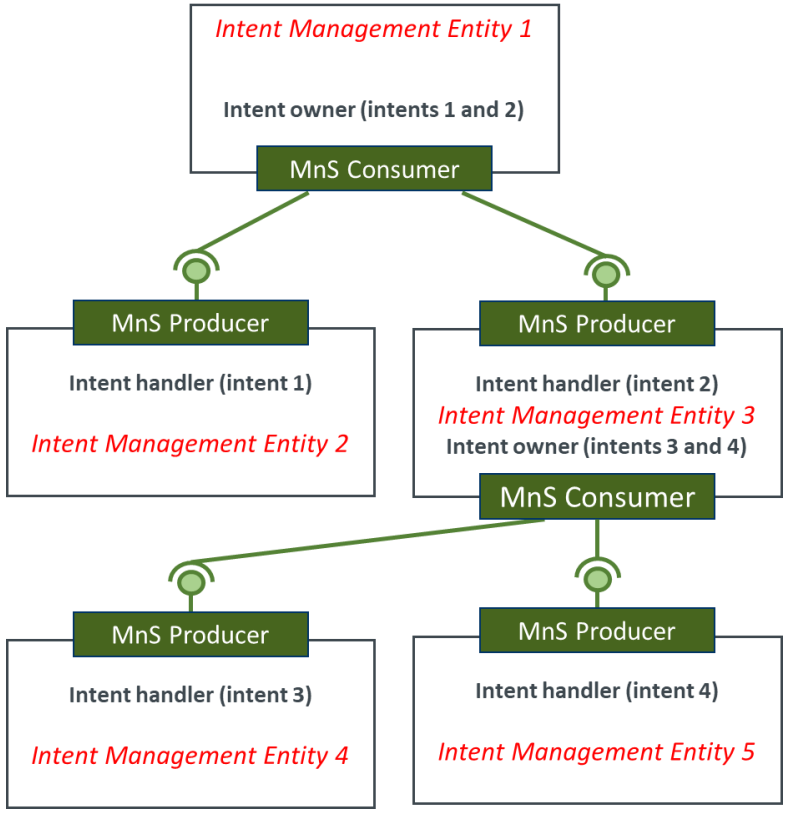
Figure 5.4.4.6-1: Potential information elements of an Intent Information Object

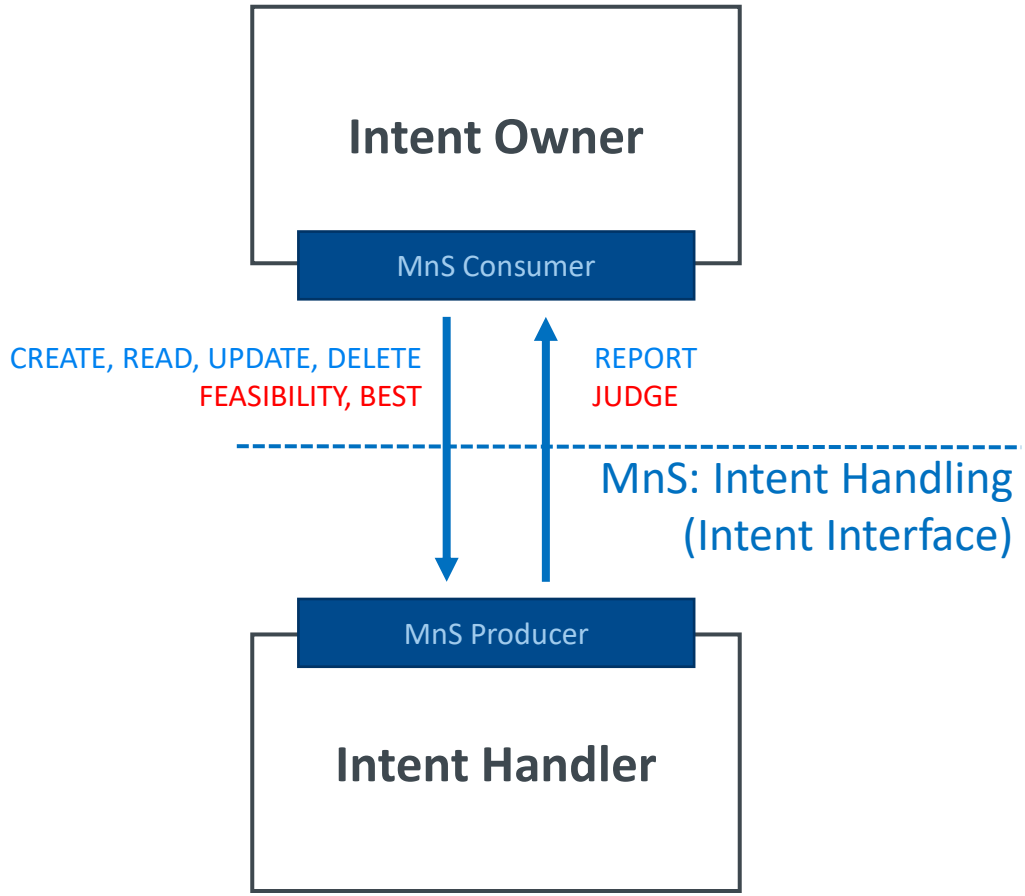
Intent LCM



Legend
1 CheckFeasibility_Valid (Handler)
2 CheckFeasibility_Invalid (Handler) or Removed (Owner)
3 Deactivated (Owner)
4 Operated and NotFulfilled (Handler)
5 Operated and Fulfilled (Handler)
6 Removed (Owner)
7 Degradation (Handler)
8 Fulfillment Successful (Handler)
9 Deactivated (Owner) or Invalid (Handler)
10 Activated(Owner) or Modified(Owner) or Valid(Handler)

Intent Interface





<u>Optional operations to ensure trust:</u>
Activate, deactivate, suspend, resume, logging, notification, testing, verification

Other topics studied

- Intent Management Entity registry
- Handling management conflicts
- Intent - Non-Intent Conflicts
- Intent translation
- Testing intent-based autonomous networks and services

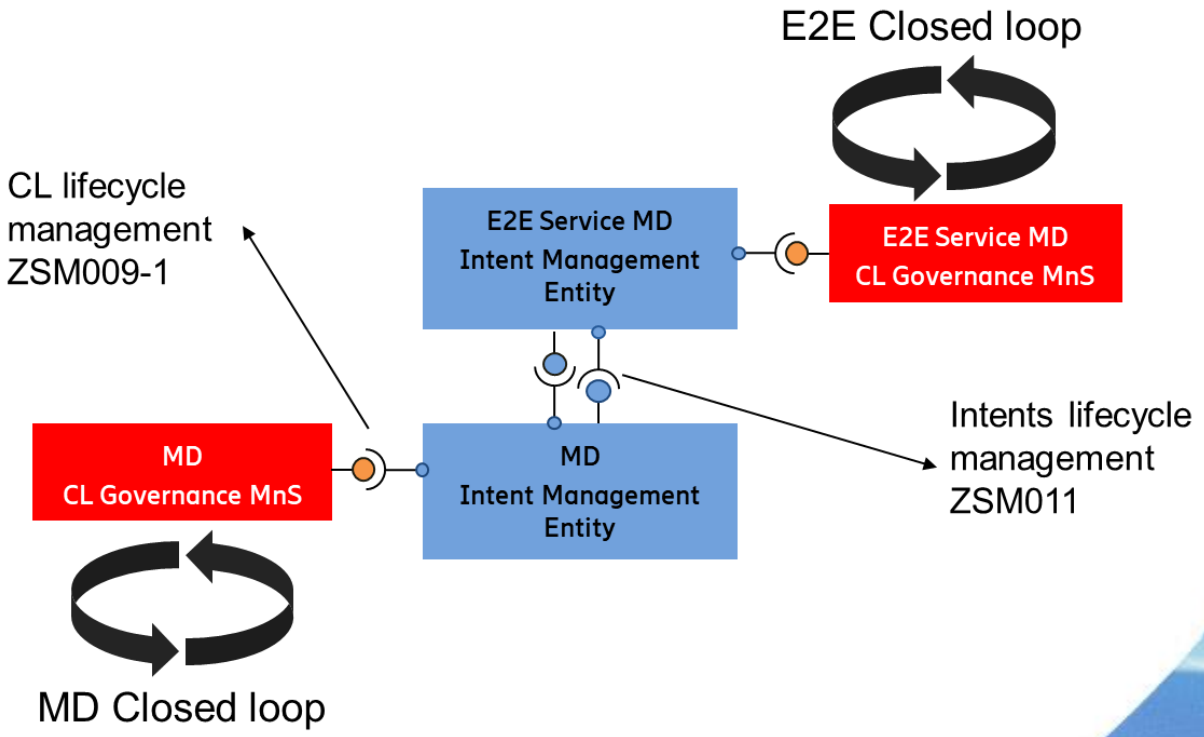
Challenges faced during ZSM011 work

- Different understandings of what intent-driven automation is
- Coexistence between non-intent interfaces and intent-based interfaces in line with the ZSM architecture
- Best intent modelling for the ZSM scope

ZSM016 Intent-driven Closed Loops

ZSM016 scope for intent-driven Closed Loops

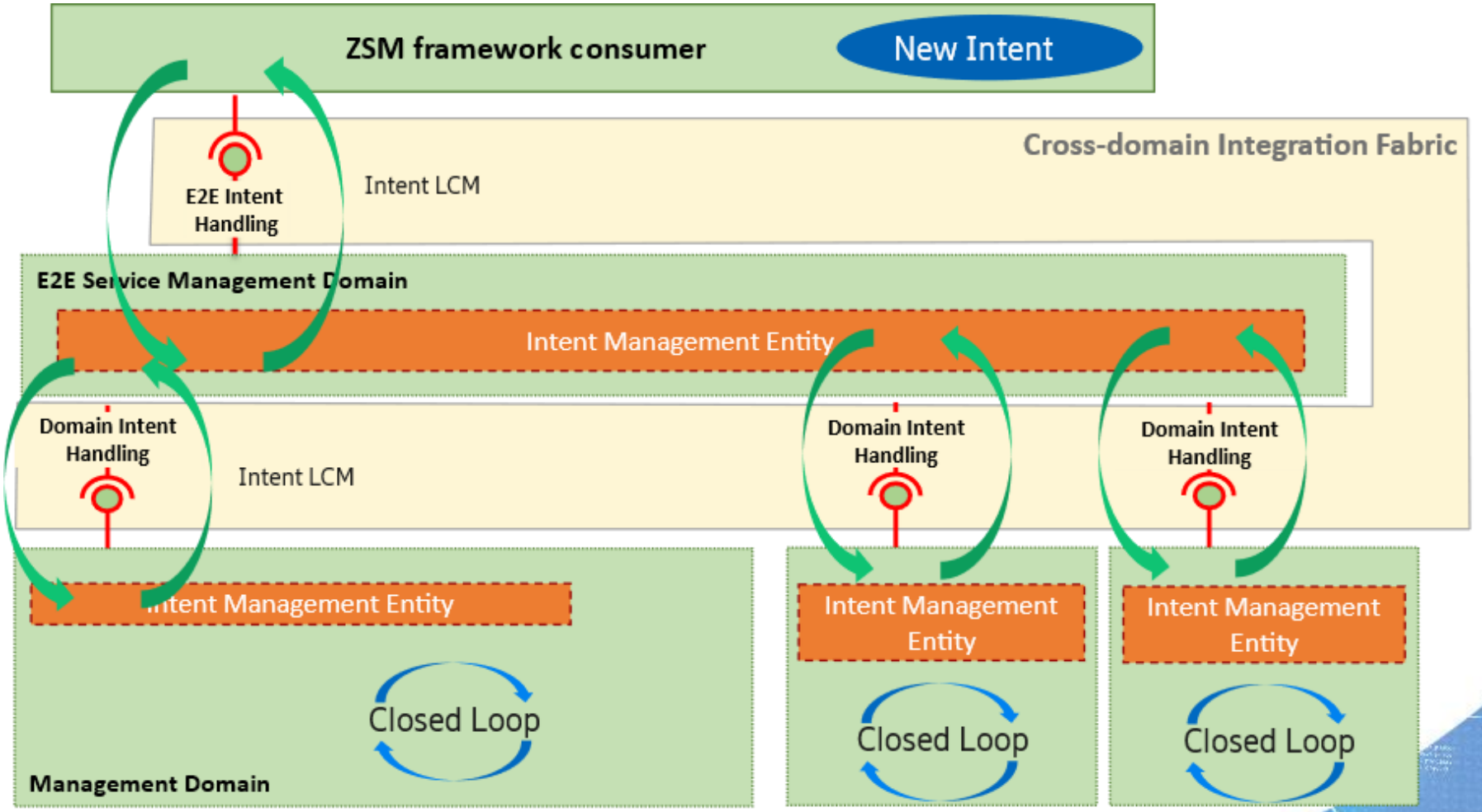
- Combination of closed-loop automation with intents originating from ZSM consumers
  - Intent-driven governance and coordination of closed loops
- Intent operations (Optional + Mandatory)
  - CRUD (Create, Read, Update, Delete)
  - Report, Best, Judge, etc.
- Intent Lifecycle Management (LCM)
- Minimal features/capabilities of IME functionality
- Additional and existing services/capabilities



ZSM016 Work References

- **ZSM**
  - ZSM GS 009-1
  - ZSM GR 009-3
  - ZSM GR 011
  - ZSM GS 002
- **Other SDOs:**
  - TMFORUM
    - IG1253
    - IG1219F
  - 3GPP SA5
    - 3GPP TS 28.536
    - 3GPP TS 28.312
    - 3GPP TR 28.912

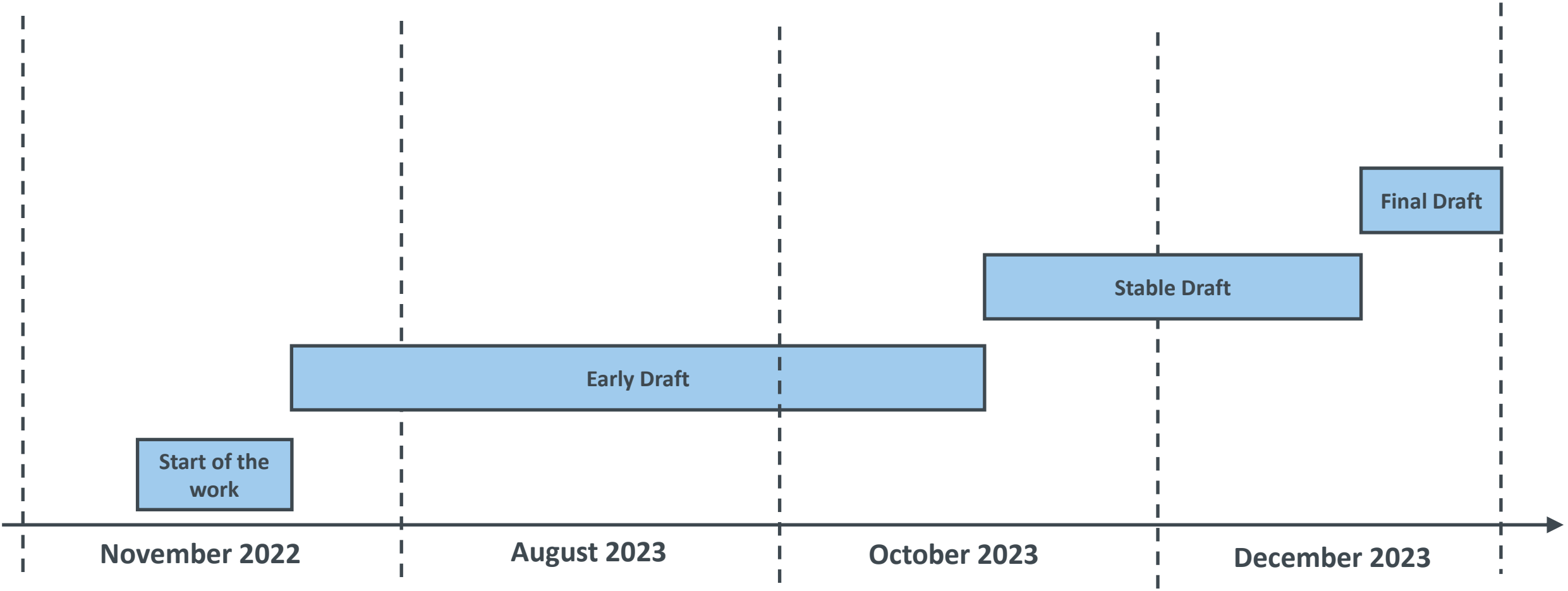
Intent-driven Closed Loops In the ZSM Framework



Challenges faced during ZSM016 work

- Definition of the IME concept
- Alignment of the concept of intent Owner/Handler with intent-driven MnS Producer/Consumer
- Intents being used for different purposes.

Work status and plan



World Class Standards

Thank you!

Time for discussion.

Authors contact

pedro.henrique.gomes@ericsson.com

andrey.silva@ericsson.com

More information on ETSI ZSM

ZSM Technology Page: http://www.etsi.org/zsm

ZSM Wiki: https://zsmwiki.etsi.org/

Published ZSM specs: https://www.etsi.org/committee/1431-zsm

ZSM Open Area (Draft specs): http://docbox.etsi.org/ISG/ZSM/Open

ZSM Portal (members' working area): http://portal.etsi.org/zsm