TM Forum Technical Report

Intent Extension Models

TR291

Maturity Level: **General availability (GA)**	Team Approved Date: 04-Jul-2024
Release Status: Production	Approval Status: TM Forum Approved
Version 3.6.0	IPR Mode: RAND

Notice

of intellectual property rights will at any time be complete, or that any claims in such list are, in fact, Essential Claims.

Direct inquiries to the TM Forum office:

181 New Road, Suite 304
Parsippany, NJ 07054, USA
Tel No. +1 862 227 1648
TM Forum Web Page: www.tmforum.org

Table of Contents

Executive Summary

This document describes a set of proposed intent extension models. They extend the vocabulary and semantics of the intent common model introduced in TR290.

Introduction

Intent and intent report objects are expressed using a federation of the intent common model and a defined set of intent extension and intent information models. The concept of intent modeling through a model federation is introduced in IG1253. The intent common model is the only mandatory model in the federation and introduced in TR290.

This document describes a proposed set of intent extension models. These extensions address various concerns and purposes, such as validity management of intent and expectation, intent probing and request for proposals and feedback, etc. For these concerns the specified intent extension models add optional additional vocabulary and define its semantics and interpretation in intent handling. These models constitute specializations of and extensions of the intent common model presented in TR290. They add to a modular landscape of intent models and allow expanding of the model supported by each distinct intent manager. Intent management functions can optionally implement support for intent extension models and announce their support through the intent manager capability profile.

The intent extension models presented in this document are optional, but still generic in the sense that they address concerns that are not specific to a network domain such as Radio, Transport, Cloud, etc. The models for these domains should be proposed by projects and workgroups specialized in the respective technologies and use cases. But nevertheless, the models here demonstrate how intent extension models can be built as specialization and extension of the intent common model and therefore fit compatibly into the intent model federation.

Revision Information

The Intent extension models in the TR291x series described in this document are part TM Forum Intent Ontology (TIO) v3.6.0.

The revision v3.6.0 of this document replaces v.3.5.0 with the following changes:

- Minor editorial corrections.

1. Principles of intent model extension

Intent extension models can be proposed and published independently by any project and organization. Every intent extension model is however an extension of a version of the intent common model defined by TM Forum in TR290.

An intent extension model is optional in the sense that an intent management function is not required by default to support and implement the model. As intent extension models typically contain expressiveness specific to a management or application domain these models can still be considered mandatory for intent managers implemented for that domain.

1.1. Typical extension artifacts

Extending the intent model means introducing new vocabulary to be used for the expression of intent and defining its semantics. The following tasks would be typical when creating intent extension models:

- New subclasses of expectation
- New parameters with typical properties
- New properties to be used in parameters as atomic compliance details
- New properties that qualify as compliance details
- New properties introduce additional compliance qualifiers
- New Context classes
- New Information classes
- New properties of existing information classes. For example, extension intent management information
- New metrics classes as objects in icm:metric statements
- New degradation reasons imo
- New rejection reasons imo

The proposed intent modelling does not recognize different types of intent as part of the formal model. For this reason, intent extension models shall not introduce new and domain specific subclasses of the class intent.

Expectations represent different types of requirements. If there are domain specific requirements that constitute a different type of requirement, the use of a new subclass of intent is encouraged.

The intent common model has a particular focus on the evaluation logic of requirement conditions and their logical combination. It is highly recommended that intent extension models introduce their contributions according to these principles. This means, they would introduce properties of expectations and parameters as compliance details and compliance qualifiers and define their effect on compliance evaluation.

2. Intent extension models in the TM Forum Intent Ontology

This chapter provides a brief overview and introduction to the intent extension models defined in the TR291x series within the TM Forum Intent Ontology (TIO).

2.1. TR291A Intent validity

This model allows attaching validity context to intent objects and intent elements. The validity context specifies a condition. If and while the condition evaluates to true, the respective intent or intent element is valid and needs to be considered in operation. For example, an intent handler is supposed to comply to the requirements expressed by a valid intent requirement. Conditions can be based on any observable property. They can also be time based to express time schedules in which requirements need to be met or not. If and while the validity condition indicate "false", the respective intent element is not supposed to be considered. For example, the respective requirement does not need to be met without the intent being considered degraded.

2.2. TR291B Intent Probing

Intent probing refers to exploring the possible results of operating according to the intent requirements. An intent handler would simulate or predict the outcomes, but is not required to actually fulfill the requirements and use resources to do so. The intent handler would however follow the reporting expectations and generate reports like it would do when operating the same intent. Intent probing in its basic form is therefore mostly a simulated dry run of intent based operation. An intent owner can use intent probing for exploration and testing of intent before issuing it for operation. This intent extension model introduces a property of intent reports that clearly distinguishes reports containing the results of actual operation from probed simulated operation.

2.3. TR291C Proposal of Best Intent

This model describes how intent owners can request proposals from an intent handler. It introduces a dedicated reporting expectation that determines when to send a proposal and what to make a proposal about. This typically request a proposal for a requirement or set of requirements present in the intent. The intent handler would assess if it has solutions available that could successfully meet a more challenging version of this requirement while still meeting all other requirements. This extreme edge case is the best proposal sent to the intent owner in an intent report. The intent owner can use this request to explore edge case for deciding what it is actually requiring. Note that the intent owner might not want to always ask for the most extreme requirement, because this typically requires a solution that is most resource consuming and costly. However, the best proposal request helps to explore the options.

2.4. TR291D Intent Acceptance Control (not yet in TIO v3 series)

Intent handlers can reject an intent or an intent update. This intent acceptance control model allows the intent owner to define how much time the handler has to make this decision. Furthermore, this model allows owner to override rejections and therefore enforce acceptance.

Intent Acceptance Control was introduced in previous versions of the TIO and is not yet ported into TIO version v3. It will be replaced by and integrated into a planned more comprehensive model for coordination between intent managers.

2.5. TR291E Intent Compliance Latency (not yet in TIO v3 series)

Intent managers take actions for transitioning the system into a compliant state. The Intent Compliance Latency model allows an intent owner to define how urgent compliance to the intent is. It expresses this with the definition of time budgets until compliance should be reached by handler actions.

Intent Compliance Latency introduced in previous versions of the TIO and is not yet ported into TIO version v3. It will be replaced by and integrated into a planned more comprehensive model for coordination between intent managers.

2.6. TR291F Intent Family Relation (depricated)

A single intent is usually part of a group of intents that together are used within the autonomous network to address a concern. There are for example parent intents, child intents and sibling intents. This model provides the vocabulary to provide this information within the intent allowing the intent handler to better understand its environment.

This model is not supported anymore in TIO v3 and onwards. Its use cases will be considered by planned new work on coordination between intent managers. The document number TR291E might be re-used for other use cases and models in the future.

2.7. TR291G Preference of Handling Outcomes

Intent handlers might find themselves in a situation where multiple possible solutions would be able to satisfy all requirements. However, some available solutions might deliver better results on subsets of the requirements, while other available solutions might emphasize another set of requirements. The Preference of handling outcomes allow an intent handler to seek decision support from the intent owner. The described communication involves sending a set of intent reports to the intent owner. Each intent reports in the set represents the expected results for a solution included in this assessment. The intent owner can specify its preferences regarding the presented outcomes.

This model re-uses the TR291G document number. It was assigned to a model regarding conditional validity in older versions of the TIO. This older model is not needed in TIO v3 anymore, because TR291A Intent Validity covers all use cases.

2.8. TR291H Intent Guarantee

A guarantee requested by the intent owner and confirmed by the intent handler means that the intent handler is highly confident that it can comply to certain requirements and also keep the operated system compliant. The model allows to request and provide the confidence level by means of a probability of compliance. Furthermore, the model allows defining a timeframe in which the provided guarantee must hold, and it allows renewing the guarantee regularly.

2.9. TR291I Utility

Utility is an expression of business value. It uses a mathematical function to describe the quantitative relationship between an observed state with a business value score, aka. Utility. These utility functions are specializations of the Information class of the intent common model.

Appendix A discusses further models and their potential purpose without presenting a detailed proposal. A full proposal for these model ideas could be added in future revisions of the document.

3. References

[1] W3C Resource Description Framework Version 1.1: https://www.w3.org/TR/rdf11-concepts/

[2] W3C RDF Schema 1.1: https://www.w3.org/TR/2014/REC-rdf-schema-20140225/

[3] W3C Time ontology in Owl: https://www.w3.org/TR/owl-time/

4. Administrative Appendix

4.1. Document History

4.1.1. Version History

Version Number	Date Modified	Modified by:	Description of changes
1.0.0	31-Mar-2022	Alan Pope	Final edits prior to publication
1.1.0	01-Jun-2022	Alan Pope	Final edits prior to publication
3.4.0	29-Feb-2024	Alan Pope	Final edits prior to publication
3.5.0	03-May-2024	Alan Pope	Final edits prior to publication
3.6.0	04-Jul-2024	Alan Pope	Final edits prior to publication

4.1.2. Release History

Release Status	Date Modified	Modified by:	Description of changes
Pre-production	31-Mar-2022	Alan Pope	Initial Release
Pre-production	02-May-2022	Adrienne Walcott	Updated to reflect TM Forum Member Evaluated status
Pre-production	01-Jun-2022	Alan Pope	Updated to v1.1.0
Pre-production	04-Jul-2022	Adrienne Walcott	Updated to reflect TM Forum Member Evaluated status
Pre-production	29-Feb-2024	Alan Pope	Updated to version 3.4.0
Production	26-Apr-2024	Adrienne Walcott	Updated to reflect TM Forum Approved status
Pre-production	03-May-2024	Alan Pope	Updated to version 3.5.0
Production	28-Jun-2024	Adrienne Walcott	Updated to reflect TM Forum Approved status
Pre-production	04-Jul-2024	Alan Pope	Updated to version 3.6.0
Production	30-Aug-2024	Adrienne Walcott	Updated to reflect TM Forum Approved status

4.2. Acknowledgments

Team Member (@mention)	Company	Role*
Jörg Niemöller	Ericsson	Author, Project Co-Chair
Kevin McDonnell	Huawei	Project Co-Chair

Team Member (@mention)	Company	Role*
Yuval Stein	Amdocs	Project Co-Chair
Kamal Maghsoudlou	Ericsson	Key Contributor
Leonid Mokrushin	Ericsson	Key Contributor
Marin Orlić	Ercisson	Key Contributor
Aaron Boasman-Patel	TM Forum	Additional Input
Alan Pope	TM Forum	Additional Input
Dave Milham	TM Forum	Additional Input
Xiao Hongmei	Inspur	Reviewer

**Select from: Project Chair, Project Co-Chair, Author, Editor, Key Contributor, Additional Input, Reviewer*