

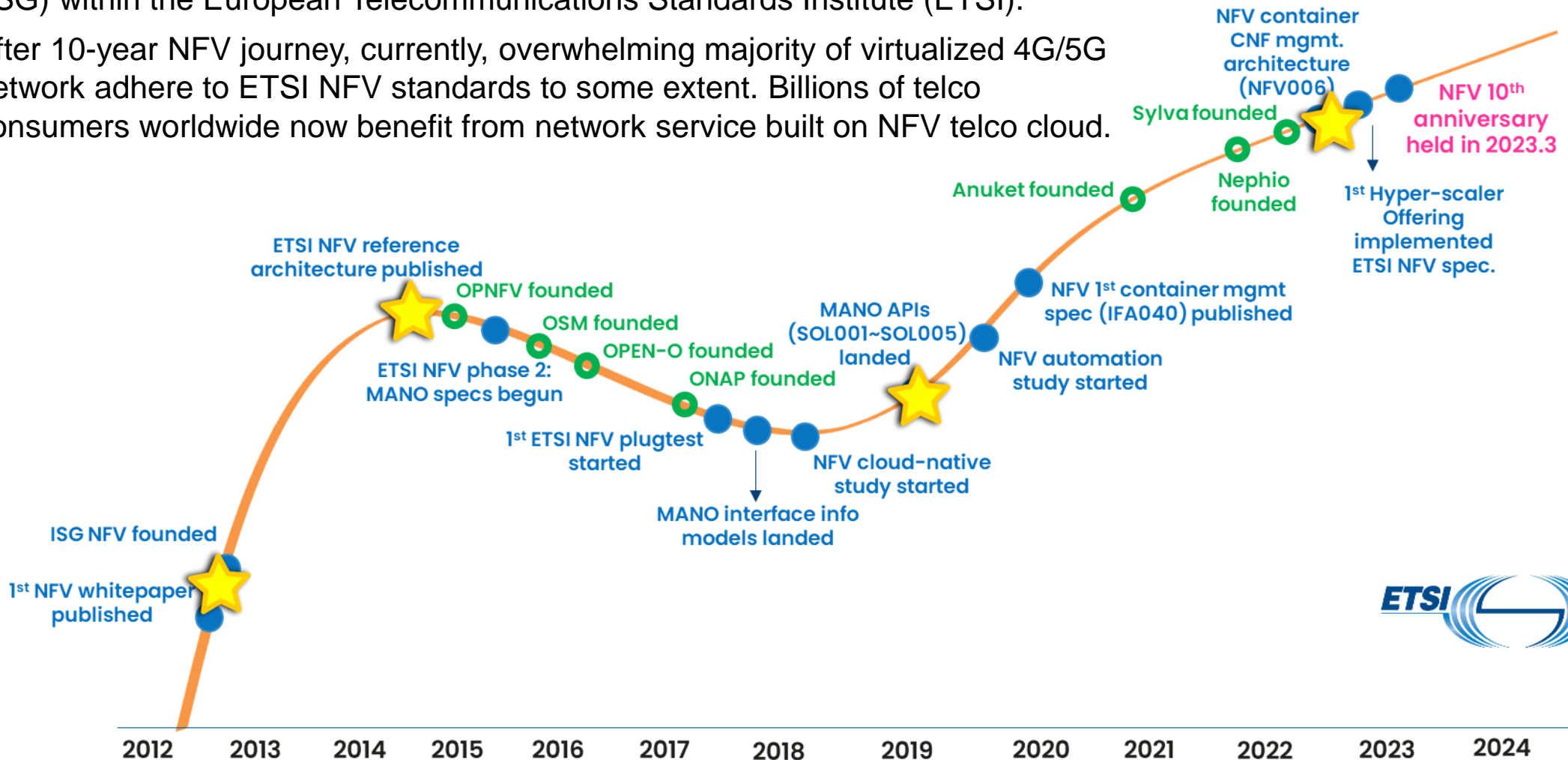


Intent Model in ETSI NFV



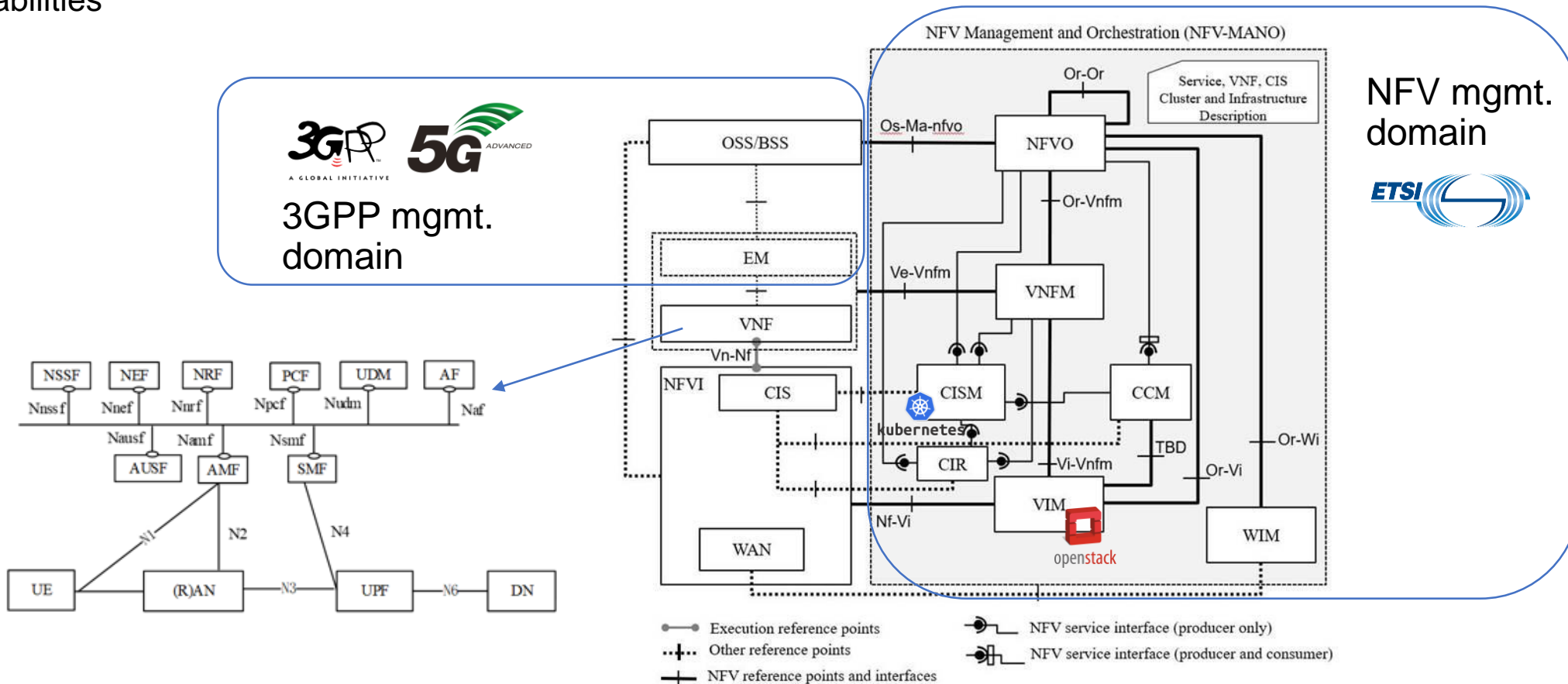
About ETSI NFV

- In October 2012, Network Functions Virtualization (NFV) white paper published with the call for action led to the creation of the NFV Industry Specification Group (ISG) within the European Telecommunications Standards Institute (ETSI).
- After 10-year NFV journey, currently, overwhelming majority of virtualized 4G/5G network adhere to ETSI NFV standards to some extent. Billions of telco consumers worldwide now benefit from network service built on NFV telco cloud.



NFV-MANO Architecture

- NFV MANO (network functions virtualization management and orchestration) is an architectural framework for managing and orchestrating VNFs and CNFs based on virtualized resources for telco cloud, which enables mobile operators to build their virtualized 5G network offering fine-grained on-demand network capabilities

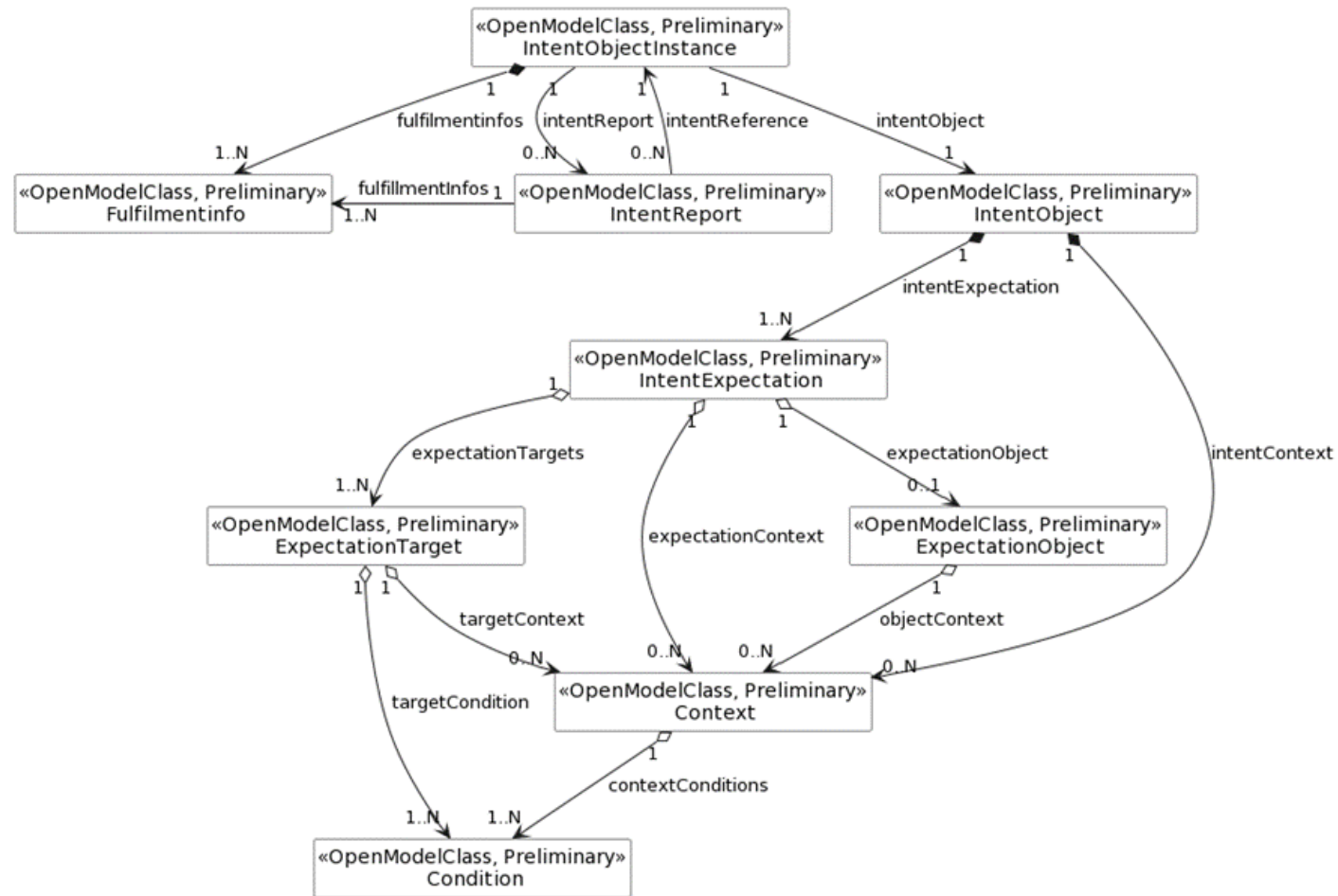


Intent for mobile network: an example

Build a 5G UPF for serving another 5,000 VR devices dedicatedly with the virtualized resources in DC site @ Budapest.

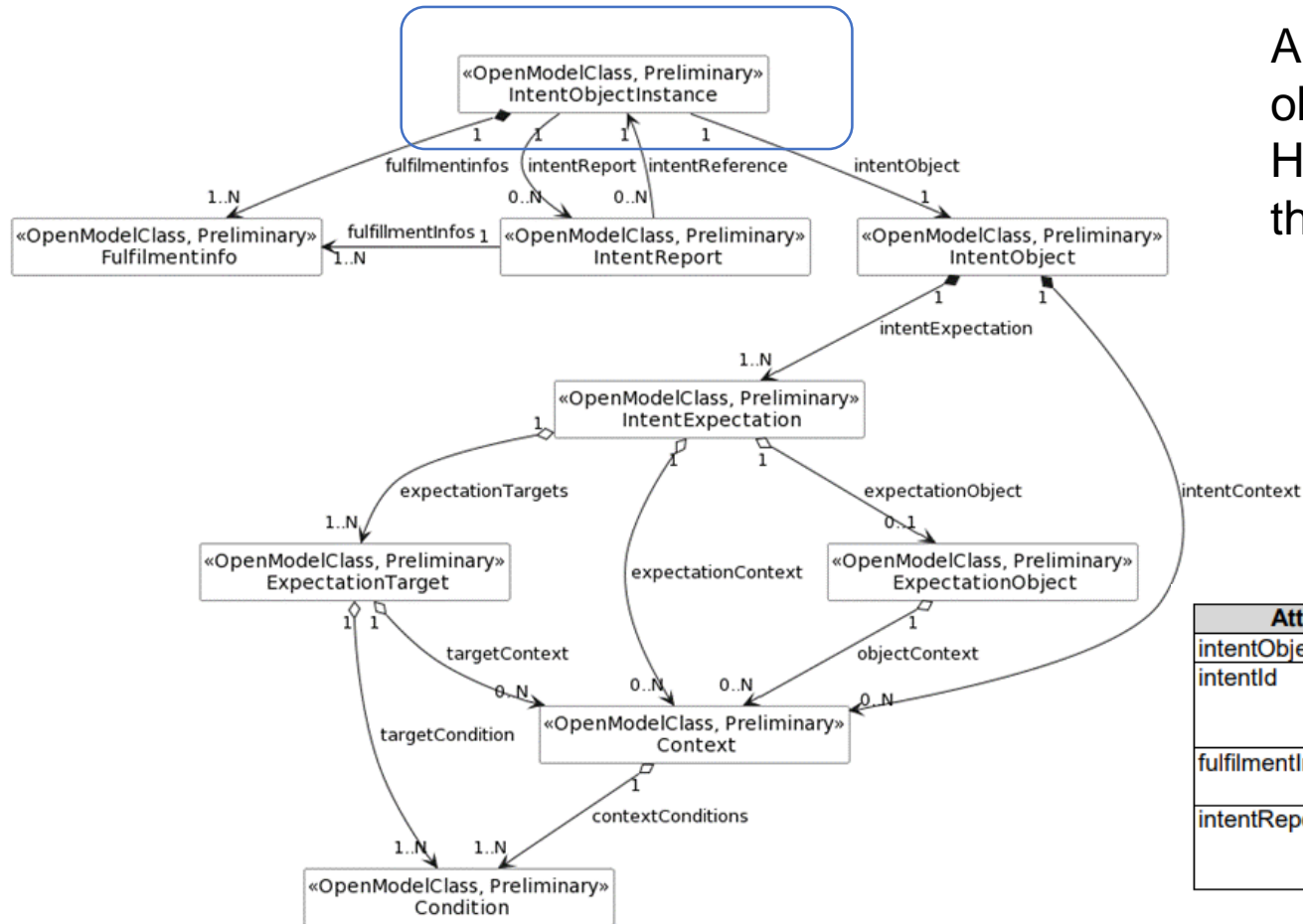


Intent Model in ETSI NFV



Intent Information Modeling Diagram related to intent management for NFV

Intent Model in ETSI NFV



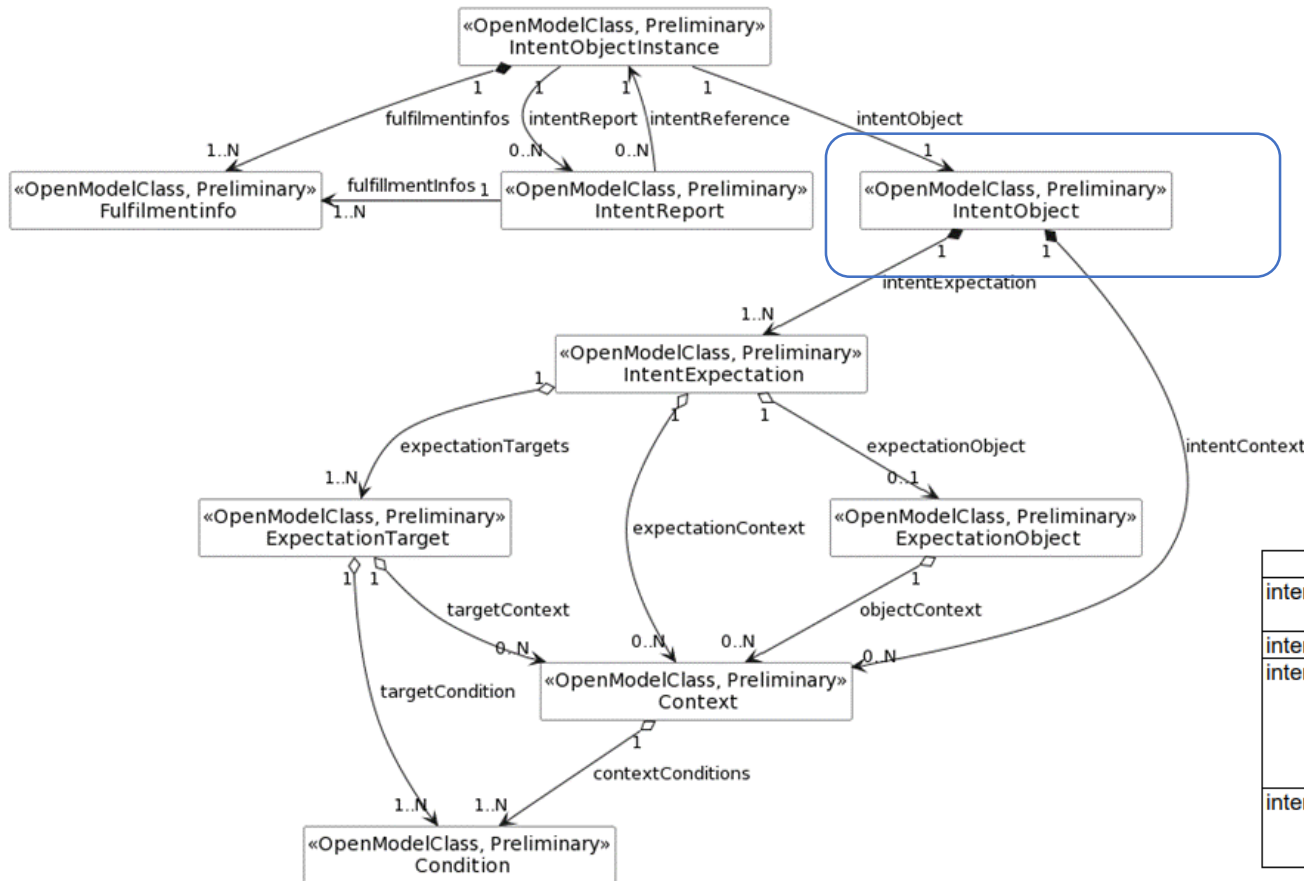
An IntentObjectInstance describes the managed object instance which is instantiated at the Intent Handler based on the intentObject received from the Intent Owner.

Attributes of the IntentObjectInstance information element

Attribute	Qualifier	Cardinality	Content	Description
intentObjectInstanceId	M	1	Identifier	The identifier of the intentObjectInstance.
intentId	M	1	Identifier (Reference to IntentObject)	It references the corresponding intentObject, by its unique identifier as assigned by the Intent Owner.
fulfillmentInfos	M	1..N	FulfillmentInfo	Fulfillmentinfos of intent, intentExpectations, expectationTargets or conditions.
intentReports	M	0..N	Identifier (Reference to IntentReport)	It identifies a series of intent reports generated based on this intentObjectInstance.

Intent Information Modeling Diagram related to intent management for NFV

Intent Model in ETSI NFV



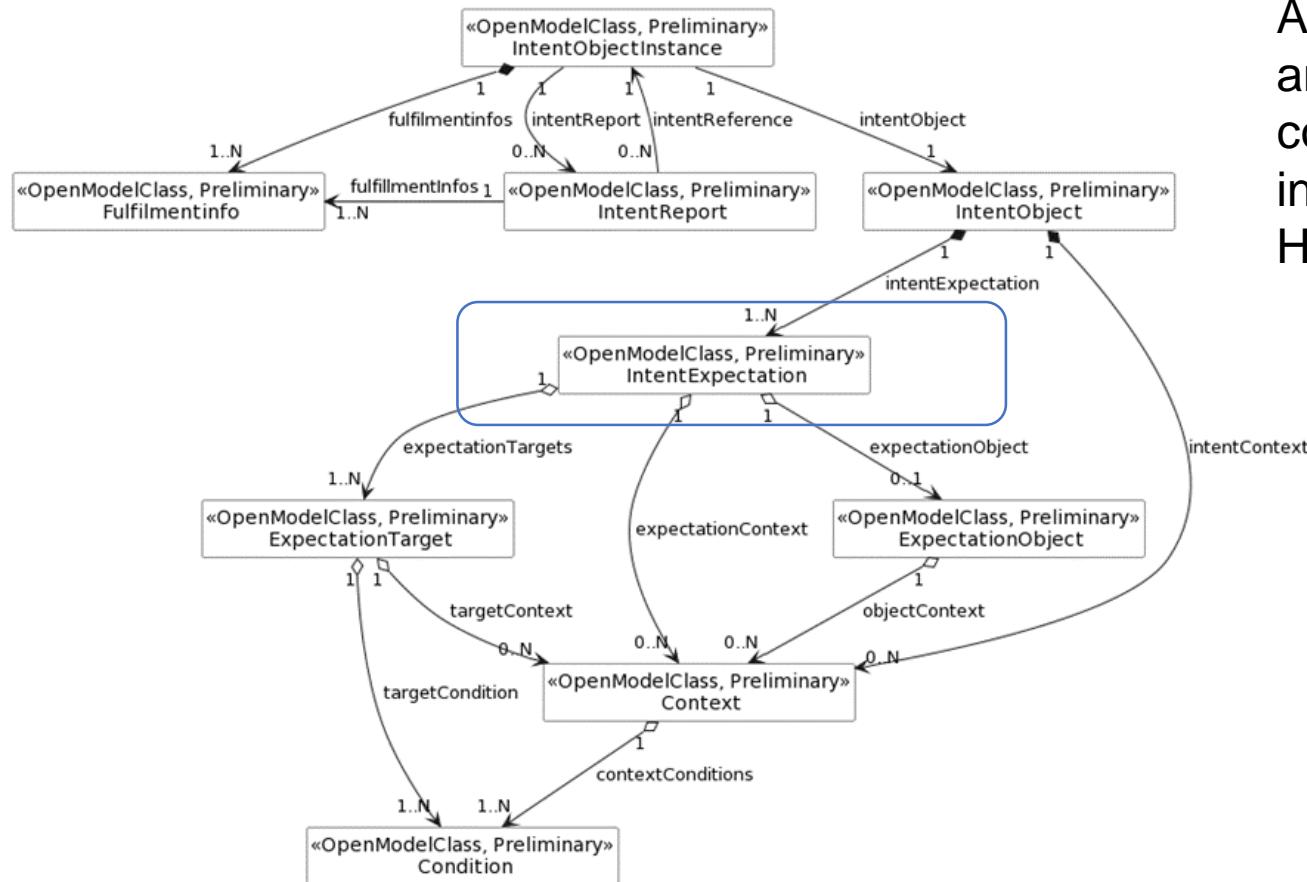
An IntentObject presents the properties of the management object whose information is capable to capture the requirements and context of the intent object.

Attributes of the IntentObject information element

Attribute	Qualifier	Cardinality	Content	Description
intentId	M	1	Identifier	Unique identifier of this intent object. Assigned by the Intent Owner.
intentName	M	1	string	Name of the intent.
intentExpectations	M	1..N	IntentExpectation	It describes the expectations including requirements, goals and contexts (including constraints and filter information for each expectation) given to the Intent Handler. It states the list of specific outcomes desired to be realized for expectation object(s).
intentContexts	M	0..N	Context	It describes the constraints and conditions that should apply for the entire intent (i.e. all the intentExpectations).

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Intent Information Modeling Diagram related to intent management for NFV

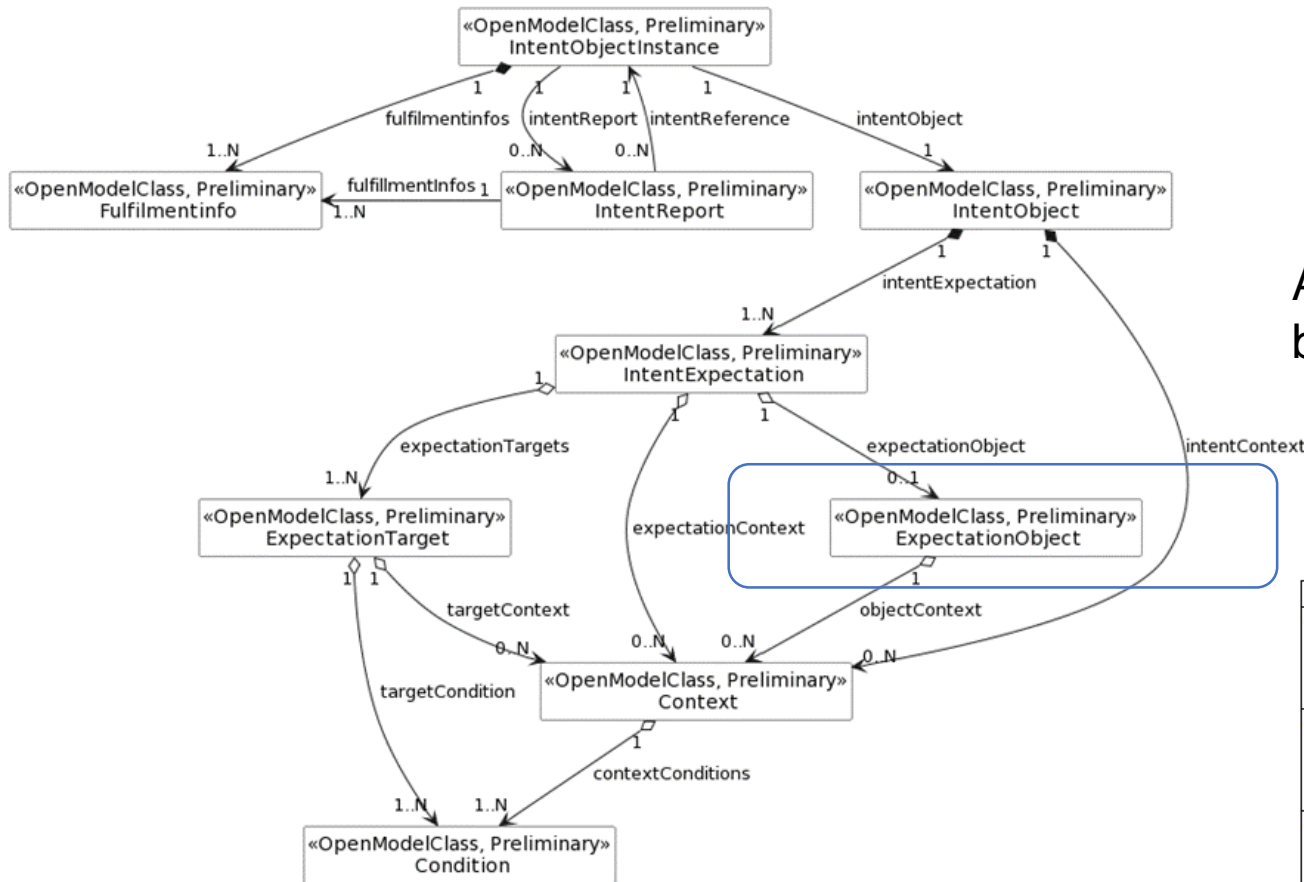
An IntentExpectation describes the expectation of an intent including requirements, goals and contexts (including constraints and filter information for the expectation) given to the Intent Handler.

Attributes of the IntentExpectation information element

Attribute	Qualifier	Cardinality	Content	Description
expectationId	M	1	Identifier	Identifier of this IntentExpectation information element.
expectationName	M	1	string	Human readable name of this IntentExpectation.
expectationType	M	1	Not specified	It describes the type of the intentExpectation. For example, the possible types are: <ul style="list-style-type: none"> • Delivery Expectation type. • Ensure Expectation type. • Property Expectation type. • Report Expectation type.
expectationObject	M	0..1	ExpectationObject	It describes the objects managed by NFV-MANO that subject to the IntentExpectation.
expectationTargets	M	1..N	ExpectationTarget	It specifies the targets for each of the expectation type defined in the Intent so for the system to achieve the desired or wanted state from its present state. E.g. a system expected to reach a goal based on a metrics with a target value or for a system to reach a target configuration, etc.
expectationContexts	M	0..N	Context	It describes the constraints and conditions that apply for a specific intentExpectation.

NOTE: When an intentObject contains multiple intentExpectations, the intentContexts at the intent level takes effect on the entire intentObject, and the expectationContexts at the IntentExpectation level takes effect on only one expectation. It is the Intent Owner's responsibility to avoid conflict between intentContexts and expectationContexts before issuing the corresponding intent management request.

Intent Model in ETSI NFV



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An ExpectationObject describes the objects managed by NFV-MANO that are subject to the IntentExpectation.

Attributes of the ExpectationObject information element

Attribute	Qualifier	Cardinality	Content	Description
objectType	M	0..1	String	It describes the type of object of the IntentExpectation that are expected to be applied on. It can be the type of the managed object, e.g. NS. See note.
objectInstanceid	M	0..N	Identifier	Identifier of a specific object instance managed by NFV-MANO to which the intentExpectation applies. For example, an Identifier of a NS instance. See note.
objectFilter	M	0..1	Not Specified	It describes the constraints and conditions to be used as filter information to identify the managed object(s) to which a given intentExpectation applies. See note.
NOTE: Either objectType or objectInstanceid, but not both, shall be present. The objectType is present only when the intent expectation is for a type of managed objects and the Intent Owner does not know which are the specific instances. While the objectInstanceid is present only when intent expectation is for specific object instance(s). objectFilter is only present when objectType is present.				

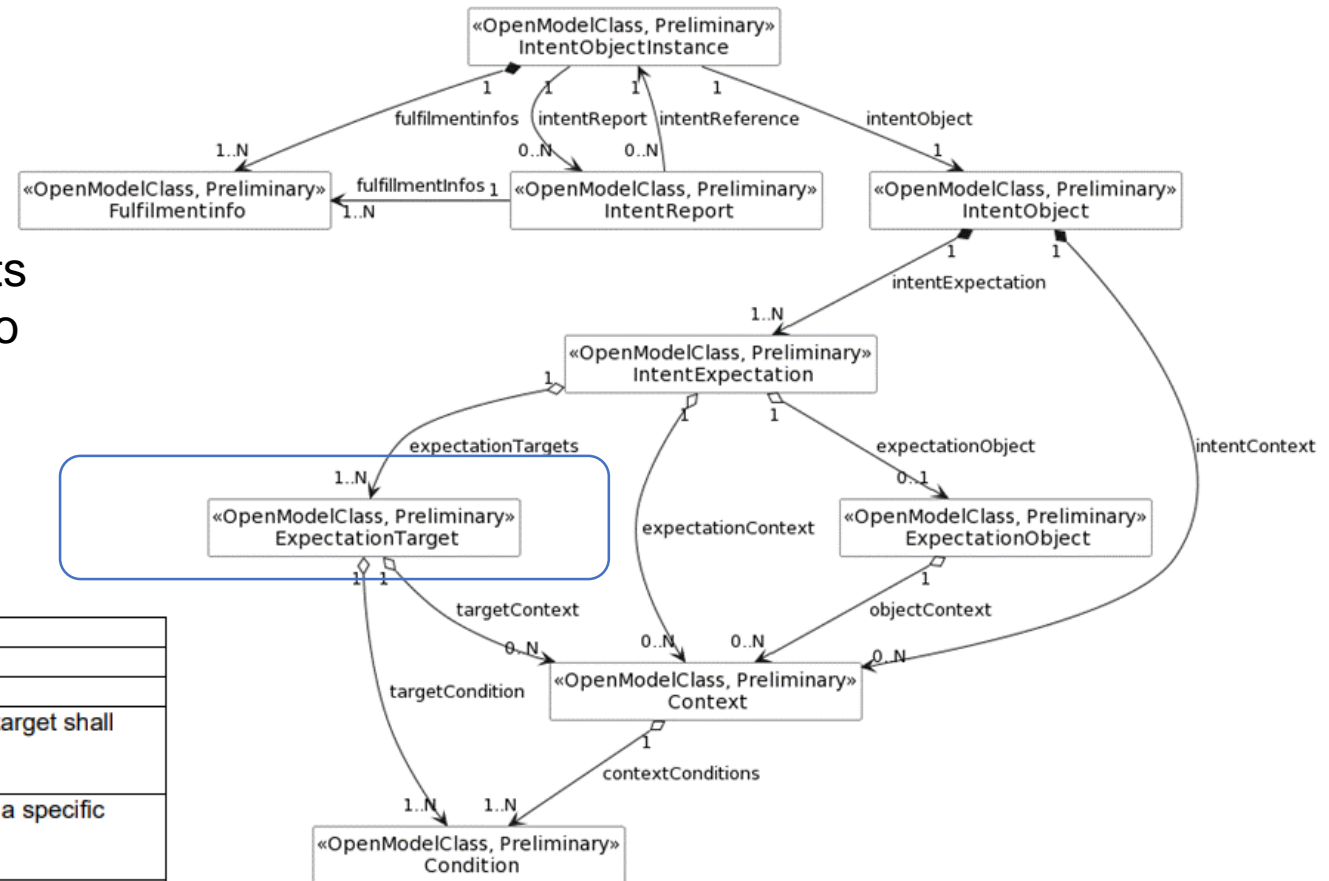
Intent Model in ETSI NFV

An ExpectationTarget describes the expectation targets for each of the expectation type defined in the intent so for the system to achieve the desired or wanted state from its present state.

Attributes of the ExpectationTarget information element

Attribute	Qualifier	Cardinality	Content	Description
targetId	M	1	Identifier	The identifier of this expectation target.
targetName	M	1	String	It describes the name of the expectation target.
targetConditions	M	1..N	Condition	It represents the conditions that the expectation target shall meet. See note.
targetContexts	M	0..N	Context	It describes the list of constraints that applies for a specific expectation target. See note.

NOTE: TargetConditions expresses the requirements/expectations that shall be met while evaluating the specific expectation target, while targetContexts expresses the constraints on when such evaluation shall be performed. E.g. the targetName could be incomingPackets, and the targetConditions could include the conditions for each SAP of the NS, and the targetContexts could include the time range that the target are expected to be fulfilled.



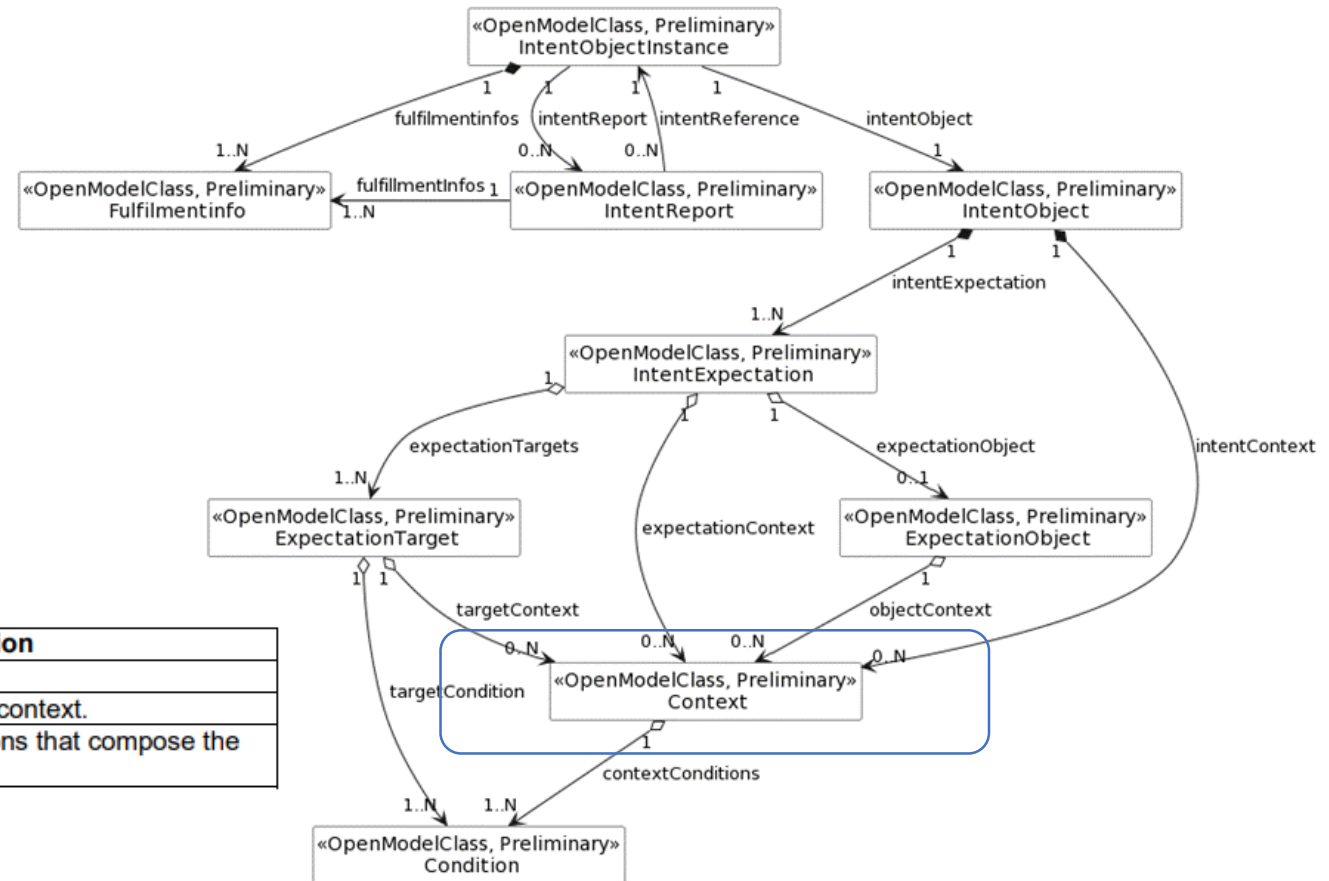
Intent Information Modeling Diagram related to intent management for NFV

Intent Model in ETSI NFV

A Context describes the applicability constraints and conditions that may apply to the intent and its information elements.

Attributes of the Context information element

Attribute	Qualifier	Cardinality	Content	Description
contextId	M	1	Identifier	The identifier of this context.
contextName	M	1	String	It describes the name of the context.
contextConditions	M	1..N	Identifier (Reference to Condition)	It identifies the list of conditions that compose the specific context.



Intent Information Modeling Diagram related to intent management for NFV

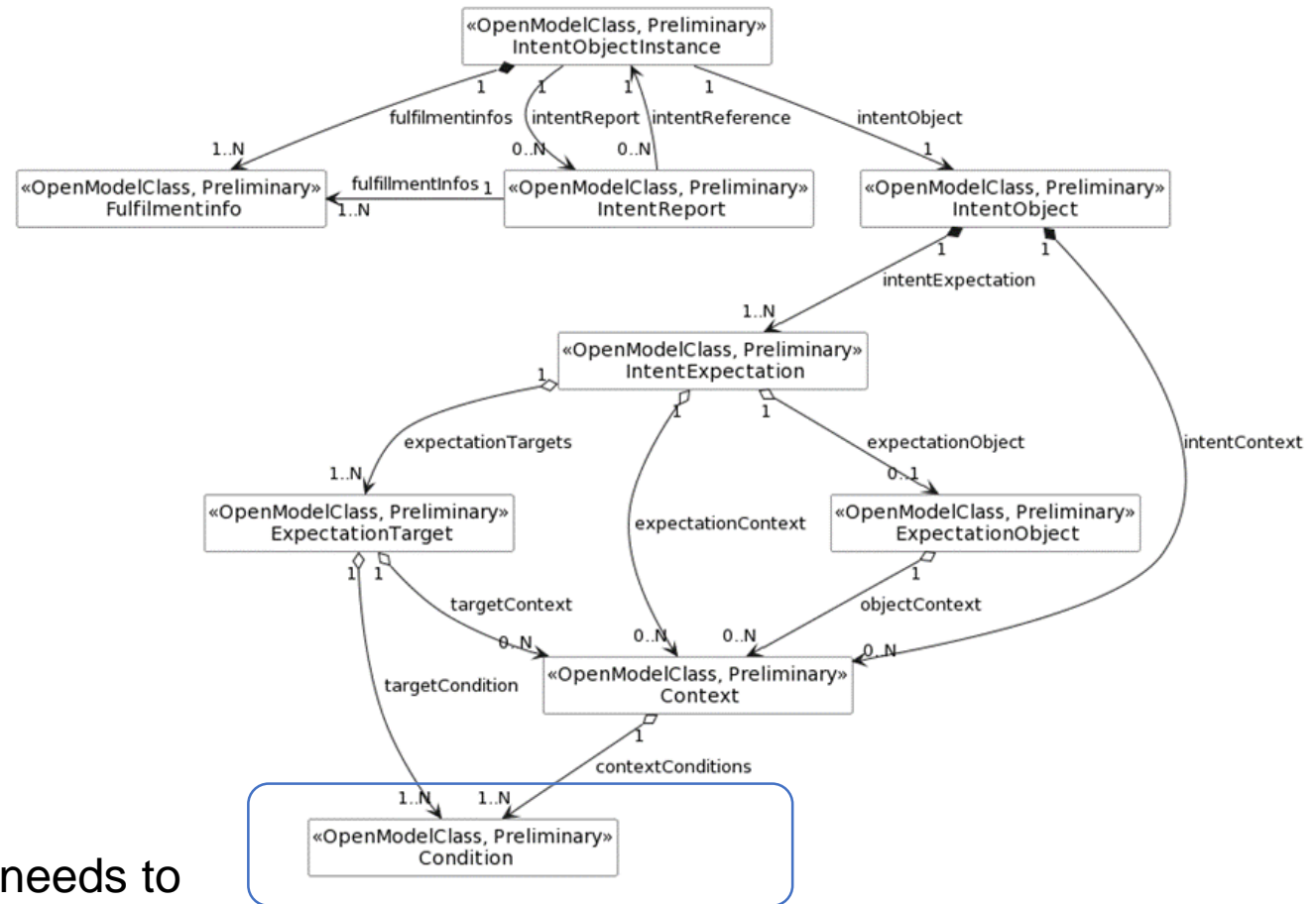
Intent Model in ETSI NFV

Attributes of the Condition information element

Attribute	Qualifier	Cardinality	Content	Description
conditionId	M	1	Identifier	The identifier of this condition.
conditionName	M	1	String	It describes the name of the condition.
operator	M	1	Enum	If conditionValue exists, represents the specific operator for condition. VALUES: <ul style="list-style-type: none"> greater than equal to less than not equal to one of some of all of maximum value minimum value median credibility If conditionList exists, represents the relationship between all conditions. VALUES: <ul style="list-style-type: none"> and or
conditionValue	M	0..1	String	For a simple condition, represents the specific value that composes the condition. See note.
conditionList	M	0..N	Identifier (Reference to Condition)	For a composite condition, identifies the list of conditions that compose the specific condition. See note.

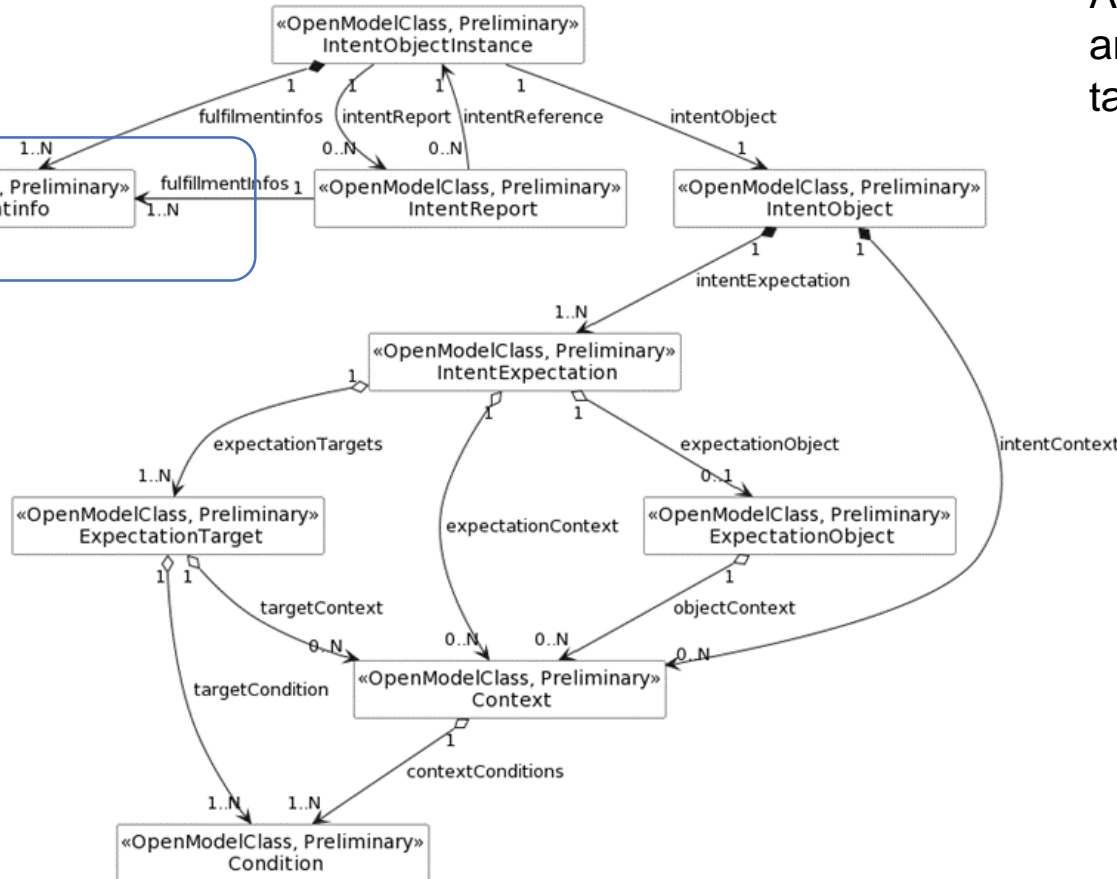
NOTE: Either conditionValue or conditionList, but not both, shall be present.

A Condition describes an assertion which needs to be met for expectation target and context.



Intent Information Modeling Diagram related to intent management for NFV

Intent Model in ETSI NFV



Intent Information Modeling Diagram related to intent management for NFV

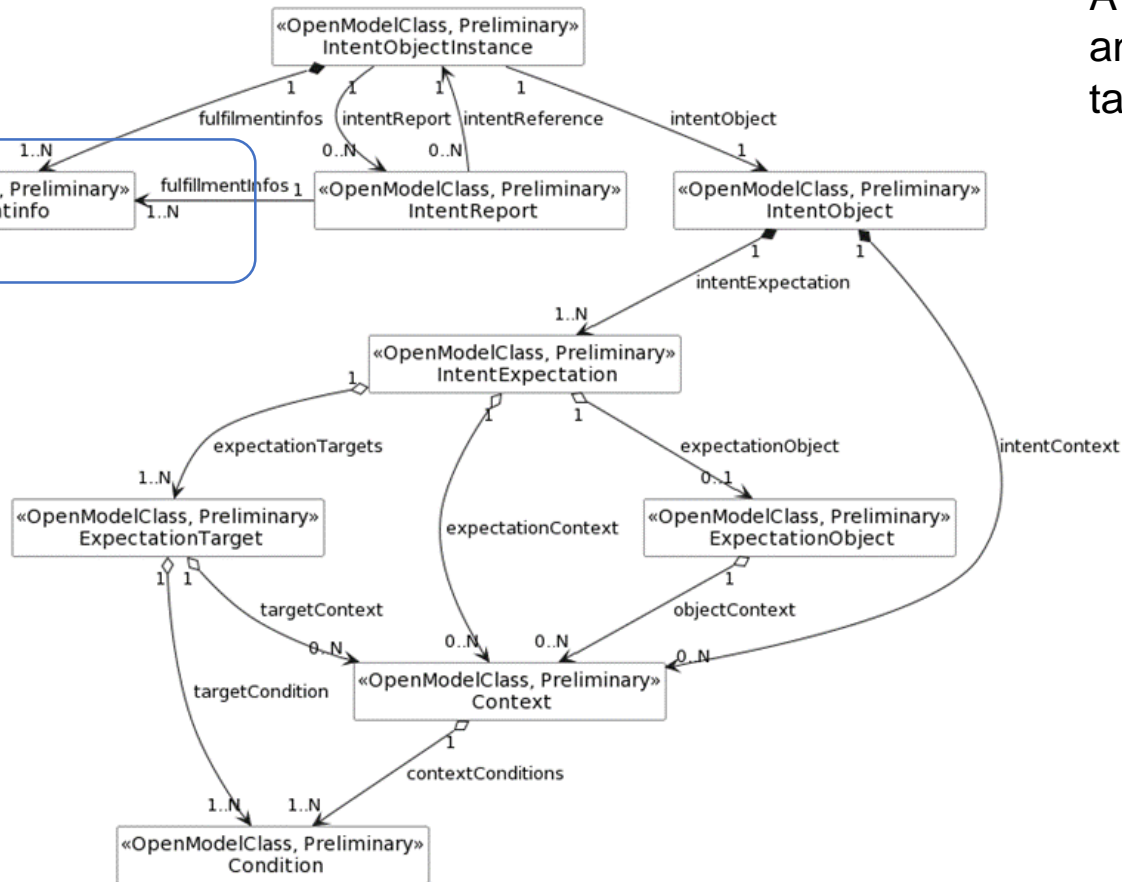
A FulfilmentInfo describes the fulfilment related information for an aspect of the intent (i.e. either an expectation, an expectation target, a condition or the whole intent).

Attributes of the FulfilmentInfo information element

Attribute	Qualifier	Cardinality	Content	Description
fulfilmentObjectId	M	1	Identifier(Reference to IntentObjectInstance, IntentExpectation, ExpectationTarget, Condition)	Reference to an intentObjectInstance, intentExpectation, expectationTarget or condition to which this FulfilmentInfo applies. See note 1.
fulfilmentStatus	M	1	Enum	It describes the current status of the fulfilment result. VALUES: • FULFILLED • NOT_FULFILLED
notFulfilledState	M	0..1	Enum	This attribute is present when fulfilmentStatus equals to NOT_FULFILLED. It describes the current progress state. VALUES: • ACKNOWLEDGED • COMPLIANT • DEGRADED • TERMINATED • FAILED See note 2.
notFulfilledReasons	M	0..1	String	This attribute is present if fulfilmentStatus equals to NOT_FULFILLED. It describes the reasons/observations related to the specific noted notFulfilledState. See note 2.
achievedValue	M	0..1	Not Specified	It describes the actual value of fulfilment for an expectation target. The attribute shall be able to associate which values associate to which conditions in an expectationTarget.
objectInstances	M	0..N	Identifier	This attribute is present if FulfilmentInfo object refers to an intentExpectation.

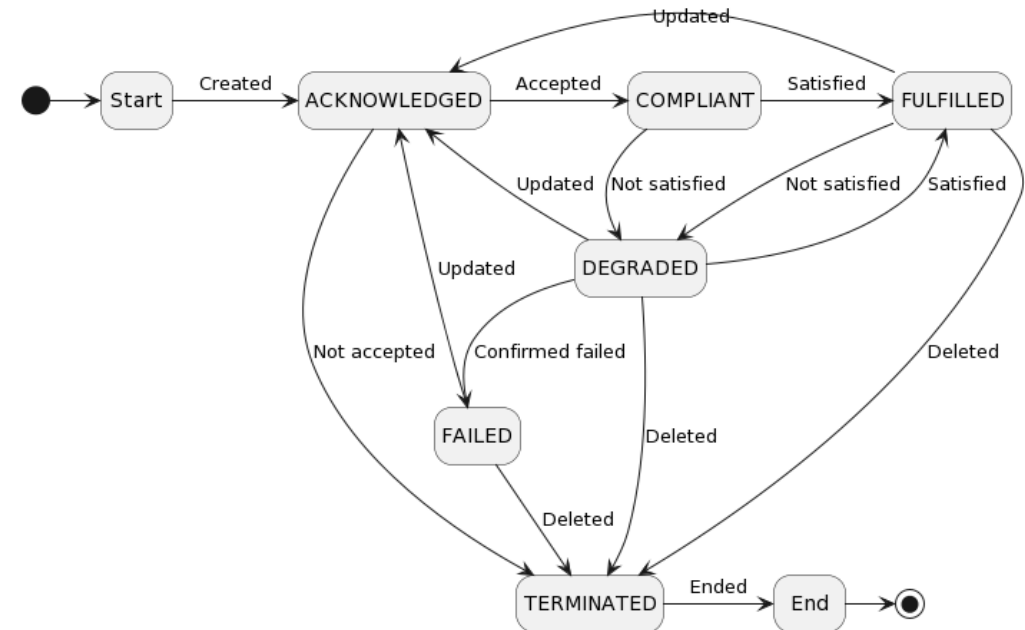
NOTE 1: It is assumed that the identifiers are unique.
NOTE 2: The notFulfilledState attribute and notFulfilledReasons attribute are present if FulfilmentInfo object represents an intent.

Intent Model in ETSI NFV



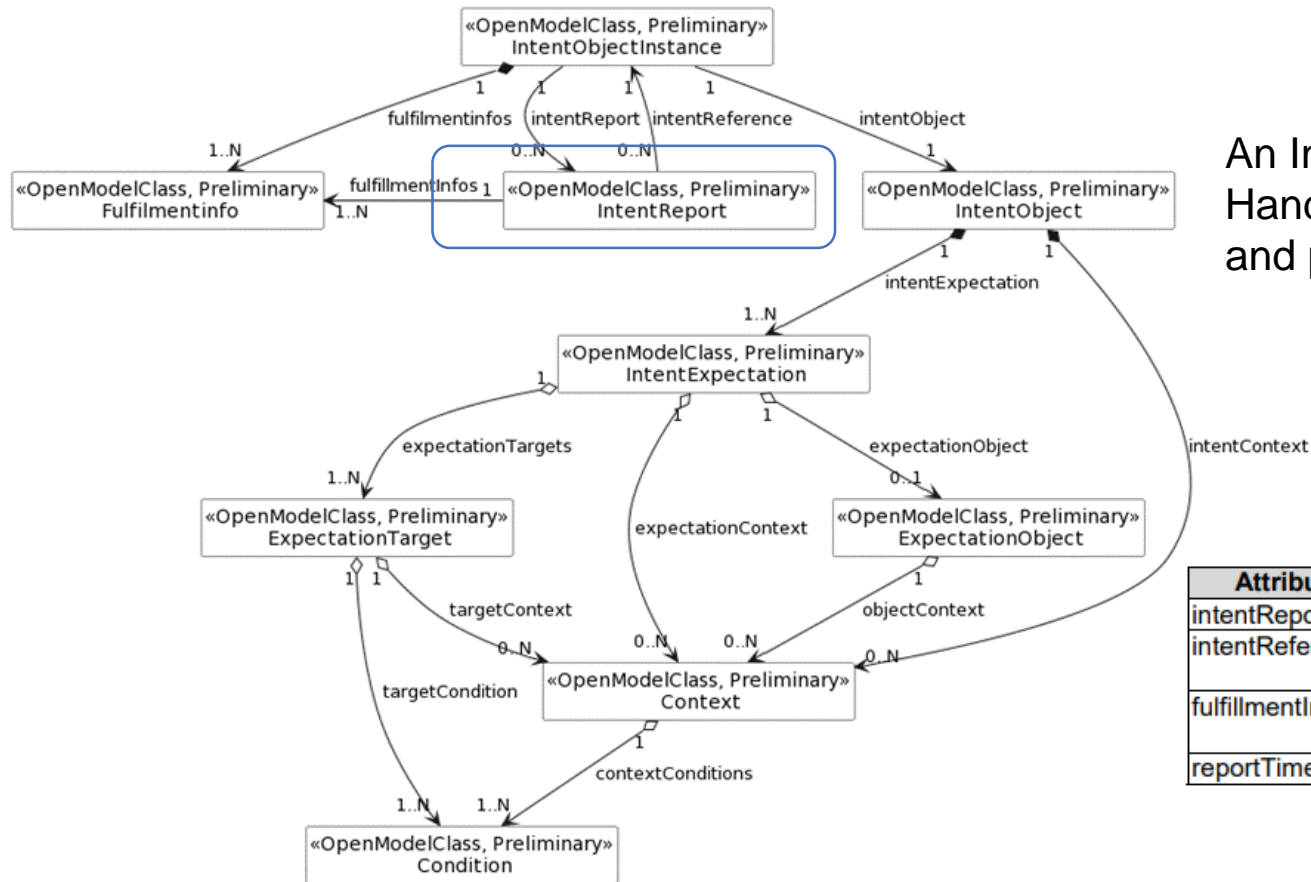
Intent Information Modeling Diagram related to intent management for NFV

A FulfilmentInfo describes the fulfilment related information for an aspect of the intent (i.e. either an expectation, an expectation target, a condition or the whole intent).



intent state machine diagram with fulfilled and notfulfilled status

Intent Model in ETSI NFV



An IntentReport describes the information provided by the Intent Handler to the subscribing entity or Intent Owner about status and progress regarding the received intent.

Attributes of the IntentReport information element

Attribute	Qualifier	Cardinality	Content	Description
intentReportId	M	1	Identifier	The identifier of the report.
intentReference	M	1	Identifier	It identifies the corresponding intent object instance.
fulfillmentInfos	M	1..N	FulfillmentInfo	FulfillmentInfos of intentExpectations and expectationTargets.
reportTime	M	1	DateTime	The creation time of the report.

Intent Information Modeling Diagram related to intent management for NFV

Stage 3 OpenAPI developing for Intent Model in ETSI NFV

- ETSI NFV starts the stage 3 protocols and data models developing for NFV Intent Management in this October, with the supporting companies: Orange, China Telecom, NTT DOCOMO, China Mobile, Huawei and ZTE
- The work item will develop a RESTful protocol for the intent management service interface integrated with NFV-MANO framework, and the OpenAPI representations for NFV intent data model.
- OpenAPIs representations will be available on <https://forge.etsi.org/> , targeting time for stage 3 deliverable is 2024Q1.
- For downloading stage 2 work: https://www.etsi.org/deliver/etsi_gs/NFV-IFA/001_099/050/04.05.01_60/gs_NFV-IFA050v040501p.pdf
- For more info about stage 3 co-developing: https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69457
- Your contribution is welcomed !



Thank you

Contact: Yu, Chao ryan.yuchao@huawei.com

