Intent Classification draft-li-nmrg-intent-classification-02

Chen Li, China Telecom Ying Cheng, China Unicom **Olga Havel, Shucheng Liu (Will)**, Huawei Technologies Pedro Martinez-Julia, NICT Jeferson Campos Nobre, Federal University of Rio Grande do Sul Diego R. Lopez, Telefonica I+D

Nov 2019

Brief Intro

- Goal: achieve agreed "Intent" related terminology and classification for NMRG, as well as guide how the term is used by other groups in IRTF/IETF, even other SDOs.
- Focus: user intents, intents definition and classification
- Scope:
 - relevant for any system or node that expects interaction with human user in the intent driven network
 - Intent driven approach is applicable to both autonomic and traditional networking, including controllers, network management systems, autonomic systems and autonomic nodes
- Proposed classification based on:
 - Solutions, Users and their Purpose
 - Lifecycle Management Requirements
 - Network Scope
 - Technical (with technical feedback) or not
- Examples were listed for each class above

Intent Classification

Intents need to be technology independent & easily transferrable; a robust system of classification will make it easier to transfer Intents, as well as easier to catalogue, search & retrieve suitable Intents

		User Intent		
Autonomic Network	SDN Network	Hybrid Autonomic/ Automated Network	Other future network (e.g. Quantum)	Any legacy network (?)

Multi-disciplinary: Autonomic, Automated, SDN, NFV, Network Management Systems, Multi-Domains, Mobile/Fixed, Wireline/Wireless, Cloud/Enterprise/DC/Carrier

History & Update

0cr 2018

Versions0001draft-draft-li-intent-classification00draft-li-nmrg-intent-classification

Comments received:

- Adding solid use cases. Brian // addressed by adding use cases in section 3.2
- Provide a framework for further intent evolution. Diego //addressed by new draft: draft-sun-nmrg-intent-framework-00

^{Abr 2019.}

01

lul 2019

Nov 2020.

03

Mar 2020 (blannea)

- Suggest to use parameters /classification table to do classification Laurent
- Classify based on granularity is not accurate, may change granularity to abstraction of service description Ericsson
- Terminology is important for discussing intent, as it's new area. Benoit
- Mapping un-professional language to professional, such as define good network for 720 video, may mean no jitter, smooth, etc.
- User to specify what is the priority, e.g., some might want instant, some want quality Alex

-02 version updates:

- Section 3.2: Added detailed use cases
- Section 4.2: Removed Granularity part and changed to feedback
- Section 5: Added Intent Classification Table Examples for Carrier, DC and Enterprise
- Section 7 : Added explanation about AI related content

-01 version ToC

		5. Intent Classification Table Example
Tabl	le of Contents.	5.1. Intent Classification Table Example (Carrier Solution)
		5.2. Intent Classification Table Example (Data Center Solutions)
پ 1	1. Introduction	5.3. Intent Classification Table Example (Enterprise Solution)
2	2. Acronyms	
	3. Abstract intent requirements	
	3.2. Intent Solutions & Intent Users	
4	 3.3. Current Problems & Requirements 3.4. Intent Types that need to be sup 4. Functional Characteristics and Behavi 4.1. Persistence 	oported
Г	4.2. Granularity	
6 5	 4.3. Hierarchy	
	6. Involvement of intent in the applicat ment	ion of AI to Network Manage
7	7. Security Considerations	
-	8. IANA Considerations	
	9. Contributors	
	10. Acknowledgments	
T	11. References 11.1. Normative References	
	11.2. Informative References	

Main Updates

٠

Main Updates (1)

- Added use cases after the table in section 3.2:
 - For carrier networks scenario, for example, if the end users wants to watch high-definition video, then the user intent for video must be converted to 1080p configuration.
 - For DC networks scenario, administrators have their own clear network intent such as load balancing. For all traffic flows that need NFV service chaining, restrict the maximum load of any VNF node/container below 50% and the maximum load of any network link below 70%.
 - For Enterprise Networks scenario, enterprise administrators express their intent from an external client (application service provider). For example, when hosting a video conference, multiple remote access is required. The intent expressed to the network operator: For any user of this application, the arrival time of hologram objects of all the remote tele-presenters should be synchronised within 50ms to reach the destination viewer for each conversation session.

Main Updates (2)

Change Section 4.2 to:

- 4.2 Feedback
 - Intent can be classified by whether it is necessary to feedback the network information to the intended proponent after the intent is executed.
 - For ordinary users, they don't care how the intent is executed and they do not care about the details of the network. As a result, they don't need to know the configuration information of the underlying network. They only focus on whether the intent execution result achieves the goal, and the execution effect such as the quality of completion and the length of execution.
 - For administrators, such as network administrators, they perform intents, such as allocating network resources, selecting transmission paths, handling network failures, etc. They require multiple feedback indicators for network resource conditions, congestion conditions, fault conditions, etc. after execution.

Main Updates (3)-1

Added explanation text in section 6:

- Al technology has played an important role in the different stages of the intent network implementation.
 - Help identify and prevent security threats: Classification algorithms can attempt to identify malware or other undesirable web content or usage;
 - Intentional translation: use AI algorithm to assist the translation module, split translation into the requirements contained in the semantics of the intention; automatic delivery and execution strategy; Automate tasks and appropriate network changes based on the existing network infrastructure configuration according to the policy model;
 - Adaptive adjustment: perceive the quality of the user experience and perform predictive analysis to proactively optimize performance, such as excessive access time;

Main Updates (3)-2

Added explanation text in section 6:

- For instance, in the intent classification, the machine learning algorithm can be utilized to extract the intent feature values and classify the intent according to the intent feature distribution. For example, using artificial intelligence clustering algorithm, a large number of intents proposed by different users are used as training data to extract multiple feature dimensions, such as vocabulary information intended to be used, related feature parameters, context proposed by the intent, and the like. Cluster analysis is performed in the same form as the coordinate system, and multiple categories are classified according to the characteristics of the sample point distribution. For the input intent later, the category of the intent is judged based on the similarity with all categories.
 - For specific classification intents, such as safety or fault information, conditions can be preset in advance, and once a common error message occurs, it will automatically alarm.
 - For the network resource information, set the corresponding threshold information. When there is a certain number of link users or the network traffic is too large, the adjustment intention is started.
 - For users with higher priority, the resources can be configured preferentially.

Classification Table Proposed (Carrier Example

5. Intent Classification Table Example

- 5.1. Intent Classification Table Example (Carrier Solution)
- 5.2. Intent Classification Table Example (Data Center Solutions)
- 5.3. Intent Classification Table Example (Enterprise Solution)

							Network F	unctions spe										
Usera	Intent Type	Intent Type Description	Connectivity	Security	Application	QøS	VNFs	PNFs	Radio Access	Transport (Access)	Transport (Aggregation)	Transport (Core)	L. xd Edyge	C ¹ sud Core	Technical (with technical feedback)	Non-technical (without technical feedback)	Persistent (Full life-cycle)	Transient (Short Lived)
ustomer i		Customer Self-Service with SLA & Value Added Service.																
ubscriber		Customer's design-time intents (e.g. policies, models) that define relationships between Customer Intents and Network Service Intents .																
	Network Service Intent	Service provided by the Network Operator to its Customer (e.g. the Service Operator), where the Intent user is Network Operator.																
Network Operator	Network Intern	Network Operator requests network-wide (service underlay or some network-wide configuration) or network resource configurations (settlens, nuters, runding, policies), includes Connectivity/Restructing? QKS/Security/ Applications Policies / Traffic Security Policies/ Configuration policies / Amintoring policies, alarm generation for non-compliance, auto-recovery, at:																
	Operational Task Intent	Network: Operator requests execution of the any automated task other them Network: Service Intent and Network Intent (e.g. Network: Migration / Server Replacements/ Device Replacement / Network: Software Upgrades)																
	Strategy Intent	Operator's design-time intents (e.g. policies, models, scripts, workflows) to be used by Network Service, Network and Operational Task Intents: Workflows can automate any tasks that Network. Operator often performed in addition to Network Service Intents and Network Intents																
	Customer Service Intent	Service Operator Customer Orders, Customer Service/ SLA																
	Network Service Intent	Service Operator Network Orders / Network SLA																
Service Operator	Uperational Task	Service Operator requests execution of the any automated task other then Customer Service Intent and Network Service Intent.																
Strategy		Operator's design-time intents (e.g. policies, models, scripts, workflows) to be used by Network Service. Network and Operational Task Intents. Workflows can automate any tasks that Network. Operator often performed in addition to Network Service Intents and Network Intents																
		Customer Service Intent API provided to the Application Developers.																
	Network Service Intent	Network Service Intent API provided to the Application Developers.																
plication	Network Intent	Network Intent API provided to the Application Developers. This is for trusted internal Operator / Service Provider DevOPs.																
onquel	Operational Task Intent	Operational Task Intent API provided to the Application Developers. This is for trusted internal Operator / Service Provider DevOPs.																
	Strategy Intents	Aprication Developer design models; policy intents and building blocks to be used by Dustomer Service Intents, Network: Service Intents, Network Intents and Operational Task Intents; This is for trusted Internal Operator, service provider or Customer DevOps.																

			 Intent Sco C4=QoS Network Fu Network Sco 	nction ope: C1=
			C3=Transpo	rt Aggre
Intent User	Intent Type	Intent Type Description	C6=Cloud C	ore)
lustomer/	Customer	Customer Self-Service with SLA & Value Added	 Abstractic C2=Non-tec 	
Subscriber	Service	Service	 Life-cycle 	
	Intent		(Short Liv	
	Strategy	Customer's design-time intents (e.g. policies,		
	Intent	models) that define relationships between		
		Customer Intents and Network Service Intents	Totant Deer	Totent 1
letwork	Network	Service provided by the Network Service Operator	Intent User	Incent
Operator	Service Intent	to the Customer (e.g. the Service Operator).		

	Network	Network Operator requests network-wide (service	+	+
	Intent	underlay or other network-wide configuration) or network resource configurations (switches,		Customer
		routers, routing, policies). Includes	Subscriber	Service
		Connectivity, Routing, QoS, Security,		
		Application Policies, Traffic Steering Policies, Configuration policies, Monitoring policies,		Strategy
		alarm generation for non-compliance,		Intent
		auto-recovery, etc. No overlap with other intental	+	+
-	Operational	Network Operator requests execution of any	Network	Network
	Task	automated task other than Network Service Intent		Service
	Intent	and Network Intent (e.g. Network Migration,		Intent
		Server Replacements, Device Replacements, Network Software Upgrades.		
				Network
	Strategy	Operator's design-time intents (e.g. policies,		Intent
	Intent	models, scripts, workflows) to be used by Network Service, Network and Operational Task		Operatio
				Task
		Intents. Workflows can automate any tasks that I Network Operator often performed in addition to		Intent
		Network Service Intents and Network Intents		+
Service	Customer	Service Operator's Customer Orders, Customer		Strateg
Operator	Service	Service / SLA		Intent
	Intent		Service	Custome
	Network	Service Operator's Network Orders / Network SLA	Operator	Service
	Service			Intent
	Intent			+
	Operational	Service Operator requests execution of the any		Network
	Task	automated task other than Customer Service Intent		Service
	Intent	and Network Service Intent		Intent
	Strategy	Operator's design-time intents (e.g. policies,		Operati
	Intent	models, scripts, workflows) to be used by [Network Service, Network and Operational Task]		Task
		Intents. Workflows can automate any tasks that		Intent
		Network Operator often performed in addition to		+
		Network Service Intents and Network Intents	1	Strateg
Application	Customer	Customer Service Intent API provided to the	1	Intent
Developer	Service	Application Developers (internal DevOps or	+	+
	Intent	external VAS developers / integrators)		Custome
	Network	Network Service Intent API provided to the		Service
	Service	Application Developers (internal DevOps or		Intent
	Intent	external)		Network
	Network	Network Intent API provided to the		Service
	Intent	Application Developers (internal DevOps or		Intent
		external)		+
	Operational	Operational Task Intent API provided to the		Network
	Task	Application Developers. This is for the trusted	1	Intent
	Intent	internal Operator / Service Providers / Customer		+
		DevOps		Operation Tack
	Strategy	Application Developer design policies, models,		Task
	Intent	scripts, building blocks and workflows to be used!		Intent
		by Customer, Service, Network and Operational Task Intents. This is for the trusted internal		Strateg
		Operator / Service Provider / Customer DevOps		Intent

Intent Scope: C1=Connectivity, C2=Security, C3=Application, C4=QoS

- Network Function (NF) Scope: C1=VNFs, C2=PNFs
- Network Scope: C1=Radio Access, C2=Transport Access, C3=Transport Aggregation, C4=Transport Core, C5=Cloud Edge, C6=Cloud Core)
- Abstraction(ABS): C1=Technical(with technical feedback),
- C2=Non-technical (without technical feedback), see Section 4.2 Life-cycle (L-C): C1=Persistent (Full life-cycle), C2=Transient (Short Lived)

Intent User Intent Type Intent NF Network ABS L-C 			+	+	+	++
i C1 (C2 (C3 (C4 (C1 (C2 (C3 (C4 (C5 (C4 (C1 (C2 (C3 (C4 (C1 (C3 (C4	Intent User	Intent Type	Intent	NF	Network	ABS L-C
Customer / Customer			Scope	Scope	Scope	
Customer / Customer			+	+	+	+++
Subscriber Service			C1 C2 C3 C4	C1 C2	C1 C2 C3 C4 C5 C6	C1 C2 C1 C2
Subscriber Service			++++	++	++++++	++++
Intent Intent Strategy Intent Intent Intent Network Intent Intent Intent Network Intent Intent Intent <tr< th=""><th></th><th></th><th></th><th></th><th></th><th></th></tr<>						
Strategy						
Strategy Intent Network Network Intent Intent Network Intent Intent Intent Strategy Intent Intent Intent Service Customer Intent Intent						
Intent Network Network Network Network Network Operator Service Network Intent Intent Intent Intent Service Customer Network Service Service Network Service Service Network Service Service Network Service Service Service Service Network Service S						
Network Networ						
Operator Service I			++++	++		++++
Intent Intent <th>Network</th> <th>Network</th> <th></th> <th>1</th> <th></th> <th></th>	Network	Network		1		
Network	Operator	Service				
Network Intent Intent Intent Operational Intent Intent Intent Strategy Intent Intent Intent Strategy Intent Intent Intent Strategy Intent Intent Intent Service Customer Intent Intent Network Intent Intent Intent Operational Intent Intent Intent Service Intent Intent Intent Service Intent Intent Intent		Intent				
intent intent <th></th> <th></th> <th>++++</th> <th>++</th> <th>++++++</th> <th>++++</th>			++++	++	++++++	++++
Operational Task Intent Task Intent Strategy Intent Operational Task Intent Strategy Intent Task Intent				1.1		
Task Intent Strategy Intent Strategy Intent Strategy Intent Service Customer Intent Intent		Intent		1.1		
Task Intent Strategy Intent Strategy Intent Strategy Intent Service Customer Intent Intent	4		+++	++	+++++	++++
Intent Strategy Intent Strategy Intent Inten						
Strategy						
Intent Intent Service Intent Intent Intent Network Intent Intent Intent Operational Intent Intent Intent Operational Intent Intent Intent Intent Intent Intent Intent Operational Intent Intent Intent Operational Intent Intent Intent Intent Intent Operational Intent Intent Intent		Intent				
Intent Intent Service Intent Intent Intent Network Intent Intent Intent Operational Intent Intent Intent Operational Intent Intent Intent Intent Intent Intent Intent Operational Intent Intent Intent Operational Intent Intent Intent Intent Intent Operational Intent Intent Intent		Chuckens,	****	******	******	****
Service Customer Cust						
Operator Service Image: Service <t< th=""><th></th><th></th><th></th><th>++</th><th>******</th><th>****</th></t<>				++	******	****
Intent Intent <th>Service</th> <th>Customer</th> <th></th> <th></th> <th></th> <th></th>	Service	Customer				
Network Image: Service	Operator	Service				
Service		Intent		1.1		
Service			+++	++	++++++	++++
Intent Intent Operational Intent Task Intent Intent Intent Strategy Intent Intent Intent <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th></t<>						
Operational Image: Strategy Image: Strateg						
Task Intent Intent Intent Strategy Intent Intent Intent Application Customer Intent Intent Intent Intent Intent Intent Application Customer Intent Intent Intent Intent Intent Intent Intent Intent Intent Intent Network Intent Intent Intent Network Intent Intent Intent Intent Intent Intent Intent Intent Intent Intent Intent Service Intent Intent Intent Intent Intent Intent Intent Service Intent Intent Intent <th></th> <th>Intent</th> <th></th> <th></th> <th></th> <th></th>		Intent				
Task Intent Intent Intent Strategy Intent Intent Intent Application Customer Intent Intent Intent Intent Intent Intent Application Customer Intent Intent Intent Intent Intent Intent Intent Intent Intent Intent Network Intent Intent Intent Network Intent Intent Intent Intent Intent Intent Intent Intent Intent Intent Intent Service Intent Intent Intent Intent Intent Intent Intent Service Intent Intent Intent <th></th> <th>Operational</th> <th>++++</th> <th>*****</th> <th>******</th> <th>****</th>		Operational	++++	*****	******	****
Intent I I I I I I I I I I I I I I I I I I I						
+		Intent				
Intent Intent Application Customer Intent Intent Intent Intent Service Intent Intent Intent		21105110	++++	++	++++++	++++
Intent Intent Application Customer Intent Intent Intent Intent Service Intent Intent Intent		Strategy		1		
Developer Service						
Developer Service			++++	++	+++++	++++
Intent				1.1		
Network Image: Strategy				1.1		
Service		Intent		1.1		
Service			+++	++	+++++	++++
Intent						
Network						
Intent		intent				
Intent		Network				
Operational Image: Comparison of the second secon						
Tesk			++++		******	++++
Tesk		Operational				
Intent				1		
+				1		
			++++	++	++++++	++++
		Strategy		1.1.1		
				1.1		
			++++	++	++++++	++++

Conclusion and Next Steps

- The current version addressed most of comments received online and offline.
- We want to ask for adoption as an RG draft
- Next steps:
 - Start using collaboration tool (agree based on preferences from all contributors and new contributors) currently added to google drive
 - Add a section briefly describing Intent work status in other SDOs, such as 3GPP, ETSI, MEF...
 - Work with community to derive unified intent definition that encompasses all intent types for all solutions and intent users.

Thank You