draft-li-intent-classification-00

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Introduction

- No intent definition, model and interface agreed by SDOs

- There are several shared principles between SDOs:
  - intent should be declarative, using and depending on as few deployment details as possible and focusing on what and not how
  - intent should provide an easy-to-use interface, and use terminology and concepts familiar to its target audience
  - intent should be vendor-independent and portable across platforms
  - the intent framework should be able to detect and resolve conflicts between multiple intents

- This document goal is to discuss and propose how to classify intents

Context

- Intent driven approach is applicable to both autonomic and traditional networking (SDN, NMS, ..).

- We are focusing on user intents here, what the definition of that intent is and how intents can be classified

- The goal is to achieve agreed terminology, definition and classification for intents both inside NMRG but also to influence how the intent term is used by other IRTF and IETF working groups.

- User intent, and therefore this draft, is relevant for any system or node that expects interaction with the intent human user in the intent driven network. This includes controllers, network management systems, autonomic systems and autonomic nodes.

NMRG Charter	Intent Classification
This includes communication services between management systems, which may belong to different management domains, as well as customer-oriented management services	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
The NMRG is expected to identify and document requirements, to survey possible approaches, to provide specifications for proposed solutions, and to prove concepts with prototype implementations that can be tested in large-scale real-world environments	The current draft achieves the first level (identify & document requirements, survey possible approaches); the next step for near-future work would be "to provide specifications for the proposed solutions" - e.g. more formal definitions of categories, some prioritisation, or discussion of overlap, multiple classifications,

User Intent (greenfield or brownfield)				
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

Requirements for Different Intent Users

- What is Intent for different stakeholders?
  - The term Intent has become very widely used in the industry for different purposes, sometimes it is not even in agreement with SDO shared principles – e.g.
    - [An Intent-based Approach for Network Virtualization, IFIP 2013]
    - [RFC7575, IETF, 2015]
    - [TR-523_Intent_Definition_Principles, ONF, 2016]
  - We should start a discussion in the industry about what intent is for different solutions and intent users. It is also imperative to try to propose some intent categories /classifications that could be understood by a wider audience. This would help us define intent interfaces, DSLs and models.

- Intent Solutions and Intent Users
  - Different Solutions have different Intent Users with different requirements and priorities for intent languages and interfaces. They have different use cases. Some users are technical while others do not have any networking knowledge.

- Different Problems and Requirements for different Users
  - Operators & Administrators
  - End-Users & Subscribers
  - App Developers & Integrators

Intent Classification based on Solutions, Users and their Purpose

Intents may be classified based on solutions and users:

- Different Intent **Solution Types** e.g. Enterprise, Data Center
- **Intent Users**   e.g. administrator/operator/end-user/customer/app developer/etc.

Intents may be classified based on its purpose:

- Customer network service intents   *'I want to stream 4K Video to Sites A & B'*
- Network resource management intents   *'Ensure Hosts in Eng don't exceed 40% avgCPU'*
- Cloud & cloud resource management intents   *'I want a Safe-DNS & Firewall service with up-to-date white/blacklists'*
- Network Policy intents   *'Use MPLS for Video and Internet for e-mail'*
- Task based intents   *'Create new repo & give access to all leads'*
- System policies intents   *'Use Host A for video & Host B for gaming'*
- etc.

Intent Classification based on When to Activate

Intent can be used to operate:

- **Immediately** on the target
  - E.g. *'Add firewall protection around RnD-Net'*
- **Whenever required**
  - When some event happens: *'If an intrusion is detected, isolate all systems'*
  - Specific time in the future: *'Migrate hosts during maintenance window'*
  - Periodically at specific time: *'Scale back all servers over the weekends'*
  - When some condition occurs: *'If video quality degrades, switch to MPLS'*

Intent Classification based on Lifecycle Management Requirements

Intents can be classified into transient/persistent intents.

- If intent is **transient**, it has no lifecycle management. As soon as the specified operation is successfully carried out, the intent is finished, and can no longer affect the target object.
    - E.g. *'Decommission host A and relocate its services'*
- If the intent is **persistent**, it has lifecycle management (activate, monitor, correct, optimize). Once the intent is successfully activated and deployed, the system will keep all relevant intents active until they are deactivated or removed.
    - E.g. *'Don't allow hosts in Eng-NET to talk to those in Finance-NET'*

Intent Classification based on Granularity

Intents can have different granularities: high granularity, low granularity and anything in between.

- **High granularity intents** are more complex to design but are the most valuable. Intent translation, intent conflict resolution and intent verification are very complex and require advanced algorithms. Examples: e2e network service, like customer network service over physical & virtual network, over access, metro, dc and wan with all related QoS, security and application policies.
  - E.g. *'ensure the service quality for 720p video transmission to user A'*

- **Low granularity intents**, like some path checks (can A talk to B) or individual network service/network/application/user policies, are the least complex. Their intent translation, intent conflict resolution and intent verification are much simpler than for high granularity intents.
  - E.g. *'ensure packet loss rate between device B to C is no higher than x%'*

Policy Continuum, Abstracted Intent Operation, Policy Targets and Policy Scope

- Policy Continuum for defining different types of Actors and their characteristics

- Intent Context / Capabilities / Constraints:
  - Context selects policies based on applicability
  - Capabilities describe the functionality provided by the policy
  - Constraints restrict the capabilities offered and/or the behaviour of the policy

- Policy Target is a set of managed objects which may be affected in the policy enforcement.

- Policy Scope (solutions, users)

Next Steps

- **Definition & Scope:** As shown in this presentation, the term intent has a very wide and vague scope.
  - Before NMRG start to work toward intent, we need to define a clear scope/terminology in IETF/IRTF perspective
  - ensure that people are having discussion on the same page – using the previous categories could help break down work
  - Engage the community into the discussion about what intent means to different stakeholders and how intents could be classified
  - Continue with more formal classification of intents with examples
- **High level strategy & architecture:**
  - Investigate if the common intent DSL, model and APIs are required or not and if so propose the ones
  - Investigate if the natural language for intent is the ultimate target
  - Investigate where would user intent language, lifecycle and multi-tenant user intent conflict resolution sit in the future network architecture
- **Other WGs (or SDOs):**
  - NMRG need to specify which WGs in IETF are related, based on categories chosen, .e.g. based on different intent users
  - This is also related to draft-clemm-nmrg-dist-intent-00, for mapping to specific categories
  - Investigate what (if any) categories of user intents need to be distributed to the autonomic nodes in original form and which ones must be processed and decomposed to the lower abstraction intents before distribution
  - This draft can also be a good base for future intent related discussions with other SDOs working on the other categories
- **Further Work:**
  - Some findings from this work could feed requirement for future design of intent framework
  - e.g. ''the intent framework should be able to detect and resolve conflicts between multiple intents''

Thank You