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ITU-T Focus Group on Autonomous Networks

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## Technical Specification

### Glossary of terms and definitions for Autonomous Networks

## Summary

This is a deliverable of the ITU-T Focus Group on Autonomous Networks (FG-AN). This document gives a glossary of terms and definitions for Autonomous Networks

## Keywords

5G, Artificial Intelligence, build-a-thon, Challenge, closed loop, controller, hackathon, Machine Learning

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## Technical Specification

### Glossary of terms and definitions for Autonomous Networks

#### 1 Scope

This document collates all definitions defined by ITU-T SG13, in the context of Autonomous Networks.

#### 2 Glossary of Terms and Definitions

Id	1
Title	adaptation controller
Definition or description	A controller responsible for selecting candidate controllers ready for integration and for executing their integration in the underlay network.
Reference	<i>ITU-T Y.3061</i>
NOTE	Dynamic adaptation is the process of continuous integration of controllers to an underlay, as the underlay undergoes changes at run-time. Adaptation controller is the component in AN responsible for selecting candidate controllers from a set of generated controller configurations which are ready for integration and executes the integration to the underlay.

Id	2
Title	AN sandbox
Definition or description	An environment in which controllers can be deployed, experimentally validated with the help of models of underlay networks, and their effects upon an underlay network evaluated, without affecting the underlay network. NOTE - Domain specific models, if available, may be used in experimental validation of controllers. Examples of domain specific models are packet flow models for various types of applications such as video, chat, etc., and radio channel propagation models for various channel conditions.
Reference	<i>ITU-T Y.3061</i>
NOTE	Experimentation is the process that validates controllers using inputs from a combination of underlay network, simulators and/or testbeds. The process of experimentation ensures that the controller under experimentation satisfies the use case requirements and is compatible with deployment in the intended underlay. In addition to generating scenarios for experimentation, experimentation controller executes the scenarios in the AN Sandbox, collates and validates the results of the experimentation.

Id	3
Title	autonomy engine

Definition or description	An environment where new controllers are autonomously generated and validated.
Reference	<i>ITU-T Y.3061</i>
NOTE	Autonomy engine refers to the grouping of the Evolutionary Exploration subsystem and the Experimentation subsystem. Together, these architectural components enable the more general trial and error process where new candidate controllers are generated in the former and validated by the latter.

Id	4
Title	Controller
Definition or description	A workflow, open loop or closed loop of a system under control in an autonomous network, composed of modules, integrated in a specific sequence, using interfaces exposed by the modules, to solve a specific problem or satisfy a given requirement. NOTE 1 – Modules composing the controller may be workflows, open loops, or closed loops. NOTE 2 - Modules can be developed independently of the system under control before being integrated into the system under control. NOTE 3- Examples of system under control are managed entities, workflows and/or processes in an IMT-2020 network. NOTE 4 – Exploratory evolution and real-time responsive online experimentation are examples of processes independent of the development of modules.
Reference	<i>ITU-T Y.3061</i>
NOTE	A controller is a workflow, closed loop or open loop of a system under control. It is composed of modules, integrated in a specific sequence, and using interfaces exposed by the modules, to solve a specific problem or satisfy a given requirement. Modules composing the controller may be workflows, open loops, or closed loops and can be developed independently of the system under control before being integrated into the system under control.  The continuous evolutionary-driven creation, validation and application of controllers is used in the use cases to realize autonomous networks [b-ITU-T Y.Supp 71] and the key concepts of Exploratory evolution, real-time responsive online experimentation and dynamic adaptation, required to enable them.

Id	5
Title	controller design
Definition or description	A low-level, non-executable representation of a controller containing modules, their configurations, and their parameter values which is used to instantiate a controller
Reference	<i>ITU-T Y.3061</i>
NOTE	Controller specifications are high-level, non-executable representations of a controller with the metadata corresponding to necessary functionality of the controller and a utility function to be achieved. Controller designs are low-level, non-executable representations of controller containing modules, their configurations, and their parameter values which are used to instantiate a

	controller. Controller designs are derived from controller specifications by the evolution controller.
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Id	6
Title	controller specification
Definition or description	A high-level, non-executable representation of a controller with the metadata corresponding to the mandatory functionality of the controller and a utility function to be achieved.
Reference	<i>ITU-T Y.3061</i>
NOTE	Controller specifications are high-level, non-executable representations of a controller with the metadata corresponding to necessary functionality of the controller and a utility function to be achieved. Controller designs are low-level, non-executable representations of controller containing modules, their configurations, and their parameter values which are used to instantiate a controller. Controller designs are derived from controller specifications by the evolution controller.

Id	7
Title	evolution controller
Definition or description	A controller responsible for the evolution of controllers by manipulating the module instance used within a controller, the structure or topology of connections between modules in a controller and/or the values chosen for the module(s) parameters.
Reference	<i>ITU-T Y.3061</i>
NOTE	Exploratory evolution and experimentation are examples of functionalities in the AN which act upon controllers. Exploratory Evolution hosts evolution controllers which provide the functionality that creates and modifies a controller in accordance with the system under control and the real-time changes therein. An evolution controller is the component responsible for managing the application of exploratory evolution on controllers. Exploratory evolution is the ability to modify the structure and configuration of a controller. This assumes that the controllers are composed of modular and configurable elements or “building blocks”.

Id	8
Title	Experimentation
Definition or description	The process of executing the generated potential scenarios of experimentation and trials upon the controllers, within the parameters of the scenarios and trials and then collecting the results.  NOTE - Example of experimentation is validating a traffic optimization controller against selected scenarios in a simulation tool, to find the controller performance with respect to a set of pre-defined service level agreements.
Reference	<i>ITU-T Y.3061</i>
NOTE	Experimentation is the process that validates controllers using inputs from a combination of underlay network, simulators and/or testbeds. The process of experimentation ensures that the controller under experimentation

	<p>satisfies the use case requirements and is compatible with deployment in the intended underlay.</p> <p>An experimentation controller is a component which generates potential scenarios of experimentations based on controller designs and representations of the use cases. Experimentation controller uses additional information, as provided by the knowledge base and AN Orchestrator, in the process of generating scenarios of experimentation.</p>
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Id	9
Title	experimentation controller
Definition or description	A controller which generates potential scenarios of experimentation based on controller specifications and additional information as provided by the knowledge base, executes the scenarios in the AN Sandbox, collates and validates the results of the experimentation.
Reference	<i>ITU-T Y.3061</i>
NOTE	<p>Experimentation is the process that validates controllers using inputs from a combination of underlay network, simulators and/or testbeds. The process of experimentation ensures that the controller under experimentation satisfies the use case requirements and is compatible with deployment in the intended underlay.</p> <p>An experimentation controller is a component which generates potential scenarios of experimentations based on controller designs and representations of the use cases. Experimentation controller uses additional information, as provided by the knowledge base and AN Orchestrator, in the process of generating scenarios of experimentation.</p>

Id	10
Title	knowledge base
Definition or description	An environment which manages storage, querying, export, import, optimization and update of knowledge.
Reference	<i>ITU-T Y.3061</i>
NOTE	<p>The analysis of data and information from the network, resulting in an understanding of what the data and information mean, is referred to as knowledge. Knowledge is used in autonomous networks for supporting the continuous exploratory evolution, realtime online experimental validation, and dynamic adaptation.</p> <p>The Knowledge Base system manages the lifecycle and optimisation of knowledge.</p> <p>Experimentation controller uses additional information, as provided by the knowledge base and AN Orchestrator, in the process of generating scenarios of experimentation.</p> <p>Knowledge stored in the Knowledge Base subsystem is used in autonomous networks for supporting the continuous exploratory evolution and continuous dynamic adaptation</p>

Id	11
Title	managed entity
Definition or description	<p>A resource, service or controller which is managed</p> <p>NOTE - An example of a controller as a managed entity, is a function tasked with traffic optimization in the user plane. In this case, the managed</p>

	entity (controller) exposes interfaces or APIs to enable the collection of information, configuration and execution of the controller.
Reference	<i>ITU-T Y.3061</i>
NOTE	<p>Each managed entity, as well as the operational and business environments in which they operate, vary from use case to use case.</p> <p>Curated controllers are selected for actual deployment in the management of the managed entity by adaptation controllers.</p> <p>An operation controller is responsible for the operation of a managed entity.</p> <p>After application of operation controller to a managed entity, the controller is continuously monitored by the selection controller for the purpose of providing the most effective operation of the managed entity.</p> <p>Controllers operate the managed entity and in its goal of supporting the continuous exploratory evolution, realtime online experimental validation, and dynamic adaptation.</p>

Id	12
Title	open loop
Definition or description	A type of control mechanism in which the outputs of the system under control are not used to adjust the behaviour of the system.
Reference	<i>ITU-T Y.3061</i>
NOTE	<i>[gives additional context or notes if needed]</i>

Id	13
Title	workflow
Definition or description	sequence of activities to describe and/or realize a given task executed by a system.
Reference	<i>ITU-T Y.3061</i>
NOTE	<i>[gives additional context or notes if needed]</i>

Id	14
Title	Trusted AN
Definition or description	the autonomous network which is trustworthy enough (i.e. be able to work correctly as intended), so that the network can be authorized to partly or completely autonomously work.
Reference	<i>ITU-T Y.3060</i>
NOTE	Whether the AN is trusted/trustworthy or not, it is suggested to make objective judgement(s) depending on the TiAN evaluation/assessment result(s), the trustworthiness evaluation/assessment result(s). Besides, before the judgement(s), the relevant benchmark(s) of TiAN is/are also necessary to set/configure.

Id	15
Title	<b>Trust in AN (TiAN)</b>
Definition or description	a measurable and quantifiable degree of trustor's confidence to some AN to let it be governed by itself with minimal to no human intervention.
Reference	<i>ITU-T Y.3060</i>
NOTE	TiAN has been specified to make trust and trustworthiness for AN measurable and quantifiable, and the TiAN is supposed to be

	evaluated/measured objectively. So that, the AN can self-prove trustworthy enough and gain more opportunity to evolve or revolve.
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<b>Id</b>	16
<b>Title</b>	<b>Trustor in AN</b>
<b>Definition or description</b>	the one who/which has the authority to authorize a network and/or the relevant entity be governed by itself with minimal to no human intervention.
<b>Reference</b>	<i>ITU-T Y.3060</i>
<b>NOTE</b>	In the aspect of trust study and standardization, furthermore, in the commercial environment(s), it is necessary to make the role(s) clearly, i.e. to clearly figure out trustor and trustee in AN.

<b>Id</b>	17
<b>Title</b>	<b>Trustee in AN</b>
<b>Definition or description</b>	a network or a network relevant entity with autonomy capabilities which can be authorized to govern itself with minimal to no human intervention.
<b>Reference</b>	<i>ITU-T Y.3060</i>
<b>NOTE</b>	In the aspect of trust study and standardization, furthermore, in the commercial environment(s), it is necessary to make the role(s) clearly, i.e. to clearly figure out trustor and trustee in AN.

### 3 Conclusion

This contribution gives a glossary of terms and definitions for Autonomous Networks.



#### 4 References

- [ITU-T Y.3060] ITU-T Recommendation ITU-T Y.3060 “Autonomous networks - overview on trust”
- [ITU-T Y.3061] ITU-T Recommendation ITU-T Y.3061 "Autonomous Networks - Architecture framework"
- [ITU-T Supplement 71] ITU-T Supplement 71 to ITU-T Y-series Recommendations, “Use cases for autonomous networks”
- [FGAN-O-029] ITU-T FG AN Deliverable “Technical Report on Proof of Concept activities”
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