Key Areas of Standardization and studies on Taas and federated testbeds

Agenda

- Testbeds Federations and TaaS short introduction
- ITU SG11 and ETSI TC INT collaboration
- The IEEE-ITU-ETSI Workshop
- The way Forward: Focus Group on Testbeds Federation
- Summary and Next Step

Testbeds Federations and TaaS short introduction

- The recent technological developments require more realistic tests and new use cases to be validated in real conditions (testbeds become more important as never).

- There is a need of testbeds federation and interconnection between testbeds – Reference Model and relevant APIs are needed.

- Vertical industry needs to experiment and pilot their "5G enabled" business case before moving to commercial.

- There is a need to standardize a generic 5G and beyond application testing and validation framework which validates the vertical application in a systematic manner under different 5G technology choices.

- TaaS is going to become strategic in order to cover testing configurations, business needs and time to market.

- TaaS will use testbeds federations through APIs exposed as vertical validation framework.

Common Work ITU-T SG11 – ETSI TC INT

International Telecommunication Union

ITU-T Q.4068

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(08/2021)

SERIES Q: SWITCHING AND SIGNALLING, AND
ASSOCIATED MEASUREMENTS AND TESTS

Testing specifications – Testing specifications for IMT-
2020 and IoT

Open application program interfaces (APIs) for
interoperable testbed federations

Recommendation ITU-T Q.4068

- Fruitful cooperation of ITU-T SG11 and ETSI TC INT

- ITU-T SG11 approved ITU-T Q.4068 (08/2021) "Open application program interfaces (APIs) for interoperable testbed federations"

- ITU-T Q.4068 is available at: http://handle.itu.int/11.1002/1000/14765

Objectives of the Recommendation

- Definition of the potential improvements of testbed interoperability and federation.

- Description of a reference model and technical framework for interoperable testbed federation.

- Specification of open APIs for the interconnection and the interoperability of testbeds.

- Definition of reference metrics to ease the integration and the interoperability.

Reference Model of Testbed Federations

[Recommendation ITU-T Q.4068](#) "Open application program interfaces (APIs) for interoperable testbed federations" (2021)

Q.4068(21)

Key: There may be established horizontal and/or hierachical/vertical federations of assets/ components or resources at specific levels across federated testbeds

Q.4068(21)

This Recommendation contains a technical framework consisting of guidelines, which provides a common reference for developers in order to facilitate the implementation and promotion of interoperability of testbeds.

Joint ITU-IEEE-ETSI Workshop, March 2021

ITU-ETSI-IEEE Joint SDOs Brainstorming Workshop on Testbeds Federations for 5G and Beyond: Interoperability, Standardization, Reference Model and APIs

Call for standardization (1/2)

1. There is a need the value creation blueprint which allows all stakeholders to join such ecosystem that is therefore to emerge around the Testbeds Federations Reference Model being standardized by ITU-T and ETSI, its APIs and its instantiations

2. APIs of TMForum that pertain to Products/Services Selling and Uptake that capture generic aspects of relevance to the new idea of "Testbed as Service" might be adopted by ITU and ETSI in elaborating APIs for the Testbeds Federations Reference Model.

3. SDOs should not go to the marketing.

4. The commercial requirements need to be identified, and the "Testbeds-as a Service" is good example.

5. Security attributes are used as a kind of reputation of the application

6. ITU-T SG17 is encouraged to collaborate with IEEE INGR Security Group on the possibility to join forces in working on the Required Security Framework (as a standard) associated with the Testbeds Federations Reference Model and its APIs (as security requirements that should be considered in Testbeds Federation).

ITU-ETSI-IEEE Joint SDOs Brainstorming Workshop on Testbeds Federations for 5G and Beyond: Interoperability, Standardization, Reference Model and APIs

Call for standardization (2/2)

7. Standardization of APIs for the Reference Model should also consider SDKs to provide guidance on how the APIs can be flexibly implemented

8. The improvement of interoperability testbeds is needed. All industrial and research solutions needs to be considered in the efforts around the Testbeds Federation Reference Model.

9. Some regulations should be put in place. JASON is used for connection 5G core at the moment. Attributes need to be defined.

10. SDO should be open. Make it easy for operators. Test once – implement multiple times.

11. Sharing information would be a good benefit to continue dialog.

12. SDOs and stakeholders are encouraged to work jointly to understand all needs.

13. ETSI TC INT and IEEE INGR Testbeds WG need to discuss together on the proposal on the need for ontologies in the case of Testing of Vertical Applications in 5G pertaining to the various KPIs as potentially a new work item is needed.

14. Possibility to launch ITU-T Focus Group is being recommended to engage various Stakeholders to contribute (ITU-T SG11 is parent group)

Key Outcomes – call for standardization

ITU-ETSI-IEEE joint SDOs brainstorming workshop

Testbeds federations for 5G and beyond: interoperability, standardization, reference model and APIs

Free I Virtual
15-16 March 2021
14:00 to 17:30 CET

http://itu.int/go/BTF4-5G

Organized by

IEEE Future NETWORKS IEEE Advancing Technology for Humanity ETSI ITU

www.itu.int/go/BTF4-5G

The way Forward: Focus Group on Testbed Federation

- Contribute to the development of the APIs being prescribed by the Testbeds Federations Reference Model;

- Share the burden on APIs Specifications and Standardization and on Roadmaps in a harmonized and collaborative way;

- Develop New Business Models for Testbeds Suppliers that derive from the Testbeds Federations Reference Model and associated APIs, such as "Testbed-as-a Service" (TaaS) Business Model.

INTERNATIONAL TELECOMMUNICATION UNION			SG11-C619
TELECOMMUNICATION STANDARDIZATION SECTOR			**STUDY GROUP 11**
STUDY PERIOD 2017-2020			**Original: English**
Question(s):	All/11		Virtual, 1-10 December 2021
		CONTRIBUTION	
Source:	Telecom Italia, Orange, Vodafone, A1 Telekom Austria, Telefonica, Mandat International, Rostelecom		
Title:	Proposal for the creation of the Focus Group on "Testbeds Federations for 5G and Beyond" (FG-TBFxG)		
Purpose:	Discussion		
Contact:	Giulio Maggiore, Telecom Italia, Italy	E-mail: giulio.maggiore@telecomitalia.it	
Contact:	Tayeb Ben Meriem, Orange, France	E-mail: tayeb.benmeriem@orange.com	
Contact:	Muslim Elkotob, Vodafone, Germany	E-mail: muslim.elkotob@vodafone.com	
Contact:	Martin Brand, A1 Telekom Austria, Austria	E-mail: martin.brand@A1.at	
Contact:	Luis Miguel Contreras, Telefonica, Spain	E-mail: luismiguel.contrerasmurillo@telefonica.com	
Contact:	Cedric Crettaz, Mandat International	E-mail: ccrettaz@mandint.org	
Contact:	Alexey Borodin, Rostelecom	E-mail: borodin.msk@mail.ru	

Additional contacts and supporting entities

Contact:	Konstantinos Tsagkaris, WINGS ICT Solutions, Greece	E-mail: ktsagk@wings-ict-solutions.eu
Contact:	Evangelos Kosmatos, WINGS ICT Solutions, Greece	E-mail: vkosmatos@wings-ict-solutions.eu
Contact:	Peter Van Daele, Fed4FIRE+ project, Belgium	E-mail: Pet.VanDaele@UGent.be

General information

- FG-TBFxG was created in **December 2021** based on received contributions (ITU-T SG11 is a parent group)

- Web page: **https://itu.int/go/fgtbf**

- As of July 2022, there are **11 ongoing work items** (see latest Work Plan)
  Note: four of them (D2.1, D2.2, D3.3 and D3.5) are on mature stage.
  All documents are available on FG **SharePoint**

- For having access to FG documents **sign up for ITU account**

- Participation is **open for all stakeholders** including non-ITU members

- **Contributions to upcoming meetings are welcome**

FG-TBFxG objectives

- **harmonize testbeds specifications across SDOs/Fora**;

- **develop the required application program interfaces** (APIs) aligned with the Testbeds Federations Reference Model defined in Recommendation ITU-T Q.4068

- **define a set of use cases** for Federated Testbeds and associated APIs, such as "Testbed-as-a Service" (TaaS) – call for use cases!

- **collaborate with SDOs/Fora, Research Communities, Researchers** on IMT-2020 and beyond, Industry Users of Testbeds, Testbeds Suppliers for IMT-2020 Testbeds and other Testbeds, CSPs, Network Operators, Infrastructure Vendors/Suppliers for ICT and Verticals, Open Source & Open Hardware Projects, Regulators.

FG-TBFxG Structure

FG Management

Chairman: Giulio Maggiore
(Telecom Italia, Italy)

Vice-Chairman: Mr Muslim Elkotob
(Vodafone, Germany)

Vice-Chairman: Ranganai Chaparadza
(Capgemini Engineering, Germany)

Vice-Chairman: Martin Brand
(A1 Telekom Austria, Austria)

Vice-Chairman: Sébastien Ziegler
(Mandat International, Switzerland)

Vice-Chairman: Tayeb Ben Meriem
(IPv6Forum, France)

Vice-Chairman: Cancan Huang
(China Telecommunications Corporation, China)

TSB Secretariat

Advisor of FG-TBFxG: Denis Andreev

WG1: Use Cases, Applications and Industry Demand, Business Models

WG1 Chairman: Muslim Elkotob (Vodafone, Germany)

WG2: Testbeds as a Service

WG2 Chairman: Cédric Crettaz (Mandat International, Switzerland)

WG3: APIs, Reference Model Instantiations

WG3 Chairman: Ranganai Chaparadza (Capgemini Engineering, Germany)
WG3 Vice-chairman: Tayeb Ben Meriem (IPv6 Forum, France)

FG-TBFxG work plan

D0.1 Technical Specification: High-Level Taxonomy

WG1

D1.1 Technical Report
Guide on Taxonomy of Use Cases for Federated Testbeds covering Verticals, Technologies, and Business Scenarios; Focus on Synergies and Commonalities

D1.2 Technical Specification
Consolidated Technical Requirement Set for Federated Testbeds Use Cases; Focus on Stakeholders Models (SMEs, ISVs, CSPs, …)

D1.3 Technical Specification
Use Case Description on Use of Federated Testbeds in Testing Federated Autonomic Management and Control (AMC) Operations by ETSI GANA Components within and Across Multiple 5G Network Operators

WG2

D2.1 Technical Specification
User requirements and reference model for Testbed as a Service

D2.2 Technical Specification
Testbed as a Service API and interoperability specifications

WG3

D3.1 Technical Specification
APIs Definitions on Testbeds Federations, and APIs Invocations Framework

D3.2 Technical Report
Instantiations of the Testbeds Federations Reference Model, Transformation of existing IMT-2020/5G related Testbeds APIs

D3.3 Technical Report
Guide on Development and Maintenance of ONPs (Open Networking Platforms) and Federations for IMT-2020/5G & Beyond

D3.4 Technical Specification
Definition of KPIs specific to Testbed Federations

D3.5 Technical Report
Use of Open-Source & Open Hardware Projects/Products in Testbed Federations for IMT-2020/5G and Beyond

Ref.: *TBFxG-O-034. All documents are available on FG's SharePoint*

FG-TBFxG extension and meetings

https://itu.int/go/fgtbf

- *Extension of FG life cycle was agreed at the SG11 opening plenary (10 May 2023).*

- *FG continues working on its subjects until June 2024.*

- **3-5 July 2023**

Note: two more meetings will be planned in 2023

Connection between Test Bed Federations and GAIA-X

Dataspaces as Telco Data Space enable forming ecosystems that connect different stakeholders and leverage data driven services

Federation-based ecosystems are best connected via unifying dataspaces for asset exchange and advanced data-driven scenarios
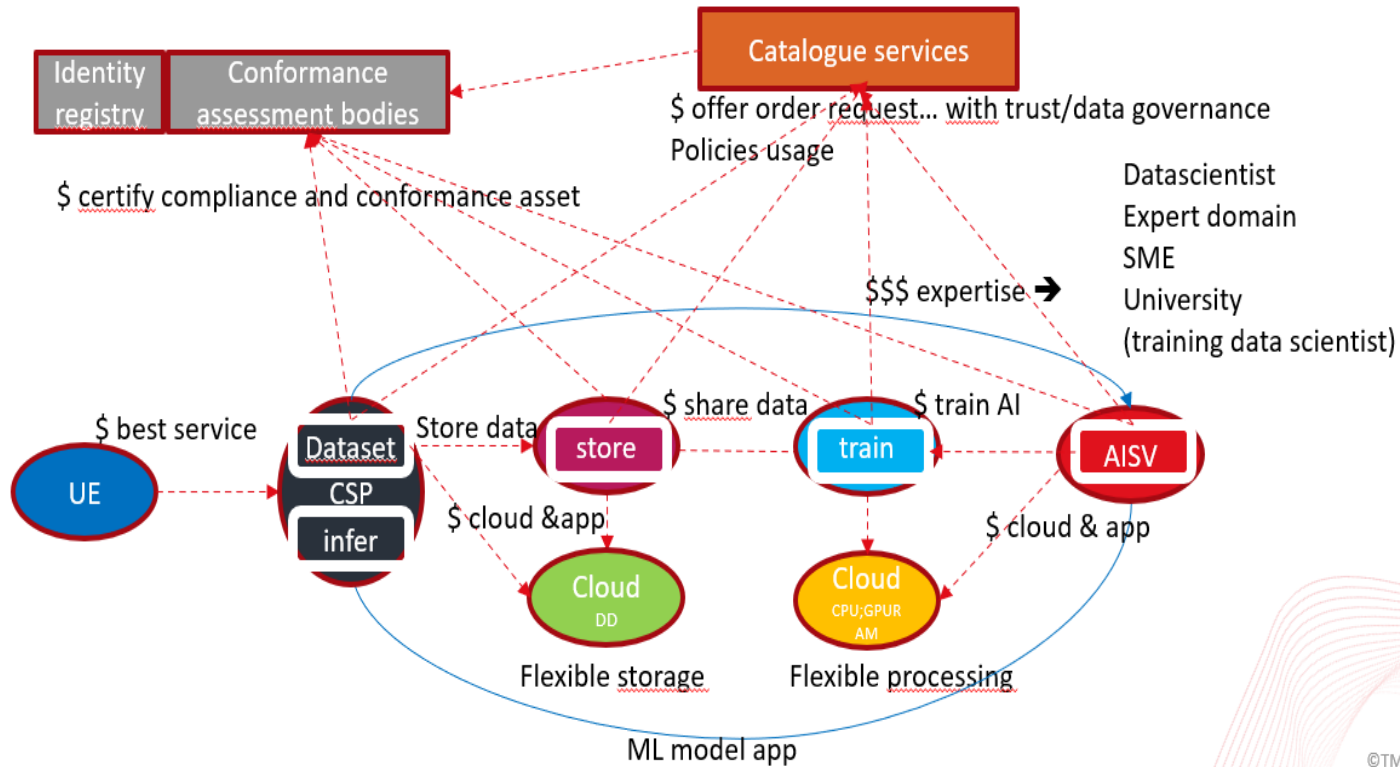
Workflow data governance must comply with regional data governance per ecosystem use cases, and data governance policies

a) Use of certification and claims with verifiable credentials

b) Distributed identity registry store certification W3C DID (data owners manage their identity certifications provided by verifiable authorities

c) Each certification claim could be verifiable

Federated AI testing certification can be verified per network, per service or per business behaviour/transaction
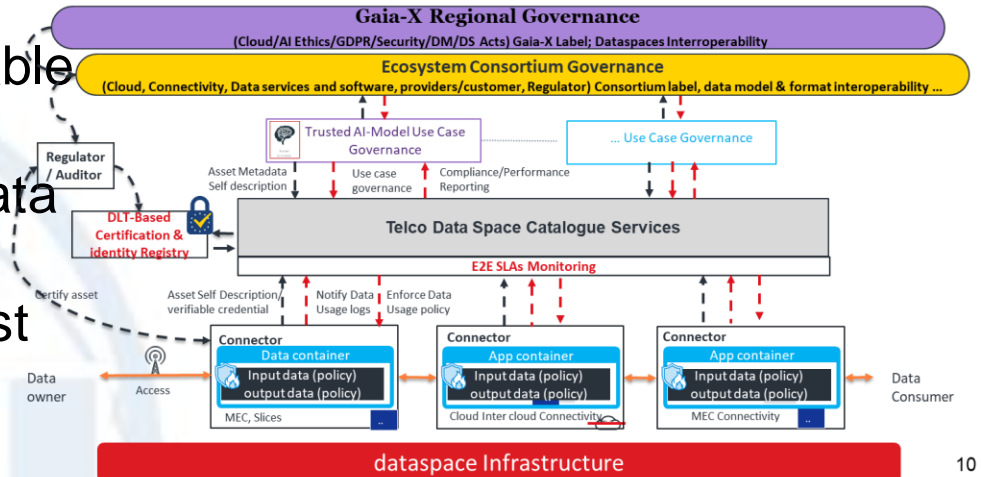
ETSI PoC for Data Driven Services& Telco Data Sharing

INT AFI is designing a multi-event PoC series to test data driven ecosystems and data sharing scenarios in various use cases and business scenarios
A Multi-operator data sharing ecosystem PoC setup is shown below
Testing focus will be on interoperability, certification, sharing-agnostic sovereignty ..

The planned PoCs shall include key elements of the Data Sharing Architecture including Service Catalogs, Service Containers, Certification Engines, Data Processing Engines (especially for privacy, sovereignty) (depicted above)
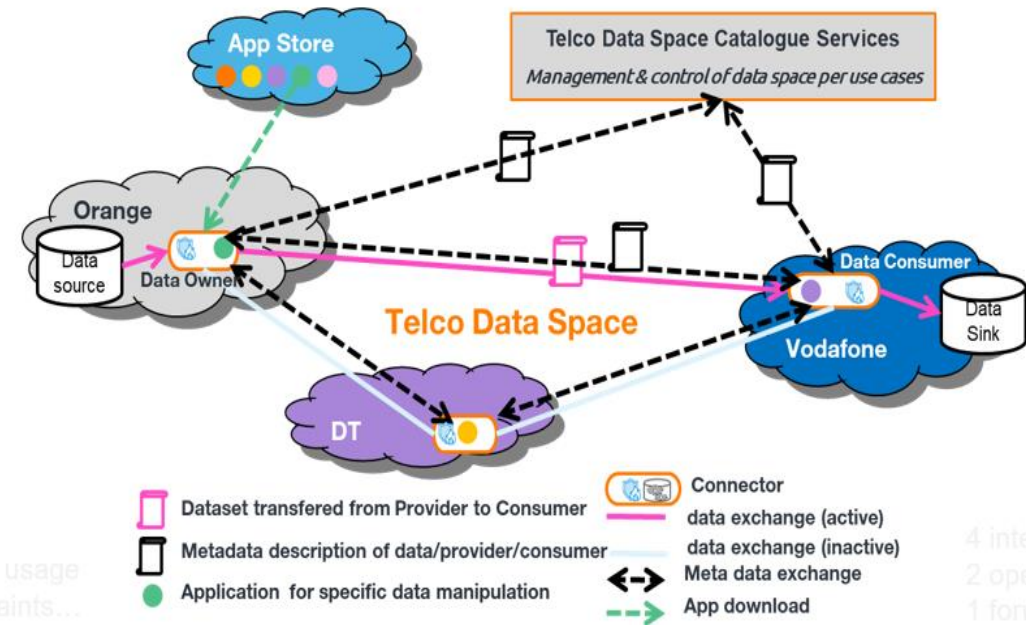
Summary and Next Step

- Industry needs to experiment and pilot their "5G enabled" business case before moving to commercial.

- Contribute to the development of the APIs being prescribed by the Testbeds Federations Reference Model;

- Share the burden on APIs Specifications and Standardization and on Roadmaps in a harmonized and collaborative way;

- Develop New Business Models for Testbeds Suppliers that derive from the Testbeds Federations Reference Model and associated APIs, such as "Testbed-as-a Service" (TaaS) Business Model.

- The work done so far in the Focus Group is in a good stage so the extension of the project will allow us to complete the work with the right quality

FG-TBFxG mailing list: fgtbf@lists.itu.int

Note: subscribe using ITU account here. Sign up for ITU user account here.

FG-TBFxG Secretariat: tsbfgtbf@itu.int

Backup

How the objectives are met ITU-T 4068

- Generic reference model for testbeds federations and key players, based on ETSI GANA Testing as Example Use Case

- Potential of testbed interoperability and federation

- Elements of a reference model of testbed federation

- Testbeds federation APIs requirements

- Some APIs for illustration of an instantiation of the generic model

- Aggregate Manager (AM) API, Slice Authority (SA) API, Member Authority (MA) API

- Reference Metrics

- Examples of use cases for testbed federation

D2.1 Use Cases for Federated Testbeds and business scenarios

UC01: Testbed on Roaming Scenarios (IMS interconnection)

UC02: Additional Testing Use Cases for IMS Emergency

UC03: Rapid Resource Deployment for Physical Disaster Scenarios

UC04: Smart Cities

UC05: Automated Construction and Demolition Waste Management using digital twin for buildings

UC06: Enabling Open Architecture Access Using IEEE 5G/6G Innovation Testbed

UC07: Testing Federated Autonomic Management and Control (AMC) by federated ETSI GANA Knowledge Planes (KPs) Platforms for Autonomic/autonomous 5G and beyond networks

UC08: Federated Testbed Cybersecurity as a Service and FTaaS

UC09: Federation of 5G services

UC10: Federation of smart city services

UC11: Imec iLab.t testbeds and the Fed4FIRE federation

UC12: Federation of smart city water treatment and distribution services