



WG(s): All virtual, 4-7 April 2022

OUTPUT DOC

Source: Chairman FG-TBFxG

Title: Report of the first meeting of ITU-T Focus Group on Testbed Federations for IMT-2020 and beyond (virtual, 4-7 April 2022)

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Abstract: This document contains a report of the first meeting of ITU-T Focus Group on Testbed Federations for IMT-2020 and beyond which was held fully virtual from 4-7 April 2022.

1 Introduction

The first meeting of the ITU-T Focus Group on “Testbed Federations for IMT-2020 and beyond” was held fully virtual from 4-7 April 2022.

The meeting was chaired by Giulio Maggiore (Telecom Italia, Italy), Chairman of FG-TBFxG, assisted by Mr Denis Andreev (TSB, Advisor of FG-TBFxG).

2 Welcome remarks

Chaesub Lee (Director of TSB, ITU), opened the meeting on 4 April 2022 at 1200 hours.

Mr Lee highlighted that ITU-T Focus Groups are key vehicles to accelerate ITU standardization work in fields of fast-growing strategic importance to ITU membership. He pointed out that Testbed Federations can play a central role in meeting these needs. This will require new partnerships, partnerships that we can build together in this Focus Group.

He emphasized that the world has come to rely on increasingly complex technologies in fields from 5G and IoT to big data, cloud computing and machine learning. This complexity calls for more sophisticated testing environments – and testing is becoming more cost-intensive as a result.

He noted that Testbed Federations could help us to maximize collective return on our testbed investments. They could help us to bring promising innovations to market faster, and more sustainably. This understanding led ITU-T Study Group 11 to develop a new standard specifying open APIs for interoperable testbed federations which defines a generic reference model for such federations and describes the foundational elements of this model – it provides a foundation for this Focus Group to build on.

He indicated that in establishing this Focus Group, ITU-T Study Group 11 is inviting new voices to influence its work – we aim to hear from as many stakeholders as possible to ensure that ITU standards provide comprehensive solutions for testbed federations.

He highlighted that Focus Group can examine the specializations of different testbeds, harmonize specifications for testbed interoperability and identify opportunities for mutually beneficial interactions.

Finally, Mr Lee welcomed all participants and wish the success to the first meeting.

3 Agenda approval

The agenda [[TBFxG-I-018](#)] of the meeting was approved at the opening plenary meeting. The updates agreed during the meeting are reflected in relevant revisions of the agenda (see the latest version).

4 Introduction session

As it is the first meeting of the FG-TBFxG, it was decided to arrange introduction session where all interested stakeholders, including SDOs/For a/Consortia, Open Source/Hardware Projects were able to share their views and activities on testbed federations and other related issues.

Among speakers of introduction session were: Giulio Maggiore (FG Chairman, Telecom Italia); Latif Ladid (IPv6 Forum); Ranganai Chaparadza (Capgemini Engineering, Germany); Tayeb Ben Meriem (IPv6 Forum); Benoit Radier (Orange, France); Muslim Elkotob (Vodafone, Germany); Cedric CRETTAZ and Sébastien ZIEGLER (Mandat International, Switzerland); Martin Brand (AT1 Telekom Austria, Austria); Anwer Al-Dulaimi (IEEE FNI); Yushi Torigoe (NICT); Mohammad Patwary (IEEE INGR Testbeds WG); Ivan Seskar (IEEE INGR Testbeds WG); Lincoln Lavoie (BBF); Wayne Cuttler (GSMA); Roman Kuznar (Sintesisio).

All presentations and materials are available in [[TBFxG-I-008](#)]; [[TBFxG-I-007](#)]; [[TBFxG-I-005-R1](#)]; [[TBFxG-I-019](#)]; [[TBFxG-I-020](#)]; [[TBFxG-I-022](#)]; [[TBFxG-I-021](#)]; [[TBFxG-I-023](#)]; [[TBFxG-I-016](#)]

It was noted that there is a huge interest to the FG areas of research as testbed federations can significantly benefit the work of different stakeholders presented their activities. Moreover, the APIs which under development in different SDOs can be exploited to the new ecosystem of Federated Testbeds for 5G and Beyond which framework was standardized by ETSI and ITU (ITU-T Q.4068) and can be used for further research under FG.

5 Focus Group structure

In addition to the VC appointed by SG11 in December 2021, the meeting appointed the following new FG vice-chairmen:

- Ranganai Chaparadza (Capgemini Engineering, Germany)
- Martin Brand (A1 Telekom Austria, Austria)
- Sébastien Ziegler (Mandat International, Switzerland)
- Tayeb Ben Meriem (IPv6Forum, France)
- Cancan Huang (China Telecommunications Corporation, China)

FG Chairman presented his view on the FG structure. He proposed to create three Working Groups (WGs) which scope will be limited to the specific areas. The proposal contains in [TBFxG-I-001](#).

The following FG structure was agreed:

- WG1: Use Cases, Applications and Industry Demand, Business Models
 - o WG1 Chairman: Muslim Elkotob (Vodafone, muslim.elkotob@vodafone.com)
- WG2: Testbeds as a Service
 - o WG2 Chairman: Cédric Crettaz (Mandat International, ccrettaz@mandint.org)
- WG3: APIs, Reference Model Instantiations

- WG3 Chairman: Ranganai Chaparadza (Capgemini Engineering: ran4chap@yahoo.com; ranganai.chaparadza@capgemini.com)
- WG3 Vice-chairman: Tayeb Ben Meriem (IPv6 Forum)

FG Chairman encouraged all WG Chairmen to provide the list of focal points of external entities to whom the oLSs to be addressed.

The final agreed structure of the FG-TBFxG is available in [TBFxG-O-001](#). FG agreed the oLS informing parent group – ITU-T SG11 about appointed VC and the results of the first meeting ([TBFxG-O-007-R1](#)).

6 Documents allocation, mailing lists and IPR

FG Chairman highlighted the logistic issues such as mailing list (fgtbf@lists.itu.int). He encouraged all to subscribe to this mailing list as it gives all delegates and interested stakeholders to exchange their views and follow the offline discussion. It was pointed out that this mailing list will be used for announcing future FG meetings. The detailed instruction on how to subscribe to the mailing list is made available on the FG webpage [here](#).

TSB gave a comprehensive overview about Focus Groups and its working methods [[TBFxG-I-017](#)].

FG Chairman asked at the beginning of the meeting, whether anyone had knowledge of patents or software copyrights, the use of which may be required to implement the Technical Specifications and Technical Reports being considered. There were no affirmative responses. Information about ITU IPR policies is available in [TBFxG-I-002](#).

The documents of the FG-TBFxG are available on the [SharePoint](#) ([ITU user account](#) is needed). TSB informed participants about the “Drafting” folder (sub-folder [220404-virtual](#)) that was created on the SharePoint. It was noted that FG management and editors have full rights. Any materials that need to be posted in the drafting folder need to be sent to the FG management and/or editors accordingly. This folder can be used for exchanging materials related to discussion. No template needed.

The short hyperlink for the FG-TBFxG web page is available at: <https://itu.int/go/fgtbf>.

7 WG reports and discussion of input contributions

The WGs Chairmen gave an overview on discussion of input contributions and relevant decisions.

7.1. WG1 Outcomes

Input document	Discussion
TBFxG-I-006	Overview and contents of NICT’s contribution on Interconnected/Integrated Testbeds built by NICT and its partners. How to contribute this contribution to the Use Cases for Testbeds Federations. The next step is to bring some structure to the mentioned used cases and match them to the overall context and structure of D1.1. Suggestion is to use a Template that will be developed by WG1 on how to describe Use Cases, and use the Template in providing the Use Cases that should be extracted from the Contribution.
TBFxG-I-014	Co-construction of an ecosystem for the digital transformation and territorial development was discussed. It contains some aspects of relevance to Use Cases and Requirements for Testbeds Federations. It was suggested that the contributor follows the suggestion to use a Template that will be developed by WG1 on how to describe Use

Input document	Discussion
	Cases, and use the Template in providing the Use Cases that should be extracted from the Contribution. The next step is to bring the contribution into perspective within the eco-system. the contribution should be an enabler for Testbeds Federations and not a consumer of achieved targets.
TBFxG-I-016	Lessons learned from running the testbed Federation Fed4FIRE for 10 years was discussed, and the conclusion was that the contribution contains very good inputs that can be provided to all the three WGs. The action suggested was that the contributor will interact with WG1 to see how to use the WG1 Use Cases Template to provide Use Cases descriptions extracted from the Contribution. Among the various good perspectives of value, the experience of the contributors on policies for Federation, role-based models to support Testbeds Federations, and differentiated methods for Federation applied per use-case are of high relevance and importance to this and other WGs of the FG
TBFxG-I-015	Discussed the Proposed skeleton of new Technical Report D1.1: Guide on Taxonomy of Use Cases for Federated Testbeds covering Verticals, Technologies, and Business Scenarios; Focus on Synergies and Commonalities. We looked into Templates that can be used for describing Use Cases: 1 Template from an ITU-T Focus Group and the other from ETSI TC INT AFI (an ETSI TR document was shared). It was agreed to follow the skeleton of the ETSI TR, to add a basis starting point for a template to capture use case features for contribution solicitations, and to cover two use-case super-clusters, CSP-centric ecosystems and non-CSP centric ecosystems.

7.2. WG2 Outcomes

Input document	Discussion
TBFxG-I-003	The template of the Technical Specification D2.1 “User requirements and reference model for Testbed as a Service” was discussed during the meeting. First of all, the KPIs of the deliverable D2.1 will be linked to the KPIs defined in WG3. Several possible KPIs were added in the deliverable D2.1. A liaison statement to OMG has been elaborated to get the guidelines from OMG concerning the methodology used to specify APIs in the context of the deliverable D2.1. The certification of testbeds for the conformance was discussed during the meeting and related inputs were added in the document as editor’s note.
TBFxG-I-004	The template of the Technical Specification D2.2 “Testbed as a Service API and interoperability specifications” was discussed during the meeting. Some features to be provided by the Testbed as a Service were mentioned and added in the deliverable D2.2 as editor’s notes. Furthermore, a liaison statement was established with TM Forum to provide some contributions concerning the TM Forum Open APIs which can be very useful for the work undertaken in the deliverable D2.2: business, monetization and catalogues of products and services.

7.3. WG3 Outcomes

Input document	Discussion
TBFxG-I-009	<p>The scope and Draft Structure and Type of Deliverable were agreed. New output document was produced based on the technical discussions. Editor’s Notes in the Output document include plans to seek to liaise with the SDOs/Fora Groups that were identified during the Discussions. Notes on if and which WG in the Focus Group should collaborate with this Work Item have been included in the Output Document too. The Liaisons will be Drafted and the Agreed before sending them to the SDOs/Fora Groups identified during the discussions. Editors will be assigned. New Chapters/Clauses have been suggested in the Output document.</p>
TBFxG-I-010	<p>The scope and Draft Structure and Type of Deliverable were agreed. New output document was produced based on the technical discussions. Editor’s Notes in the Output document include plans to seek to liaise with the SDOs/Fora Groups that were identified during the Discussions. Notes on if and which WG in the Focus Group should collaborate with this Work Item have been included in the Output Document too. The Liaisons will be Drafted and the Agreed before sending them to the SDOs/Fora Groups identified during the discussions. Editors will be assigned. New Chapters/Clauses have been suggested in the Output document.</p>
TBFxG-I-011	<p>The scope and Draft Structure and Type of Deliverable were agreed. New output document was produced based on the technical discussions. Editor’s Notes in the Output document include plans to seek to liaise with the SDOs/Fora Groups that were identified during the Discussions. Notes on if and which WG in the Focus Group should collaborate with this Work Item have been included in the Output Document too. The Liaisons will be Drafted and the Agreed before sending them to the SDOs/Fora Groups identified during the discussions. Editors will be assigned. New Chapters/Clauses have been suggested in the Output document.</p>
TBFxG-I-012	<p>The scope and Draft Structure and Type of Deliverable were agreed. New output document was produced based on the technical discussions. Editor’s Notes in the Output document include plans to seek to liaise with the SDOs/Fora Groups that were identified during the Discussions. Notes on if and which WG in the Focus Group should collaborate with this Work Item have been included in the Output Document too. The Liaisons will be Drafted and the Agreed before sending them to the SDOs/Fora Groups identified during the discussions. Editors will be assigned. New Chapters/Clauses have been suggested in the Output document.</p>

Input document	Discussion
TBFxG-I-013	The scope and Draft Structure and Type of Deliverable were agreed. New output document was produced based on the technical discussions. Editor's Notes in the Output document include plans to seek to liaise with the SDOs/Fora Groups that were identified during the Discussions. Notes on if and which WG in the Focus Group should collaborate with this Work Item have been included in the Output Document too. The Liaisons will be Drafted and the Agreed before sending them to the SDOs/Fora Groups identified during the discussions. Editors will be assigned. New Chapters/Clauses have been suggested in the Output document.

8 Status of deliverables

The list of deliverables was updated according to the results of discussion and approved by the Focus Group closing session as contained in [\[TBFxG-O-014-R1\]](#).

The progress report incorporates all achievements of the FG-TBFxG is contained in Annex A.

9 Incoming and Outgoing Liaison statements

9.1 Incoming Liaison statements

LS/i on establishment of a new ITU-T Focus Group on Testbeds Federations for IMT-2020 and beyond (FG-TBFxG) and first meeting (virtual, 4-7 April 2022) [from ITU-T SG11].
[\[TBFxG-LSi-001\]](#)

This iLS was taken for information.

LS/i on final deliverables of ITU-T FG-QIT4N [from FG-QIT4N] [\[TBFxG-LSi-002\]](#)

This iLS was taken for information.

9.2 Outgoing Liaison statements

It was agreed to send the following liaison statements:

oLS	Title	To	Related to iLS
TBFxG-O-002-R2	Proposed outgoing liaison statement on request for contributions and presentation from TM Forum concerning the utilisation of TM Forum APIs in the context of testbed federations	TM Forum (for action)	-
TBFxG-O-003-R2	Proposed outgoing liaison statement on call for presentation on the development of Open APIs in the context of testbed federations	OMG (for action)	-
TBFxG-O-007-R1	Proposed outgoing liaison statement on progress report of FG-TBFxG and appointed Vice-chairmen	ITU-T SG11 (for information)	-

oLS	Title	To	Related to iLS
TBFxG-O-006-R1	Proposed outgoing liaison statement on the outcomes of the first meeting of the ITU-T Focus Group on Testbed Federations for IMT-2020 and beyond (FG-TBFxG)	All ITU-R, ITU-T and ITU-D Study Groups; ITU-R WP5A; ITU-R WP5D; all ITU-T Focus Groups; BBF; CableLabs; ETSI TC INT; IEEE FNI Testbeds WG; IEEE INGR Future Networks; NGMN; NIST Advanced Networking Technologies Division (ANTD); O-RAN; TIP; TM Forum; OMG; IPv6 Forum; GSMA; ONAP; OPNFV; CCSA (for action)	-

10 Next FG-TBFxG meetings

The next Focus Group meeting will be held fully virtual from 19 to 21 July 2022 (1200-1700 hours, Geneva time). The relevant announcement will be spread out via FG mailing list. Also, the announcement and registration link as well as all related information will be made available on FG-TBFxG webpage (<http://itu.int/go/fgtbf>).

11 Interim WGs meetings

- WG1 and WG3 (26 May 2022 and 23 June 2022, time slots TBD)
- WG2 (30 May 2022 and 27 June 2022, time slots TBD)

12 Wrap up and Closing

The FG-TBFxG agreed the FG structure and list of potential deliverables. Also, during FG meeting the progress on some ongoing work items was achieved.

The FG-TBFxG Chairman thanked the Focus Group Vice-Chairmen, the Working Group Chairmen and Vice-Chairmen and contributors for their activities and unwavering support. He also extended his appreciation to Mr Denis ANDREEV, Advisor (TSB) and FG-TBFxG Secretariat for their assistance during the meeting.

Annex A

Progress report of the FG-TBFxG

1 Summary

The ITU-T Focus Group on Testbed Federations for IMT-2020 and beyond (FG-TBFxG) was created by ITU-T Study Group 11 (SG11) at its virtual meeting from 1-10 December 2021.

It was created as a result of the joint ITU-IEEE-ETSI Workshop (www.itu.int/go/BTF4-5G) and outcomes of ITU-T SG11 discussion in December 2021.

The ITU Focus Group will become a platform to engage and bring all interested stakeholders together in order to facilitate development of standards and APIs for the associated ecosystem on Testbeds Federations for 5G and Beyond. Among other issues, the Focus Group will study use cases and relevant APIs which may be applicable to the Federated Testbeds.

FG-TBFxG established three Working Groups (WGs) which will cover all aspects on testbed federations.

The first meeting of the FG-TBFxG took place fully virtual from 4-7 April 2022.

This progress report highlights the achievements of the Focus Group.

2 Terms of reference

The [terms of reference](#) of the Focus Group, as adopted by SG11, are available on the Focus Group website (www.itu.int/go/fgtbf).

According to the ToR, there are following objectives of the FG-TBFxG:

- To define a set of APIs definitions that complement the ongoing ITU-T SG11 study activities related to Testbed Federations and APIs of the Testbeds Federations Reference Model;
- To collect Use Cases for Testbeds Federations of relevance to IMT-2020 and beyond;
- To identify use cases and services based on Testbed Federations reference model that should be considered for various types of Stakeholders on the benefits of them joining the ecosystem around Testbeds Federations for IMT-2020 and beyond;
- To study the various Topics/Points compiled in the Key Takeaways from the ITU-T, ETSI, IEEE Joint SDOs Brainstorming Workshop on Testbeds Federations for 5G & Beyond (www.itu.int/go/BTF4-5G) in order to take them into consideration in the work of the Focus Group;
- To identify Metrics/Key Performance Indicators (KPIs) of relevance to Use Cases for Testbed Federations per and across ICT industry sectors in different domains (verticals); and propose methods/mappings by which E2E relationships among various metrics (e.g. KPIs) across Testbeds can be defined (see NOTE below):

NOTE: Among KPIs for Testbed Federations are:

- (1) KPIs of relevance to a Technology or combined Technologies that are being Tested using Federated Testbeds such that the measured KPIs help in the Test Cases verdicts setting;
- (2) KPIs of relevance to utilization, availability, capabilities, customer-experience (satisfaction) of the Testbeds and their resources being consumed or can be consumed in Testbed usage in a Test Scenario;

(3) Non-technical KPIs that relate to Testbed Service Offerings and Consumption

- To develop guidance to Research and Industry communities working on IMT-2020 and beyond on how to use the Testbeds Reference Model to contribute to the development of the APIs being prescribed by the Testbeds Reference Model, and also contribute to various instantiations cases of the Reference Model
- To facilitate discussions by which various SDOs/Fora can share ideas on how they can potentially share the burden on APIs Specifications and Standardization and on Roadmaps in a harmonized and collaborative way, based on the Testbeds Federations Reference Model, and produce a matrix that maps SDOs/Fora and other Stakeholders to APIs types they will be addressing or have interest to address;
- To define Potential New use cases and services for Testbeds Suppliers that derive from the Testbeds Federations Reference Model and associated APIs, such as “Testbed-as-a Service” (TaaS);
- To develop guidelines to Owners of Existing Testbeds and Platforms for IMT-2020 and beyond on how they could embark on Transformation or Evolution of existing Testbeds (Industry-grade, and potential Research Testbeds as well) and their Federation APIs to meet the requirements of the Testbeds Federation reference model (ITU-T Q.4068);
- To develop guidelines to the Industry on how to address the Challenges that need to be addressed as guided by the Reference Model and APIs for Testbeds Federations for IMT-2020 and beyond;
- To identify any Regulatory requirements and other aspects of relevance to Testbeds Federations and engage the relevant Stakeholders on how such aspects can be addressed;
- To define steps that can be pursued by the Industry towards Developing and Maintaining ONPs (Open Networking Platforms) for IMT-2020 and beyond, and the Use of the Testbeds Federations Reference Model and APIs to build ONPs;
- To develop reports of the FG activities on reference model and APIs for testbeds federation after the FG finished its work;
- To encourage participation from various projects and fora in the activities of the FG-TBFxG.

3 Management team

The management team was appointed as follows:

Chairman: Mr 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 (IPv6 Forum, France)

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

4 Structure

In order to efficiently progress the Focus Group established three working groups, as follows:

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

Chairman WG1: Mr Muslim Elkotob (Vodafone, [muslim.elkotob\[at\]vodafone.com](mailto:muslim.elkotob@vodafone.com))

WG2 — Testbeds as a Service

Chairman WG2: Mr Cédric Crettaz (Mandat International, [ccrettaz\[at\]mandint.org](mailto:ccrettaz@mandint.org))

WG3 — APIs, Reference Model Instantiations

Chairman WG3: Mr Ranganai Chaparadza (Capgemini Engineering: [ran4chap\[at\]yahoo.com](mailto:ran4chap@yahoo.com); [ranganai.chaparadza\[at\]capgemini.com](mailto:ranganai.chaparadza@capgemini.com))

Vice-chairman WG3: Tayeb Ben Meriem (IPv6 Forum, [tay.b52\[at\]yahoo.com](mailto:tay.b52@yahoo.com))

5 Document storage area and mailing lists

All documents of the FG-TBFxG are available on [SharePoint](#). It is used as document repository and for organizational purposes. The site is open to ITU TIES and Guest users (sign up for ITU user account [here](#)).

In order to facilitate collaboration, TSB created FG-TBFxG mailing list fgtbf@lists.itu.int. The Focus Group start using its mailing lists. There are 37 subscribers as of 7 April 2022.

6 Meetings

Error! Reference source not found. below provides an overview and statistics of the FG-TBFxG meetings held since establishment of the Focus Group. It also contains the number of input contributions considered at the meetings, output documents and the meeting reports which summarize detail discussion results and decisions taken.

Table 1. Overview of FG-TBFxG meetings

Meeting	Virtual 4-7 April 2022
Input docs	24
Output docs	16
Meeting report	TBFxG-O-015-R1
Number of participants	82 from 29 countries
List of participants	TBFxG-O-016

7 Workshops and introductions sessions

FG-TBFxG organized introduction session at the first meeting on 4th April 2022. The objective of the session was to give a background about testbed federations and highlight the FG plans. Different stakeholders share their views and activities on testbed federations and other related issues. Some presentations delivered at the meeting are listed in [TBFxG-I-018-R6](#).

8 Deliverables

The Focus Group developed Working groups structure and updated list of deliverables. It is updated at every particular meeting of the Focus Group. The latest list of deliverables agreed by the FG-TBFxG meeting is available in [TBFxG-O-014-R1](#).

9 Relationships

The Focus Group worked in close cooperation with related standards developing organizations, industry forums and consortia, research and development communities.
