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| ITU logo | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2017-2020 | | | | | TSAG-TD475 |
| **TSAG** |
| **Original: English** |
| **Question(s):** | | | N/A | Geneva, 23-27 September 2019 | | |
| **TD** | | | | | | |
| **Source:** | | | FG DLT | | | |
| **Title:** | | | Final report of FG DLT to TSAG | | | |
| **Purpose:** | | | Discussion | | | |
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| --- | --- |
| **Keywords:** | Report; FG DLT; TSAG; distributed ledger technology; blockchain; focus group; |
| **Abstract:** | The document contains the final report of FG DLT to TSAG. |
| **Action:** | TSAG is invited to review the outcomes of FG DLT and discuss the efficient transfer of the deliverables and the further steps of DLT standardization in ITU-T. |

# Introduction

The ITU-T Focus Group on application of distributed ledger technology (FG DLT) was established by TSAG in May 2017

– to identify and analyse DLT-based applications and services;

– to draw up best practices and guidance which support the implementation of those; applications and services on a global scale; and

– to propose a way forward for related standardization work in ITU-T Study Groups.

# Summary of meetings and participation

FG DLT held seven face-to-face meetings since its establishment, as summarized in Table 1 below.

To advance the work in-between the face-to-face meetings, the working groups established under FG DLT made extensive use of the remote meeting facilities.

WG1 held 13 remote meetings; WG2 held 16 remote meetings; WG3 held 17 remote meetings; WG4 held 22 remote meetings; and the work on a technology outlook for DLT was progressed in 17 remote meetings.

The FG DLT email reflectors played an instrumental role in planning and advancing the work.

As of 23 July 2019, the FG DLT list for general announcements ([fgdlt@lists.itu.int](mailto:fgdlt@lists.itu.int)) had 389 subscribers (including 222 subscribers without TIES account).

WG2 had 220 subscribers; followed by WG3 (201); WG1 (191); WG4 (184); DLT outlook (120).

By 23 July, 125 messages were posted on the general announcements list; and the figures for the working groups were: WG1 (116); WG2 (168); WG3 (120); WG4 (292); DLT outlook (175).

**Table 1 - Summary of FG DLT Meetings**

|  | **Meeting** | **Host** | **Inputs** | **Outputs** | **Meeting report** | **Remote participants** | **Total participants** | **Co-located events** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **Geneva, 17-19 October 2017** | ITU | [39](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/Forms/AllItems.aspx#InplviewHash902f8203-0285-4882-8591-a67076714b95=FilterField1=Meeting-FilterValue1=Geneva%2C%2017%2D19%20October%202017) | [7](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/Forms/AllItems.aspx#InplviewHash8de520fa-10cf-4ed4-b4d3-f651727ae46d=FilterField1=Meeting-FilterValue1=Geneva%2C%2017%2D19%20October%202017) | [O-007](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/DLT-O-007.docx?Web=1) | 24 | [81](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/DLT-I-039.pdf?Web=1) | - |
| **2** | **Bern, 5-7 February 2018** | Swisscom | [37](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/Forms/AllItems.aspx#InplviewHash902f8203-0285-4882-8591-a67076714b95=FilterField1=Meeting-FilterValue1=Bern%2C%205%2D7%20February%202018) | [12](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/Forms/AllItems.aspx#InplviewHash8de520fa-10cf-4ed4-b4d3-f651727ae46d=FilterField1=Meeting-FilterValue1=Bern%2C%205%2D7%20February%202018) | [O-019](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/DLT-O-019.docx?web=1) | 23 | [64](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/DLT-I-076.pdf?Web=1) | - |
| **3** | **Geneva, 28-30 May 2018** | ITU | [26](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/Forms/AllItems.aspx#InplviewHash902f8203-0285-4882-8591-a67076714b95=FilterField1=Meeting-FilterValue1=Geneva%2C%2028%2D30%20May%202018) | [12](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/Forms/AllItems.aspx#InplviewHash8de520fa-10cf-4ed4-b4d3-f651727ae46d=FilterField1=Meeting-FilterValue1=Geneva%2C%2028%2D30%20May%202018) | [O-028](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/DLT-O-028.docx?web=1) | 29 | [60](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/DLT-I-102.pdf?web=1) | - |
| **4** | **Beijing, 9-12 October 2018** | CAICT, Trusted Blockchain Initiatives | [21](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/Forms/04.aspx) | [14](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/Forms/04.aspx) | [O-045](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/DLT-O-045.docx?web=1) | 16 | [47](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/DLT-I-123.pdf?web=1) | Trusted Blockchain Summit 2018 |
| **5** | **Rio de Janeiro, 14-17 January 2019** | BNDES | [34](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/Forms/05.aspx) | [12](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/Forms/05.aspx) | [O-057](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/DLT-O-057.docx) | 31 | [67](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/DLT-I-157.pdf) | Workshop on DLT for transparency and integrity​​ |
| **6** | **Madrid, 1-4 April 2019** | Alastria | [41](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/Forms/06.aspx) | [13](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/Forms/06.aspx) | [O-070](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/DLT-O-070.docx) | 20 | [48](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/DLT-I-198.pdf) | Workshop on DLT, Blockchain and SDG Attainment |
| **7** | **Geneva, 29 July - 1 August 2019** | ITU | [24](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/Forms/07.aspx) | [12](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/Forms/07.aspx) | [O-082](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/output/DLT-O-082.docx) | 15 | [62](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/input/DLT-I-223.pdf) | Workshop on DLT scalability and interoperability |
| **Total** | | | 223 | 82 |  | 158 | 429 |  |

# Summary of the deliverables

FG DLT produced and adopted eight deliverables as summarized in Table 2 below.

Highlights and key takeaways from each of the Deliverables are reproduced in Annex A.

**Table 2 - Summary of FG DLT deliverables**

| **Number** | **Type** | **Title** | **Text** | **Description** |
| --- | --- | --- | --- | --- |
| D1.1 | Technical Specification | DLT terms and definitions | ​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d11.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d11.docx) | This document contains a baseline set of definitions of terms commonly used in DLT. The definitions provide a basic characterization of the term, and where appropriate, a note is included to provide additional clarity. |
| D1.2 | Technical Report | DLT overview, concepts, ecosystem | ​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d12.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d12.docx) | This document provides an overview, concept and ecosystem for the distributed ledger technology. |
| D1.3 | Technical Report | DLT standardization landscape | ​​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d13.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d13.docx) | This document describes the standardization landscape for DLT, as of July 2019. It covers ITU-T, ISO, IEEE Standards Association, W3C, UNECE/CEFACT, ETSI, CEN/CENELEC, NIST, DIN, and other communities. |
| D2.1 | Technical Report | DLT use cases | [PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d21.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d21.docx) (Report only)  ​[ZIP](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d21.zip) (Report and use cases) | This document consolidates each of the real-world use cases gathered during the lifetime of the ITU-T FG DLT. It also consolidates the knowledge extracted from these use cases, highlighting the competitive advantage of each use case brought by DLT, the main barriers to DLT adoption, how new business models based on DLT can contribute to the attainment of the SDGs and how the use cases could benefit from a standardization effort. |
| D3.1 | Technical Specification | DLT reference architecture | [PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d31.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d31.docx) (Specification only)  ​[ZIP](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d31.zip) (Specification and platform mapping) | This document defines the reference architecture for distributed ledger technology, the hierarchical relationship and specific functions of the distributed ledger technology architecture, important modules and specific functions in the structure of distributed ledger technology, the main technical route and direction of the core module in the distributed ledger architecture. The mapping of this DLT reference architecture to popular DLT platforms was conducted and the results contained in the attachments to this report. |
| D3.3 | Technical Specification | Assessment criteria for DLT platforms | ​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d33.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d33.docx) | This document defines an assessment framework for a DLT platform, which includes a set of criteria for function, performance and other aspects. The framework can be used as a guideline for DLT platform assessment as well as information disclosure of a certain DLT platform product. |
| D4.1 | Technical Report | Distributed ledger technology regulatory framework | ​[PDF​](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d41.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d41.docx) | This document considers the key properties of DLT that are common among the diversity of many approaches. We aim to bring into focus the topics that are of concern to the regulators. By supplying practical recommendations for users, regulators, and technologists, we hope to mitigate the risks of potential harms. |
| D5.1 | Technical Report | Outlook on distributed ledger technologies | ​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d51.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d51.docx) | This document explores the advancement of DLT beyond legacy landscapes, frameworks, architectures and introduces the emerging concepts related to DLT. |

A ZIP file containing all Deliverables in MS Word format is available at <https://www.itu.int/en/ITU-T/focusgroups/dlt/Documents/FGDLT-deliverables.zip>.

# Summary of the interaction with other organizations

The Focus Group has taken into consideration the guidance provided in Recommendation ITU-T A.7, Appendix I.

All FG DLT meetings started with presentation of status updates and review of liaison statements from ITU-T study groups (2, 11, 13, 16, 17, and 20) and ITU-T focus groups (DPM, DFC), ISO/TC 307 (Blockchain and DLT) and other external bodies (including GSMA Internet Group, BIS WG Digital Innovation).

A liaison officer to ISO/TC 307 (Blockchain and distributed ledger technologies) was appointed by the Focus Group, was granted access to TC 307 meetings and documentation (leveraging ITU’s Category A liaison status), and is reporting to FG DLT on work items of common interest. TC 307 appointed two liaison representatives to follow DLT-related work in ITU-T, including in FG DLT.

UN/CEFACT, NIST, CEN-CENELEC, ETSI and European Commission presented their work on blockchain technologies and DLT to the Focus Group.

One of the Focus Group Deliverables, D1.3, draws a comprehensive DLT standardization landscape (as of July 2019).

FG DLT representatives were invited to attend the workshop of JPEG DLT Workshop, Conference of International Chamber of Commerce (ICC) 2019, WIPO Blockchain Conference, WSIS Forum 2019, Telco Blockchain Forum and other events to present ITU-T work on DLT.

FG DLT deliverables are serving as basis for the development of training material for ITU Academy.

The focus group has been considering the attainment of the sustainable development goals (SDGs) through the use of DLT and has highlighted related aspects and standardization needs in its work on DLT use cases in Deliverable 2.1. DLT and SDG attainment was theme of one of the workshops organized by the Focus Group in conjunction with their face-to-face meetings.

# Transfer of deliverables to ITU-T study groups

FG DLT has taken note of the initiation of DLT-related standardization activities and work items across ITU-T study groups. Especially, ITU-T study groups 16 and 17 have established Questions dedicated to DLT within their respective mandates.

SG16 has established a new Question, Q22/16, Distributed ledger technologies and e-services. The Q22/16 focus on DLT infrastructure and DLT based e-service and applications, the terms of reference of this group are available at <https://www.itu.int/en/ITU-T/studygroups/2017-2020/16/Pages/q22.aspx>.

SG17 established a new Question, Q14/17, Security aspects of distributed ledger technologies. The Q14/17 focus on the security aspects of DLT and the terms of reference are available at <https://www.itu.int/en/ITU-T/studygroups/2017-2020/17/Pages/q14.aspx>.

With a view to streamlining the transfer of the deliverables, FG DLT propose to consider Q22/16 and Q14/17 the primary recipients for further development and adoption of its deliverables as the foundation of ITU-T Recommendations or Technical Papers after TSAG review.

Considering that FG DLT attracted a high number of non-members, including many representatives of start-ups and SMEs, it appears advisable to allocate a bulk of the work to one study group. As one of a few study groups, SG16 is participating in the SME trial[[1]](#footnote-1) and could be a candidate to be a primary recipient of the bulk of FG DLT deliverables, except the aspects of the deliverables dealing with security.

On the other hand, FG DLT’s work on terminology has greatly benefitted from Q14/17 involvement and leveraged existing DLT work undertaken mainly in Q14/17, but also in other study and focus groups. To ensure continuity and coordination, the terms and definitions deliverable could find its new home in Q14/17.

The detailed proposals are summarized in Table 3 below.

**Table 3 - FG DLT deliverables distribution proposal**

| **Number** | **Type** | **Title** | **Text** | **Primary recipient** | **Proposed action** |
| --- | --- | --- | --- | --- | --- |
| D1.1 | Technical Specification | DLT terms and definitions | ​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d11.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d11.docx) | Q14/17 | Adopt as ITU-T Recommendation |
| D1.2 | Technical Report | DLT overview, concepts, ecosystem | ​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d12.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d12.docx) | Q14/17 | Adopt as ITU-T Technical Paper |
| D1.3 | Technical Report | DLT standardization landscape | ​​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d13.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d13.docx) | Q14/17 | Keep information up-to-date |
| D2.1 | Technical Report | DLT use cases | [PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d21.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d21.docx) (Report only)  ​[ZIP](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d21.zip) (Report and use cases) | Q22/16  *Note: SG17 to receive the aspects of this deliverable dealing with security.* | Adopt as ITU-T Technical Paper |
| D3.1 | Technical Specification | DLT reference architecture | [PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d31.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d31.docx) (Specification only)  ​[ZIP](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d31.zip) (Specification and platform mapping) | Q22/16 | Adopt as ITU-T Recommendation (existing work item H.DLT) |
| D3.3 | Technical Specification | Assessment criteria for DLT platforms | ​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d33.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d33.docx) | Q22/16  *Note: SG17 to receive the aspects of this deliverable dealing with security.* | Adopt as ITU-T Recommendation (existing work item F.DLT-AC) |
| D4.1 | Technical Report | DLT regulatory framework | ​[PDF​](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d41.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d41.docx) | Q22/16 | Adopt as ITU-T Technical Paper |
| D5.1 | Technical Report | Outlook on DLTs | ​[PDF](https://itu.int/en/ITU-T/focusgroups/dlt/Documents/d51.pdf) | [DOCX](https://extranet.itu.int/sites/itu-t/focusgroups/fgdlt/Shared%20Documents/Deliverables/d51.docx) | Q22/16  *Note: SG17 to receive the aspects of this deliverable dealing with security.* | Adopt as ITU-T Technical Paper |

A ZIP file containing all Deliverables in MS Word format is available at <https://www.itu.int/en/ITU-T/focusgroups/dlt/Documents/FGDLT-deliverables.zip>.

Further to putting forward the deliverables for adoption in Qs 14/17 and 22/16, TSAG is encouraged to make available the set of FG DLT deliverables with all other ITU-T study groups and focus groups.

# Other considerations and recommendations

Since cooperation remains crucial at the current stage of DLT standardization, internal coordination and collaboration between different ITU-T study groups needs to be continued after the termination of FG DLT.

FG DLT recommends that a pragmatic approach be taken by study groups to take further action to avoid segmentation, inconsistency and overlap of DLT standardization.

In the near future, joint rapporteur meeting or co-located meeting arrangements of different groups (e.g., Q22/16 and Q14/17) can be a good practice to facilitate further collaboration.

Considering the great number of subscribers and interaction on the FG DLT reflectors (389 on general announcement list), it is proposed to migrate the subscriber base to the Q22/16 and Q14/17 reflectors (on an opt-out basis).

FG DLT has enjoyed the frank and fruitful exchange of information and cross participation of delegates with ISO/TC 307, and other organizations developing DLT standards and specifications. It is recommended to maintain and build on these existing relationships moving forward.

The Focus Group has discussed in great length the application of DLT to contribute to the attainment of the SDGs. It is recommended to keep engaged in this discussion through workshops, side events, hackathons at WSIS Forums, ITU TELECOM World, or similar events. As a member of the UN family, ITU has committed to advancing the SDGs. It is recommended that all ITU-T study groups furthering the work on DLT will discuss SDG relevance and inclusiveness.

1. **Acknowledgements**

The ITU-T FG DLT management team acknowledges the Working Group Champions, editors, contributors, liaison officers, meeting hosts, participants, and ITU staff. The work of the Focus Group would not have been possible without their contributions and commitment.

See Appendix I for a list of all participants in the seven FG DLT meetings.

Annex A – Highlights and key takeaways of FG DLT deliverables

The Focus Group on Application of Distributed Ledger Technology (FG DLT) was set up to analyse applications and services based on Distributed Ledger Technology (DLT) that can be standardized by ITU-T study groups, identify best practices and guidance, which could support the implementation of such applications and services on a global scale, and identify a way forward that ITU-T study groups need to study in order to meet the urgent market needs.

A key element of achieving this mission was to identify and introduce the foundation of the DLT ecosystem (including e.g., terms and definitions, taxonomies and concepts, and standardization activities). To this end, the Focus Group produced three deliverables (*“DLT terms and definitions”*, *“DLT overview, concept and ecosystem”*, and *“DLT standardization landscape”*).

The consolidation of terms and definitions is perhaps one of the most important topics for DLT standardization. The Focus Group defined distributed ledger as *“a type of ledger that is shared, replicated, and synchronized in a distributed and decentralized manner”*. Sixty-one other DLT-related terms were defined by the Focus Group in its terms and definitions specification, based on an extensive study of industry and standardization organizations dealing with DLT worldwide.

Besides terms and definitions, the Focus Group produced a report introducing major DLT characteristics and concepts, as well as ecosystem stakeholders and their respective roles.

Another report provides a snapshot of DLT-related standardization activities in ITU and other standardization bodies and communities, including ISO, IEEE Standards Association, and others.

The above-mentioned documents provide a neutral perspective and introduction to DLT and will be of benefit to all stakeholders with an interest in the topic. They facilitate communication between different parties, including, but not limited to, standards makers in ITU-T and other organizations.

In order to better understand how the technology can be applied in different scenarios and industries, the Focus Group conducted an in-depth analysis of applications and services based on DLT, represented in its report titled *“DLT use cases”*.

Many existing use cases from different countries were collected in a uniform way, describing general aspects of the respective project, outlining the processes with and without the application of DLT, and identifying benefits and drawbacks associated with the use of DLT in the respective scenario. This includes a description of non-functional requirements, including security, privacy, performance, as well as legal considerations and risks.

The Focus Group prioritized those 39 use cases that have developed proofs of concept or running implementations, in order to provide lessons learned as close to reality as possible. The use cases gathered comprise the vertical and horizontal domains: the vertical domain includes applications and services enabled by DLT in the financial, healthcare, information and communication technology, entertainment, industrial, government and public sectors, whereas the horizontal domain covers services applicable across sectors, such as identity, security and data management, governance and decentralized autonomous organizations, and crypto-infrastructure.

Based on the analysis, the report describes the competitive advantages brought by the application of DLT, main barriers to DLT adoption, covering both technical and non-technical issues. The report also outlines how DLT can contribute to the attainment of the United Nations’ Sustainable Development Goals, and describes how the use cases studied could benefit from an international standardization effort. The report concludes with recommendations on DLT applications targeting standards developers, policy makers, industry, and implementers.

Beyond the above work, the collected use cases can serve as knowledge base for further studies, e.g., on business models, security and privacy of solutions using DLT, risk assessment, governance models, and much more.

The use cases collected by the Focus Group are built on various DLT platforms. While many platforms share a set of key components, some elements are different, and comparing and evaluating becomes an increasingly difficult task.

The Focus Group has studied many of the DLT platforms available and described their key components and features.

The common components and features are defined in the Focus Group’s *“DLT reference architecture”* specification, which also describes their hierarchical relationship. The applicability of the reference architecture was illustrated by mapping it to 14 live DLT platforms, including some of the most popular ones.

Based on reference architecture and platform mapping, the Focus Group identified *“Assessment criteria for DLT platforms”* described in a separate specification. These 25 criteria aim to assist implementers to evaluate and compare different platforms.

Reference architecture and assessment criteria form the basis for further studies and standardization with the goal of increasing user awareness and interoperability.

Apart from considering technical issues, many implementers are concerned with the applicability of DLT in their respective legal and regulatory environments. Meanwhile, lawmakers and regulators are considering the need to adapt their instruments to this emerging technology. The Focus Group has considered the key properties of DLT and their relevance to law and regulation.

By analysing associated challenges and supplying practical recommendations addressing users, regulators, and technologists, the *“DLT regulatory framework”* developed by the Focus Group aims to create awareness and mitigate risks. Developed by a multidisciplinary group of experts, the report describes DLT-property specific problems and risks, and guides stakeholders on how to address them.

The Focus Group considered that technology, applications and regulatory practices related to DLT are evolving at a rapid pace. At this early stage of DLT development, many of the challenges are yet to be identified and addressed.

The “DLT Outlook” report explores the advancement of DLT beyond the current state of development, and addresses, *inter alia*, governance, computation networks, identity and privacy, resilience, risk and audit. The report summarizes existing studies, provides the reader with some future perspectives on these issues, and discusses related standardization aspects.

The reports and specifications developed by the Focus Group can be used as a baseline for the development of international standards for DLT and the applications and services build on top of it. They provide best practices and guidance supporting the implementation of those applications and services on a global scale.

More than creating the deliverables summarized above, the Focus Group has succeeded in creating an international and multidisciplinary community sharing an interest in the advancement of distributed ledger technology and its application.

Appendix I – List of all participants in the seven FG DLT meetings[[2]](#footnote-2)

| **Surname** | **First Name(s)** | **Affiliation** | **Country** |
| --- | --- | --- | --- |
| ABDULRAHMAN | Faizal | Malaysia | Malaysia |
| ABELOOS | Benoit | European Commission | - |
| ADAMONIS | Andrius | Central Bank of Lithuania | Lithuania (Republic of) |
| ADOLPH | Martin | International Telecommunication Union | - |
| ALVARADO | Jorge | ELCA | Switzerland (Confederation of) |
| ANDREEV | Denis | International Telecommunication Union | - |
| AREFZADEH | Shahin | Viridis Networks | United States of America |
| ARISTIDOU | Christiana | SmartCity Business Ltd | Cyprus (Republic of) |
| ARRIBAS | Ismael | Kunfud Cero Seis S.L | Spain |
| ARSHAVSKIY | Igor | Rostelecom PJSC | Russian Federation |
| AURELIANO | Reinaldo | Reinaldo Aureliano | Brazil (Federative Republic of) |
| AYVAZOV | Alexander | Rostelecom PJSC | United States of America |
| AZUMA | Mitsuhiro | Fujitsu | Japan |
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| WU | Feng | ChainNova | China (People's Republic of) |
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| XIAOJUN | Zhang | Huawei Technologies Co., Ltd. | China (People's Republic of) |
| XIONGWEI | Jia | China Unicom | China (People's Republic of) |
| XUE | Miao | China Unicom | China (People's Republic of) |
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1. <https://itu.int/en/join/smes/Pages/default.aspx> [↑](#footnote-ref-1)
2. Includes remote and on-site participants of the FG DLT meetings. Affiliation at time of participation. [↑](#footnote-ref-2)