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ITU-T F.751.7 (12/2022)

SERIES F: Non-telephone telecommunication services

Multimedia services

Functional assessment methods for distributed ledger technology platforms

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Recommendation ITU-T F.751.7

Functional assessment methods for distributed ledger technology platforms

Summary

Recommendation ITU-T F.751.7 defines functional assessment methods for distributed ledger technology (DLT) platforms based on the assessment criteria defined in Recommendation ITU-T F.751.1. For each item of the assessment criteria defined in Recommendation ITU-T F.751.1, one test case is defined in this Recommendation accordingly. The description of each test case is composed of test purpose, test workflows and expected results.

History

Edition	Recommendation	Approval	Study Group	Unique ID[*]
1.0	ITU-T F.751.7	2022-12-14	16	11.1002/1000/15201

Keywords

Distributed ledger technology, DLT, functional assessment.

[*] To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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Recommendation ITU-T F.751.7

Functional assessment methods for distributed ledger technology platforms

1 Scope

This Recommendation defines distributed ledger technology (DLT) functional assessment methods for assessment criteria proposed in [ITU-T F.751.1]. This Recommendation can be used as a guideline for DLT assessment.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T F.751.0] Recommendation ITU-T F.751.0 (2020), *Requirements for distributed ledger systems*.

[ITU-T F.751.1] Recommendation ITU-T F.751.1 (2020), *Assessment criteria for distributed ledger technology platforms*.

[ITU-T F.751.2] Recommendation ITU-T F.751.2 (2020), *Reference framework for distributed ledger technologies*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 asset [ITU-T F.751.0]: A representation of value. It can be a diamond, a unit of currency, items inside a shipping container, etc. An asset can be physical or virtual.

3.1.2 Byzantine fault tolerance [ITU-T F.751.1]: Property that enables a system to continue operating properly even if some of its components fail or the existence of intentional bad actors.

3.1.3 consensus [ITU-T F.751.0]: Agreement that a set of transactions is valid.

3.1.4 crash fault tolerance [ITU-T F.751.1]: Property that enables a system to continue operating properly even if some of its components fail.

3.1.5 distributed ledger [ITU-T F.751.0]: A type of ledger that is shared, replicated, and synchronized in a distributed and decentralized manner.

3.1.6 entity [ITU-T F.751.0]: Anything that has a separately identifiable existence (e.g., organization, person, group, smart contract or device). An entity uses distributed ledger technology to solve the problem of its business or information systems.

3.1.7 node [ITU-T F.751.0]: Device or process that participates in a distributed ledger network.

3.1.8 smart contract [ITU-T F.751.0]: Program written on a distributed ledger system which encodes the rules for specific types of distributed ledger system transactions in a way that can be validated, and triggered by specific conditions.

3.1.9 token [ITU-T F.751.0]: A digital representation of value on a shared distributed ledger that is owned and secured using cryptography to ensure its authenticity and prevent modification or tampering without the owner's consent.

3.1.10 transaction [ITU-T F.751.0]: An incident or an operation that leads to a change in the status of a ledger, such as adding a record or equivalent exchange based on currency.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 peer-to-peer network: A computer network comprised of nodes with equal control and operation capabilities.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

BFT	Byzantine Fault Tolerance
CFT	Crash Fault Tolerance
DLT	Distributed Ledger Technology
HTTPS	Hypertext Transfer Protocol Secure
MSP	Management Server Platform
P2P	Peer-to-Peer
RPC	Remote Procedure Call
SDK	Software Development Kit
TLS	Transport Layer Security

5 Conventions

None.

6 Overview of assessment methods

The assessment criteria defined in [ITU-T F.751.1] cover DLT core technology, application support, operation, performance, and ecosystem. The DLT assessment framework is shown in Figure 1 of [ITU-T F.751.1], and is reproduced as Figure 1 in this Recommendation. The aim of this Recommendation is to extend [ITU-T F.751.1] and to define specific test methods and test cases for DLT functional assessment.

For each test case, the following three aspects are proposed:

– test purpose, which clarifies the reason for this test case;

– test workflow, which specifies the test execution steps of this test case for the testers; and

– expected results, which specify the expected test consequences of this test case.

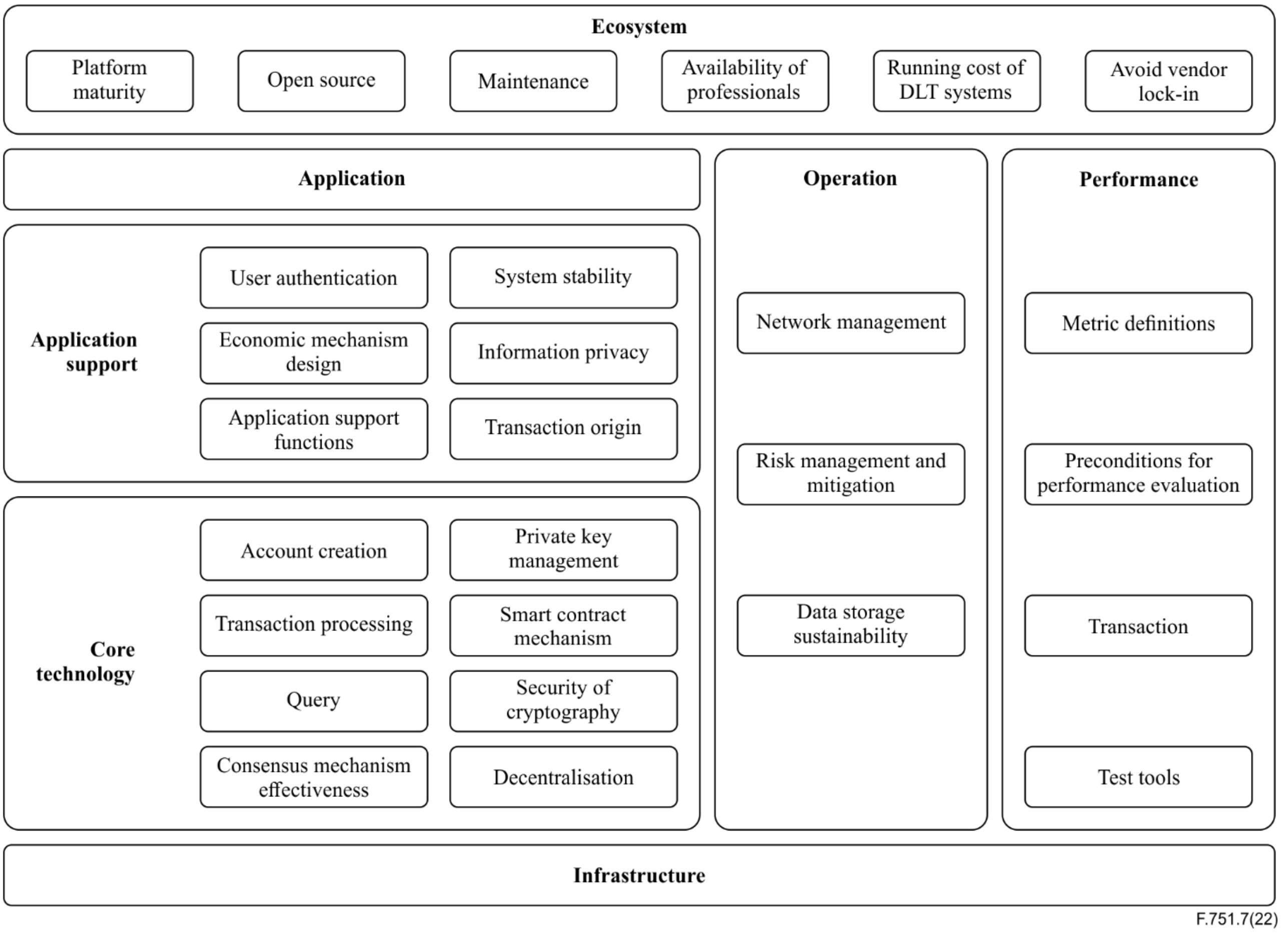

Figure 1 – Framework of assessment for DLT platforms

Reproduced from [ITU-T F.751.1]

7 Core technology assessment methods

7.1 Account creation

Table 1 – Account creation

Test case 01	Account creation
Reference	Clause 7.1 of [ITU-T F.751.1]
Test purpose	To validate DLT platform account creation ability.
Test workflow	Step 1. Create a user account, the private key is stored in ciphertext; Step 2. Submit a transaction with the account created above, and verify the transaction execution result; Step 3. Deploy a smart contract with the account created above.
Expected results	1. The account was created successfully, private key was stored in ciphertext; 2. The transaction was submitted and executed successfully; 3. The smart contract was deployed successfully.

7.2 Transaction processing

7.2.1 Transaction processing flow

Table 2 – Transaction processing flow

Test case 02	Transaction processing flow
Reference	Clause 7.2 of [ITU-T F.751.1]
Test purpose	To validate the transaction process in the DLT platform.
Test workflow	Step 1. Construct and submit a transaction, and verify the transaction signature; Step 2. Validate the broadcast process of the transaction; Step 3. Validate the consensus and packaging process of the transaction; Step 4. Validate the transaction verification process of the transaction; Step 5. Validate the persistent storage of the transaction.
Expected results	1. The transaction was constructed successfully and the transaction signature was correct; 2. The transaction was broadcasted to other nodes successfully; 3. The transaction was packaged and verified successfully; 4. The transaction was stored persistently.

7.3 Query

7.3.1 Query DLT basic information

Table 3 – Query DLT basic information

Test case 03	Query DLT basic information
Reference	Clause 7.3 of [ITU-T F.751.1]
Test purpose	To validate the ability to query basic information in the DLT platform.
Test workflow	Step 1. Check the current block height through a DLT browser or other methods; Step 2. Check the original data of a specific block through a DLT browser or other methods; Step 3. Check the block information by block hash or block height through a DLT browser or other methods.
Expected results	The basic information of DLT platform was obtained successfully, including block height and block data.

7.3.2 Query DLT transaction information

Table 4 – Query DLT transaction information

Test case 04	Query DLT transaction information
Reference	Clause 7.3 of [ITU-T F.751.1]
Test purpose	To validate the ability to query transaction information in the DLT platform.
Test workflow	Step 1. Query the original information of the transaction by the transaction hash; Step 2. Query the list of transactions in a specified block.
Expected results	1. The transaction original information was obtained successfully; 2. The list of transactions was obtained successfully.

7.3.3 Query DLT account information

Table 5 – Query DLT account information

Test case 05	Query DLT account information
Reference	Clause 7.3 of [ITU-T F.751.1]
Test purpose	To validate the ability to query the account information in the DLT platform.
Test workflow	Step 1. Check the list of accounts in the DLT platform; Step 2. Check the account asset of an account address; Step 3. Check the contracts list of the DLT platform; Step 4. Check the details of a contract.
Expected results	1. The account list and the account balance in the DLT platform were viewed successfully; 2. The contract list and the contract details in the DLT platform were viewed successfully.

7.4 Consensus algorithm effectiveness

7.4.1 Consensus algorithm declaration

Table 6 – Consensus algorithm declaration

Test case 06	Consensus algorithm declaration
Reference	Clause 7.4 of [ITU-T F.751.1]
Test purpose	To validate the consensus algorithms supported by the DLT platform.
Test workflow	Step 1. Display the consensus algorithms supported by the DLT platform, such as crash fault tolerance (CFT) consensus or Byzantine fault tolerance (BFT) consensus; Step 2. Check the relevant codes and configuration files of the consensus algorithm; Step 3. Construct and submit a transaction to verify the consensus algorithm supported in the system.
Expected results	1. The relevant codes and configuration files of the consensus algorithms supported by the system were displayed successfully; 2. The transaction was sent successfully and the supported consensus algorithms were verified correctly.

7.4.2 Consensus process with no crash and no Byzantine nodes

Table 7 – Consensus process with no crash and no Byzantine nodes

Test case 07	Consensus process with no crash and no Byzantine nodes
Reference	Clause 7.4.2 of [ITU-T F.751.1]
Test purpose	To validate the ability of reach consensus with no crash and no Byzantine nodes in the DLT platform
Test workflow	Step 1. Construct and submit a valid transfer request; Step 2. Validate the transaction execution result; Step 3. Construct and send an invalid transfer request, such as the transfer token is more than the balance; Step 4. Validate the transaction execution result.
Expected results	1. The consensus of the valid transfer request was reached successfully and the transaction was executed successfully; 2. The consensus of the invalid transfer request was reached unsuccessfully, but the transaction executed failed and reason for failure was given.

7.4.3 Consensus process with crash nodes less than the threshold value

Table 8 – Consensus process with crash nodes less than the threshold value

Test case 08	Consensus process with crash nodes less than the threshold value
Reference	Clause 7.4.2 of [ITU-T F.751.1]
Test purpose	To validate the consensus ability when the number of crash nodes is less than the threshold value.
Test workflow	Step 1. Ensure that the number of crash nodes is less than the threshold value, the threshold value is the largest number of crash nodes that can be tolerated in the DLT platform; Step 2. Construct and submit a transfer transaction to a non-crash node, then check the transaction execution result; Step 3. Construct and submit a transfer transaction to a crash node, then check the transaction execution result.
Expected results	1. The transaction submitted to the non-crash node was executed successfully and the consensus was reached successfully; 2. The transaction submitted to the crash node was executed failed and the reason for failure was given.

7.4.4 Consensus process with crash nodes more than the threshold value

Table 9 – Consensus process with crash nodes more than the threshold value

Test case 09	Consensus process with crash nodes more than the threshold value
Reference	Clause 7.4.2 [ITU-T F.751.1]
Test purpose	To validate the consensus ability when the number of crash nodes is more than the theoretical value.
Test workflow	Step 1. Ensure that the number of crash nodes is greater than the threshold value, the threshold value is the largest number of crash nodes can be tolerated in the DLT platform; Step 2. Construct and submit a valid transfer transaction to a non-crash node, then check the transaction execution result; Step 3. Construct and submit a valid transfer transaction to a crash node, then check the transaction execution result.
Expected results	1. The transaction submitted to the non-crash node was executed failed and reason for failure was given; 2. The transaction sent to the crash node was executed failed and the reason for failure was given.

7.5 Private key management

7.5.1 Software-based private key management

Table 10 – Software-based private key management

Test case 10	Software-based private key management
Reference	Clause 7.5.1 of [ITU-T F.751.1]
Test purpose	To validate the ability of private key management based on software.

Table 10 – Software-based private key management

Test workflow	Step 1. Generate a key pair by software, and store the private key in ciphertext; Step 2. Construct and submit a transfer transaction using the created account and verify the transaction signature.
Expected results	1. The key pair was generated successfully and the private key was stored in ciphertext; 2. The transaction was executed successfully and the transaction signature was verified successfully.

7.5.2 Hardware-based privacy key management

Table 11 – Hardware-based private key management

Test case 11	Hardware-based private key management
Reference	Clause 7.5.2 of [ITU-T F.751.1]
Test purpose	To validate the ability of private key management based on hardware.
Test workflow	Step 1. Generate a key pair by hardware or software, then store the private key in hardware; Step 2. Construct and submit a transfer transaction using the hardware client, and verify the transaction signature.
Expected results	1. The private key was generated successfully, and stored in hardware client successfully; 2. The transaction was executed successfully and the transaction signature was verified successfully.

7.6 Smart contract mechanism

7.6.1 Complete lifecycle management of smart contract

Table 12 – Complete lifecycle management of smart contract

Test case 12	Complete lifecycle management of smart contract
Reference	Clause 7.6.2 of [ITU-T F.751.1]
Test purpose	To validate the complete lifecycle management of the smart contract.
Test workflow	Step 1. Compile and deploy a smart contract on the DLT platform; Step 2. Invoke the smart contract by submitting a transaction; Step 3. Freeze the contract and submit a transaction to invoke the contract; Step 4. Unfreeze the contract and submit a transaction to invoke the contract; Step 5. Destroy the contract and submit a transaction to invoke the contract.
Expected results	1. The smart contract was compiled and deployed successfully; 2. The contract was invoked successfully by the transaction; 3. The contract was frozen, unfrozen, and destroyed successfully.

7.6.2 Forward compatibility of smart contract operating mechanism

Table 13 – Forward compatibility of smart contract operating mechanism

Test case 13	Forward compatibility of smart contract operating mechanism
Reference	Clause 7.6.1 of [ITU-T F.751.1]

Table 13 – Forward compatibility of smart contract operating mechanism

Test purpose	To validate the forward compatibility of the smart contract operating mechanism.
Test workflow	Step 1. Compile and deploy a smart contract in the DLT platform; Step 2. Invoke the smart contract by submitting a transaction; Step 3. Upgrade the DLT platform, then invoke the smart contract again by submitting a transaction.
Expected results	1. The smart contract was deployed successfully on the DLT platform; 2. The contract was invoked successfully before DLT platform upgraded; 3. The contract was invoked successfully after DLT platform upgraded.

7.6.3 Smart contract upgrade

Table 14 – Smart contract upgrade

Test case 14	Smart contract upgrade
Reference	Clause 7.6.3 of [ITU-T F.751.1]
Test purpose	To validate the ability of smart contract upgrade in the DLT platform
Test workflow	Step 1. Compile and deploy a smart contract in the DLT platform; Step 2. Upgrade the smart contract, then invoke the upgraded smart contract by submitting a transaction.
Expected results	1. The smart contract was deployed successfully; 2. The contract was upgraded successfully, and the smart contract invoked successfully.

7.7 Security of cryptography

7.7.1 Encryption declaration

Table 15 – Encryption declaration

Test case 15	Encryption declaration
Reference	Clause 7.7.1 of [ITU-T F.751.1]
Test purpose	To validate the encryption algorithms supported by the DLT platform.
Test workflow	Step 1. Display the default supported encryption algorithms, including hash algorithms, symmetric encryption algorithms, and asymmetric encryption algorithms; Step 2. Construct and submit a transaction by the default algorithm, then check the transaction execution result.
Expected results	The transaction was constructed and submitted successfully, and the transaction was executed successfully.

7.7.2 Pluggable encryption algorithm

Table 16 – Pluggable encryption algorithm

Test case 16	Pluggable encryption algorithm
Reference	Clause 7.7.2 of [ITU-T F.751.1]
Test purpose	To validate optional encryption algorithms supported in the DLT platform.

Table 16 – Pluggable encryption algorithm

Test workflow	Step 1. Display the optional encryption algorithms supported in the DLT platform, including hash algorithms, symmetric encryption algorithms, and asymmetric encryption algorithms; Step 2. Construct and submit a transaction by any optional algorithms displayed above, then check the transaction execution result; Step 3. Construct and submit a transaction by another algorithm, then check the transaction execution result.
Expected results	1. The transaction constructed and submitted by any optional algorithms successfully, and the transaction executed successfully; 2. The transaction constructed and submitted by another algorithm successfully, and the transaction executed successfully.

7.8 Decentralization

7.8.1 Reduce the range of consensus

Table 17 – Reduce the range of consensus

Test case 17	Reduce the range of consensus
Reference	Clause 7.8 of [ITU-T F.751.1]
Test purpose	To validate the stability of the DLT platform after reducing the number of consensus nodes.
Test workflow	Step 1. Reduce the number of consensus nodes in the DLT platform or convert consensus nodes into non-consensus nodes; Step 2. Construct and submit a transaction, then check the transaction execution result.
Expected results	1. The number of consensus nodes was reduced successfully; 2. The transaction was executed successfully.

7.8.2 Expand the range of consensus

Table 18 – Expand the range of consensus

Test case 18	Expand the range of consensus
Reference	Clause 7.8 of [ITU-T F.751.1]
Test purpose	To validate the expansion capabilities of consensus scope.
Test workflow	Step 1. Increase the number of consensus nodes in the DLT platform, such as by adding a new consensus node or converting a non-consensus node to consensus node; Step 2. Construct and submit a transaction, then validate the transaction execution result.
Expected results	1. The new consensus node was added successfully, and the number of consensus nodes was increased successfully; 2. The transaction was executed successfully.

8 Application support assessment methods

8.1 User authentication

Table 19 – User authentication

Test case 19	User authentication
Reference	Clause 8.1 of [ITU-T F.751.1]
Test purpose	To validate the user management and authentication of DLT platform.
Test workflow	Step 1. Create a user account with the necessary information, such as public key, address, etc. Step 2. Login in the DLT platform using the account created above, then check the authentication result.
Expected results	The user account was created and authenticated successfully.

8.2 System stability

Table 20 – System stability

Test case 20	System stability
Reference	Clause 8.2 of [ITU-T F.751.1]
Test purpose	To test the stability of DLT platform.
Test workflow	Step 1. Submit transactions to the DLT network with a certain pressure, then execute the following steps; Step 2. Create a new node and join the existing DLT network, then submit a transaction and verify the transaction execution result; Step 3. Exit a node from the existing DLT network, submit a transaction and verify the transaction execution result; Step 4. Upgrade a node from the existing DLT network, submit a transaction and verify the transaction execution result.
Expected results	1. The node was joined successfully, and the transaction was executed successfully; 2. The node was exited successfully, and the transaction was executed successfully; 3. The node was upgraded successfully, and the transaction was executed successfully.

8.3 Economic mechanism design

Table 21 – Economic mechanism design

Test case 21	Economic mechanism design
Reference	Clause 8.3 of [ITU-T F.751.1]
Test purpose	To validate the economic mechanism of DLT platform.
Test workflow	Step 1. Display the economic mechanism of the DLT platform, including financial incentives and non-financial incentives; Step 2. Validate the lifecycle management mechanism of the token in the DLT platform, including token issuance, token transfer, token withdrawal, token settlement, as well as token querying.

Table 21 – Economic mechanism design

Expected results	1. The economic mechanism of the DLT platform was verified successfully, and incentives were provided when the process was completed; 2. The token was issued successfully, some of the token was transferred successfully, and the token balance was queried successfully.

8.4 Information privacy

8.4.1 Secure transmission

Table 22 – Secure transmission

Test case 22	Secure transmission
Reference	Clause 8.4.1 of [ITU-T F.751.1]
Test purpose	To validate the secure transport protocols for information transmission in DLT platform.
Test workflow	Step 1. Display the secure transmission protocols in the DLT platform, such as transport layer security (TLS), hypertext transfer protocol secure (HTTPS), etc.; Step 2. Check the secure transmission protocols, including the key codes and configuration files; Step 3. Check the information transmitted to verify the encrypted status.
Expected results	1. The key codes and configuration files were valid; 2. The information was transmitted in ciphertext.

8.4.2 Restricted data access

Table 23 – Restricted data access

Test case 23	Restricted data access
Reference	Clause 8.4.2 of [ITU-T F.751.1]
Test purpose	To validate the data access control and security protection mechanism of the DLT platform.
Test workflow	Step 1. Display the data access control and security protection solutions of the DLT platform; Step 2. Verify the data access control and security protection capabilities of the DLT platform, including: a) Check the data encryption storage, such as symmetric passwords, asymmetric passwords, and hash algorithms; b) Check the secure management of keys; c) Verify the user rights to ensure that data access can be controlled.
Expected results	1. The data was stored in the DLT platform encrypted; 2. The keys were managed securely in the DLT platform; 3. The data with rights are visible, and the data without rights are invisible.

8.4.3 Privacy protection

Table 24 – Privacy protection

Test case 24	Privacy protection
Reference	Clause 8.4.3 of [ITU-T F.751.1]
Test purpose	To validate the privacy protection algorithms of the DLT platform.
Test workflow	Step 1. Display the types and details of the privacy protection algorithms of the DLT platform, such as zero-knowledge proofs, ring signatures, secure multi-party computation and homomorphic encryption; Step 2. Check the privacy protection algorithms, including the key code and configuration files; Step 3. Invoke the algorithm interface of the DLT platform and encrypt the data.
Expected results	1. The key code and configuration files of the privacy protection algorithms were valid and complete; 2. The interface was invoked and the data was encrypted successfully by the privacy protection algorithms.

8.5 Application support functions

8.5.1 User interface

Table 25 – User interface

Test case 25	User interface
Reference	Clause 8.5 of [ITU-T F.751.1]
Test purpose	To test the user interface provided by DLT platform.
Test workflow	Step 1. Display the types of user interfaces provided by the DLT platform, such as HTTP, remote procedure call (RPC), etc.; Step 2. Check the key code of the user interfaces; Step 3. Invoke the user interface, submit a transaction and verify the transaction execution result.
Expected results	1. The key code of the user interfaces was valid and complete; 2. The interface was invoked, with the transaction submitted and executed successfully.

8.5.2 Multi-language software development kits

Table 26 – Multi-language software development kits

Test case 26	Multi-language software development kits
Reference	Clause 8.5 of [ITU-T F.751.1]
Test purpose	To validate multi-language software development kits (SDK) supported by the DLT platform.
Test workflow	Step 1. Display the multi-language SDK supported by the DLT platform, and the supported language of the SDK; Step 2. Check the key code of the multi-language SDK; Step 3. Invoke the multi-language SDK, submit a transaction and verify the transaction execution result.

Expected results	1. The key code of the multi-language SDK was valid and complete; 2. The multi-language SDK was invoked, with the transaction submitted and executed successfully.

8.6 Transaction origin

Table 27 – Transaction origin

Test case 27	Transaction origin
Reference	Clause 8.6 of [ITU-T F.751.1]
Test purpose	To validate capabilities for identifying the origin of transactions of DLT platform.
Test workflow	Step 1. Display the mechanism for identifying the origin node and account address of transactions; Step 2. Submit a transaction and verify the transaction execution result; Step 3. Identify the original node and account address of the transaction.
Expected results	1. The transaction was submitted and executed successfully; 2. The original node and account address of the transaction were identified.

9 Operation assessment methods

9.1 Network management

Table 28 – Network management

Test case 28	Network management
Reference	Clause 9.1 of [ITU-T F.751.1]
Test purpose	To validate the node management and monitor capabilities in the DLT platform.
Test workflow	Step 1. Add a new node in the DLT platform and check the new node in the DLT platform; Step 2. View the node monitoring.
Expected results	1. The number of nodes was increased successfully according to the node management mechanism; 2. The node information was displayed according to the node monitoring mechanism.

9.2 Risk management and mitigation

Table 29 – Risk management and mitigation

Test case 29	Risk management and mitigation
Reference	Clause 9.2 of [ITU-T F.751.1]
Test purpose	To validate the data backup and fault recovery capabilities in the DLT platform.
Test workflow	Step 1. Make a data backup; Step 2. Trigger the data recovery mechanism manually or automatically; Step 3. Validate the effectiveness of the data recovery mechanism, including data integrity and consistency.

Expected results	1. The data backup was executed successfully; 2. The data recovery mechanism was triggered successfully; 3. The data recovery mechanism was effective and the data was completely recovered.

9.3 Data storage sustainability

Table 30 – Data storage sustainability

Test case 30	Data storage sustainability
Reference	Clause 9.3 of [ITU-T F.751.1]
Test purpose	To validate the data persistent storage and data query capabilities in the DLT platform.
Test workflow	Step 1. Construct and submit a transfer transaction to validate the persistent storage capability in the DLT platform; Step 2. Construct and submit a query transaction to validate the data query capability in the DLT platform.
Expected results	1. The transfer transaction was executed successfully; 2. The query transaction was executed successfully.

10 Ecosystem assessment methods

10.1 Platform maturity

Table 31 – Platform maturity

Test case 31	Platform maturity
Reference	Clause 11.1 of [ITU-T F.751.1]
Test purpose	To validate the DLT platform maturity status.
Test workflow	Step 1. Check construction start time and calculate maintenance period of the DLT platform; Step 2. Check the network scale, the number of users, and the number of smart contracts of the DLT platform; Step 3. Evaluate the DLT platform values, including economic value and social value.
Expected results	1. The DLT platform was constructed early; 2. The network scale of the DLT platform was large, the number of users was large, and the number of smart contracts was large; 3. The DLT platform has great economic value or social value.

10.2 Open source

Table 32 – Open source

Test case 32	Open source
Reference	Clause 11.2 of [ITU-T F.751.1]
Test purpose	To validate the DLT platform open-source status, including license, code hosting platform, and repository address. This case is optional.

Table 32 – Open source

Test workflow	Step 1. Display the open-source status, including the code hosting platform, repository address, and license; Step 2. Check the code repository and verify the license at the specified open-source address; Step 3. Go to the specified open-source address and check the consistency of the key code and the testing system.
Expected results	1. Codes of the DLT platform have been open-sourced and hosted on the open-source platform; 2. The repository address and open-source license were valid, codes hosted in the specified repository were consistent with the DLT platform.

10.3 Maintenance

Table 33 – Maintenance

Test case 33	Maintenance
Reference	Clause 11.3 of [ITU-T F.751.1]
Test purpose	To validate the maintainability of the DLT platform.
Test workflow	Step 1. Check the update records of the code, including the code committing records, branch changing records, and version releasing records; Step 2. Check the discussion records of core issues, and check contributors changing records.
Expected results	1. The core codes of the DLT platform were updated recently, and new version was released recently; 2. Core issues were discussed recently, and the core contributors were stable.

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