





ITU-T standards and the way forward

Reference framework for distributed ledger technologies

Ning HU

Timeline

- SG Q22/16, Aug, 2020
 - T-REC-F.751.2-202008-P
- FG DLT
 - Meeting #7 Geneva, 29 July - 1 August 2019
 - Meeting #6 Madrid, 1-4 April 2019
 - Meeting #5 Rio de Janeiro, 14-17 January 2019
 - Meeting #4 Beijing, 9-12 October 2018
 - Meeting #3 Geneva, 28-30 May 2018
 - Meeting #2 Bern, 5-7 February 2018
 - Meeting #1 Geneva, 17-19 October 2017

FG DLT: Structure

- WG1: State of the Art: Ecosystem, Terms, Definitions, Concepts
- WG2: Applications & Services
- **WG3: Technology Reference Framework**
- WG4: Policy Reference Framework

- WG5: Standardization Roadmap

Meeting #1 Summary

Mission: Technology reference framework

- *Mission: Study architectural aspects of DLT including interoperability and abstract a high level technology reference framework. Provide a mapping of existing DLT platforms on the framework, and explore criteria and methods for assessment.*
- Lead on ToR items: 6
- Shared ToR items: 1 (ALL), 10 (ALL), 12 (ALL)
- WG leader: **Mr. WEI Kai** (China) (a.i.)
- Supporters: Korea (Rep. of); Bochen Technology (China), Central Bank of Russia (Russian Federation), Huawei Technologies (China), Symantec (US), Tencent Technology (China), Triangularity (Switzerland), ZTE (China), Gabriel Zigelboim.

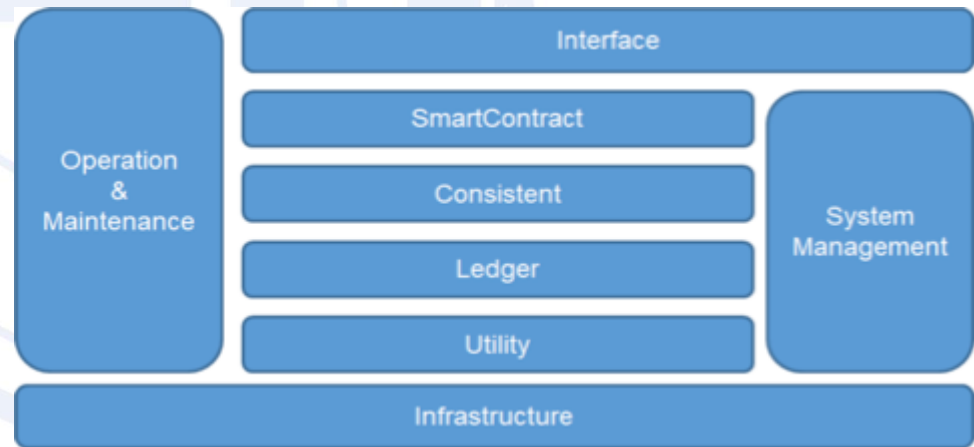


Meeting #2 Summary

Feed back for deliverables – D3.1

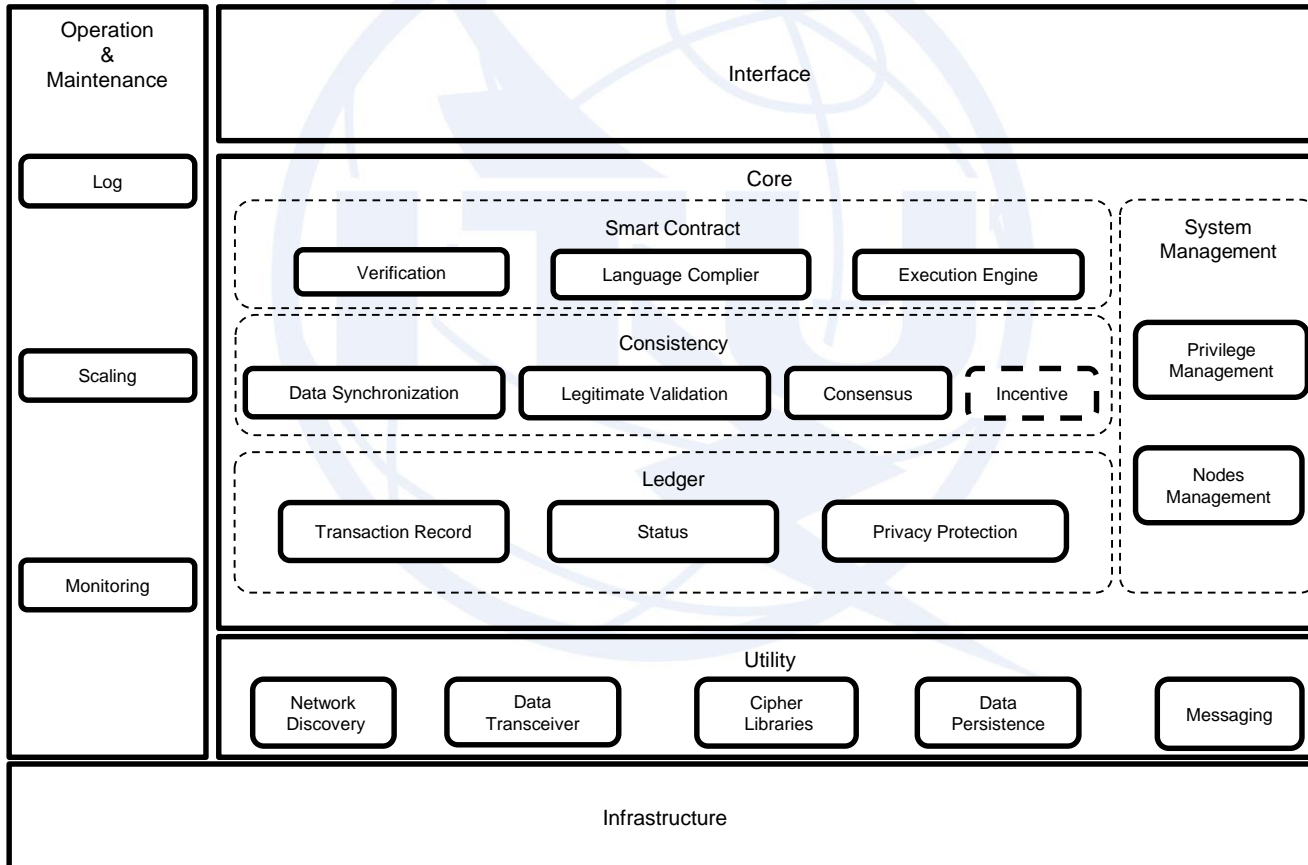
DLT-I-058: Draft of reference architecture

- Highlight the modules identifies the technology stack as DLT
- Architecture should be implementable, some necessary modules as Logging, Encryption, Networking and Orchestration need to be added to the architecture.
- The draft architecture is containing many functions, they should be re-organized as functional components.
- Architecture should contain only functional modules, the top layer describes visions of DLT should be removed.



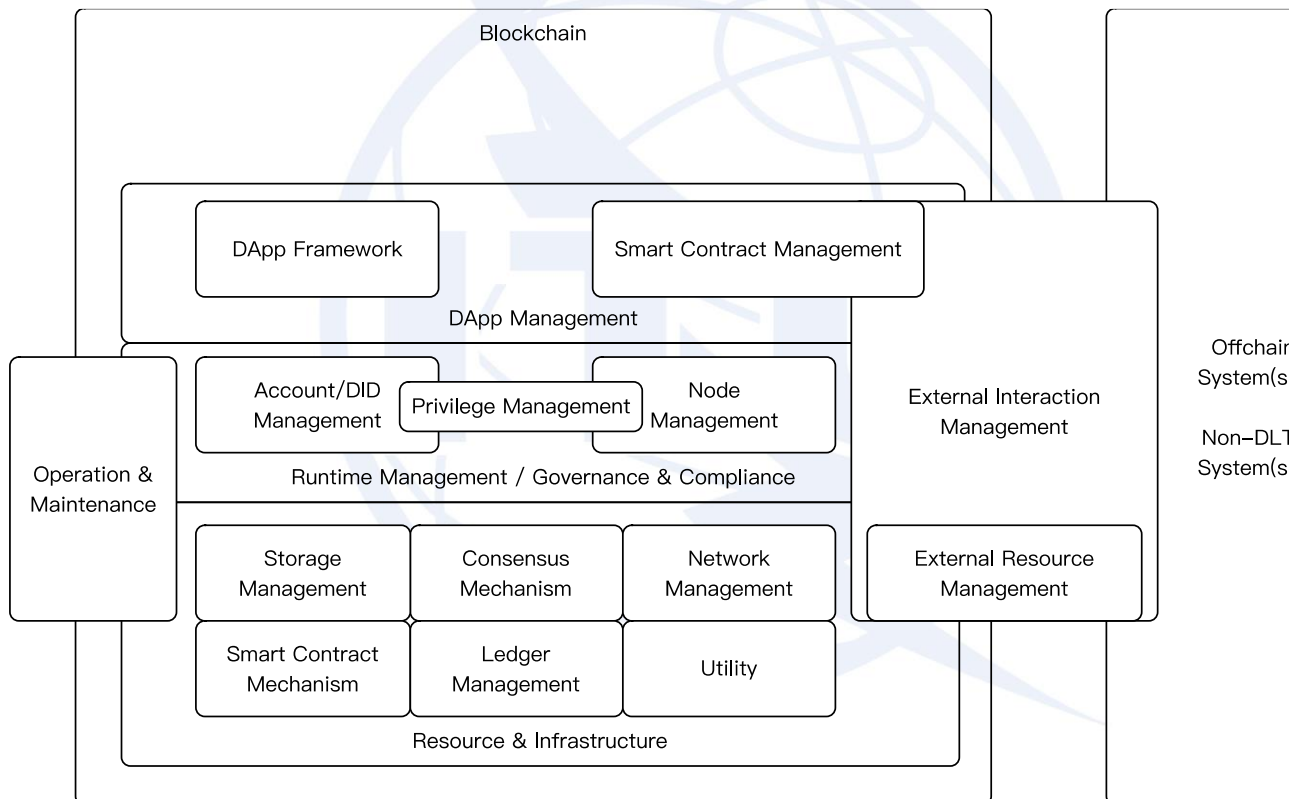
Meeting #3 Summary

Architecture Revised



Meeting #4 Summary

Conceptual architecture of DLT

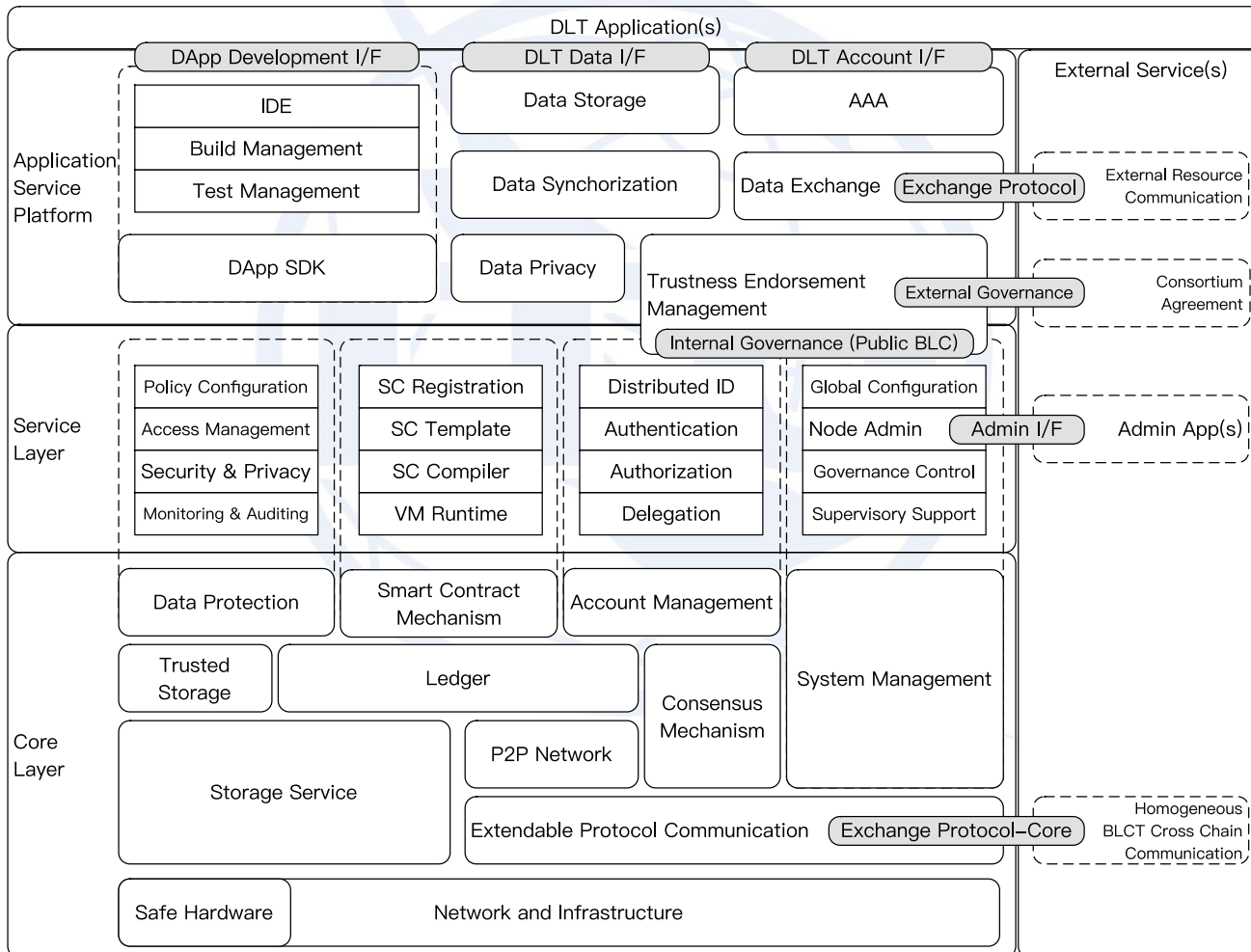


*Develop the mapping template from reference architecture to live DLT systems



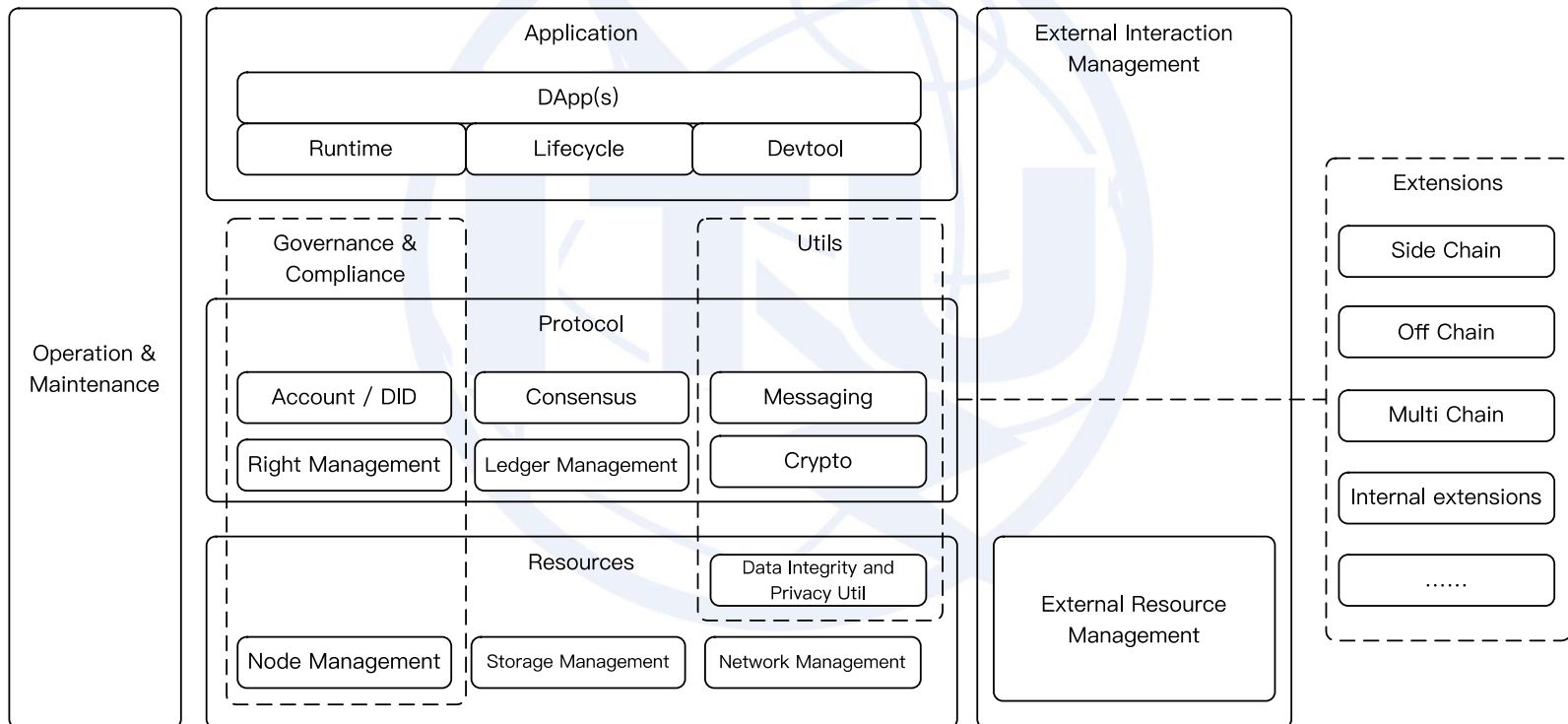
Meeting #4 Summary (cont.)

Reference architecture of DLT



Meeting #5 Summary

Update conceptual architecture of DLT



Meeting #5 Summary (cont.)

D3.2: Mapping

- Minor updates made to the mapping template, more edits needed
 - Finalize the template in our next online meeting
 - Existing mapping need to be updated according to latest template
- Mapping editors assigned

Project	Contributor	Reviewer / Support
Ontology	Ning HU	
Stellar	Taynaah Reis	
Ontology 2B	Ning HU	
Sawtooth	Ruifeng HU	
Fabric	Ruifeng HU	Taynaah Reis
EOS	Ning HU	Thiago Canellas
Ethereum	Ray Valdes	
Alastria	Ismael Arribas	
Corda	Paulo Brizola	
Quorum	Courtney Guimaraes	
IOTA	Courtney Guimaraes	Taynaah Reis
Disledger	Dan Conner	
Hashgraph	Courtney Guimaraes	
Other platforms	Contributions welcome	

Meeting #6 Summary

D3.2: Mapping Template

Section 9 Extensions

Platform trust endorsement policy	
Type	Law/Agreement; <u>Tokenomics</u> ¹ ;
Tool	Token ID; Contract ID; ...
Policy	Policy to support governance

Economic Model (optional)	
Price Model to Deploy Contracts and do Transactions	Charged by transaction, mandatory to have tokens, inflationary system

¹ Alternative term: economic incentives. Depends on the terms in the output of D1.1, if the term of tokenomics has clear definition, use tokenomics, otherwise, economic incentives

Who pays the costs of the network	Users; Developers; Nodes
Monetary Policy of Tokens	Finite or infinite token supply; Total of tokens; Pre-Issued or not; How much issued per blocks;
Rights of Tokens	Property rights, rights to specific IP, rights to part equity ownership

Section 8 External Resource Management

Platform External Resource Management	
Interoperation solution	Non-DLT system; 3 rd DLT system; ...
Description	Further description if any

Platform Extensions - optional	
<i>[the following list can be duplicated for multiple extensions]</i>	
Name	Name of the extension if any
Extension type ³	Internal; external
Extension mode ⁴	Scalability (horizontal); capability (vertical)
Solution	<i>[external]</i> side-chain; off-chain; multi-chain <i>[internal]</i> child-chain; sharding
Serve domain	Horizontal: sharding; non-DLT system; ... Vertical: storage; ...
Description	Further description if any

³ Standing from DLT system instance perspective, any extension inside the instance is marked as “internal”, while any extension outside the instance is marked as “external”

⁴ All extension instances are equal (with similar capability and functional features), targeting for the scalability of DLT instance, marked as “horizontal”; extensions with different functional features, targeting to enforce the capability of DLT instance, marked as vertical. Extension type and mode pair(s) is/are used to describe the extension as to the whole DLT system. E.g., sharding (internal – horizontal), lightning – BTC (external – vertical), Corda Contract (internal – vertical).

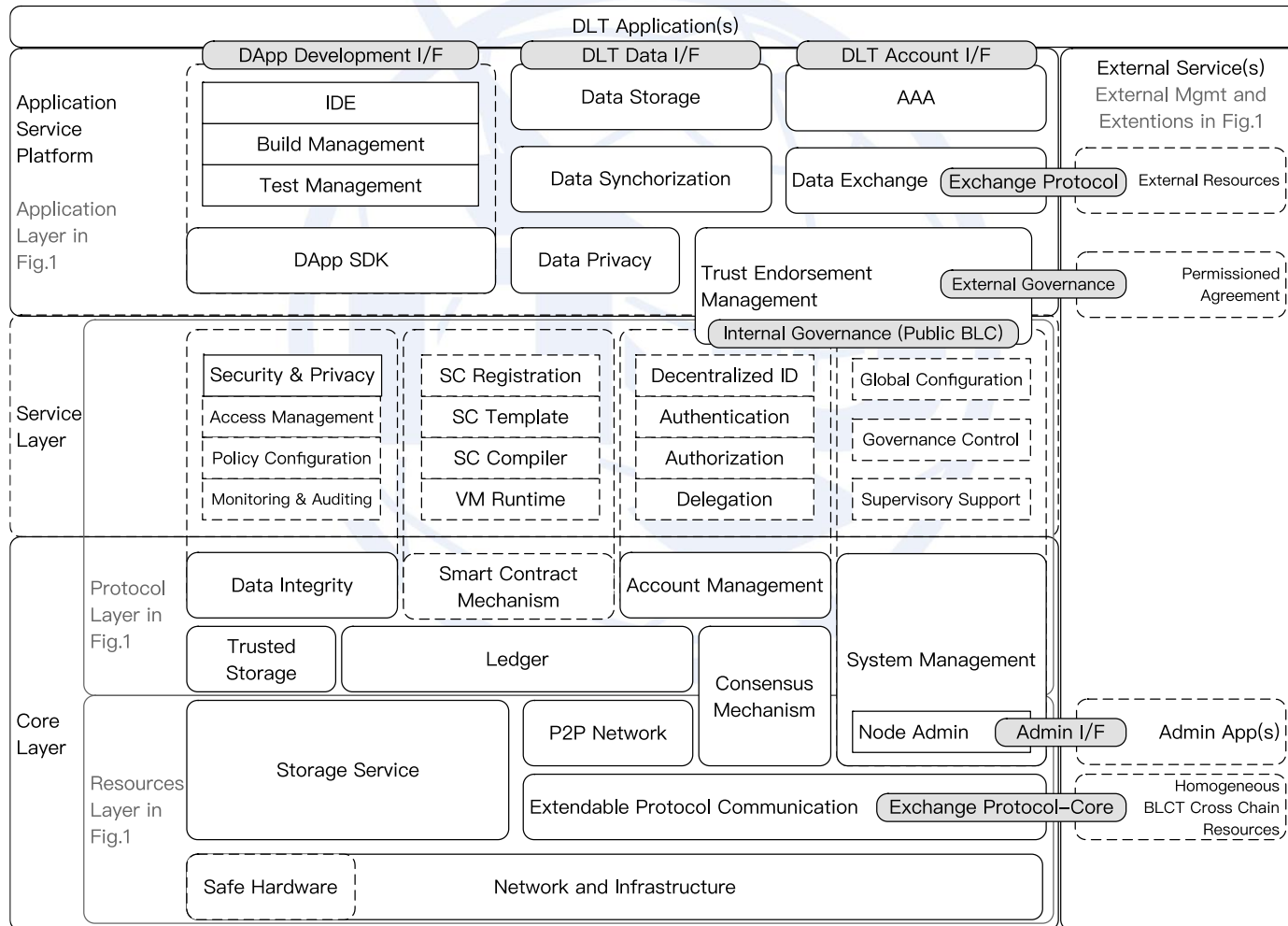
Meeting #6 Summary (cont.)

D3.2 Mapping Documents

Project	Contributor	Reviewer / Support	Status
Ontology	Ning HU		Submitted
Stellar	Taynaah Reis		Submitted
Ontology 2B	Ning HU		Submitted
Sawtooth	Ruifeng HU		Submitted
Fabric	Ruifeng HU	Taynaah Reis	Submitted
EOS	Ning HU	Thiago Canellas	Submitted
Ethereum	Ray Valdes	Suzana	
Alastria	Ismael Arribas		
Corda	Paulo Brizola		Submitted
Quorum	Courtney Guimaraes		
IOTA	Courtney Guimaraes	Taynaah Reis	
Disledger	Dan Conner		
Hashgraph	Courtney Guimaraes		
Ardor	Skylar Hurwitz		Submitted
Other platforms	Contributions welcome		

Meeting #7 Summary

Update reference architecture of DLT



Meeting #7 Summary (cont.)

Overview of architecture mapping to existing DLT platforms

Attachment	Platform	Contributor	Organization	Reviewer	Organization
I	Alastria (Quorum version)	Jesus Ruiz	Alastria	Paulo Brizola	Multiledgers
II	Ardor	Skylar Hurwitz	Jelurida	Xiaofeng Chen	Qulian
III	Bitcoin	Robin Renwick	Independent	Lisa Tan	Economics Design
IV	Corda	Paulo Brizola	Multiledgers	Ruifeng Hu	Huawei
V	EOS	Ning Hu	Ontology	Giovanni Cambroner	ANCE
VI	Ethereum	Suzana Maranhão	BNDES	Ning Hu	Ontology
VII	Fabric	Ruifeng Hu	Huawei	Paulo Brizola	Multiledgers
VIII	Hyperchain	Xiaofeng Chen	Qulian	Baixue Yang	CAICT
IX	LACChain	Marcos Allende	IADB	Ismael Arribas	Kunfud
X	Masterchain	Alexander Chuburkov	Russian Fintech Association	Lisa Tan	Economics Design
XI	Monero	Robin Renwick	Independent	Lisa Tan	Economics Design
XII	Ontology	Ning Hu	Ontology	Baixue Yang	CAICT
XIII	Quorum	Ismael Arribas / Jose Nogueira	Kunfud/BNDES	Paulo Brizola	Multiledgers
XIV	Sawtooth	Ruifeng Hu	Huawei	Xiaofeng Chen	Qulian







Q & A

Thanks

