Trustworthy networking and technical considerations for 5G

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Trust Standardization in SG13

- **ITU-T CG-Trust under Q16/13**
- **Three Recommendations** on Trust
  - **Y.3051 (Y.trusted-env):** The basic principles of trusted environment in ICT infrastructure
  - **Y.3052 (Y.trust-provision)**: Overview of trust provisioning in ICT infrastructures and services
  - **Y.3053 (Y.trustnet-fw)**: Framework of trustworthy networking with trust-centric network domains
- Other on going draft recommendations
  - **Y.trustworthy-media**, **Y.trust-index**, etc.

What is Trust?

Trust of a party **A** to a party **B** for a given task **S** is the measurable belief of **A** in that **B** accomplishes **S** dependably for a specified period **P** within a particular trust context **T** (in relation to the task **S**)
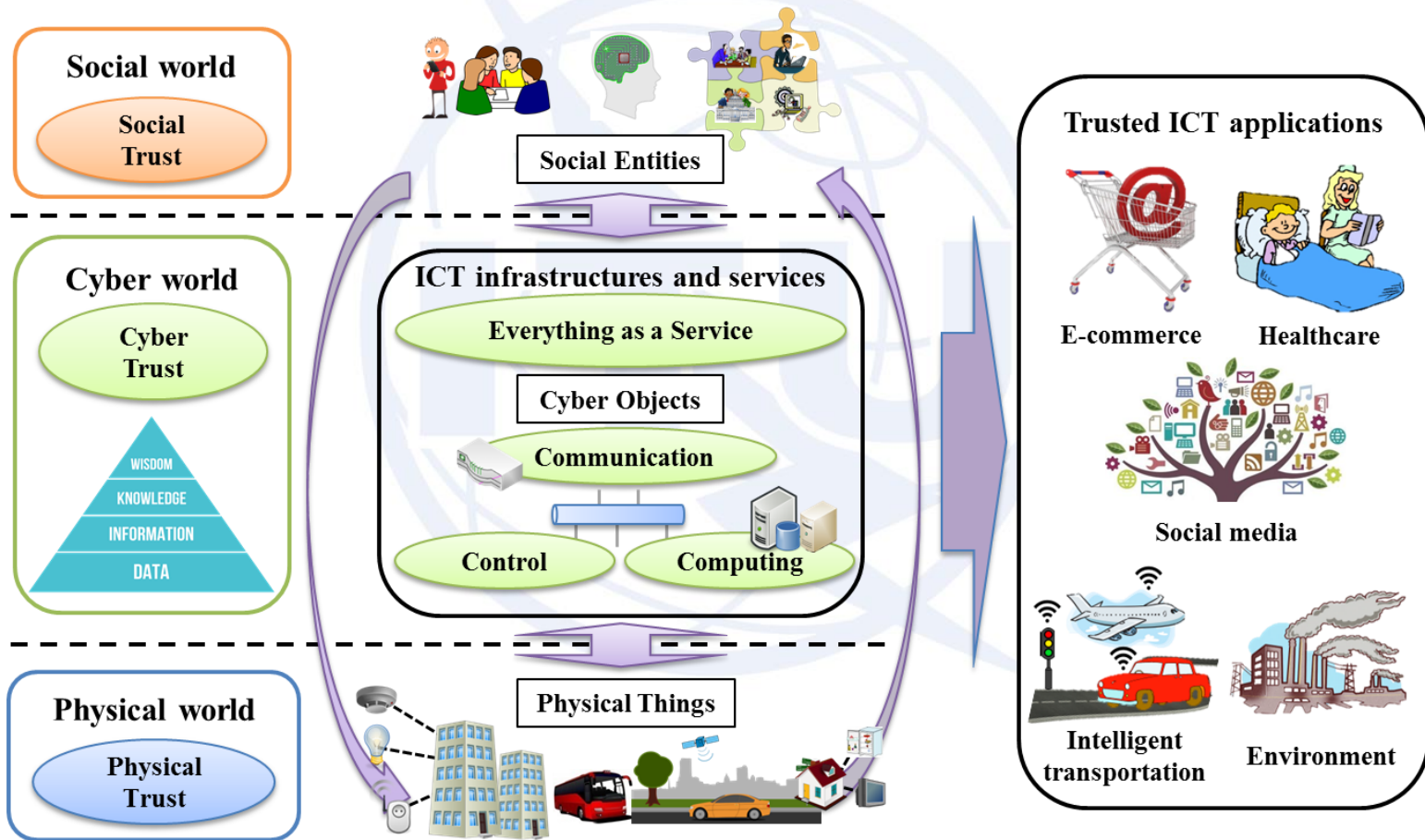
Trust is **relative** to a specific task (a service). Different trust relationships appear in different business contexts

The measurement may be **absolute** (e.g. probability) or **relative** (e.g. Level of Trust)
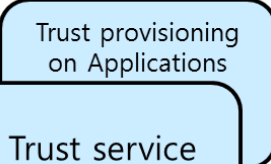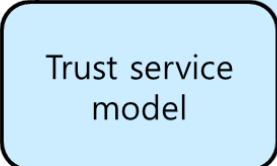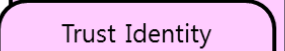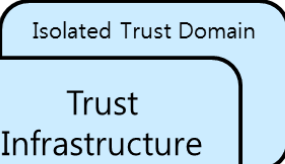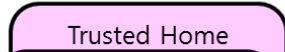
This period may be in the **past** (history), the **duration of the service** (from now and until end of service), **future** (a scheduled or forecasted critical time slot), or always

Dependability is deliberately understood broadly to include **availability, reliability, safety, confidentiality, integrity and serviceability**

3

Social Cyber Physical Trust

Social world
- Social Trust

Cyber world
- Cyber Trust

WISDOM
KNOWLEDGE
INFORMATION
DATA

Physical world
- Physical Trust

Social Entities

ICT infrastructures and services
- Everything as a Service
- Cyber Objects
- Communication
- Control
- Computing

Physical Things

Trusted ICT applications

E-commerce   Healthcare

Social media

Intelligent transportation   Environment

Roadmap for Trust Standardization

Stages / Layer, Domain	(1st stage) Concept and Key Features of Trust	(2nd stage) Trust Provisioning on ICT	(3rd stage) New eco-service model for trust
Knowledge (Social)		Trust provisioning on Applications / Trust service model	Trust Economy / Trust Identity / Trust-based Eco-Platform
Information (Cyber)	Trust Data Analytics / Trust Index / Overview, Concepts of Trust		
Data (Physical)		Isolated Trust Domain / Trust Infrastructure Architecture	Trusted Home / Trusted Enterprise / Multi-domain Trusted Network

Trustworthy networking

- **ITU-T Y.3053 (Y.trustnet-fw)**
  - "Framework of trustworthy networking with trust-centric network domains"

- Scope
  - A conceptual model of trustworthy networking and trust-centric network domains;
  - High-level and functional requirements;
  - A functional architecture;
  - Scalability of trust-centric network domains.
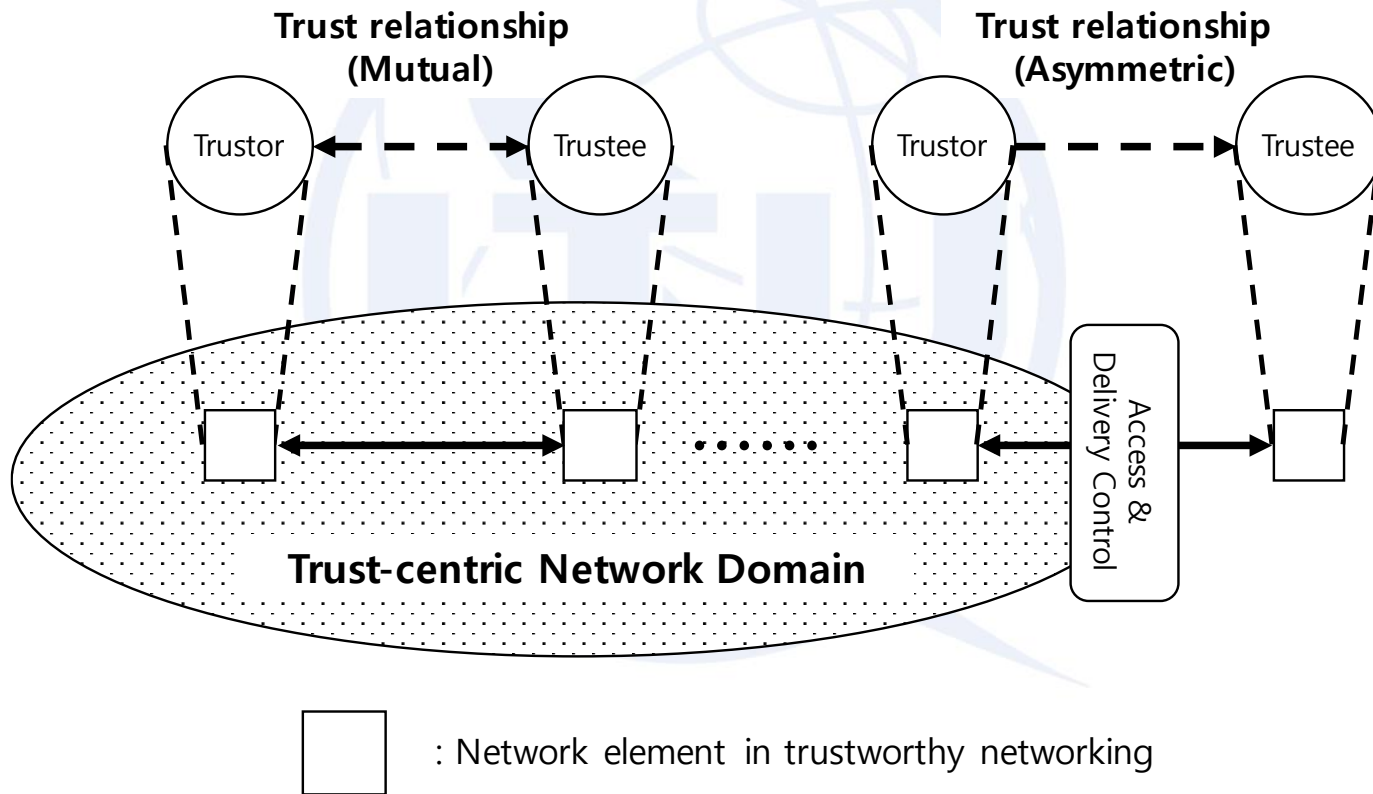
A conceptual model of trustworthy networking

Trust-centric network domains

Trust relationship (Mutual)

Trust relationship (Asymmetric)

Trustor — Trustee

Trustor — Trustee

Access & Delivery Control

Trust-centric Network Domain

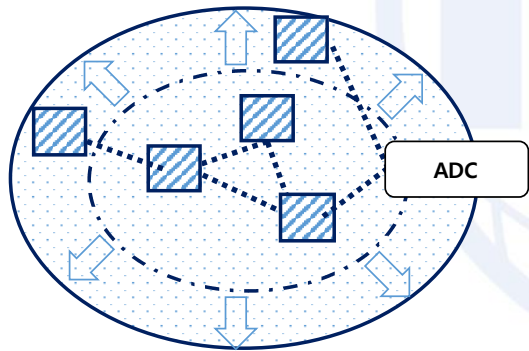: Network element in trustworthy networking
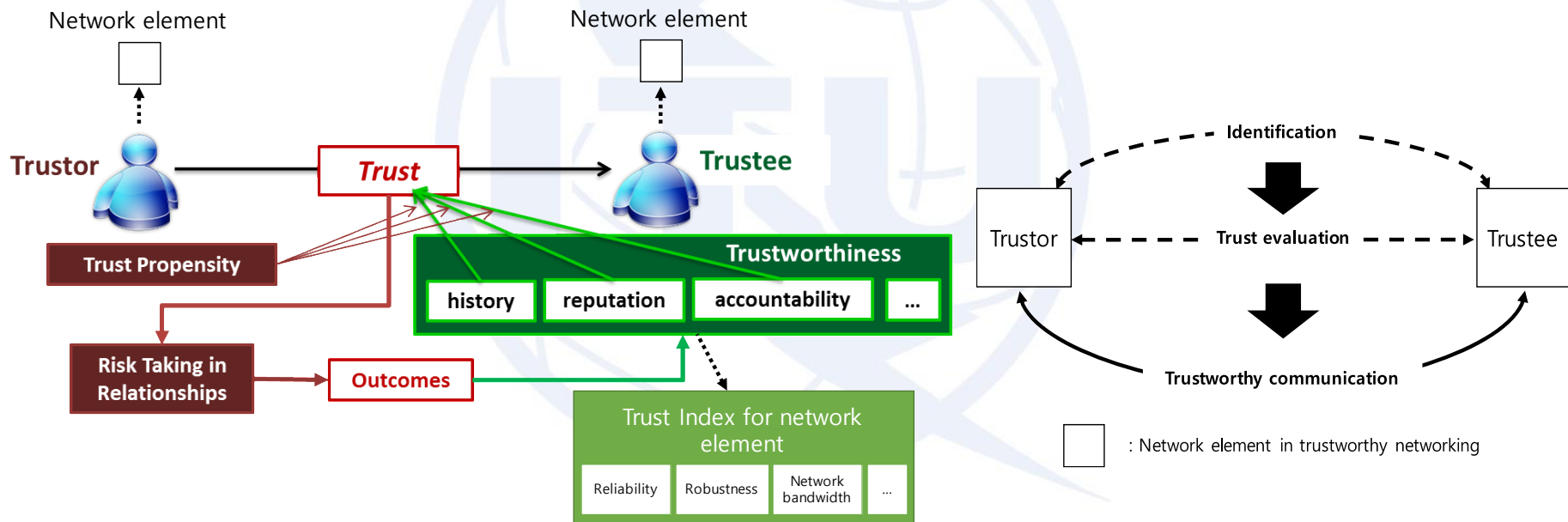
Networking scenario between the trust-centric network domains
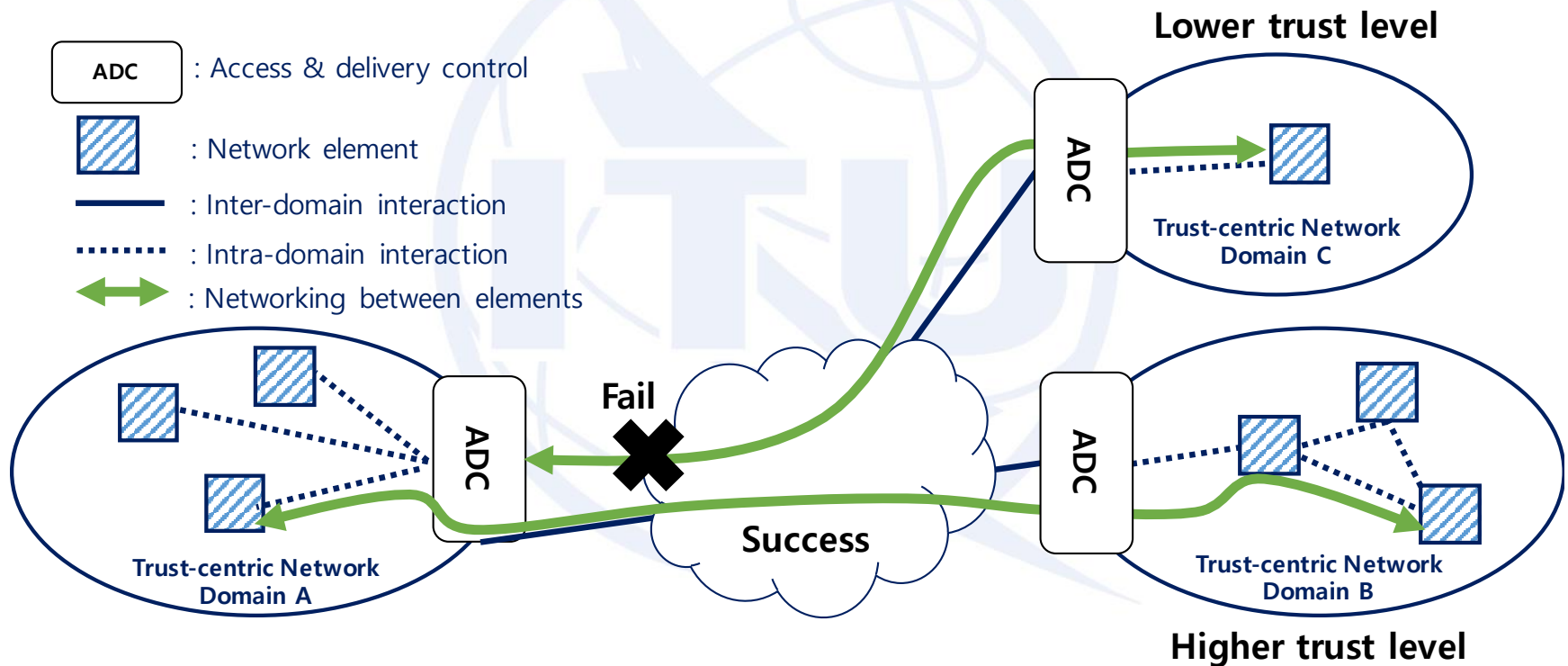
Expanding the trust-centric network domains

Legend:
- : Network element
- : Inter-domain networking
- : Intra-domain networking
- : Trust-centric Network Domain
- : Expanded domain
- : Access & delivery control

Trust-centric Network Domain A

(a) Accepting new elements in a domain

Trust-centric Network Domain B′

ADC

ADC

Trust-centric Network Domain B″
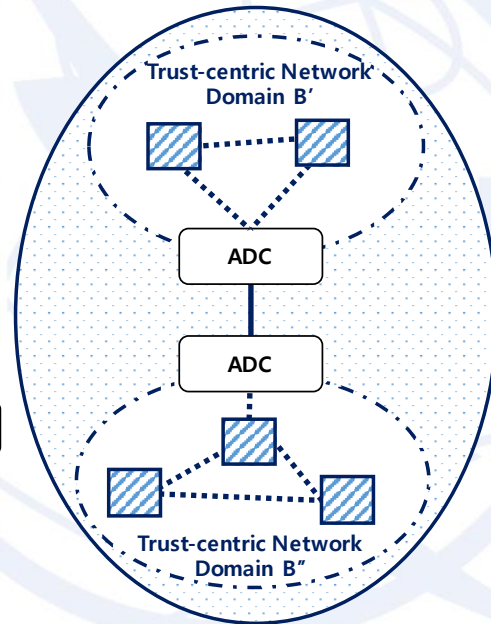
Trust-centric Network Domain B

(b) Collaboration of domains

ADC

ADC

Trust-centric Network Domain C′
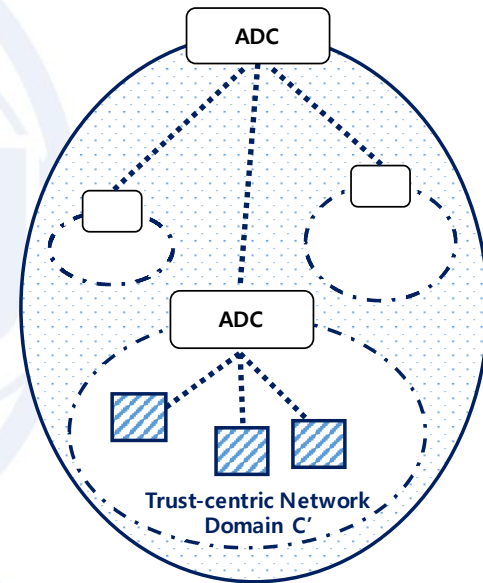
Trust-centric Network Domain C

(c) Hierarchical structure of domains

A functional architecture of trustworthy networking
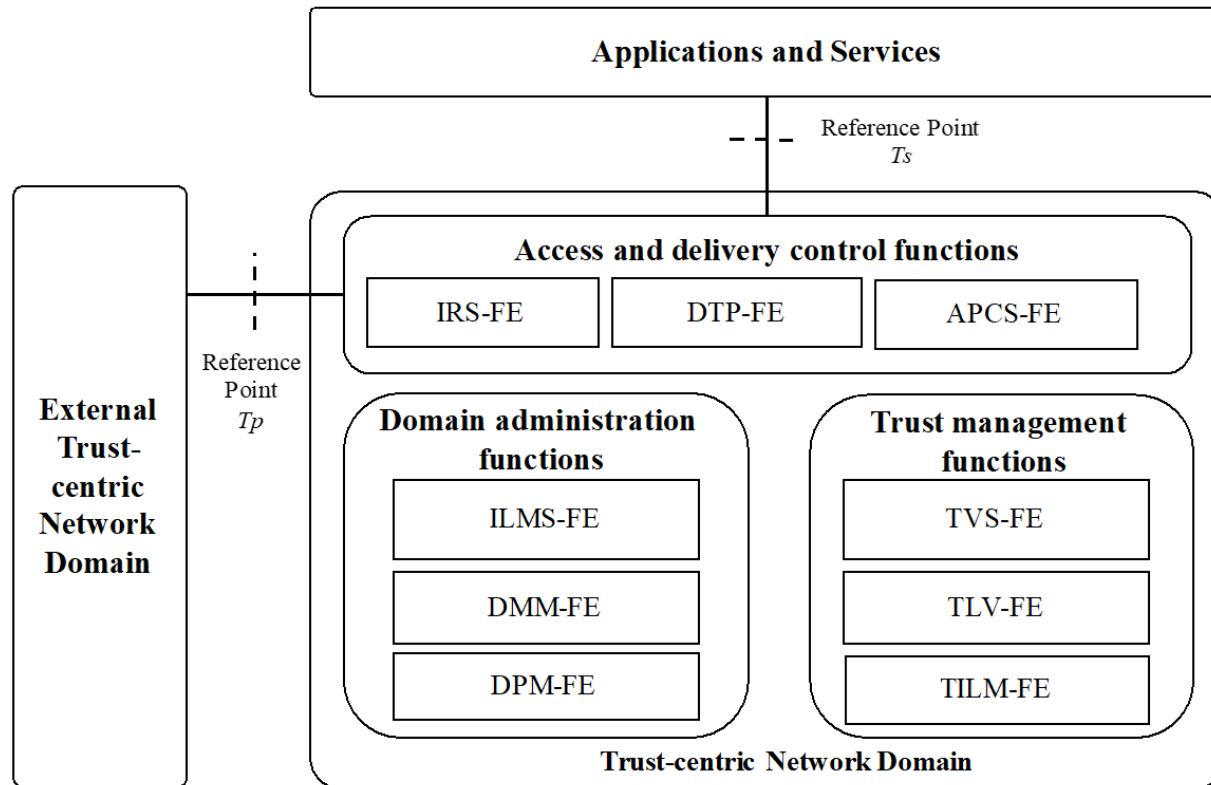
APCS: Accessing/Peering Control Support, DMM: Domain Membership Management, DPM: Domain Policy Management,
DTP: Data Transport and Processing, ILMS: ID-locator Mapping Support, IRS: ID-based Routing Support
TILM: Trust Information Lifecycle Management, TLV: Trust Level Validation, TVS: Trust Verification Support

Technical considerations for 5G

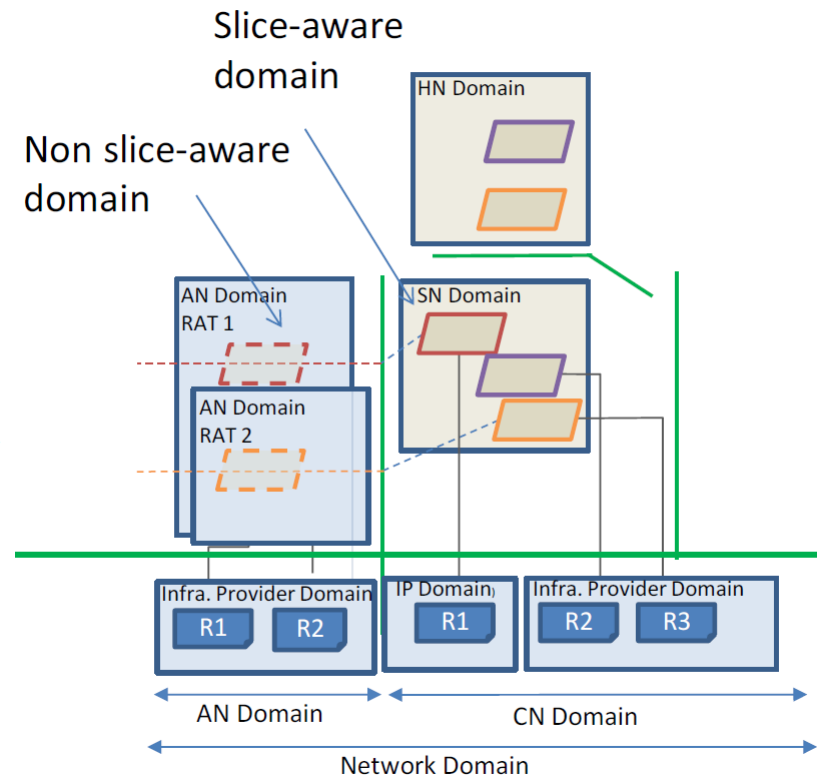- Network virtualization/slicing
  - A network operator might opt to run parts of its network functions and applications
  - A slicing approach to provide each different service with a unique logical network slice
- Different business models
  - Minimizing latency and increasing reliability

5G slicing architecture
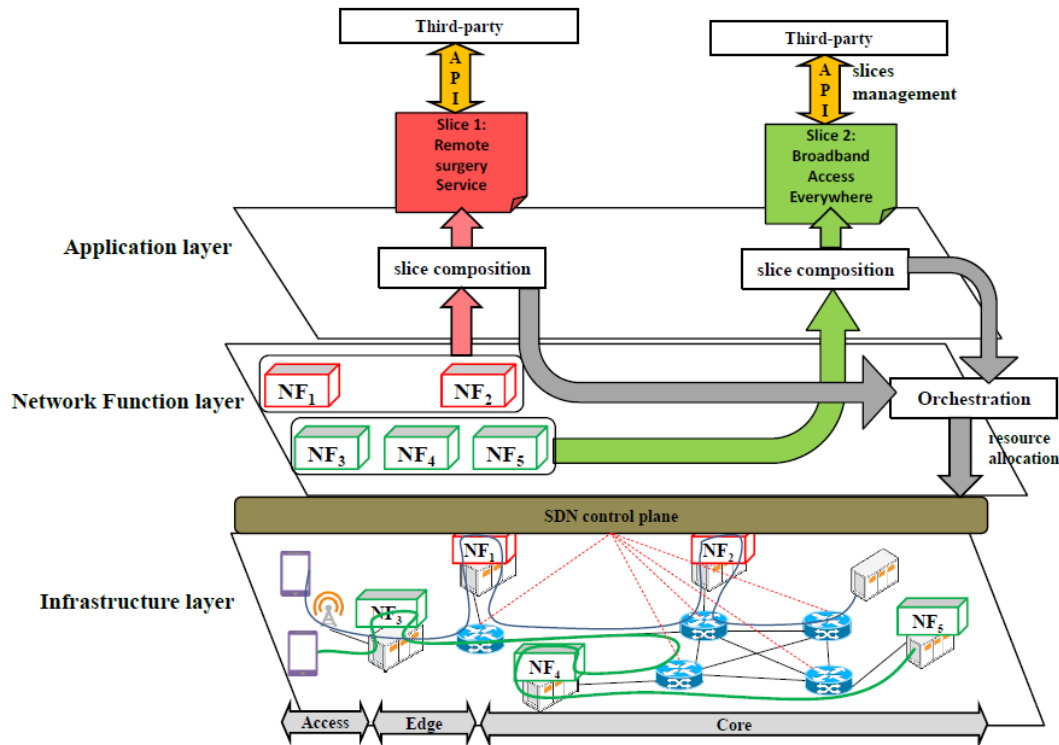
Source: 5G Ensure Project

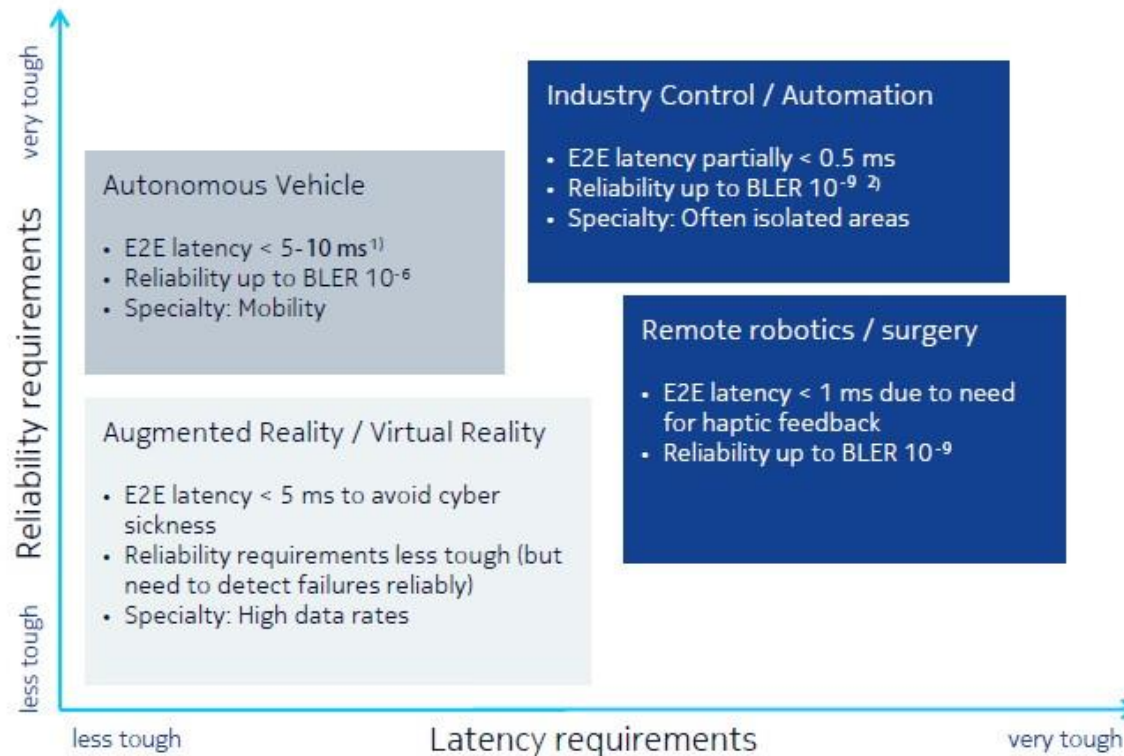# 5G Use cases requiring low latency and/or high reliability

Autonomous Vehicle
- E2E latency < 5-10 ms[1]
- Reliability up to BLER 10^{-6}
- Specialty: Mobility

Industry Control / Automation
- E2E latency partially < 0.5 ms
- Reliability up to BLER 10^{-9} [2]
- Specialty: Often isolated areas

Augmented Reality / Virtual Reality
- E2E latency < 5 ms to avoid cyber sickness
- Reliability requirements less tough (but need to detect failures reliably)
- Specialty: High data rates

Remote robotics / surgery
- E2E latency < 1 ms due to need for haptic feedback
- Reliability up to BLER 10^{-9}

Axes: Reliability requirements (less tough → very tough) vs Latency requirements (less tough → very tough)
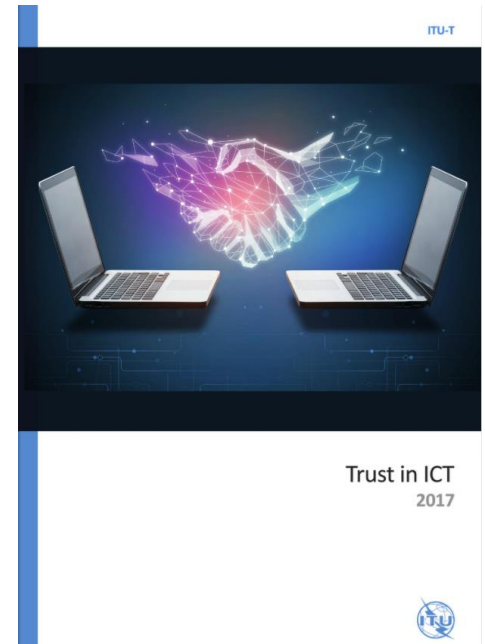
Source: 5G Ensure Project

Conclusion

Trust considerations as an important item for standardization
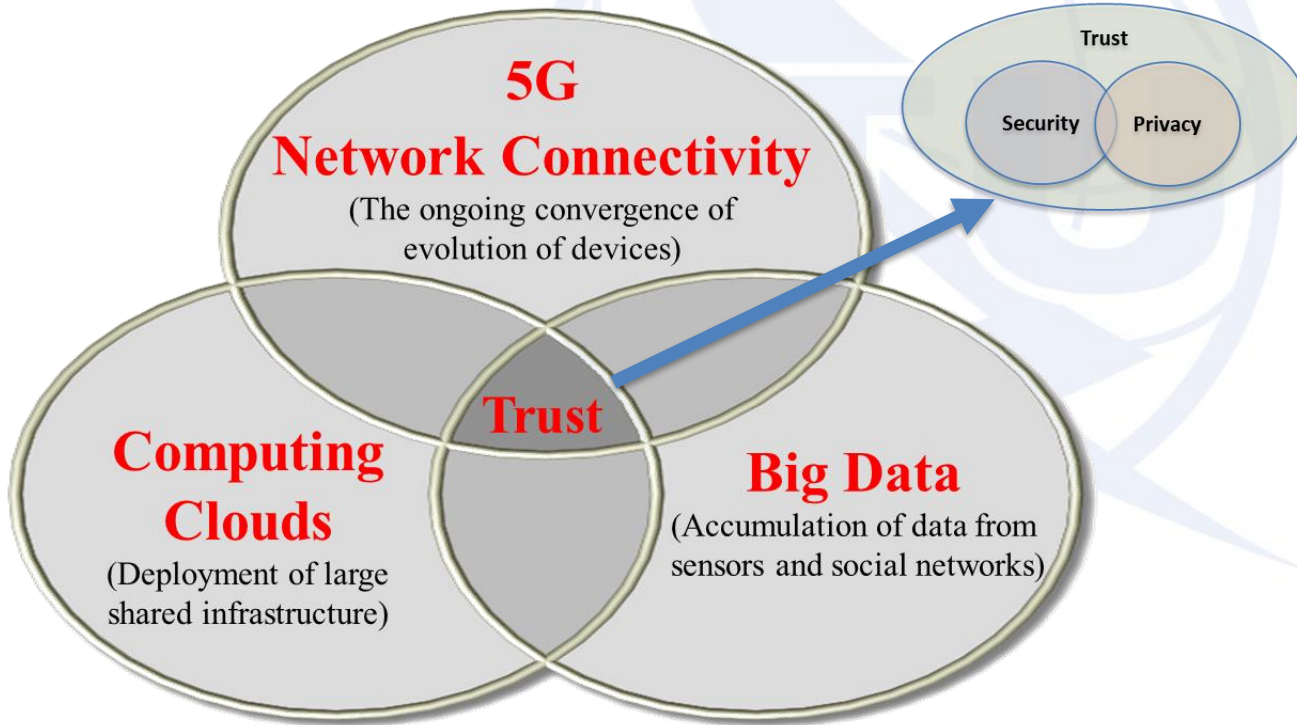
ITU Publications - Flipbook

5G
Network Connectivity
(The ongoing convergence of evolution of devices)

Trust

Computing Clouds
(Deployment of large shared infrastructure)

Big Data
(Accumulation of data from sensors and social networks)

Trust

Security   Privacy

ITU-T

Trust in ICT
2017

https://www.itu.int/en/publications/Documents/tsb/2017-Trust-in-ICT-2017/mobile/index.html#p=1