Vision 2020 and ITU

3 September 2015

Chaesub Lee

TSB Director

Большое спасибо за приглашение!

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I. Trends of ICT
II. Issues to be resolved
III. Vision 2020
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V. Academia and ITU
VI. Concluding Remarks

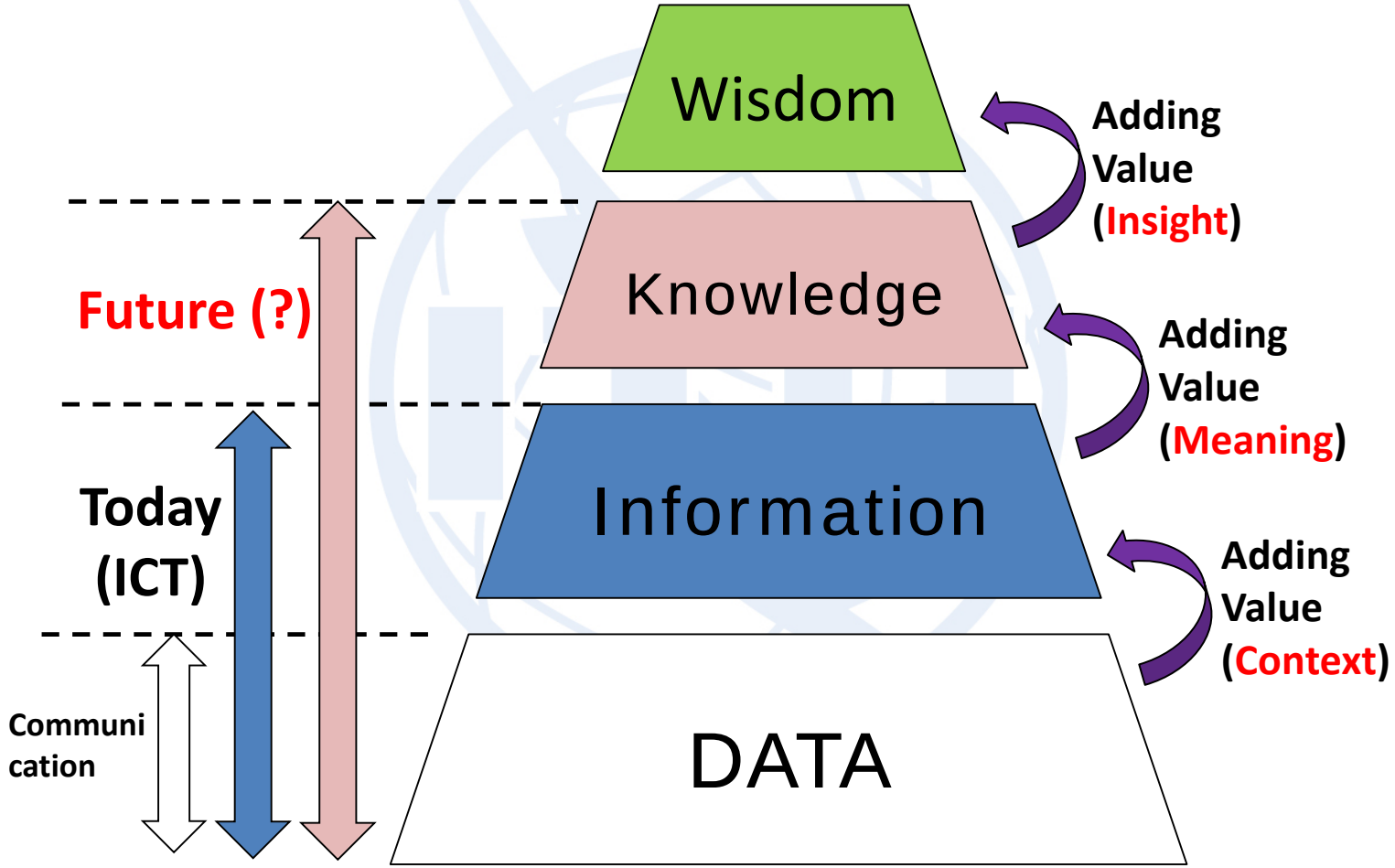
Attachments: Back up slides on ITU-T Activities

Buzz Words

- Data, Information and Knowledge
- Intelligent vs Smart
- Cloud vs Virtualization
- USN, M2M, MoC, WoT, WoO and IoT
- Big Data
- Security vs Privacy and Trust
- Future Internet, Future Networks and 5G

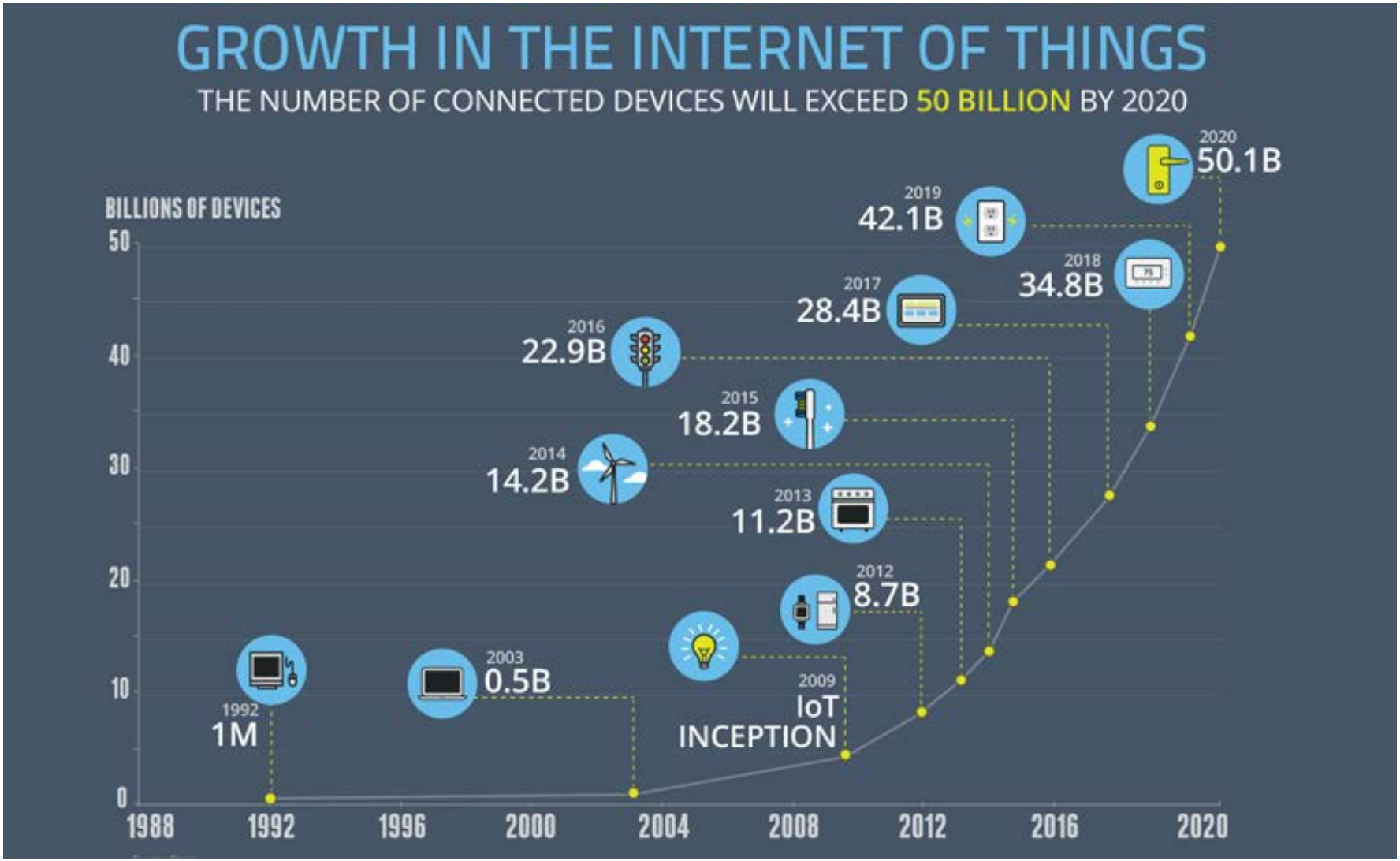
I. Trends of ICT

- **Continue on developments: Data → Information, then Future will be Knowledge based (Knowledge Society?)**



* note: R.L.Ackoff, "From Data to Wisdom," presidential address to ISGSR in June 1988

I. Trends of ICT



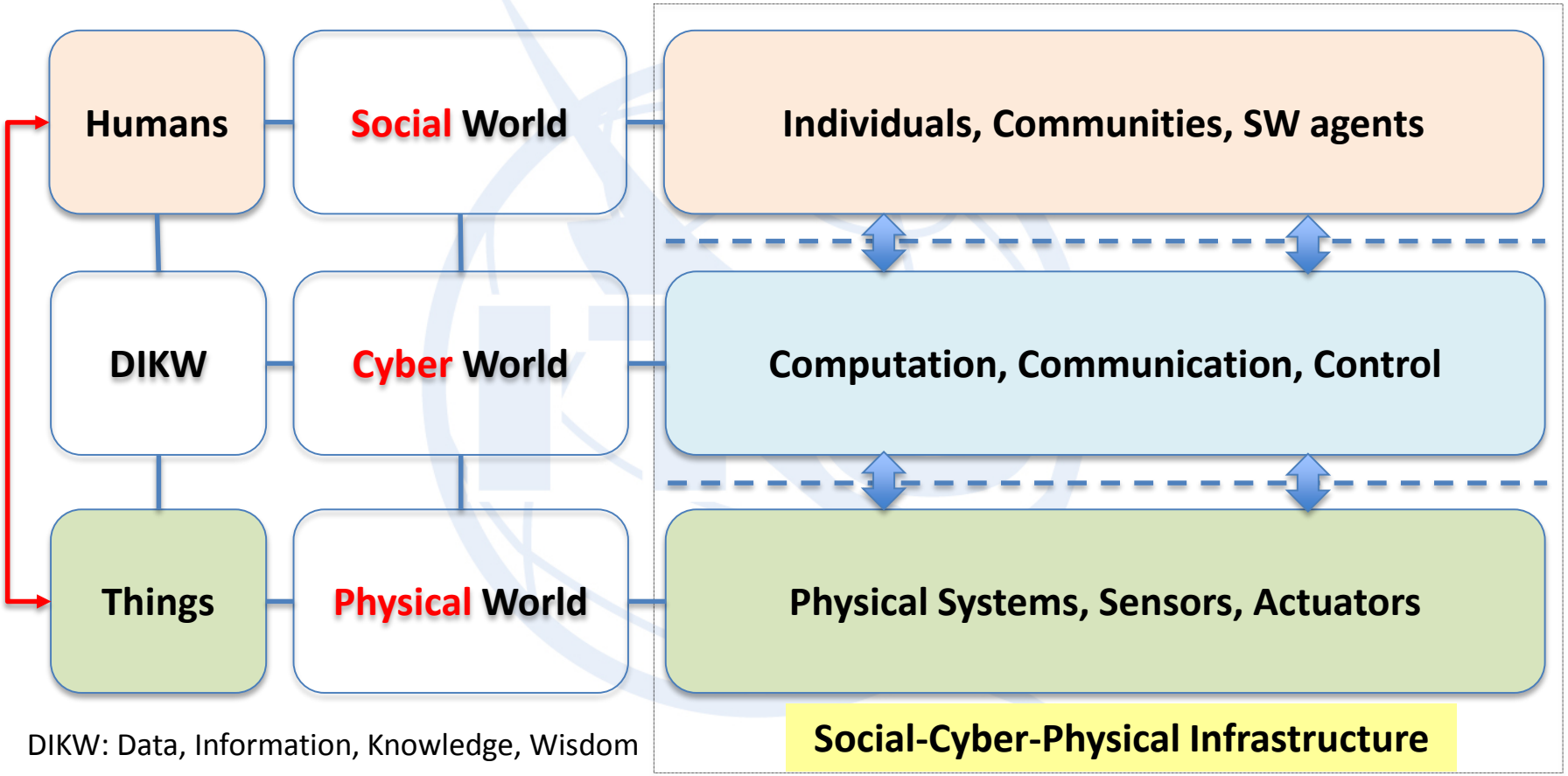
Source: Cisco (March, 2015)

Smart sustainable cities and citizens with IoT applications

- Smart cities are projected to use 2.7 billion connected things in 2017

Source: Gartner (data in millions)

Relationship among Social-Cyber-Physical Infrastructure



DIKW: Data, Information, Knowledge, Wisdom

Requirements for future networks

5G
(IMT-2020)

- 1~10 Gbps/user
- Tactile: < 1~10s ms RTT
- Sensing: 10 k/cell
- Resilience: 10^{-x} outage
- Security & Trust
- Heterogeneity
- Energy Saving
- OAM&P (operation, administration, maintenance, provisioning): Guarantee vs Smart
- Infrastructures: Harmony

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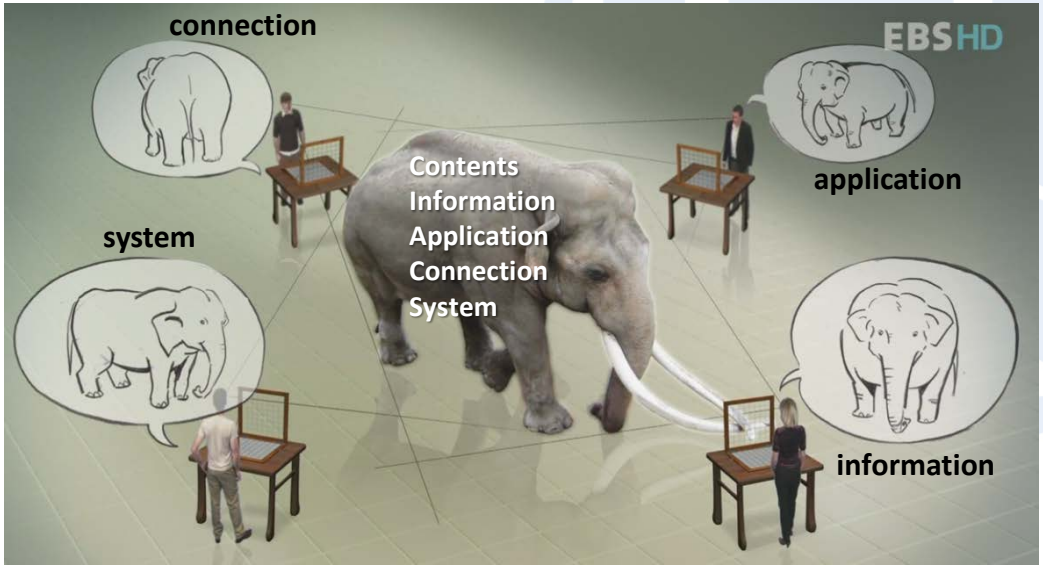
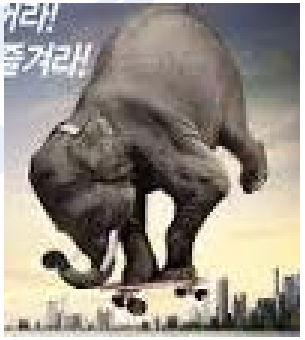
II. Issues to be resolved

- **Problem Space 1: Convergences**
  - **Intra** convergence (FMC) → **Inter** convergence (IPTV) → **External** convergence (ITS, Smart Grid, e-health)
  - Leaded by Technology Innovation concluded by business success
  - Differences: culture, environment, eco-systems

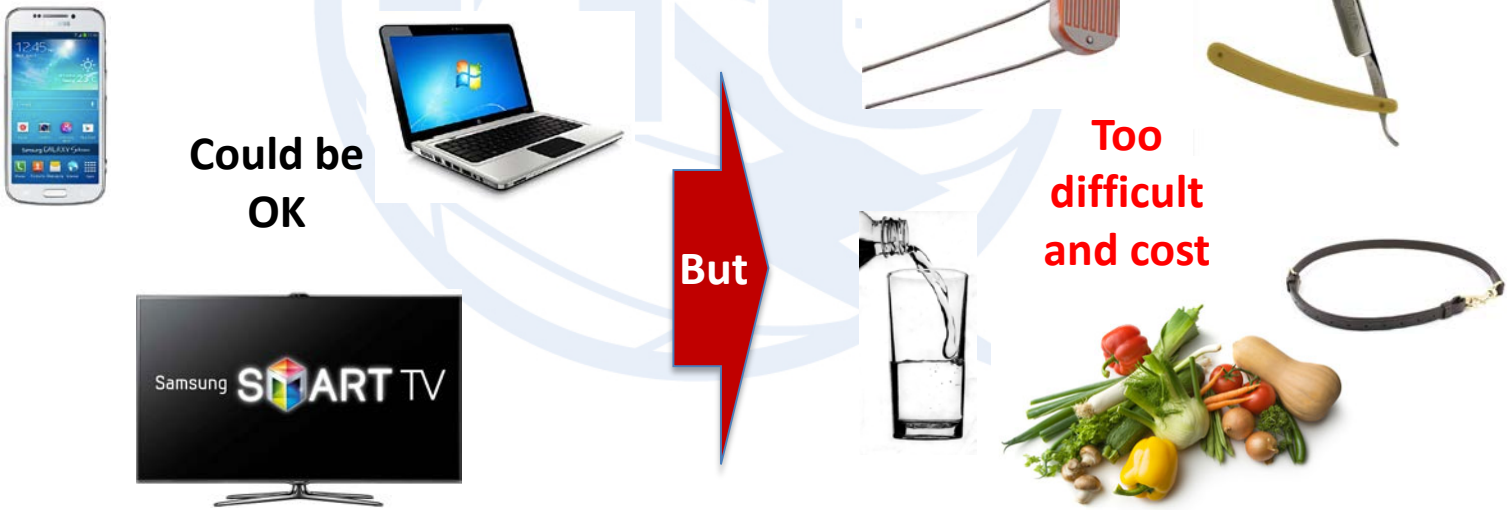




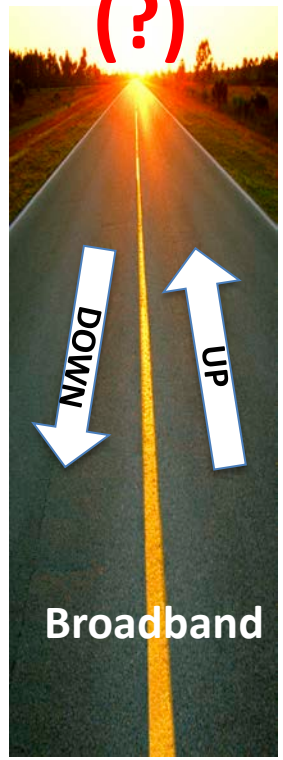
Present

II. Issues to be resolved

- **Problem Space 2: Complexity and Heterogeneity**
  - **Functions and capabilities** getting complex
  - Integrate various functions/capabilities into a system/function
    - Codecs: voice, video, multimedia, including Related PF
    - Connecting capabilities: WiFi (802.11 a/g/ab)+3G+4G+5G
    - Security platforms and protocol stacks

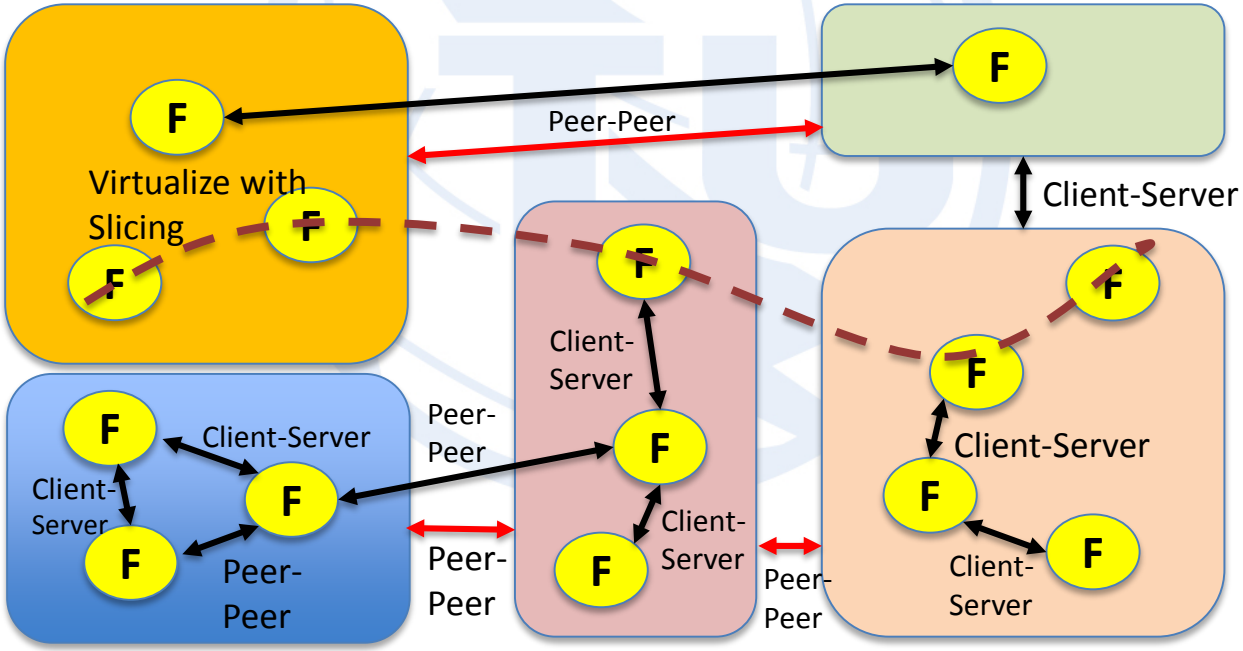


Problem Space 3: Service Environments in future



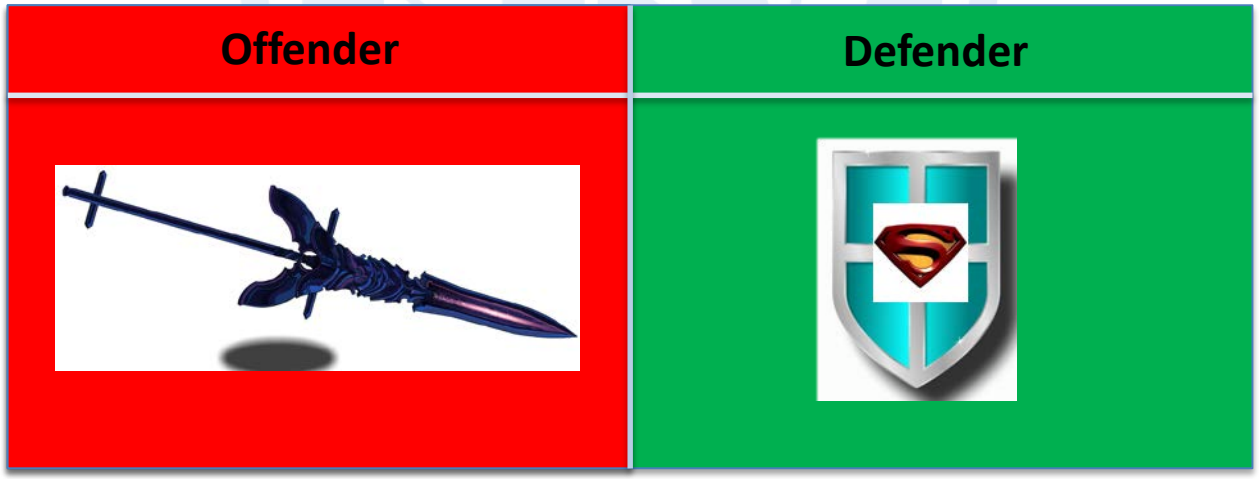
II. Issues to be resolved

- **Problem Space 4: Autonomy**
  - Increase of **autonomy** functions and systems even **under distributed and software** based environments
  - **Distributed** processing and computing even communication
  - Increase **sharing** resources and **binding** as one among **different** resources (slicing and virtualization)



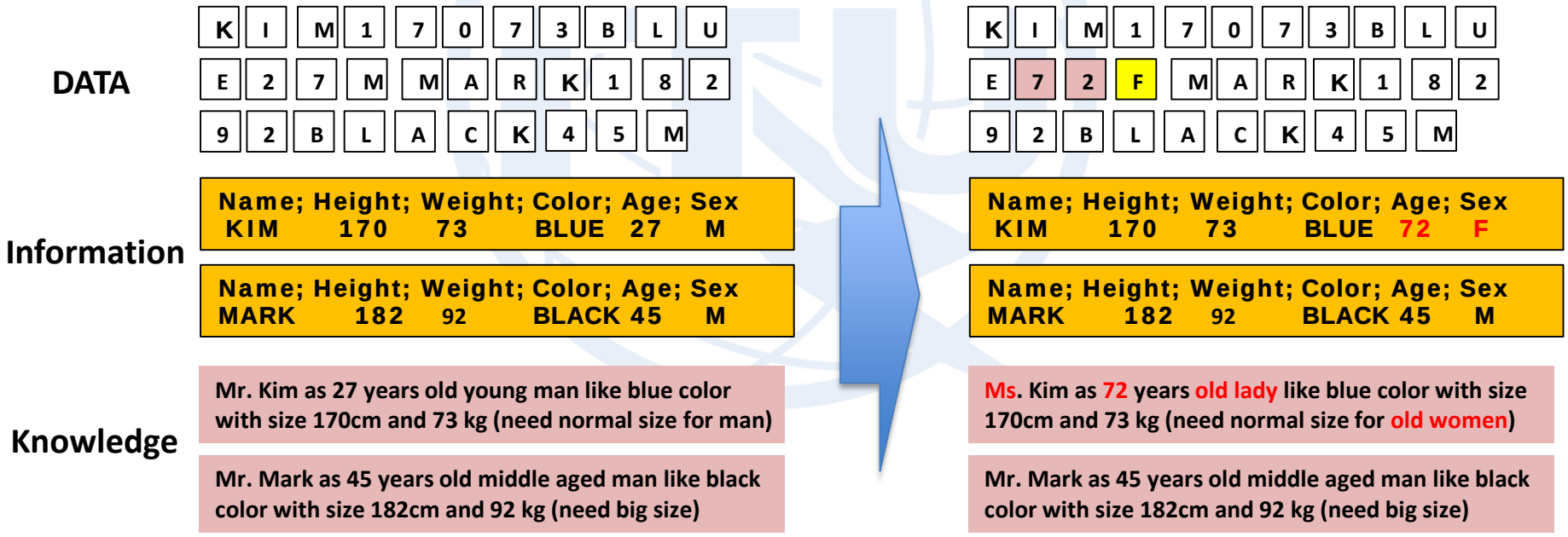
II. Issues to be resolved

- **Problem Space 5: Cybercrimes**
  - exposing our societies to the threat of cybercrimes
  - cyber-attacks on ICTs are **borderless** (anywhere)
  - Status of today cybercrimes:
    - 12 cybercrime victims/second, 1 M victims/day
    - 50% on-line adults have been victims of cybercrime
  - Additional **costs** but very few impacts to raise **income**
  - **Divide** the world in **two groups**, so never ending (Spear & Shield)



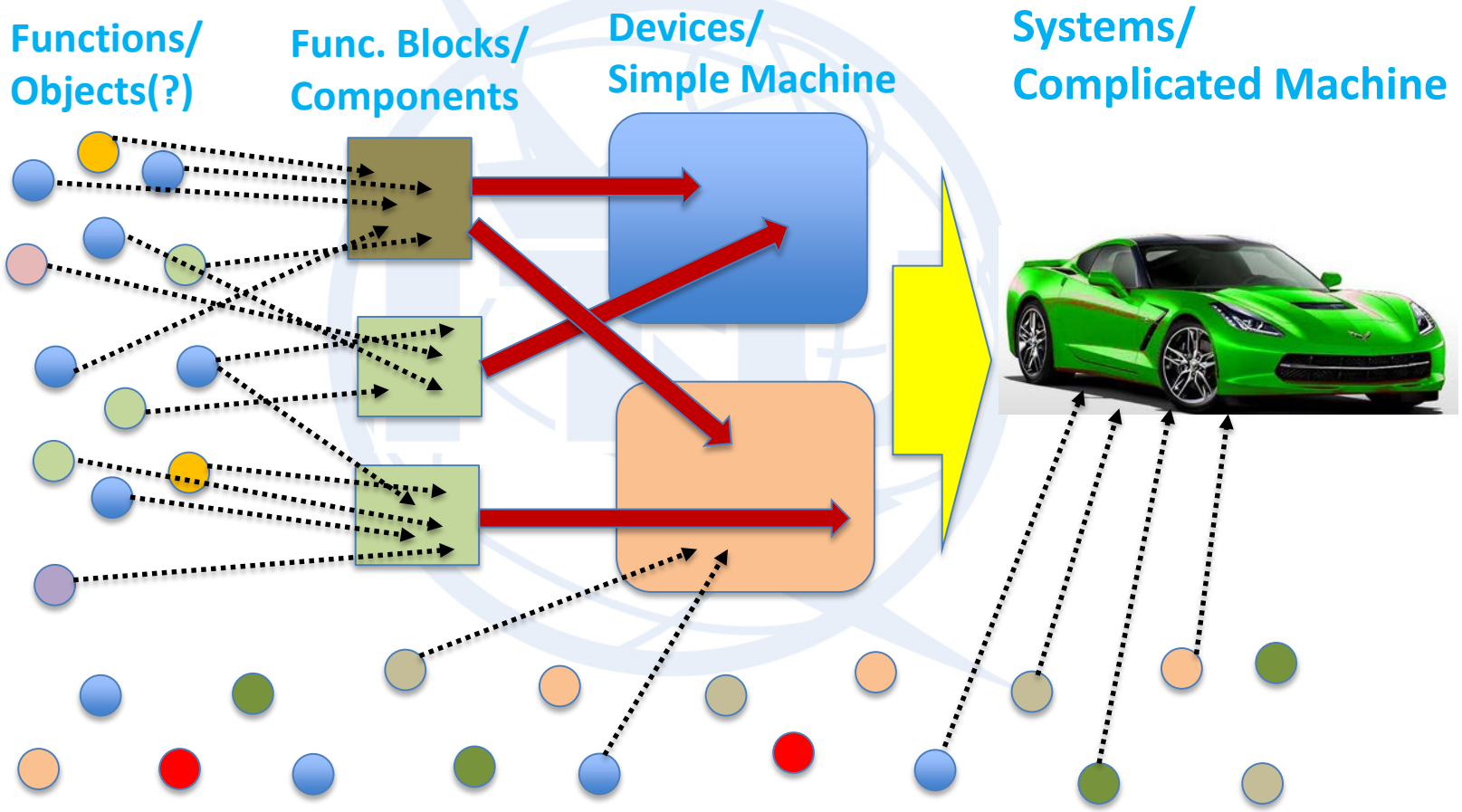
II. Issues to be resolved

- **Problem Space 6: Trust…**
  - How to ensure trust of **sources from on-line** (data, information, knowledge, providers, contents, brokers etc.)
  - **Less** trust data → **Incorrect** information → **Poor** knowledge
  - **waists** huge **time**: productivity, efficiency and effectiveness
  - no guidelines and reference to indicate the **level of trust**



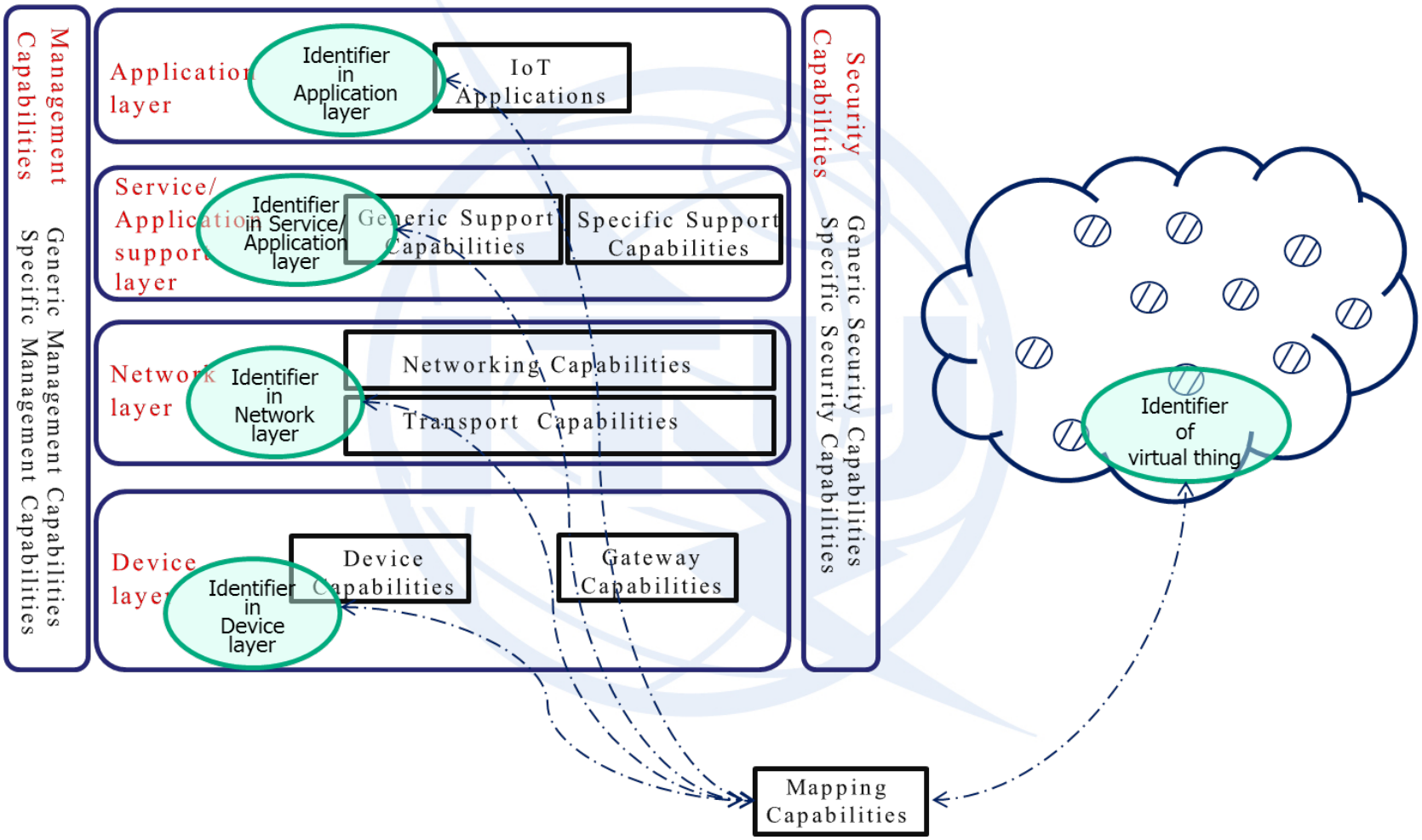
II. Issues to be resolved

- **Problem Space 7: Target Things (not yet clear to identify as a communication target)**



II. Issues to be resolved

- **Problem Space 8: Identifiers**



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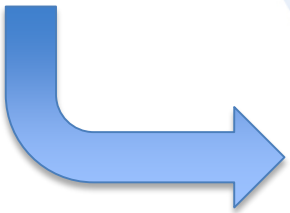


Network 2020
IoT 2020
Trust 2020

III. Vision 2020

Information Society (1993~5)

Information Super Highway

GII: Global Information Infrastructure

Forming concept & Social consensus

Connecting the people: Mobile

Connect the world: Broadband

Provide Connectivity

Smart Devices: Smart ICTs

Connecting the Things: IoT

Provide Mobility

Make Safe and Smart Information Society

Towards Future Trusted Infrastructures

Secure (Safe)

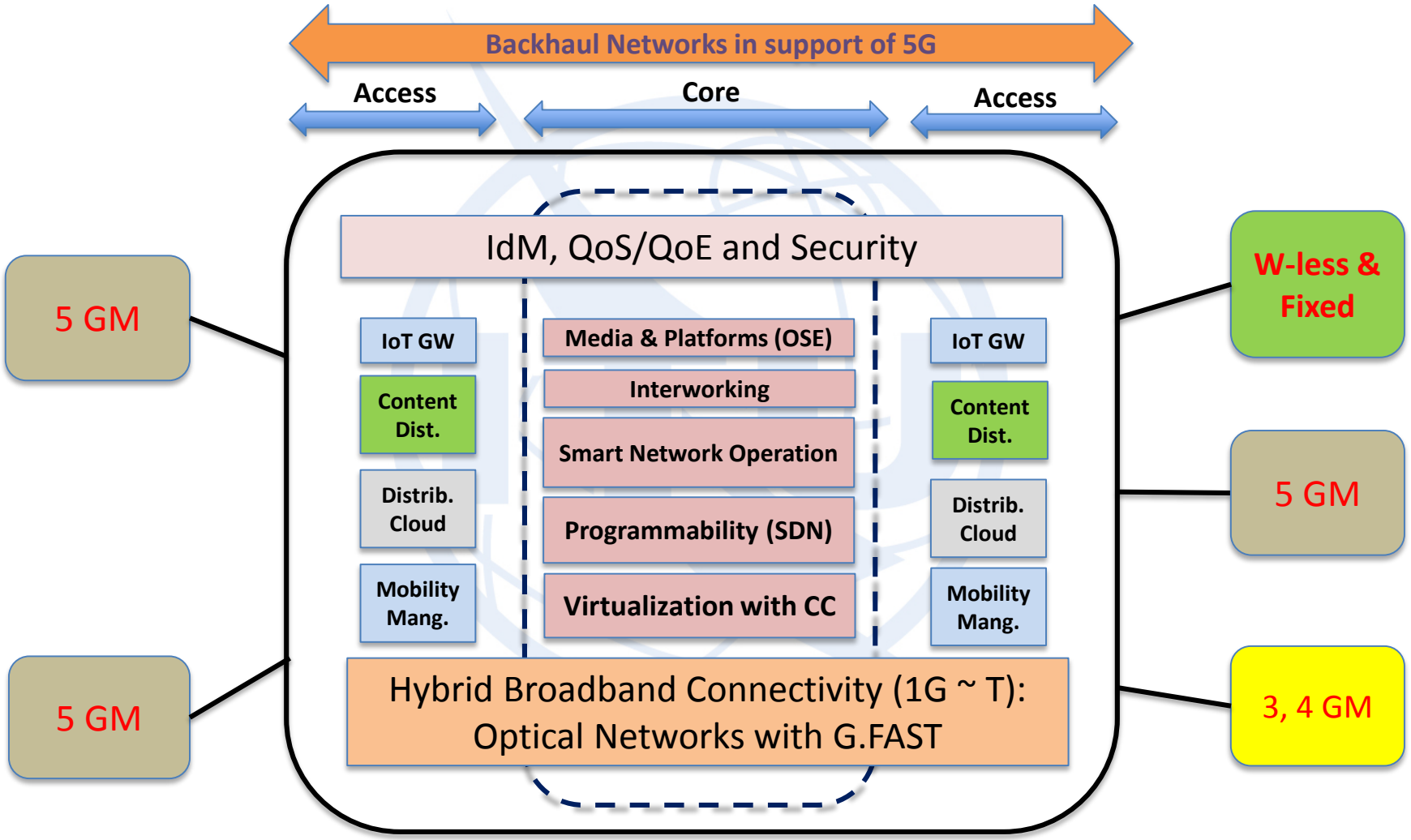
Smart

Intelligent

Building trust

III. Vision 2020

Network 2020: support non-radio part of 5G



IoT 2020: Infrastructure for connected life

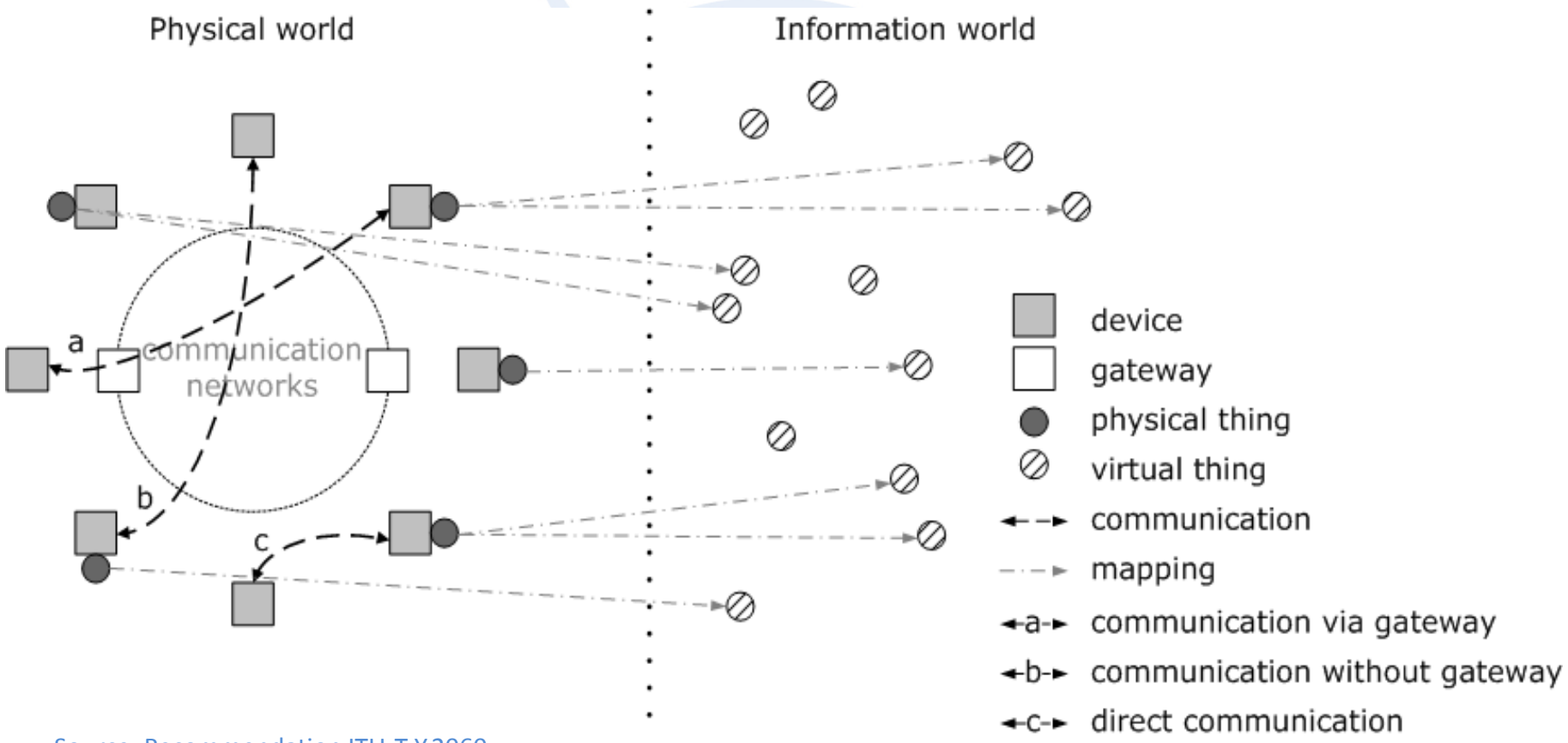
A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable ICTs.

Characteristics:

- Interconnectivity
- Things-related services
- Heterogeneity
- Dynamic changes
- Enormous scale

Source: Recommendation ITU-T Y.2060

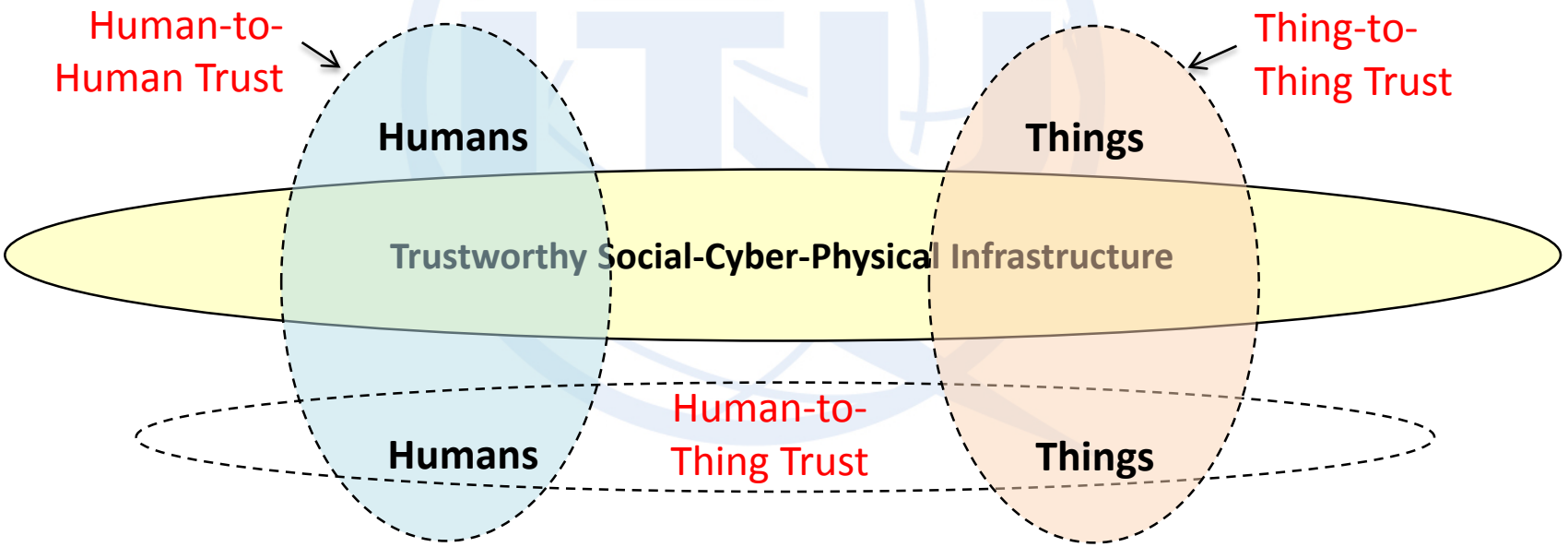
IoT 2020: Building connected Cyber-Physical Space



Source: Recommendation ITU-T Y.2060

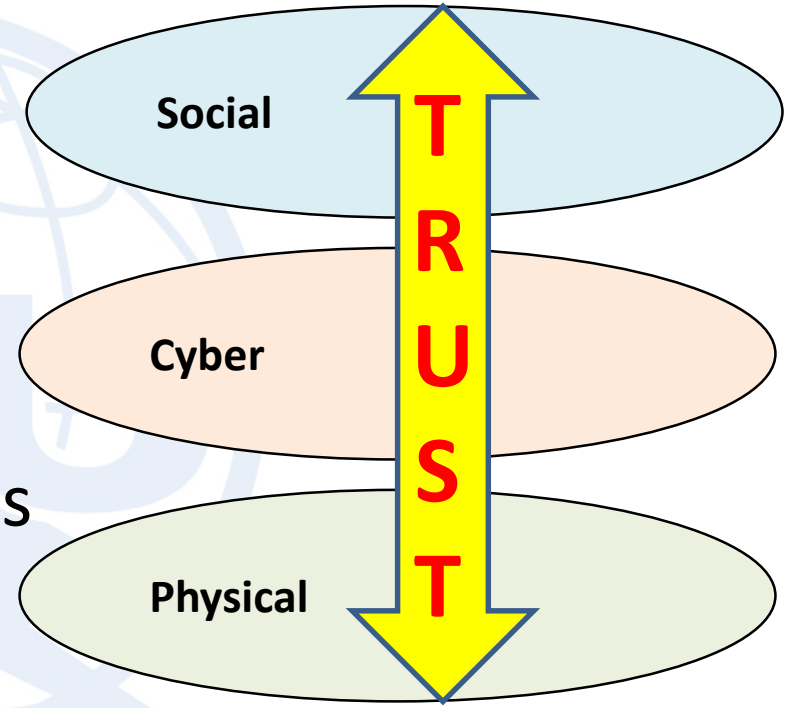
Trust 2020: Building Trust Relationship

- Social Trust among humans and things
- From individual Trust to community Trust



Trust 2020: Building Trust in SCP

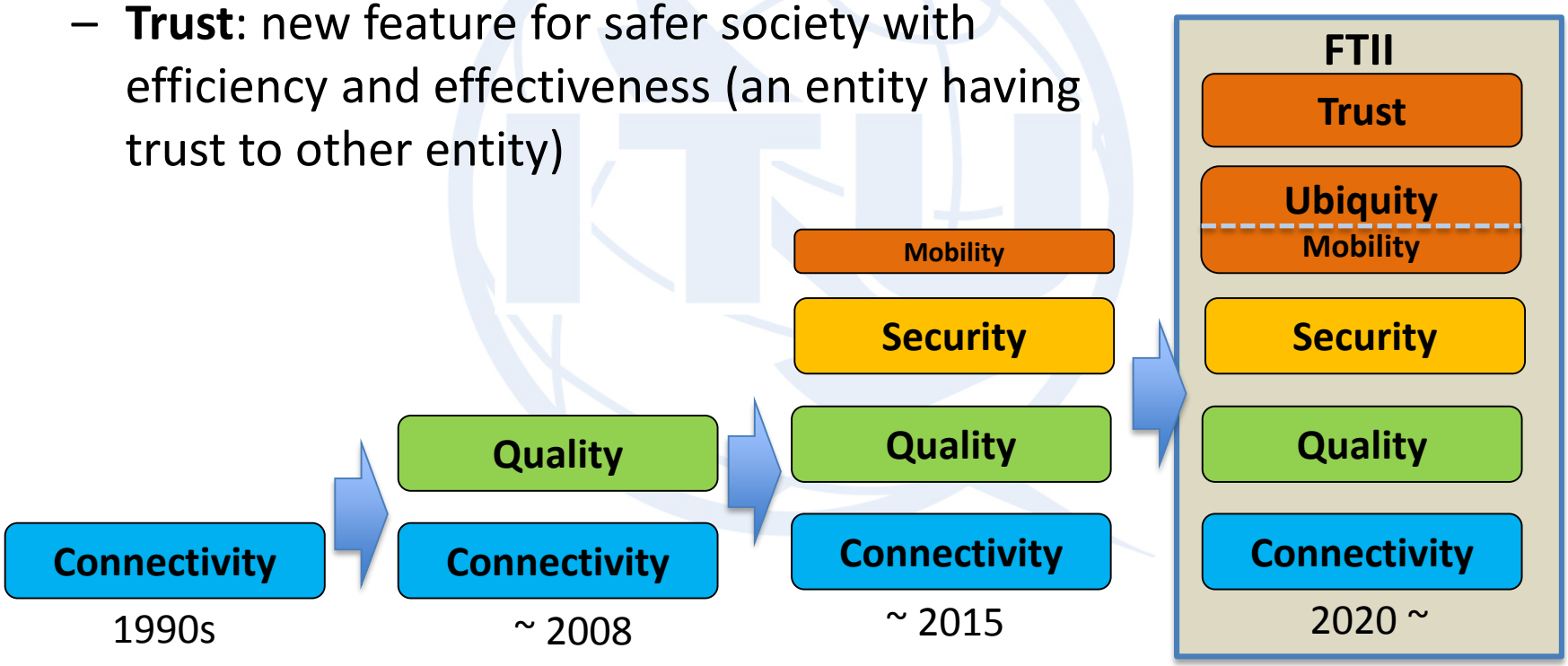
- **Social-Cyber-Physical Relationships**
  - Co-existence
  - Connectivity
  - Interactivity
  - Spatio-temporal situations
- **Human-Thing Relationships**



Trust as a cross domain relationship

III. Vision 2020

- **New Infrastructure: Trustworthy Information Infrastructure**
  - Better solution for **Safer and Smarter operation of Infrastructure**, while well enhance quality (with enhanced Broadband)
  - **Ubiquity and Mobility**: need enhancement (e.g. seamless) of mobility and realize **better Ubiquity**
  - **Trust**: new feature for safer society with efficiency and effectiveness (an entity having trust to other entity)



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IV. ITU (International Telecommunication Union)

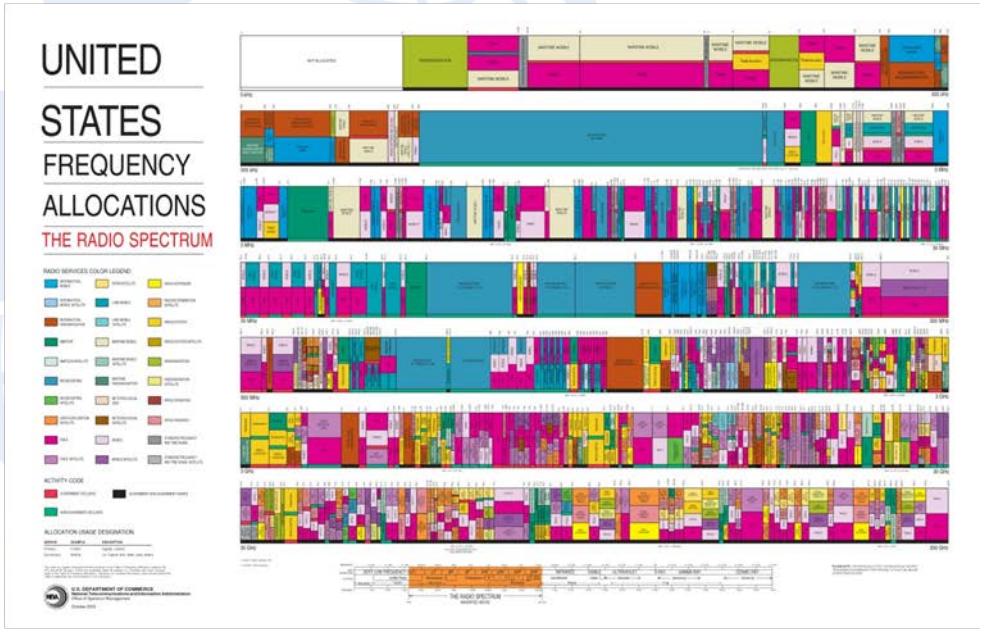
ITU

- UN specialized agency for ICTs
- 150th Anniversary: 17 May 2015
- Standards developing organization
- Unique public/private partnership

Members:

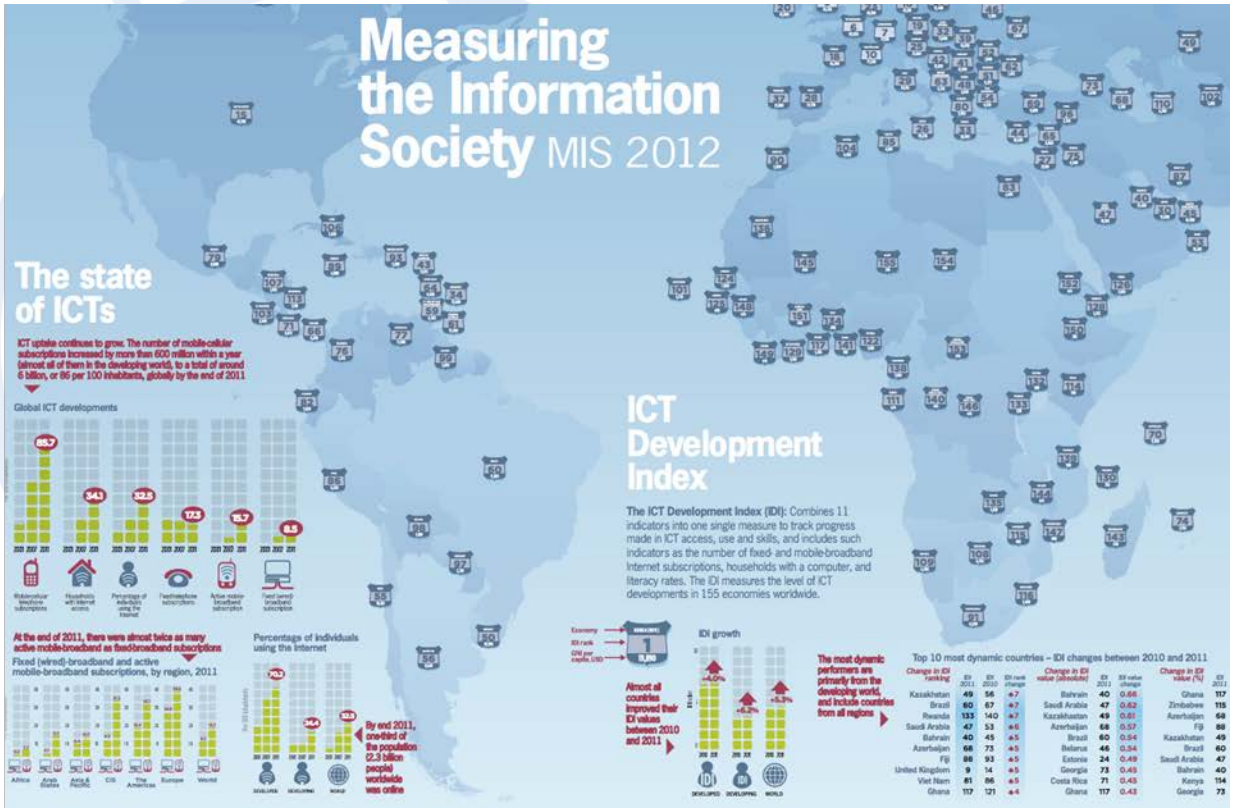
- 193 Member States (Governments and regulatory bodies)
- Over 700 Private Sector (Sector Members and Associates)
- Over 90 Academia

ITU allocates (1) frequency spectrum to different services, (2) satellite orbit assignments, (3) numbers and identifiers



ITU-T develops international standards

ITU assists developing countries in building up their ICT infrastructure



ITU-T structure (1): ITU-T Study Groups

- SG2 Operational aspects
- SG3 Economic and policy issues
- SG5 Environment and climate change
- SG9 Broadband cable and TV
- SG11 Protocols and test specifications
- SG12 Performance, QoS and QoE
- SG13 Future networks (incl. cloud)
- SG15 Transport and access
- SG16 Multimedia
- SG17 Security
- SG20 IoT & Smart Cities

ITU-T structure (2): ITU-T Focus Groups

Augment the Study Group system

- **Way to quickly react to ICT standardization needs**
- **Great flexibility of working methods**
- **Open to non-member participants**

Current Focus Groups:

1. **5G/IMT-2020 Wireline**
2. **Aviation applications of cloud computing for flight data monitoring**
3. **Digital financial services**
4. **Smart sustainable cities**
5. **Bridging the gap: from innovation to standards**
6. **Smart water management**

ITU-T Focus Group "IMT-2020"

- 5G focus mostly on air interfaces, radio access networks and protocols
- Little importance given to impact of IMT-2020 / 5G on the fixed network
- But fixed network will play a very important role
- ITU established new Focus Group on 5G to identify the standardization requirements of the networks
- Open platform for network experts representing ITU members and non-members to advance 5G agenda from fixed network perspective

Please join

3rd meeting at 21 ~ 24 September 2015 (Turin, Italy)

IoT and its applications including smart cities and communities (SC&C)

- **Initiated by SG13 and several SGs since 2008**
- **ITU-T creates a new Study Group 20**
- **Approved new ITU Resolution: *"Facilitating the Internet of Things to prepare for a globally connected world"***
  - Coordination and collaboration
  - Facilitating exchange of experiences
  - Foster capacity building to enable IoT and SSC

Please join

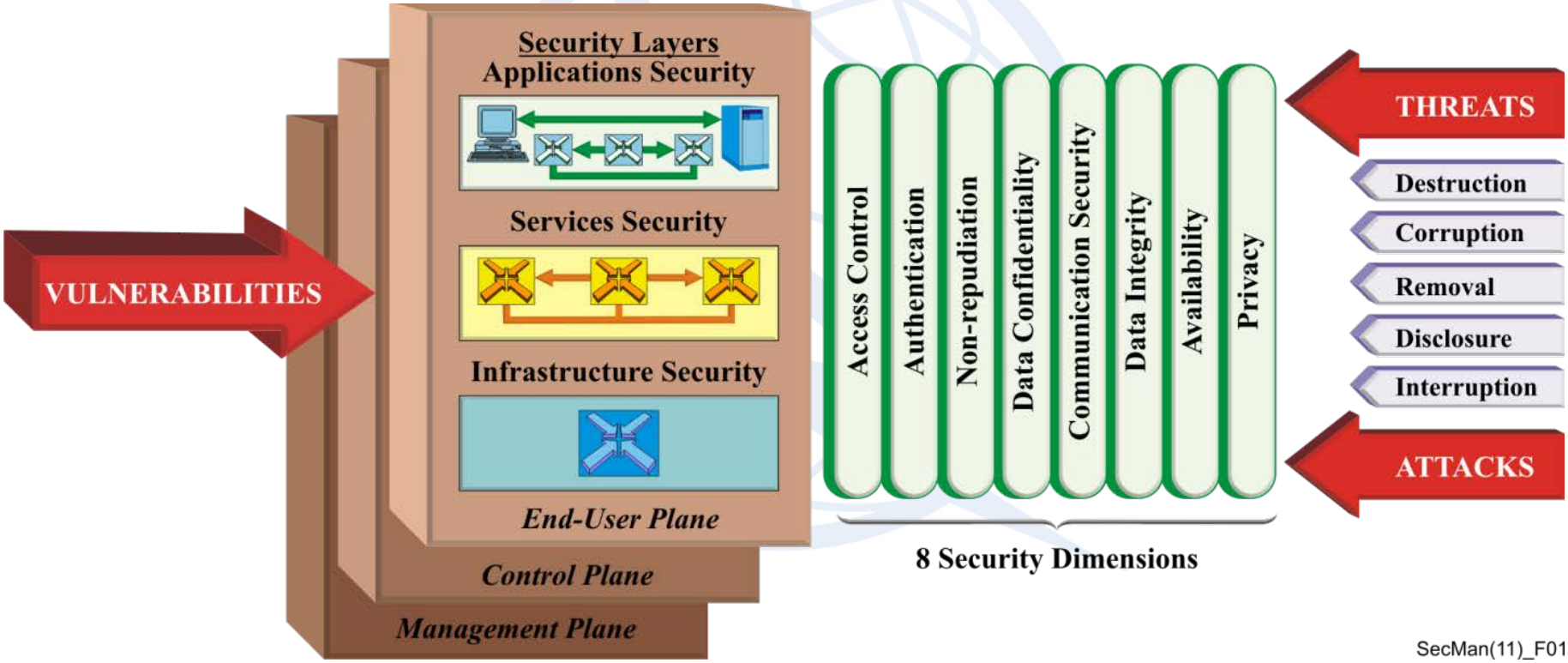
1st meeting at 19 ~ 23 October 2015 (Geneva, Switzerland)

Security and Trust

- **SG17: Security (to build confidence and security in the use of ICTs)**
- **Chairman: Mr. Arkadiy Kremer**
- **Lead Study Group for:**
  - Security
  - Identity management
  - Languages and description techniques
- **Responsible for specific E, F, X and Z series Recommendations (334 Recommendations, 22 Supplements and 3 Implementer's Guides)**
- **Work organized into 5 Working Parties with 12 Qs**
- **http://itu.int/ITU-T/go/sg17**

Security study results in SG17

Security architecture: for systems providing end-to-end communications (Rec. ITU-T X.805)



Security study results in SG17

- Information security management guidelines for telecommunications organizations based on ISO/IEC 27002 (Rec. ITU-T X.1051)
- Information Security Management System (Rec. ITU-T X.1052)
- Governance of information security (Rec. ITU-T X.1054)
- Risk management and risk profile guidelines (Rec. ITU-T X.1055)
- Security incident management guidelines (Rec. ITU-T X.1056)
- Asset management guidelines (Rec. ITU-T X.1057)

Security Study results in SG17

- **CAP (Common alerting protocol)**
  - a simple but general format for exchanging all-hazard emergency alerts and public warnings over all kinds of networks
  - CAP 1.1 (ITU-T X.1303) & CAP 1.2 (ITU-T X.1303bis)
  - disseminate a consistent warning message simultaneously over many different warning systems
- **Cybersecurity Information Exchange (CYBEX)**
  - Overview (Rec. ITU-T X.1500)
  - Procedures for the registration of arcs under the object identifier arc for cybersecurity information exchange (Rec. ITU-T X.1500.1)

ongoing Security issues within SG17

- IoT and SDN security
- Smart grid security
- ITS and V2V Infrastructure/nomadic devices security
- Information security management
- Privacy, Cybersecurity and Mobile Security
- Anti-spam
- Cloud computing security and Big data security
- Telebiometrics and IdM

Please join

next meeting at 8 ~ 17 September 2015
(Geneva, Switzerland)

ITU events on trust

- Mainly leaded by SG13 → 2 Recommendations approved and several on-going works
- Workshop "Future Trust and Knowledge Infrastructure", Phase 1 (24 April 2015)
- Workshop “Building trust – the technical challenges” (28 July 2015, Geneva)
- ITU Telecom World, 12 ~ 15 October, Budapest Hungary
- ITU Kaleidoscope conference, Barcelona, Spain, 9-11 Dec: Trust in the Information Society

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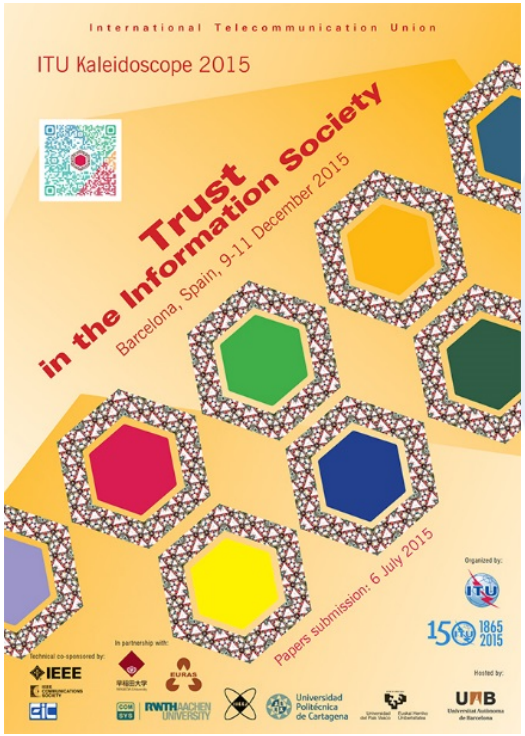
ITU Kaleidoscope 2015

9-11 December, Barcelona, Spain

"Trust in the Information Society"



- Selection of papers through a double-blind, peer review process by over 150 ICT experts.
- Selected papers will be published in the conference proceedings and in **IEEE *Xplore.***
- Best papers will be considered for publication in a special edition of **IEEE Communication Magazine**
- A prize fund totaling $10,000 will be awarded to the three best papers.

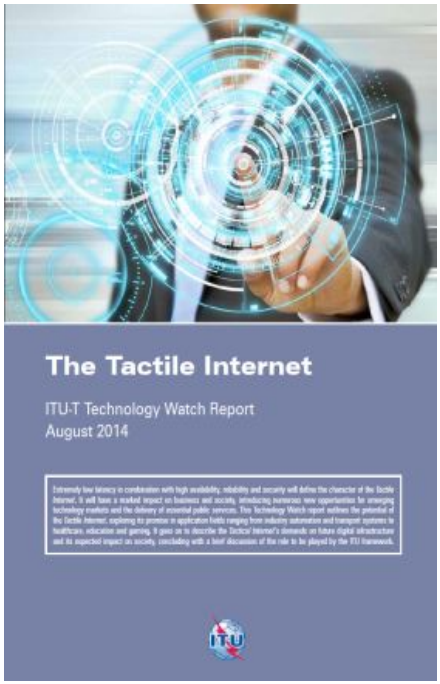
Call for Papers

Deadline

6 July 2015

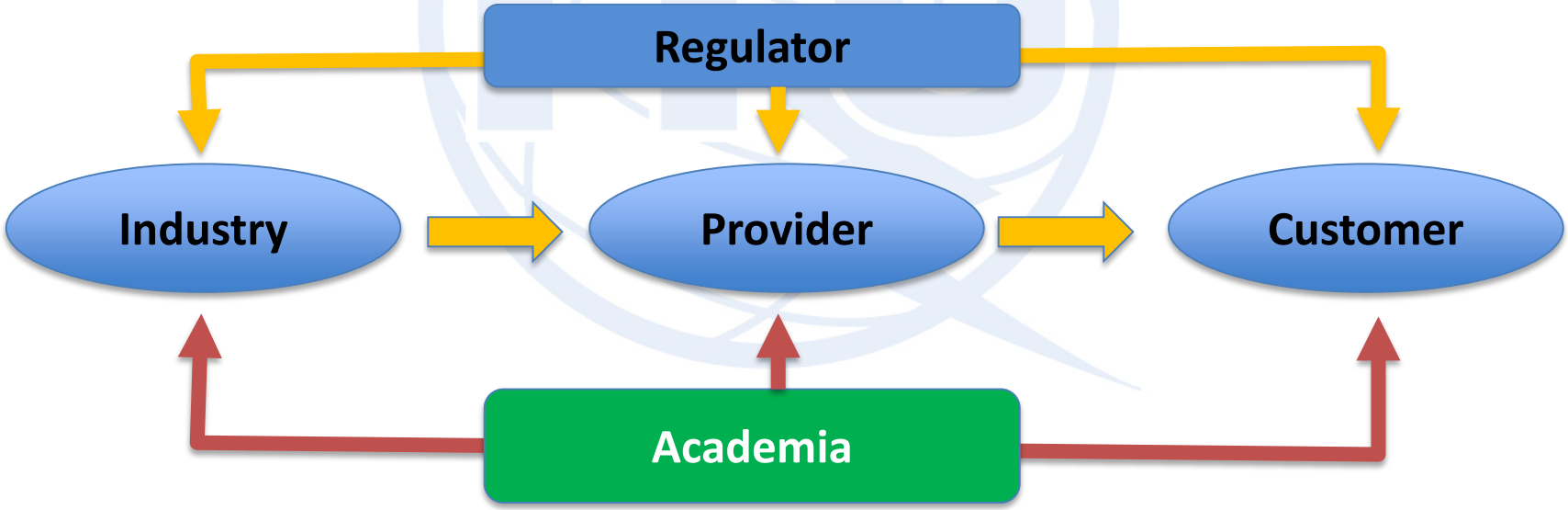
http://itu.int/go/K-2015

Technology Watch: scouting the future



Standards in Academia

- Whole ITU welcome of Academia members (one membership covers three bureau: ITU-R/T/D)
- Academia membership (90+) category great success
- Stimulates new work in study groups
- Academia should take a role as a stakeholder



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- New life environments (**Vision 2020**)
  - New **cultures** by emerging new generation
  - Enhancement of **Business Value Chains by "Trust"**
- Future society need better balance among different roles
  - today segmented **Eco-Systems → Open & collaborative Eco-Systems (= Echo-systems; big role from Academia)**
  - Review relationships: **Public and Private including Academia**
- ICT (Information Communication Technology): enough?
  - Impact for **extra convergences** (energy, transport, health…)
  - Support **Knowledge networking** (creation, processing, sharing and Echoing)

ITU invites Academia

International Telephone and Telegraph Union

International Telecommunication Union

International Trust Union

I

Trust

yoU

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Optical Core Network

- **1 wavelength = 100 Gbit/s**
- **1 core, e.g. 100 wavelengths → 10 Tbit/s (DWDM; e.g. ITU-T G.698.x series)**
- **Future: Multicore fibre**

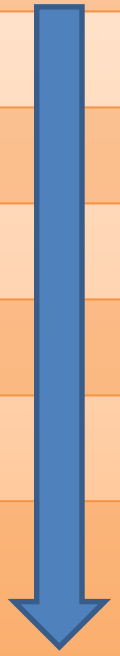
High speed access through fibre

Type	ITU-T	Initial approval	Max down
BPON	G.983	1998	622 Mbps
GPON	G.984	2003	2.5 Gbps
XG-PON	G.987	2010	10 Gbps
NG-PON2	G.989	2013	40 Gbps

PON: Passive Optical Networks

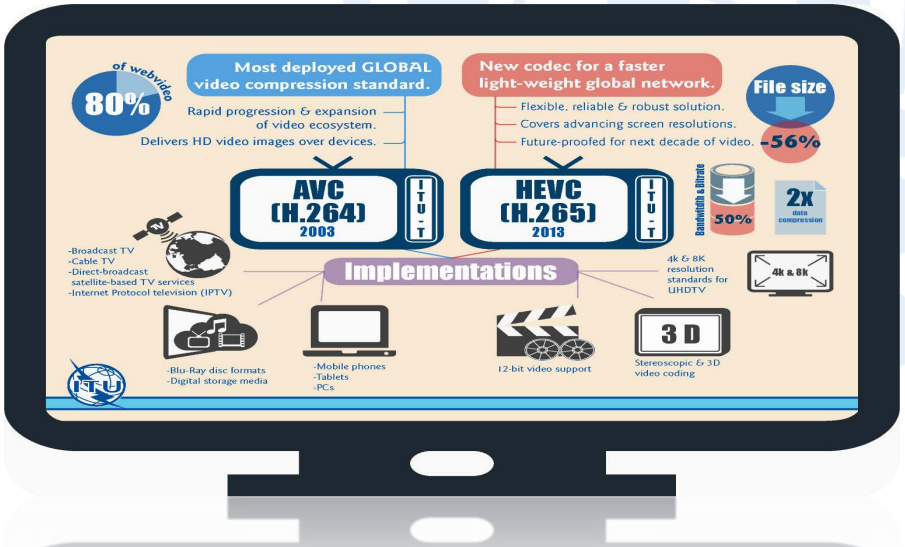
Breathing new life into existing copper infrastructure

Type	ITU-T	Initial approval	Max up/down
HDSL	G.991.1	1998	2 Mbps
ADSL	G.992.1	1999	
SHDSL	G.991.2	2001	
ADSL2	G.992.3	2002	
VDSL	G.993.1	2004	
VDSL2	G.993.2	2006	100 Mbps
G.fast	G.9701 / G.9700	**5 Dec 2014** / April 2014	1 Gbps (**10 Gbps**)



High Efficiency Video Coding eases pressure

- **Video: eats 50%+ of bandwidth use**
- **New ITU-T H.265 (2013) doubles data compressions ratio of ITU-T H.264**
- **Succeeds 10-year old Prime-time Emmy award winner ITU-T H.264 (accounts for 80% of web video)**



ITU-T connects clouds

ITU-T Y.35xx series on cloud computing:

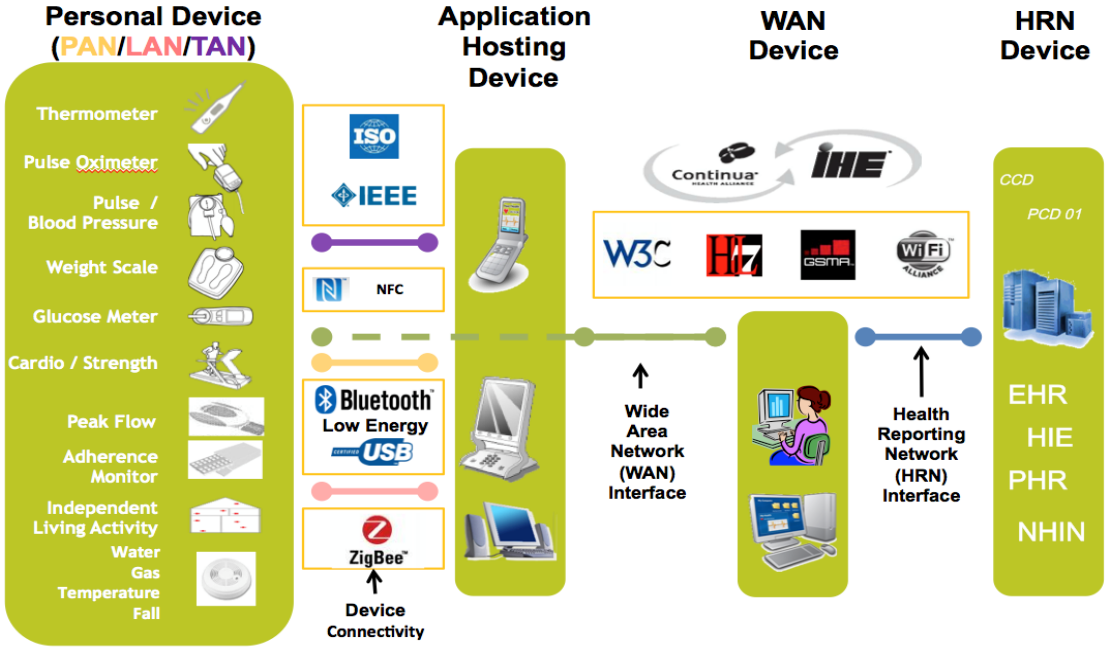
- **Definition, Framework, high-level requirements**
- **Reference architecture**
- **Requirements desktop as a service (DaaS)**
- **Infrastructure requirements**
- **Framework of inter-cloud computing**
- **Functional requirements of NaaS**
- **Functional requirements of IaaS**
- **Security framework for cloud computing security (ITU-T X.1601)**

Green ICT standards

- New universal charger for laptops and other portable devices approved (ITU-T L.1002)
- Standard for green batteries for smart phones (ITU-T L.1010)
- Methodology to assess the environmental impact of ICT in cities (ITU-T L.1440):
- ITU-T L.1410 (environmental impact of ICT goods, networks and services) aligned with ETSI lifecycle assessment methodology

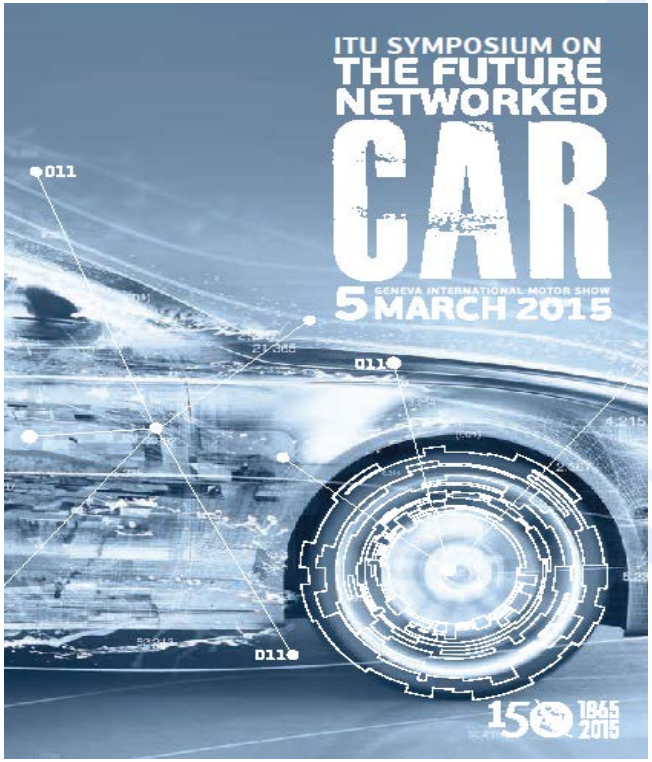
Connecting medics with patient data

- **ITU's Personal Health Care Standards: ITU-T H.810 (based on Continua Health Alliance)**
- **Gives interoperability guidelines for personal health systems**
- **32 new testing specifications for conformance testing with > 1000 test cases**



Combining vehicles and ICTs

10th edition



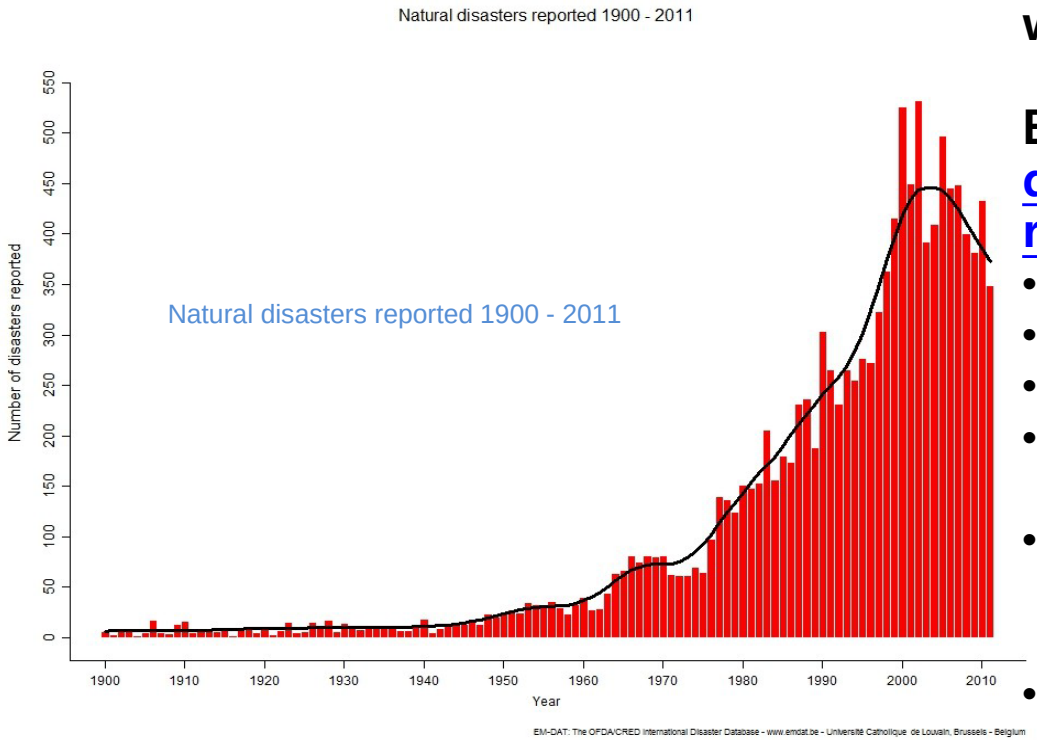
ITU's "Collaboration on ITS Communication Standards" group

- **Goal: harmonized set of ITS communication standards**
- **Close collaboration with UNECE on vehicle regulation**

Some topics in ITU-T study groups

- **Secure procedures for remote SW updates for ITS communication devices**
- **Security guidelines for V2X comms systems**
- **Specs for vehicle gateway**
- **Taxonomy for ICT-enabled motor vehicle automated driving systems**
- **e-call: speech quality / intelligibility**

Natural disasters on the rise: Emergency Communications



Common alerting protocol (CAP; ITU-T X.1303): XML-based data format for exchanging public warnings and emergencies

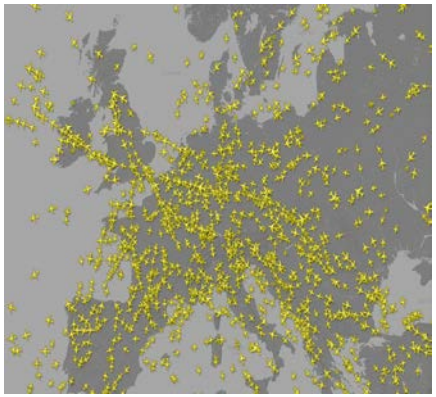
Extensive ITU documentation on disaster relief systems, network resilience and recovery (July 2014):

- **Gap Analysis**
- **Promising technologies and use cases**
- **Requirements for Disaster Relief Systems**
- **Requirements for network resilience & recovery**
- **Requirements on the improvement of network resilience and recovery with movable and deployable ICT resource units**
- **Technical Report on Telecommunications and Disaster Mitigation**

ICT solutions for aviation in the 3rd millennium

"I believe that data from aircraft, including from the black box could be continuously transmitted and stored in data centres on the ground"

Expert dialogue on real-time monitoring of flight data: Malaysia, May 2014



ITU-T Focus Group on Aviation Applications of Cloud Computing for Flight Data Monitoring

1st meeting 1-3 Dec 2014, Malaysia

Towards smart cable television

- Cable TV networks provide interactive video services (e.g. set top boxes, APIs)
- ITU-T standards assess quality of audio and video over cable networks
- Conditional Access (e.g. protection of subscription services etc.)
- Transmission of Large Screen Digital Imagery (Ultra High Definition TV)

Attachments: ITU-T Issues and Activities

Promote adoption of mobile money

2.5 billion adults have no access to bank accounts

ITU brings together financial sector and telecommunications sector in

- **Focus Group on Digital Financial Services to promote financial inclusion using ICTs**

First meeting: 4-5 December 2014, Geneva

Maintaining stability in global numbering resources

ITU assigns directly or indirectly > 20 types of International Numbering Resources, e.g.

- **Country codes**
- **Mobile country codes and mobile network codes**
- **Signaling area network codes and intl signaling point codes**
- **Universal international freephone numbers**

Tariff & Accounting matters for international telecom services

- **NGN Charging and Accounting**
- **International Mobile Roaming**
- **International Internet Connectivity (IIC)**
- **Commercial agreements for int'l telecoms services**

Latest topics of study:

- **Definition of relevant markets and identification of operators with SMP (significant market power)**
- **Economic impact of OTTs (over-the-top players)**

Combating counterfeit ICT devices

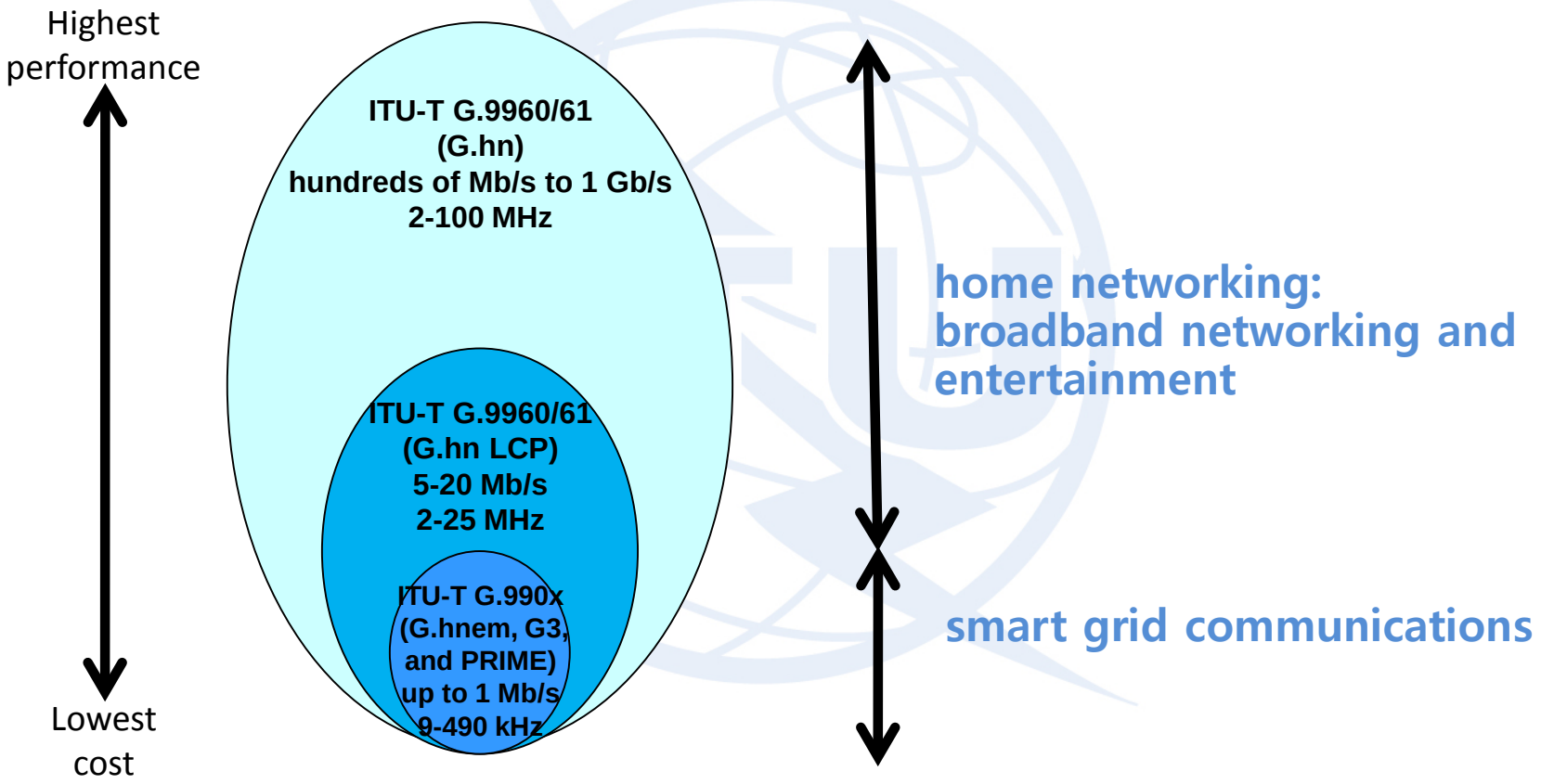
ITU event: 17-18 November 2014, Geneva

- **What is global scope and impact of counterfeit devices?**
- **What best practices are in place to fight it?**
- **Possible role of ICT standards to fight counterfeit (ICT) products?**

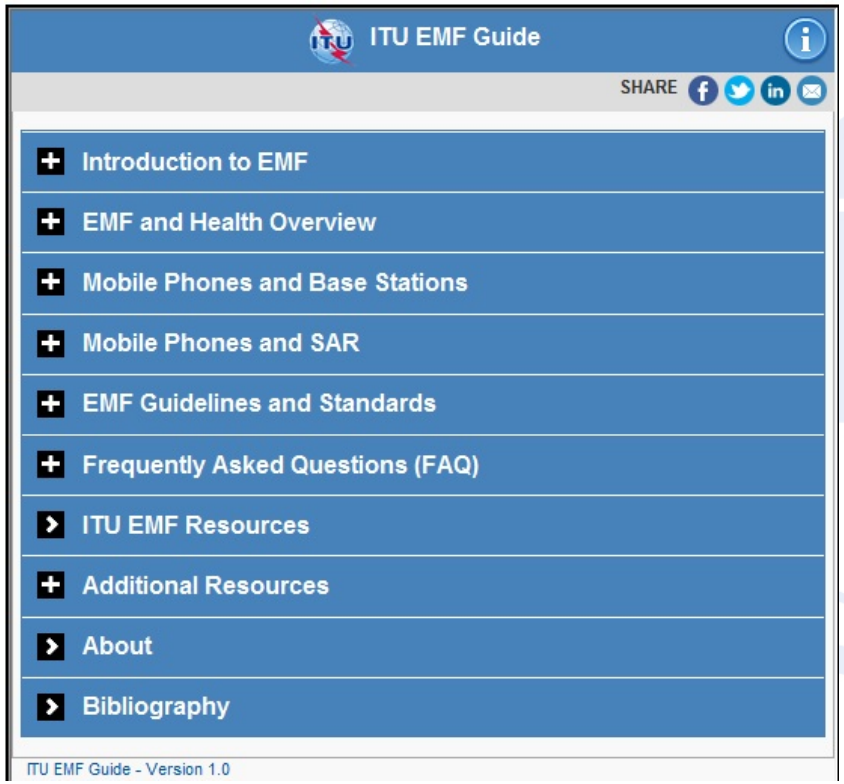
Technical Report on Counterfeit ICT equipment (Nov 2014)

Attachments: ITU-T Issues and Activities

Powerline communications (PLC) for home networking & smart grid



Electromagnetic Fields (EMFs): mobile phones and base stations



- ITU-T Recommendations give guidance on how to calculate and measure EMFs for compliance with human exposure limits (ITU-T K-Series)
- ITU EMF application (left): launch last month
- Public database empowers consumers with ability to check field strengths of transmitting antennas
- EMF Estimator Software: exposure level evaluations overlaid on a (Google) map

Smart Water Management

Roadmap and Technical reports for implementing Smart Water Management:

- **standardization gaps and identify new standardization work items**
- **architecture for smart water grid**
- **Security issues for smart water grid**
- **Technical Report on Smart Water Management for Smart Sustainable Cities**

Green Cables for ocean and climate monitoring and tsunami warning

- **Idea: equip repeaters of submarine telecom cables with sensors**
- **4th workshop Singapore, 16-17 October 2014**
- **Joint Task Force:**

ITU UNESCO IOC WMO

Attachments: ITU-T Issues and Activities

Addressing a lack of interoperability

Conformance to standards enables global interoperability of ICT networks and devices

ITU Action plan based on 4 pillars:

1. **Conformity assessment**
2. **Interoperability events**
3. **Capacity building**
4. **Assistance in the establishment of test centres and C&I programmes in developing countries**

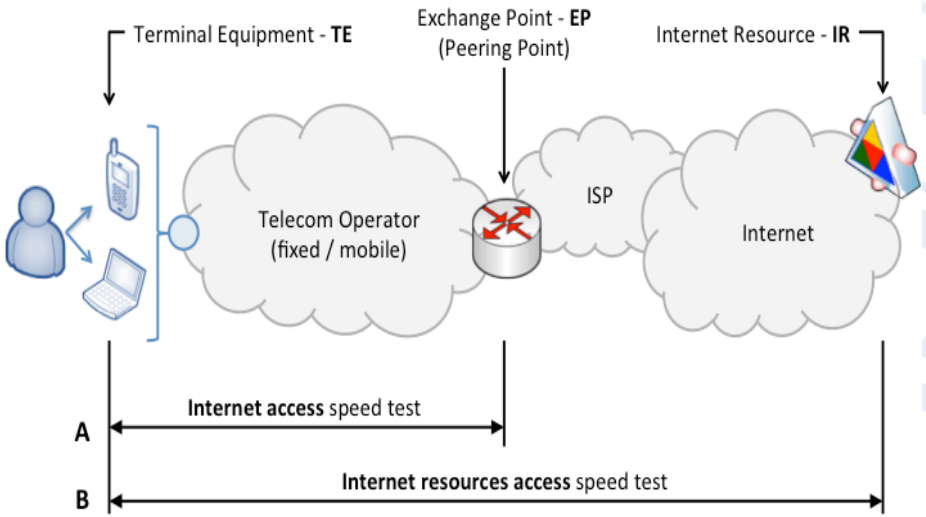
Image left:

- **Testing for hands-free mobile performance,12-15 May 2014 (Mercedes, Volvo, Toyota, Bosch, Renault…)**

How fast is your Internet connection?

Two types of measurements:

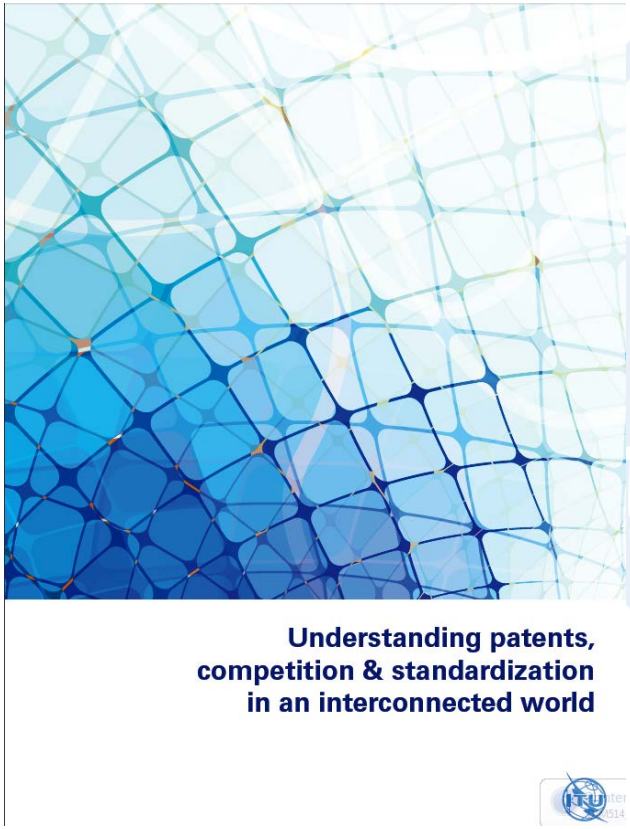
- **Internet access speed**
- **Internet resources access speed**



in progress:

"Unified methodology of Internet speed quality measurement usable by end-users on the fixed and mobile networks"
(Q.Int_speed_test; website)

Intellectual Property Rights



Common Patent Policy: ITU/ISO/IEC

Current litigation on standard essential patents (SEPs) led to ITU Patent Roundtable 2012

Publication (left):

- **explores recent years' uptick in litigation involving SEPs**
- **explains contemporary tensions and conflicts surrounding inclusion of patented technology in standards**

Mainstreaming Accessibility in ICTs

ITU is a strong advocate of "Universal Design":

- **Produce solutions that are inherently accessible to people with and without disabilities**

Persons with disabilities are part of ITU processes

- **sign language, captioning;**
- **events, documents, web pages need to be accessible**

3rd ITU IPTV Application Challenge:

- **Showcase your app at the Rio 2016 Paralympics !**

Bridging the standardization gap: developing countries have become an active part in the standards process

- **e-learning courses:**
  - **ITU-T working methods**
  - **Quality of Service**
- **Remote participation to each Question meeting during a study group meeting: 1300 e-meetings in 2013**
- **New guidelines on establishing a National Standardization Secretariat**
- **Interpretation of plenaries**
- **Translation of ITU-T Recommendations**
- **Fellowship programme**