ITU-T Vision @ 2020

International Telecommunication Union ~ United Nations specialized agency for ICTs
Today & Problem Spaces
Problem Spaces 1 (different observations)

- Contents
- Information
- Application
- Connection
- System

Present
Problem Spaces 2 (objects of smart)

Could be OK

But

Too difficult and costly
Problem Spaces 3 (multi-video vs big data)

Could be OK

BUT
Problem Spaces 5 (verticals part of horizontals)

FROM

Closed & unconnected *vertical silos* of functionally oriented service providers

TO

Innovative and Collaborative new models that *connect these vertical silos*
Problem Spaces 6-1 (traffic routing)
Problem Spaces 6-2 (traffic routing)
Existing Mobile networks

SGSN : Serving GPRS Support Node
RNC : Radio Network Controller
SGW : Serving Gateway
PDNGW : Packet Data Network GW
ACR : Access Control Router
ER : Edge Router
DG : Packet Data Gateway

Wired Fixed IP Network (Managed IP Network)

WiBro

WiFi

4G

3G

4G Core

3G Core

GTP

GTP
New Waves
New Wave 1: Autonomy

- Increase **distributed** processing, computing & communication
- More **software** based environments
- Expand **automatics**: functions, systems, services & application (Automatic driving)
- Becoming **Resources**: sharing and **binding** (slicing and virtualization)
New Wave 2: Agent
New Wave 3: Trustworthy

Smart

Intelligent

Building trust

- Openness
- Privacy
- Scalability
- Resilience
- Data protection
- Security
- Flexibility
- Cultural and age adaptation
- Reliability
Benefit of Trustworthy

Trust complements to enhance Safety and reduce Complexity
ITU-T Vision @ 2020
Hot ITU-T Topics

- 5G (non-radio) and Future networks
- IoT including M2M, MOC, WoO (for smart sustainable cities)
- Security, Privacy and Trust
- Transport, Access, Home
- Video coding, e-everything (e.g., e-health)
- ICT and the environment
- Digital Financial Service (e.g., Mobile money)
- Global roaming, Over The Top
- Bridging Gaps (standards, technology)
- ...
5G in ITU: Integrated Management
Things (Physical & Virtual): key communication infrastructure
But more than “connected things”
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.
FTII@2020: CPS as Communication entities

Source: Recommendation ITU-T Y.2060

- **Physical world**
- **Cyber world**

- **Device**
- **Gateway**
- **Physical thing**
- **Virtual thing**
- **Communication**
- **Mapping**
- **Communication via gateway**
- **Communication without gateway**
- **Direct communication**

Source: Recommendation ITU-T Y.2060
Future Environments of Information Society @2020

- Change of communication objects: Humans and Things
- Expand living spaces: Autonomous but complex
- Living space@2020: Social-Cyber-Physical
- Social-Cyber-Physical Relationships
  - Co-existence
  - Connectivity
  - Interactivity
  - Spacio-temporal situations
- Human-Thing Relationships
- Need more than “Security and Privacy”
- Trust as a cross domain relationship
Better solution for **Safer and Smarter operation of Infrastructure**, while enhancing quality (including enhanced Broadband)

- **Ubiquity and Mobility**: need enhancement (e.g. seamless) of mobility to realize **better Ubiquity**
- **Trust**: new feature for safer society with efficiency and effectiveness (an entity trusting another entity)
Future of Video (1)

Importance of Video

• Video is the chief driver of bandwidth use
• Video already accounts for more than 50% of bandwidth use – growing fast
• It is estimated that, in three years, IP video will account for 80% of all consumer Internet traffic
• By 2018, every second, nearly a million minutes of video content will cross IP networks around the globe → it would take more than 5 million years to watch one month’s worth of all the video that crosses networks worldwide
• Looking at end-user viewing habits: continue to see increasing consumption of video
• Video consumption on mobile devices is forecast to grow by 44% in 2015, and by 35% in 2016
Future of Video (2)

• To ensure efficient content delivery, the network study should:
  – Cope with the high demand for video traffic and ensure high availability
  – Optimize bandwidth consumption
  – Shape the future by highlighting the requirements supported by IMT-2020/5G

• For operators also doing business as content providers, it is important to study technologies that:
  – reduce vendor lock-in
  – minimize reworking of content
  – reflect the best practices and international consensus
5G in ITU: collaboration with Open Source Community

Service Providers → FG IMT-2020 → Vendors

Help consolidate POC ideas and work with Open Source bodies.

1. Co-ordinate POC tests/demos

- Containers –
- Docker
- Kubernetes
- OPNFV
- Open-O
- O3 Project
- OpenStack
- OpenLTE
- OpenAirInterface.org

2. Proof-of-Concept #1

- TransportSDN (Englewood)
- OpenDaylight
- ONOS
- Android
- Linux
- Fabric as a Service (FaaS)
- Open CCN

Proof-of-Concept #N