



Future Internet
Conference Week
13 – 17 December 2010
ICC, Ghent, Belgium

Towards Future Networks

ITU-T FG FN viewpoint

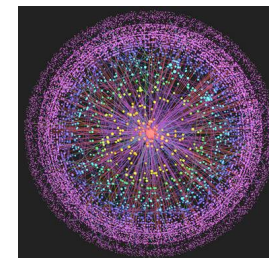
<http://www.itu.int/en/ITU-T/focusgroups/fn/Pages/Default.aspx>



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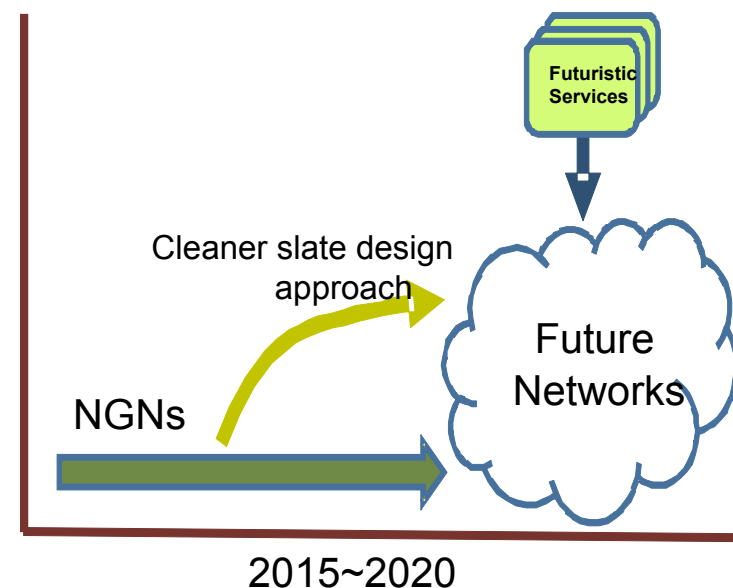
Future networks

- ITU-T start pre-standardization activities with identification of FNs input requirements (FG FN) :
 - new social requirements (e.g., environment),
 - new application areas (e.g., IoT, cloud, smart grid),
 - new implementation technologies are found!



These will introduce the development of new network architectures; we call this **Future Networks**

- ITU is not R&D body. Direction is find by surveying already existing activities (Asia, EU, USA)
- Produced document **Future Networks: Objectives and Design Goals** (8th FG FN meeting Ljubljana) is first “guidance”.
- Appropriate timeframe for prototyping and phased deployment of FNs is 2015 - 2020
- Next phase is also task of researcher to **find the best answers** on requirements.



ITU FG-FN Milestones



- 1. 2009; ITU-T SG13; Establishment of FG-FN
 - Question 21 (Q.21) was also established
- 6.2009; FG-FN #1 @Lulea, Sweden
 - Collocated with FIREweek
- 11.2009; FG-FN #2 @Salt Lake, US
 - Collocated with GENI Engineering Conference (GEC)
- 1.2010; FG-FN #3 @Geneva, Switzerland
 - Collocated with NGN-GSI
- 3.2010; FG-FN #4 @Tokyo, Japan
 - Collocated with Int. Symposium on ICT System Testbed
- 4.2010; ITU-T SG13; FG-FN lifetime was extended till 12.2010
- 6.2010; FG-FN #5 @Geneva, Switzerland
- 9.2010; FG-FN #6 @Geneva, Switzerland
- 10.2010; FG-FN #7 @Busan, S.Korea
- 11.2010; FG-FN #8 @Ljubljana, Slovenia
- 1.2011; ITU-T SG13; FG results review

More info: <http://www.itu.int/en/ITU-T/focusgroups/fn/Pages/Default.aspx>

Definition



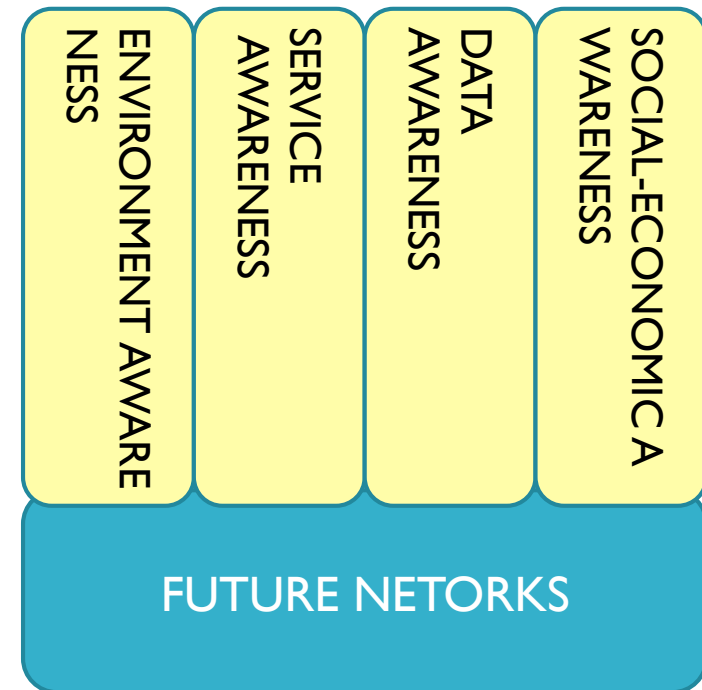
- Future Networks (FNs):
 - A future network is a network which is able to provide revolutionary services, capabilities, and facilities that are hard to provide using existing network technologies. A future network is either:
 - a) new component network or an enhancement to an existing one; or
 - b) federation of new component networks or federation of new and existing component networks.

FN - Vision document

- fundamental issues that are not paid enough attention in designing today's networks as 'objectives',
- capabilities that should be supported by future networks as 'design goals',
- ideas and research topics of future networks that are important and may be relevant to future ITU-T standardization as 'promising technologies'.

Four Objectives

- **Environment awareness**
 - FNs should be environmental friendly.
- **Service awareness**
 - FNs should provide services that are customized with the appropriate functions to meet the needs of applications and users.
- **Data awareness**
 - FNs should have architecture that is optimized to handling enormous amount of data in a distributed environment.
- **Social-economic awareness**
 - FNs should have social-economic incentives to reduce barriers to entry for the various participants of telecommunication sector.



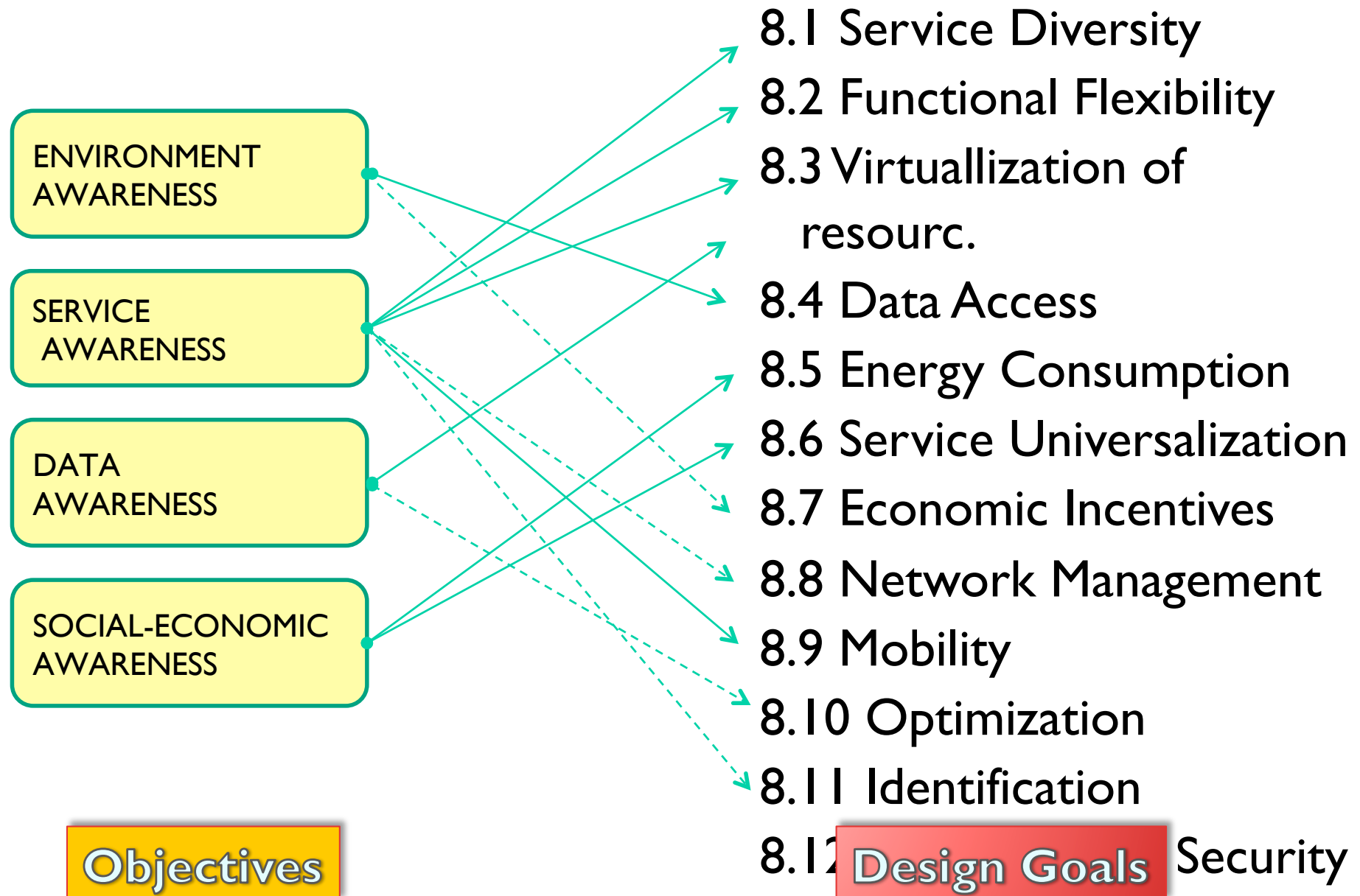
I2 - Design Goals

1. FNs should accommodate a wide variety of traffic and support diversified services (**Service Diversity**)
2. FNs should have flexibility to support and sustain new services derived from future user demands (**Functional Flexibility**)
3. FNs should support virtualization so that a single resource can be used concurrently by multiple virtual resources. FNs should support isolation and abstraction (**Virtualization of resources**)
4. FNs should have mechanisms for retrieving data in a timely manner regardless of its location (**Data Access**)
5. FNs should have device, system, and network level technologies to improve power efficiency and to satisfy customer's requests with minimum traffic (**Energy Consumption**)
6. FNs should facilitate and accelerate provision of convergent facilities in differing areas such as towns or the countryside, developed or developing countries (**Service Universalization**)

12 - Design Goals (Cont.)

7. FNs should be designed to provide sustainable competition environment to various participants in ecosystem of ICT by providing proper economic incentives (**Economic Incentives**)
8. FNs should be able to operate, maintain and provision efficiently the increasing number of services and entities (**Network Management**)
9. FNs should be designed and implemented to provide mobility that facilitates high levels of reliability, availability and quality of service in an environment where a huge number of nodes can dynamically move across the heterogeneous networks (**Mobility**)
10. FNs should provide sufficient performance by optimizing capacity of network equipments based on service requirement and user demand (**Optimization**)
11. FNs should provide a new identification structure that can effectively support mobility and data access in a scalable manner (**Identification**)
12. FNs should support extremely high-reliability services (**Reliability and Security**)

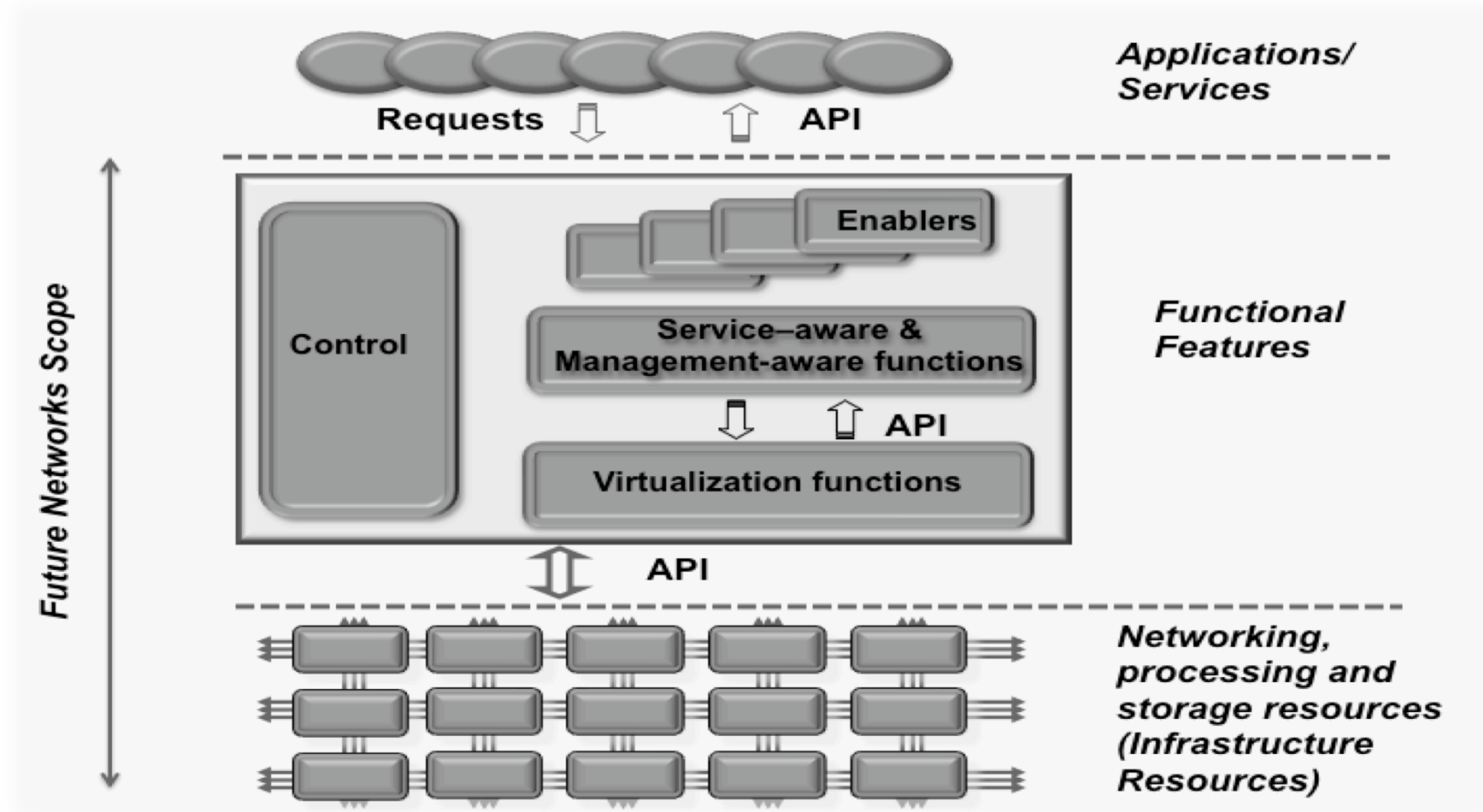
Objectives vs. Design Goals



Technologies for achieving the design goals

- Network Virtualization (Virtualization of Resources)
 - Enables creation of logically isolated network partitions over shared physical network infrastructures so that multiple heterogeneous virtual networks can simultaneously coexist over the shared infrastructures; it allows the aggregation of multiple resources and makes the aggregated resources appear as a single resource
- Data/Content-oriented Networking (Data Access)
- Energy-saving of Networks (Energy Consumption)
 - Forward traffic with less power
 - Control device/system operation for traffic dynamics
 - Satisfy customer requests with minimum traffic
- In-system Network Management (Network Management)
- Distributed Mobile Networking (Mobility)
- Network Optimization (Optimization)
 - Device / System / Network level optimization (Path optimization, Network topology optimization, Accommodation point optimization)

Key Features of Future Networks



Conclusion

To design FN, wider collaboration than traditional ICT framework is necessary.

- Today's promising areas are all interdisciplinary ones between ICT and other industries
 - Cloud: computer, smart grid: power, IoT: health, vehicle, etc.
- ICT has become an infrastructure of every industry, so we need to learn their needs to design future networks
 - We can't design smart grid ready network without understanding power industry's requirements

Thank you!

Questions?