



Future Networks standardization in ITU-T

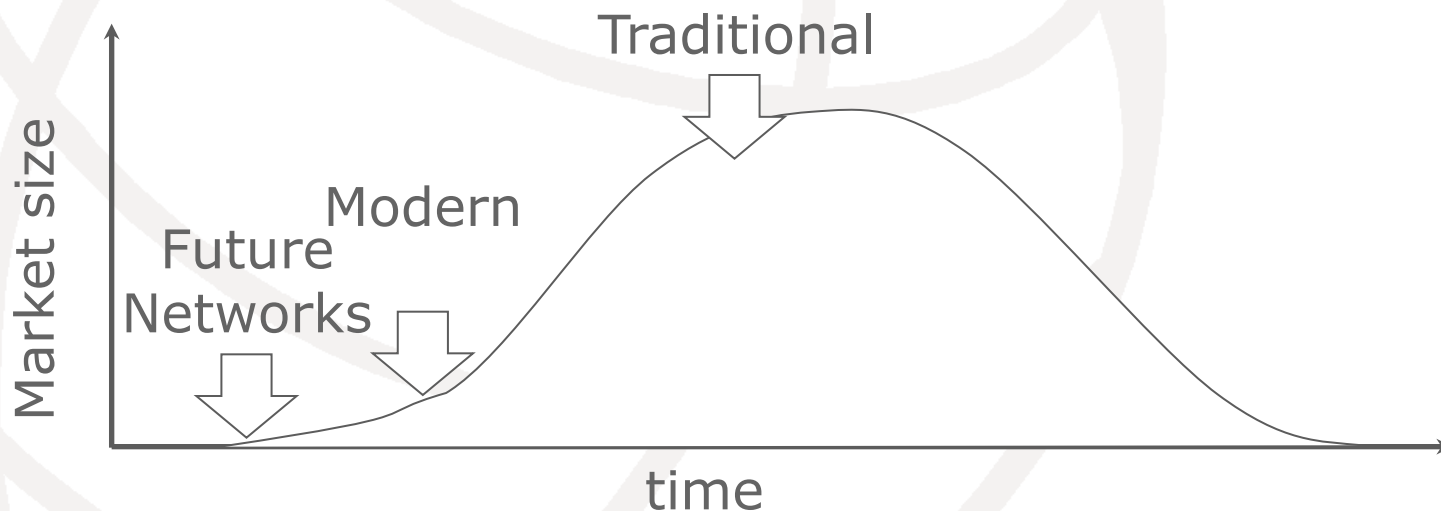
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Backcast/forecast in standardization

- Historically, standardization target already existed in the market (backcast)
- Modern standardization is done to develop market (forecast)
- Future Networks: long-term forecast
 - History of standardization is filled with unused standards, in particular in ICT area...?!



Aims of standardization



- Prune options (future possibilities)
Restrict the freedom of innovation
 - Non-IP packet format is almost extinct
 - Optimal for particular purpose, but non-standardized (ie, customized) product cannot become majority if standardization works well
- Define the area of competition, making it severer (=benefit for consumers)
- Simplify our life
 - Makes some part of our life 'decided'
 - We concentrate on remaining part
- Expand the market
 - By making average users easier to understand/use

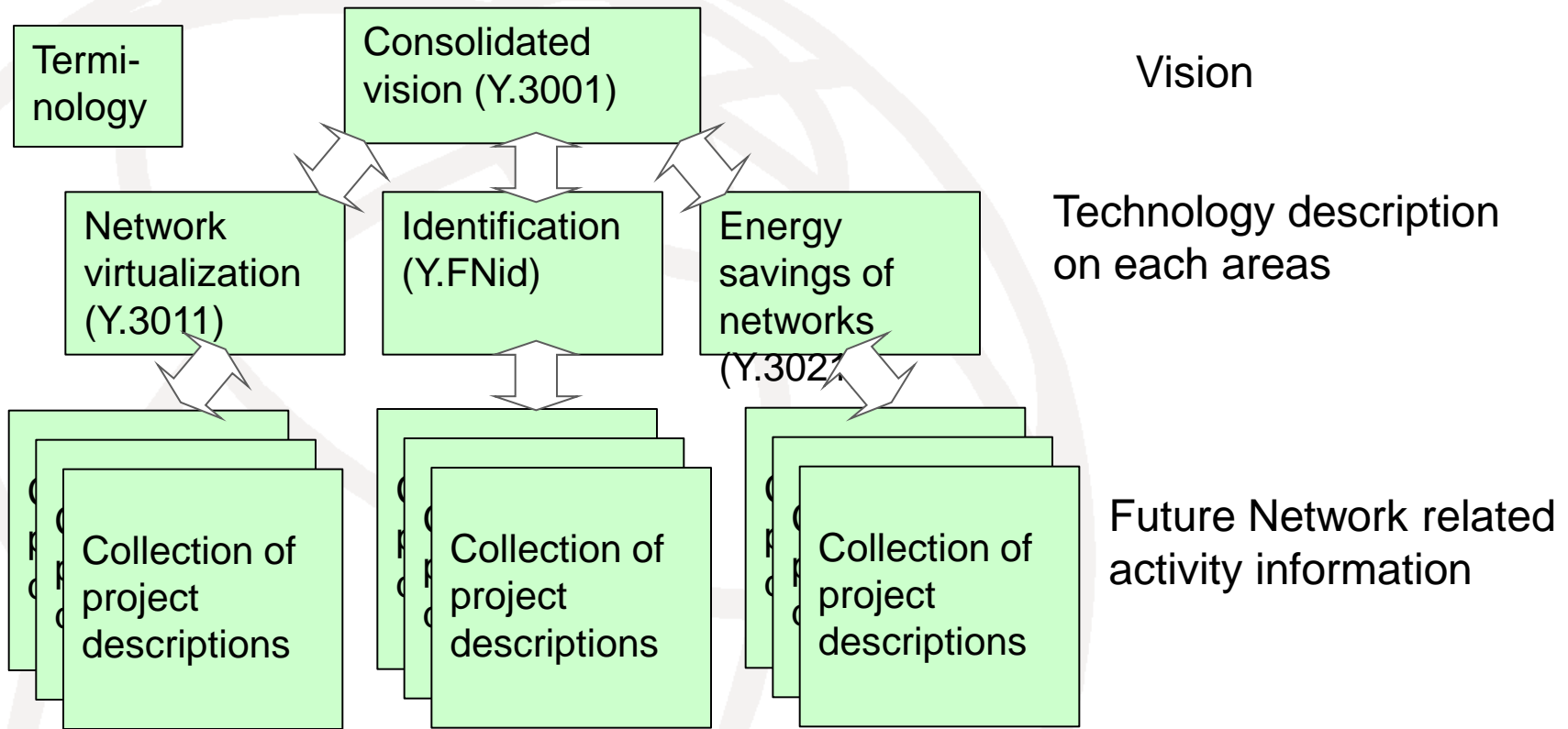


Questions for FN standardization

- Do we have enough options?
 - Are they mature enough to prune, or to freeze innovation?
Which part is mature, which is not?
- Is the emerging market clear enough?
 - Can we expect enough participation from industries?
ITU-T is contribution driven (no progress without contribution).
 - Do industries ready to compromise to expand the market?
If we specify standards, do market respect our specifications?

FNs are still in their early stage, so it is not yet the time to define overall architecture

ITU-T Focus Group on Future Networks (FG-FN) approach



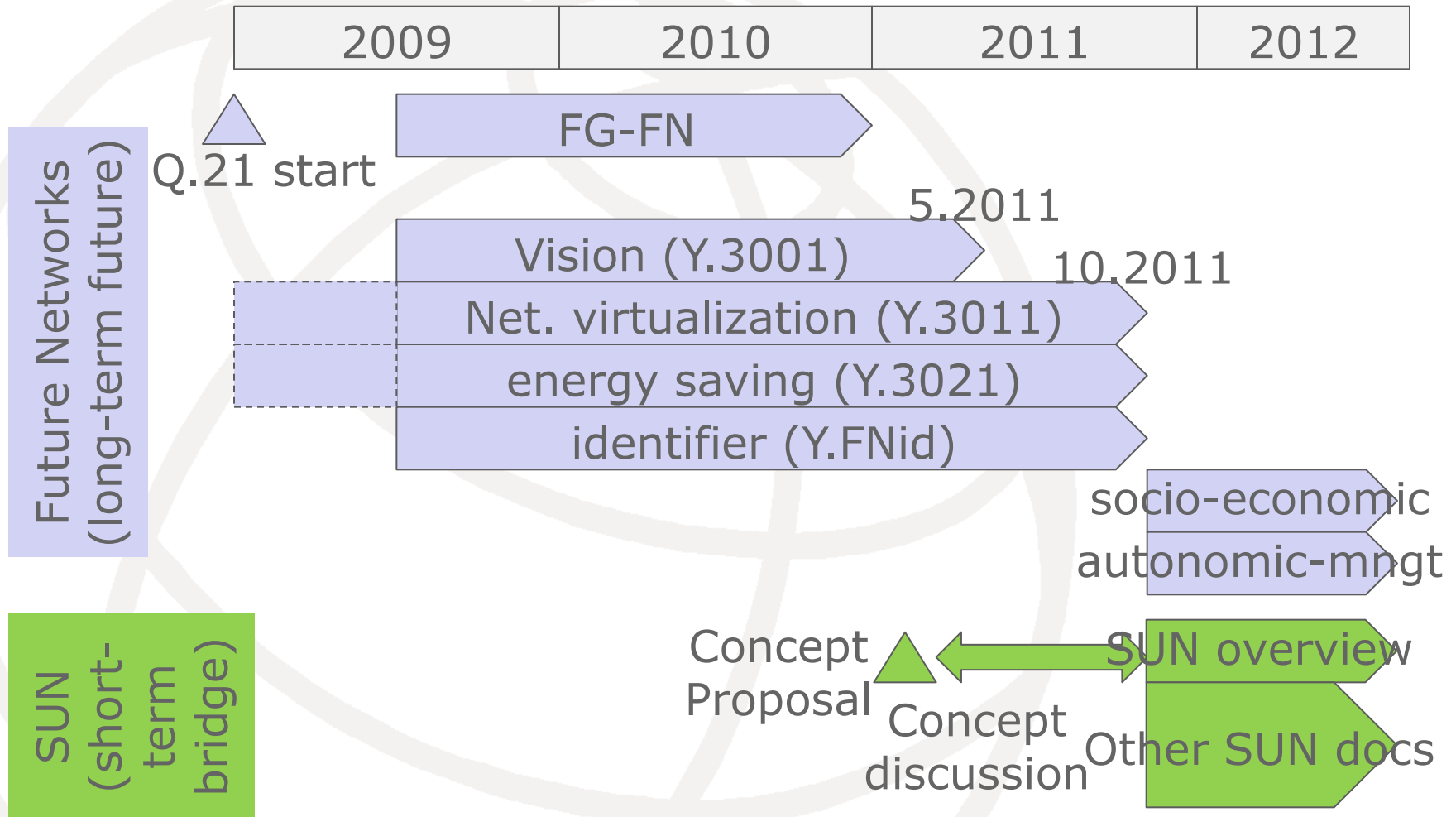
- Top-down: develops 'vision' as mature part
- Bottom-up: develops specifications on particular areas considering research activities as mature building blocks

Future Networks in ITU-T



- SG13 (Future Networks including NGN and mobile) leads this activity
 - Approved/agreed on three specifications
- Future Networks (FNs) study is now expanding in SG13
 - Started in Focus Group on Future Networks (FG-FN) and Q.21/13
 - FG-FN: temporary, Q.21: standing
 - Smart Ubiquitous Network (SUN), the bridge between NGN and FN is currently studied in several Qs in SG13

ITU-T FN activity timeline



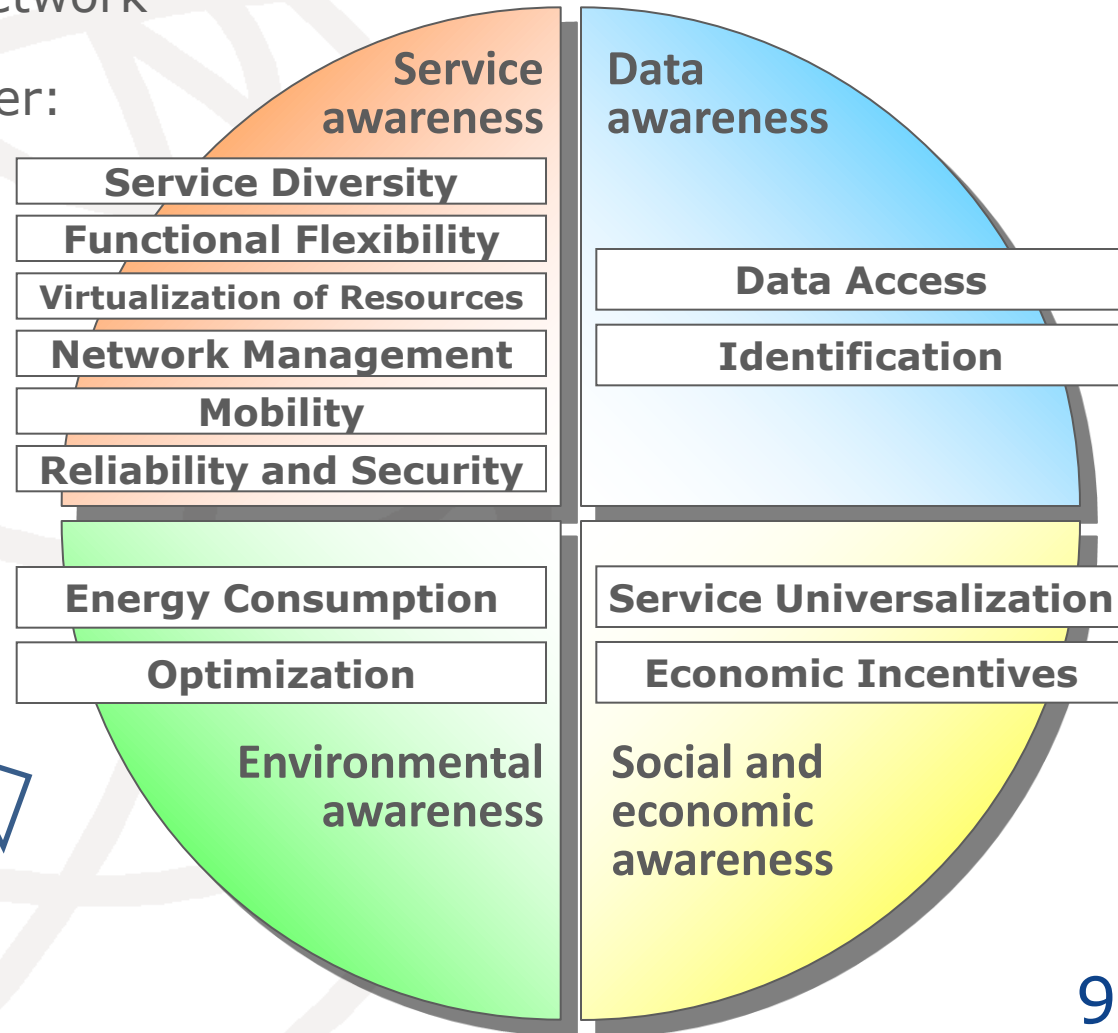


Future Networks (long-term future)

Vision of Future Networks (Y.3001)



- Definition of FN:
 - A network able to provide services, capabilities, and facilities difficult to provide using existing network technologies.
 - A Future Network is either:
 - a) A new component network or an enhanced version of an existing one, or
 - b) A heterogeneous collection of new component networks or of new and existing component networks that is operated as a single network.
- Target Date: roughly 2015-2020



4 objectives and 12 design goals

Network Virtualization for FNs (Y.3011)



- Definition of "network virtualization":
 - A technology that enables the creation of **logically isolated network partitions** over shared physical networks so that **heterogeneous** collection of multiple **virtual networks** can simultaneously **coexist** over the **shared networks**. This includes the aggregation of multiple resources in a provider and appearing as a single resource.

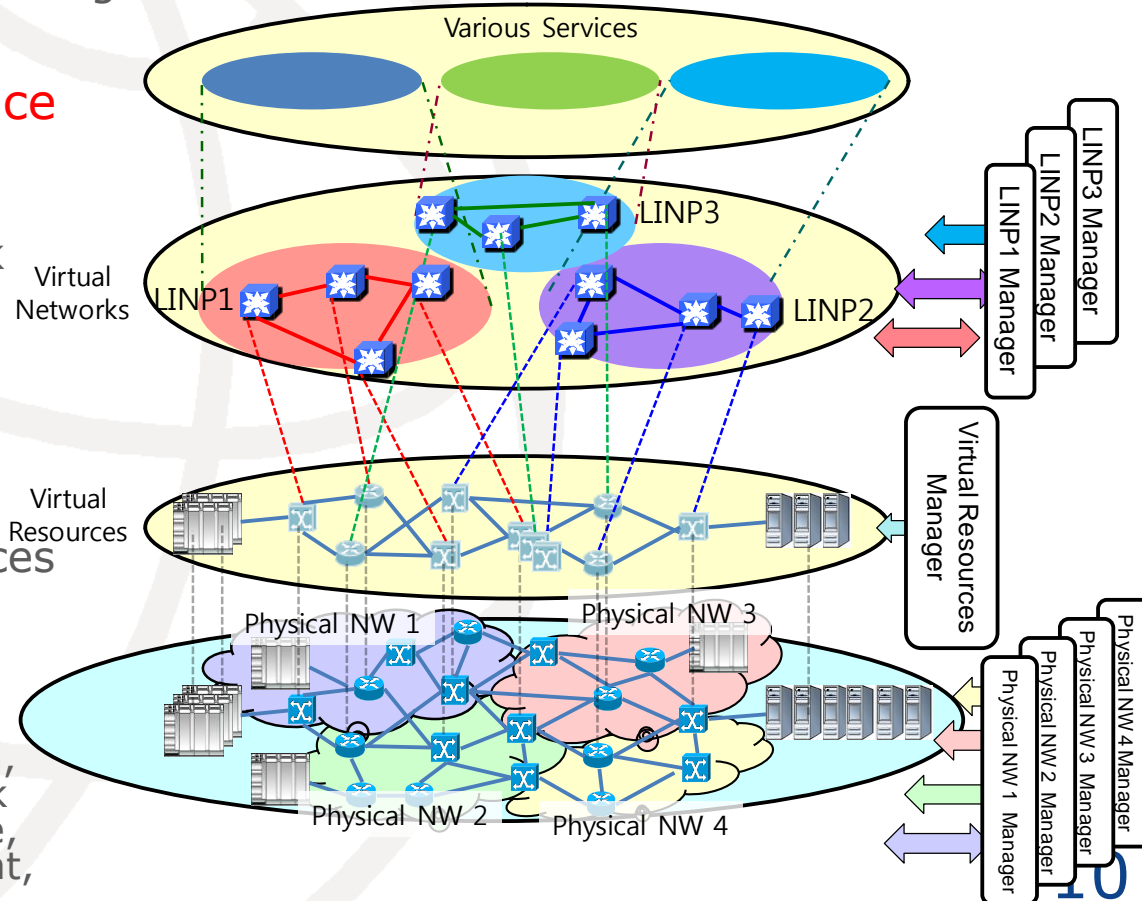
- Motivation

- Key technology for **Service Awareness** of FNs

- Diverse services
- Heterogeneous network architectures

- Problem spaces & design goals

- **Coexistence** of multiple networks
- **Simplified access** to resources
- **Flexibility** in provisioning
- **Evolvability**
- Design goals
 - Isolation, network abstraction, topology awareness and quick reconfigurability, performance, programmability, management, mobility, wireless



Energy saving for FNs (Y.3021)



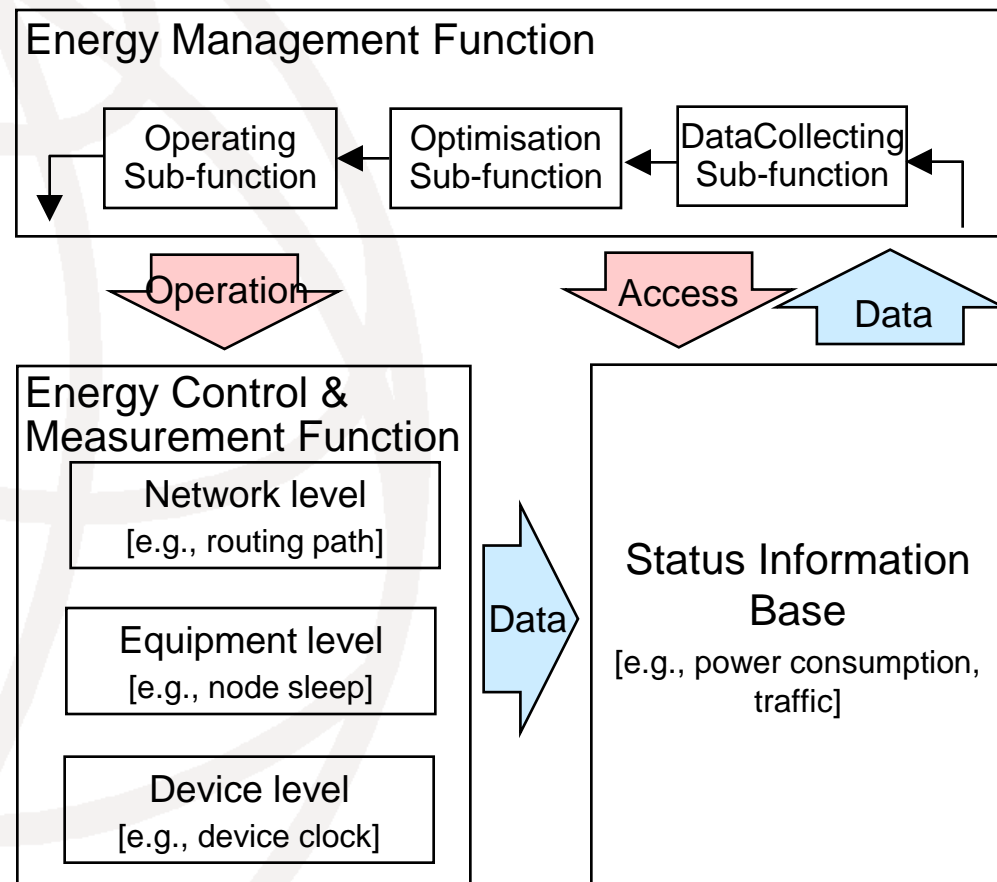
- Definition of "Energy saving of networks":
 - Network capabilities and their operations where the total energy for network equipment is systematically used in an efficient manner

- Approaches

- Reduction of required network capacity
- Improvement of efficiency

- Possible functions

- Energy Control & Measurement Function
 - Three levels of technologies
- Energy Management Function
 - Function to calculate the optimum case of operation
- Status Information Base
 - Database of energy-related information



Y.FNsocioeconomic



Is this technology good for society?
Economically reasonable?

Some interfaces/mechanisms are too integrated,
and difficult to improve because too many parties are involved

When a technology is given, Y.FNsocioeconomic

- Lists and describes methods to assess socio-economic effect of the technology
- Analyze potential tussles among parties
- Helps design/select appropriate technology for Future Networks

FN related documents



	Status	Short title
Y.3001	05.2011 approved	Future networks: Objectives and design goals
Y.3011	10.2011 (consent)	Network virtualization
Y.3021	10.2011 (consent)	Energy saving
Y.FNid (formerly Y.FNidentifier)	Target: 2.2012	Identifiers
Y.FNid-config	Target: 12.2012	ID configuration
Y.FNsocioeconomic	Target: 2013	Tech evaluation method
Y.amnsa	Target: 12.2012	Autonomic network management

Environmental consideration clause



- Security is important, and we have security consideration clause in every standards ---why not for environment?
 - Environmental consideration clause is now in every FN related ITU-T Recommendations
 - Describes environmental assessment of the recommended technology
 - Describes the facts. No evaluation
 - Development guideline will be necessary in the future
- For security consideration, we have RFC 3552, '*Guidelines for Writing RFC Text on Security Considerations*'. What should be for environment?

Environment consideration in Y.3011 (network virtualization)



- Network virtualization technology changes the resource (metal, fiber, etc.) consumption and energy consumption of networks by changing the overall architecture of networks.
- This technology enables operators to develop multiple logical networks on a single physical network. This reduces necessary physical resources for constructing networks, e.g., optical fibre or copper cable, which generally reduces energy consumption.
- This technology regroups a set of mechanisms allowing more than one service to operate on the same piece of physical resource, thus improving the hardware utilization. This opens possibility to lower energy consumption because a single machine under high load generally consumes less energy than several lightly loaded ones. Also, network virtualization can support resource consolidation which regroups underutilized devices to reduce the energy consumption.
- A possible drawback is that the structure of each node, in particular the routers and switches become more complicated, which may increase energy consumption.



Smart Ubiquitous Networks (Short-term bridge)

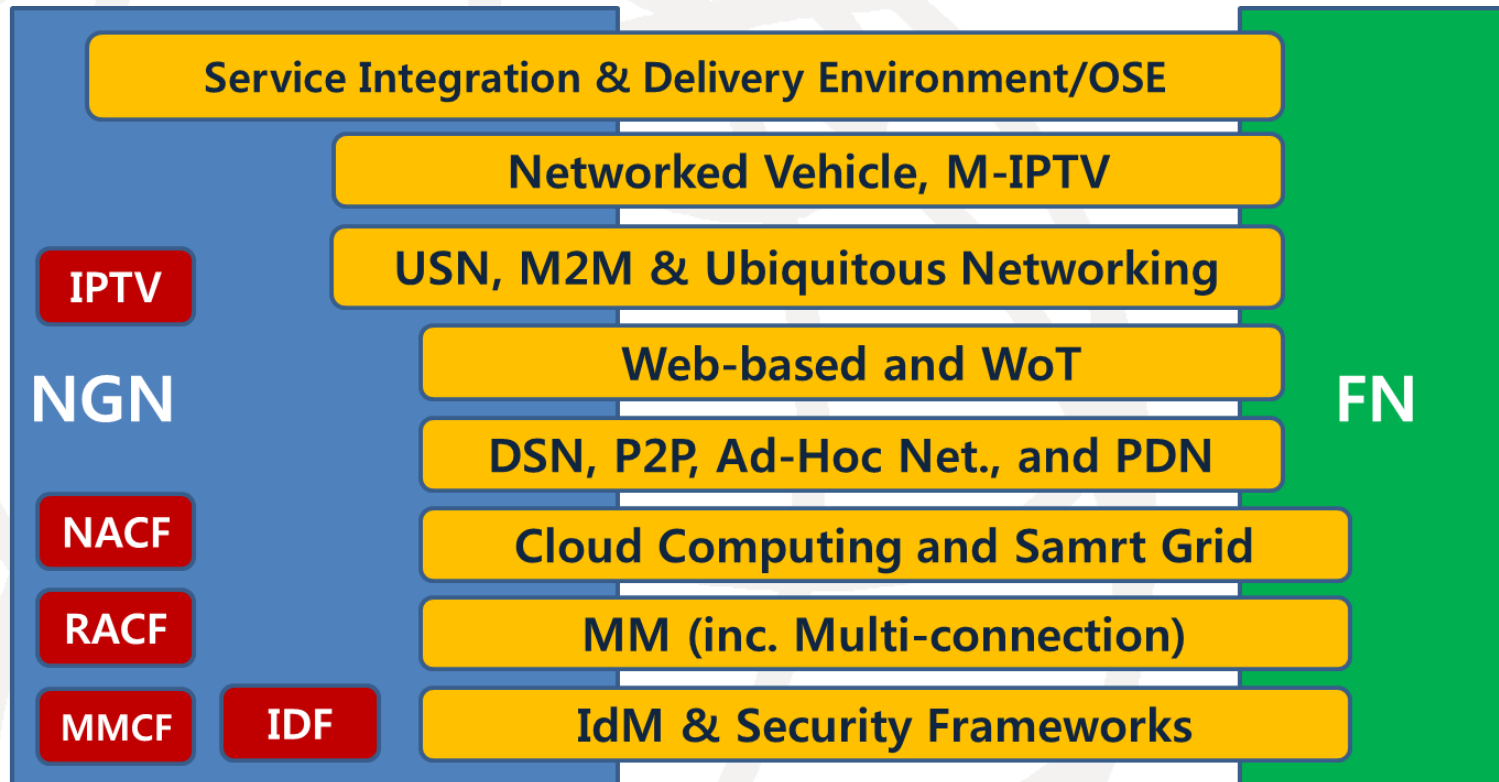
SUN, bridge between NGN & FN



current

SUN

Long term future
2015-2020 & beyond



Started 1.2011

0/4 docs
completed

Started 1.2009

3/7 docs
completed

Definition of SUN



Smart ubiquitous networks are IP-based packet networks that can provide transport and delivery a wide range of existing and emerging services to people and things. The services provided by the networks can cover aspects such as control, processing and storage. The networks are smart in the sense that they are knowledgeable, context-aware, adaptable, autonomous, programmable and can effect services effectively and securely. The networks are ubiquitous in the sense that they allow access anytime anywhere through varied access technologies, access devices including end user devices, and human-machine interfaces.

- Smart: context aware
- Initial activities focus on context aware content delivery and related issues

SUN related documents



	Status	Short title
Y.SUNoverview	Target: 6.2012	Overview
Y.SUN-content	Target: 12.2012	Content awareness
Y.SUN-context	Target: 12.2012	Context awareness
Y.SUN-trcmf	Target: 2.2012	Traffic Resource Ctrl. & Mngt. Functions



Backup slides

History of FN related activities

- 1.2009~: a Question (Q.21/13) and a Focus Group (FG-FN) started their activities
- 12.2010: FG-FN closure
- 1.2011: discussion on Smart Ubiquitous Network (SUN), the bridge between FN and NGN started
- 5.2011: Y.3001 (FNs: objectives and design goals), 1st Recommendation approved
- 10.2011: Y.3011 (network virtualization for FN), Y.3021 (energy savings of FN) was consented
Study on Four SUN documents started