

Some Telco thoughts on Future Networks

Based on ETNO response to public consultation on
FP7 phase 2 Work-Program
SO 1.1 Future Network
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The context

The network and service infrastructure domain is facing many changes:

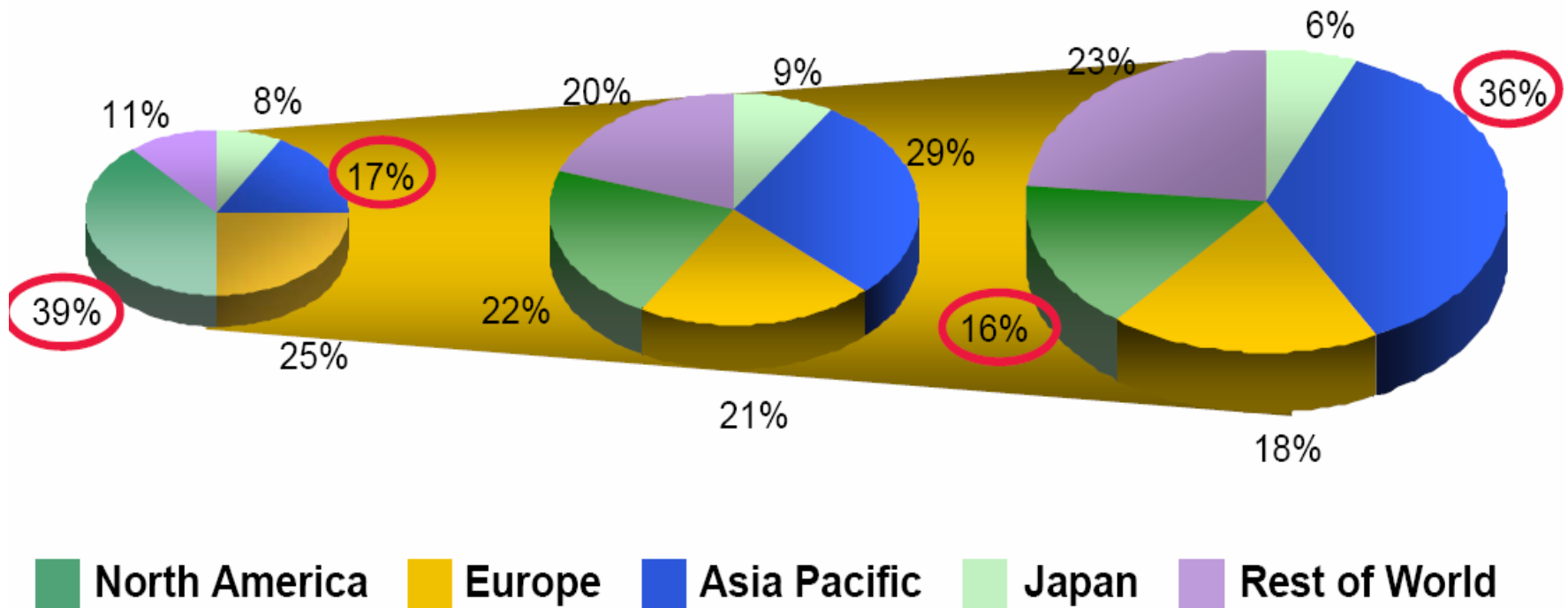
- explosive growth of data rates and capacities
- the emergence of massive data and content delivery & consumption
- evolution towards a converged architecture that has dramatically increased the permutations and combinations of services and usages between people, devices, media, and even between real and virtual worlds
- user involvement in defining his communication sphere has led to much more customisation, personalisation, and users becoming producers
- Not obvious the high volume, low overhead, guaranteed throughput type of communication is possible under current architectural ideas.

Growth of the Internet

2000 Internet Users
386 million

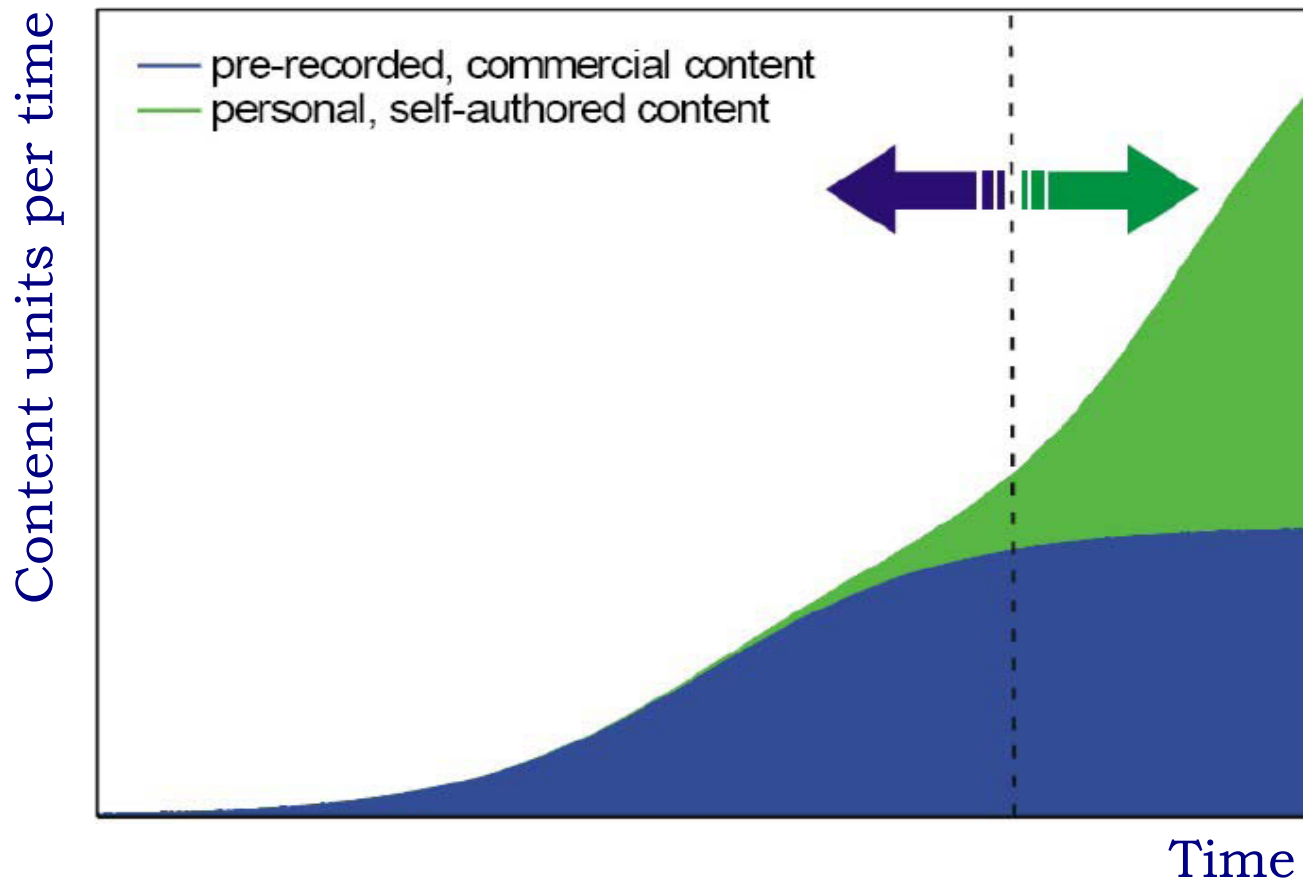
2005 Internet Users
1,009 million

2010E Internet Users
1,750 million



Source: World Bank, CIA Factbook (2005), Jupiter Research (2006), PWC (2005), Computer Industry Almanac (2006) and Internal Estimates

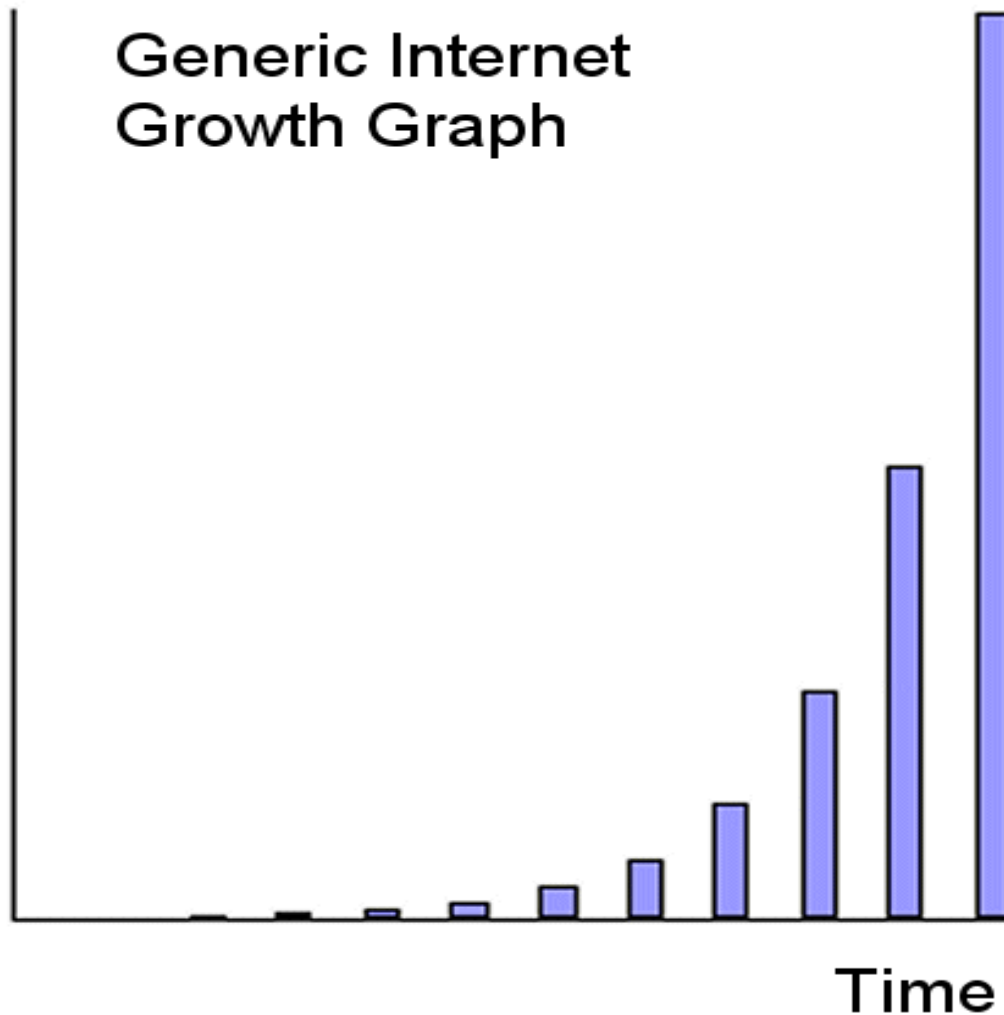
Trend in Content



Consumers become content producers *and* publishers

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Think about it....



- **New users**
- **New domains**
- **New routers**
- **Routing tables**
- **Internet hosts**
- **Access speed**
- **Devices**
- **Data per user**

High Speed Access

- **Higher bit rate cost-effective optical solutions** (radio?)
 - Research is needed on cheap optical components
- **Novel metro architectures**
 - The most likely place in the network where both aggregation and short timescale flexibility may be required
 - Optical Burst Switching and a range of other alternatives mixing the amount of optical and electrical high speed functionality need to be explored
- Getting the wireless network to support transmission rates similar to DSL connections.
- Minimising the distinction between fixed and mobile with a concept of a **universal high bandwidth connection**.
- **Integration of innovative public/private network architectures** where the last hop is provided by the end user (as many hotels/restaurants do with WLAN today)

Massive data and content delivery in the core network

Optical switching

- Current industry standard for an optical switch is a 1:9 Wavelength Selective Switch. This is between 10 and 100 times too small for long term scalability in the core network. Is there any current work looking into this? There's lots of work on Tuneable Dynamic Optical Networks, but these won't work very well if the switches haven't been properly researched.

Multi-Layer Architectures

- How can the switching functionality offered by optics be integrated with higher layers (OTN, Ethernet-PBBTE, IP/MPLS)?
- How do these new architectures facilitate carrying future huge bandwidth services?
- How do they provide equivalent access to multiple Service Providers?
- How can they be optimised for minimal cost?
- How can they be designed to offer Carrier grade performance?
- What level of flexibility is required from them (amount of traffic variations, and how quickly) and how can they be optimised to provide this?
- Do we want to play cache-cache?

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New concepts for devices & usage

Communicating Objects

- Mobile phone as life device (VW/Audi are already studying how the phone could be your car keys, navigation system, communications hub, wallet, etc....from the car point of view)
- Sensors, sensors, sensors.
How to find them, how to use them, how to trust them,

Ambient Services

- e.g. delivery of service to device other than that requesting it
- Use of environment around you to receive your requested services/info...e.g. you ask your mobile for the train to Brussels and the route appears on the railway map inform of you at the station.
- Your pay TV subscription follows you to the hotel in Brussels so you can watch the football.

New demands on the Networks

Architecture for federating (net resources and user identity)

- Identity management
- Resource consumption monitoring & management
- Service consumption monitoring and management
- Data logging for billing and costing
- Data recording for lawful interception requirements

Application aware network (intelligent routing)

- How can the network identify “sensitive” traffic, what traffic should be treated differently,
- Net neutrality is not useful when traffic is inherently different and has different transmission requirements.

Deploying and managing new networks

Network Planning (modelling)

- Understanding the new user paradigm - users as content generators
- Modelling the new traffic flows – Peer to Peer as much as radial
- Simplifying the network model – one network for all services/applications

Autonomic Network Management

- Designing robust networks with more than limited local views of the network.
- Signalling systems (out of band?) that can survive and respond to network threats
- Traffic management that optimises resource usage

Home Networks (inter-domain network management)

- Public /private interface (use of private networks for public access)
- Management across this interface,
- Role of Home in future network Architecture (personal home location registers)

The Internet is all new.....



Fred McNabb, 1956

.....but the concepts are not that new

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Thank you for your attention

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