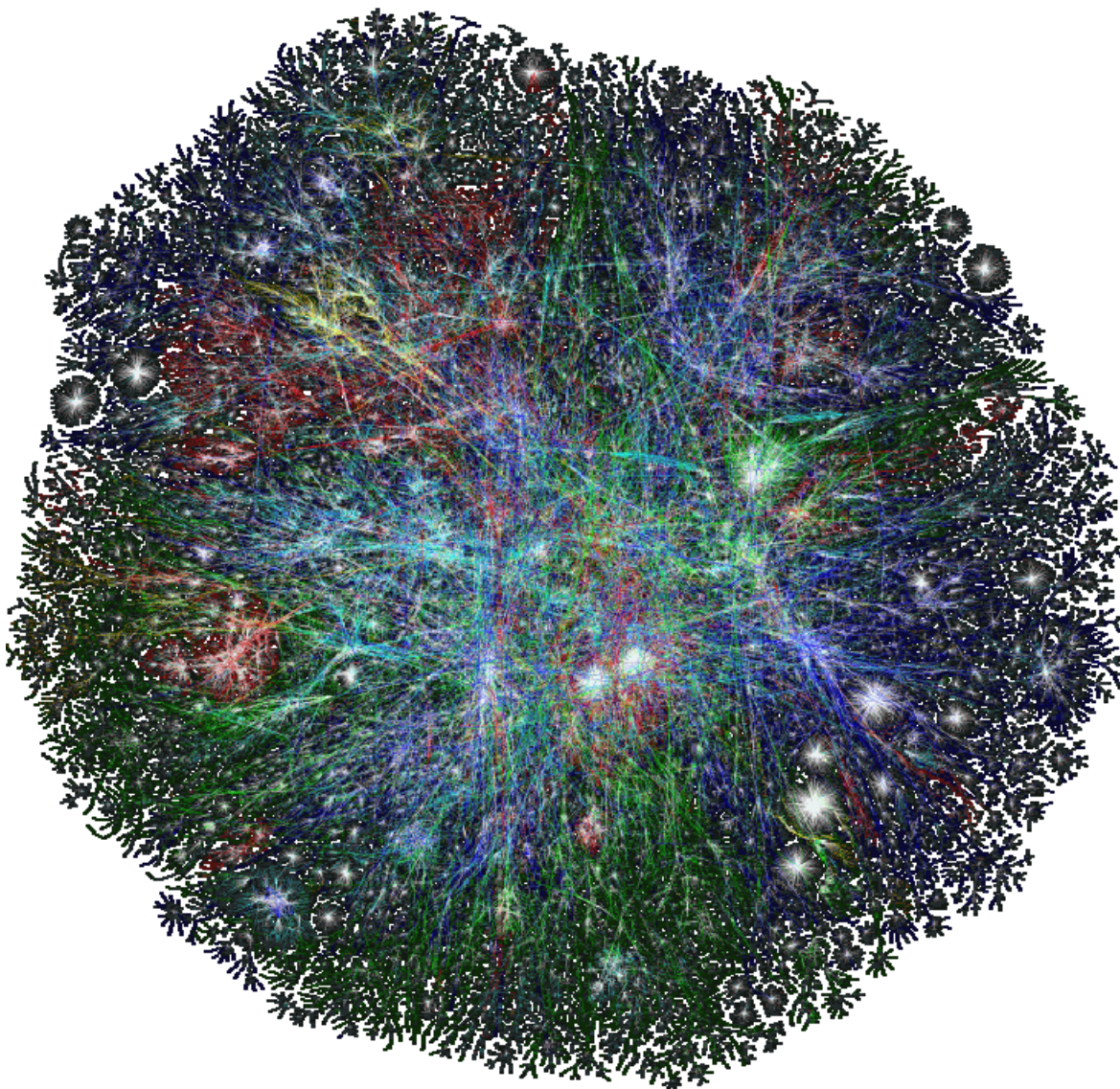




Future Content Network Scenarios

Contribution to the Future Internet Assembly



Created by the Future Content Networks Group
Prague, May 2009



European Commission
Information Society and Media





Table of Contents

1	Future Internet Usage Scenarios	3
2	Scenario 1: Off-line or “near” off-line services	3
2.1	Description	3
2.2	Functional requirements.....	4
2.3	Possible barriers and problems.....	4
2.4	Challenges	4
3	Scenario 2: The mobile device will be the primary connection tool to the Internet.....	5
3.1	Description	5
3.2	Functional requirements.....	6
3.3	Possible barriers and problems.....	6
3.4	Functional requirements.....	6
4	Scenario 3: Intelligence in the network	7
4.1	Description	7
4.2	Functional requirements.....	7
4.3	Possible barriers and problems.....	8
4.4	Challenges	8
5	Scenario 4: Augmented reality/Interacting in artificial spaces.....	9
5.1	Description	9
5.2	Functional requirements.....	10
5.3	Possible barriers and problems.....	10
5.4	Challenges	10

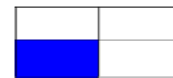
1 Future Internet Usage Scenarios

The Internet is a living, dynamic entity; constantly and rapidly evolving, reshaping and transforming. Two decades ago, it would have been too difficult, to guess Internet’s current form and capabilities. In the same way, with the exponentially increasing rate of the technological developments, it is very hard to foresee the exact shape of the Future Internet.

Many Internet Usage Scenarios may be considered, both in the FCN group and outside it¹. The scenarios described here, indicate how the provisional Future Content Networks Framework can serve both “Business” and the individual “Citizen”. They have been categorised into four major categories: Business-Incremental (BUS-INC), Business-Visionary (BUS-VIS), Citizen-Incremental (CIT-INC) and Citizen-Visionary (CIT-VIS)

. In each scenario we give its description, its functional requirements, potential barriers and problems and the provisional R&D challenges.

2 Scenario 1: Off-line or “near” off-line services



BUS-INC

2.1 Description

John buys a ticket for a cinema film, he has two options: the simple ticket and the “special ticket”. The “special ticket” is a smart card that includes a summary of the content, critiques of the film, special effects, scenes that have been cut during the montage, actors CVs etc.



Figure 1. Special Ticket case

Then John goes to the supermarket and has the Ultra-Wide band interface of his mobile phone or PDA activated. While he is selecting what to buy, the best movies of the week (or based on his profile) are loaded on his mobile.

When John is sleeping or when he is out of his home, his Set Top Box/DVR downloads any film that he might like to watch. He may select what he’ll watch, and he’ll be charged for that on-line. Otherwise the content will expire and be deleted.

¹ J. Anderson, et.al. “The Future of the Internet III,” Pew Internet & American Life Project, Dec. 14, 2008

2.2 Functional requirements

- Interoperability of services and terminals
- Seamless connection
- Reliable speed without bottlenecks
- Personalization
- Huge amounts of storage in the mobile device
- Content Adaptation
- Cross-border rights management
- New forms of content
- Transparent charging mechanisms

2.3 Possible barriers and problems

- Different providers of this service use different platforms and systems
- The supermarket is in a shielded building (e.g. metal-skinned Faraday cage or basement of a concrete building) and does not have repeaters for all bands
- Too many parallel ultra-wide band users for available bandwidth
- Content Adaptation
- Cross-border rights management
- New forms of content
- Transparent charging mechanisms

2.4 Challenges

- Interoperability at all layers (including rights management)
- Reliable, interoperable and secure Micropayments
- Providing enough high-bandwidth, deep-building penetration at all RF bands
- The capacity needs to be much higher than today
- Providing sufficient storage and power in the mobile device
- Copying needs to be much faster and the cost per Giga-Byte or Tera-Byte is negligible
- Wireless LANs and Ultra-Wide Band LANs in the range of Gbps with seamless handover
- Cross-border rights management
- Devising new forms of content that will make such services attractive
- Finding a business model that might work
- Providing transparent and reliable billing

3 Scenario 2: The mobile device will be the primary connection tool to the Internet

3.1 Description

John leaves home, goes by bike to the metro station and is riding the metro to the office. While on the way, he checks and replies to the most important emails and gets some news and entertainment update. Wearable devices (e.g. glasses with screen monitors) help him to read the emails in a simpler way.

When reading the newspaper, John can also get related videos from ABC. The videos are projected on the newspaper next to the corresponding printed news article and he can start playing them using natural gestures (e.g. pressing on the projected "Play" button).



Figure 2. Mobile Internet & Wearable Devices²

His glasses also provide him a semi-transparent view of his environment. Context sensitivity sensors adapt the transparency and interaction modes to the situation he is in. By focusing on people in his user interface, he can increase his and their attention – an advanced form of presence.

During his working day John is on the move, visiting customers and presenting the proposals for new designs using holographic projection providing also haptic possibilities from his mobile device. He is happy that the navigation provided by his device on his way from customer to customer takes traffic jams as well as delays in his customer's schedules into account.



Figure 3. Mobile Internet Scenarios: Meeting, Retrieve Information, New Business²

Today, John has to join a meeting, but he is late due to some delays in the metro schedule. While on the way to the office he connects to the meeting room. He can exchange documents and presentations with the other participants. As the discussion is about a new product, he may watch the 3D representation at his mobile phone.

² Figures provided by P. Daras, CERTH/ITI

During the working day, the device that he is wearing provides him additional information about people he is meeting with. By focusing on a person, John can get information about the person's domain expertise and position, tags from her blog page, revealing her interests, etc.

3.2 Functional requirements

- Seamless connectivity in-door and outdoor with a single piece of user equipment.
- Multi-modal interfaces adapt the content objects to the most suitable presentation mode
- Context sensitivity simplifies user interactions – especially needed when mobile.
- Virtual/augmented reality
- All information relevant to the next customer present in his device.
- Scheduling and routing updated based on real-time data
- Object access and handling on small mobile devices
- Interaction with 3D objects (visually and haptically)

3.3 Possible barriers and problems

- “Will it not detract attention from traffic?”
- “Will it be acceptable to people to rely on context sensitive user interfaces?”
- “Will people be able to trust the advices from his devices?”
- “Will it be no security infringement to view confidential designs in the metro?”

3.4 Functional requirements

- Small connected mobile devices with multi-radio capabilities and high energy efficiency
- Non-intrusive new forms of mobile user interaction
- Multi-modal communication with a high degree of scalability in every mode
- Adaptable context sensitivity
- Multimodal interfaces, supporting recognition of natural gestures
- Implicit queries based on content, context , and topic detection
- Audio-visual search and recommendation
- Small scale holographic projection
- Haptic experiences on holographic projections
- Schedule based object provisioning
- Navigation based on real-time changes
- Virtual presence in meetings
- 3D on mobile
- Security to have access to objects in the VPN in the public space
- Support of multiple media types (text, video, user generated content)

4 Scenario 3: Intelligence in the network



CIT-INC

4.1 Description

John and Sarah regularly watch TV on a Thursday, it's a ritual they enjoy, and use a TV butler to find the best value source of their entertainment content. They look at the menu of programming that their butler offers them; they agree to watch something funny.

The TV butler service then provides a number of programme choices some of which they have seen. All the choices are HD as this is a preference the system has learned and it looks great on their 52" TV.

They agree on a recent episode of a sit com that show they both enjoy and choose a one ad break format as this makes it cheaper (they actually like an ad break – it gives them a chance to make a cup of tea and go to the loo.) The sit-com starts immediately in perfect HD quality.



Figure 4. Telefonica I+D's Future Home Environment

Unknown to them, as the programme plays, a number of products, and brand names are placed in the images, chosen to match their profile. The programme plays and a short message appears on the remote telling them that their daughter is now "home". Clearly the shopping is over.

Sarah is anxious to catch up with Susan and through the remote invites her for a chat. After telling John that Susan is home and, slightly to John's annoyance, she brings Susan up on the TV. The sit com shrinks to a quarter of the screen as the call is initiated John lets it play on for a bit, but once Susan's appears on the screen he pauses it and it shrinks further as Susan's image takes up the major part of the screen.

4.2 Functional requirements

- A personalized search and discovery agent that can learn and anticipate content needs, identify providers of the content (across multiple potential vendors) and that is able to agree terms of delivery (Cost, quality etc.).
- The cost of delivery will be negotiated
- A system capable of rendering personalised product placement within a stream.
- Widget type functionality able to render images over a streamed image.

- Real time automatic screen composition based on templates that are able to dynamically adapt to the appearance of new services that demand screen space.
- Low delay spatial audio and video.

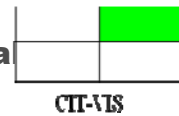
4.3 Possible barriers and problems

- Vertically integrated models of 'valuable media' delivery are prevalent now and are just about the only models with a business case. Moving to this re-intermediation between users and content isn't easy.
- Current players in the value chain will need to see value in this new model content service provision.
- The customer will feel loyalty to a butler not a service provider in this model. The service providers won't want to move to this position.
- "What if file delivery is cheaper than stream delivery (which it could easily be). A lot of the network intelligence moves to the edge. Is it still 'network' intelligence?"
- "What if people just WILL NOT allow video comms?"

4.4 Challenges

- The business model has to show that the content owners will win, otherwise they won't play.
- Technical task based on wide scale distributed storage of content and massive database issues to reconcile rights payments, cost assessment, payment negotiation and the associated TRUST issues, authentication, authorization, data integrity, privacy and non-repudiation.
- The argument on content storage costs needs to be won. This might be a whole "cloud" argument.
- In-line compositing and rendering of streams of personalised content in a manner acceptable to the original content owners
- Intelligent scripting to accommodate new services (that need screen space) coming on-line.
- Low delay spacial audio in a perfect quality in addition to low delay high-definition video.

5 Scenario 4: Augmented reality/Interacting in artificial spaces



5.1 Description

John is a young engineer who lives in Berlin and works for an automotive industry. He had an accident, 6 months ago and since then, he has a difficulty when walking due to a knee injury.

John needs to fly to London for meeting a business partner and he is in a taxi, on his way to the airport. He looks at his plane ticket and the device he is wearing projects on the ticket additional information about his flight: gate number, expected delay time, etc. In addition, when looking at a small travel guide for London, he gets recommendations for musicals now playing in London, which he generally enjoys watching in the evening, together with ratings from his London network of musical fans.

It is Friday morning. John's company has organized a course for the young Engineers for teaching them how they can assemble parts of the new 'X-model' car. John enters a Hi-tech room with his colleagues, which produces a real immersive environment.

He wears a haptic glove and he connects to the course. At the same time, other young Engineers from Stuttgart join another Hi-tech room there and also connect to the course. Two expert industrial technicians in Tokyo join their Hi-tech room and the course starts. John and the other young Engineers not only enjoy the course, but also feel as they were all together (see, talk to each other, ask the tutors questions and inspect or even touch the parts of the 'X-model').



Figure 5: Augmented reality/interacting in artificial spaces scenario³

Early afternoon, John returns home and enters his personal immersive room. He connects with his remote therapist which is located in Vienna. He plays a pre-recorded set of exercises sent by his therapist and he tries to repeat the exercises. The doctor is able to analyze John's movements and evaluate his performance. At the same time, other body signals are sent to the doctor.

³ Figure provided by P. Daras, CERTH/ITI

Later, John decides to tele-meet with his old friends from the university. They used to frequently meet in the apartment of one of them to sit together to enjoy playing their musical instruments. However, after they all graduated they all spread out over Europe. But using their Hi-tech systems they can again meet without having to travel for a long time.

The experience is almost the same as when they met in person in the apartment back then. The virtual persons appear so realistic and in 3D that they look as if they are really there. Also the spatial position of everybody matches with the direction of the sound, making it really natural to communicate and play.

In the evening, John wishes to do some shopping. As he is a convinced ecologist, he prefers environmental friendly products. His wearable device helps him in making a choice informing him about the environment friendliness of the product on the cover

5.2 Functional requirements

- Distributed Immersive environments become common and a natural way of collaboration.
- Virtual and real worlds are seamlessly mixed and interconnected.
- Wearable devices are easily integrated to this new paradigm
- Natural Interfaces (gesture, voice, touch, etc) are common.
- Personalised home-immersive environments become a reality.
- Personal monitoring and sensing devices, preserving privacy and confidentiality to data.
- Low delay spatial audio and video in natural (face-to-face) quality.
- 3D visual and sound are accurately captured and regenerated.
- Emotions are fully captured and exchanged.
- Social interactions are realized through virtual worlds.
- Interaction and communication are enhanced. All senses are involved.

5.3 Possible barriers and problems

- Can a real person be confused by mixing real with virtual?"
- "Can these new social networking tools make someone to feel alone and live only in virtual reality?"
- "Does this paradigm promote communication with dangerous people?"
- "Do people trust the services?"

5.4 Challenges

- Realistic 3D A/V capturing Rendering
- Immersive User Interfaces
- New (Future) Media Coding/Streaming
- Network Support
- Full multi-modal interaction
- Emotion capturing and reproduction
- Augmented reality
- Implicit queries and recommendation based on context and preferences

- Haptic interfaces with a natural feeling.
- Secure communication with guaranteed privacy.
- Low delay spatial audio and video in natural (face-to-face) quality.
- Personalisation (getting personalised selection, recommendation and ranking of content)
- Natural communication feeling
- 3D Video and spatial audio
- Emotion capturing

6 Conclusions

These and many new incremental and visionary scenarios may be considered. Envisioning Future Internet the only limitation should be our imagination.



Figure 6: Social Networking in Future Internet⁴

⁴ Figure provided by P. Daras, CERTH/ITI

7 List of Contributors

A large number of scenarios have been contributed by the NEM and the Future Content Networks (FCN) group via ideas, emails, PhCs, discussions and comments. Based on them, the scenarios listed here have been extracted by the following list of contributors.

Petros Daras	CERTH/ITI	daras@iti.gr
Doug Williams	BT	doug.williams@bt.com
Carmen Guerrero	UC3M	guerrero@it.uc3m.es
Ian Kegel	BT	ian.c.kegel@bt.com
Isidro Laso	European Commission	Isidro.LASO@ec.europa.eu
Jan Bouwen	Alcatel-Lucent	jan.bouwen@alcatel-lucent.be
Jean-Dominique Meunier	Thomson	Jean-Dominique.Meunier@thomson.net
Norbert Niebert	Ericsson	norbert.niebert@ericsson.com
Theodore Zahariadis ⁵	Synelixis Ltd	zahariad@synelixis.com

⁵ Document Editor