



Networking Paradigm for Information Universe

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❖ *Megatrends*

- *Information Universe*

❖ *Scale up*

❖ *Scale down*

❖ *Reach out*

❖ *Internet in 2030*

- *Realtime Internet*
- *Quality Internet*
- *Knowledge Internet*

❖ *Architecture*

- *Device – network – Service*

❖ Smart

- Device
- Network
- Application
- Society

❖ Interaction

- Between People
- Between Machines
- Between Data

❖ Explosion

- Internet Traffic
- Information Creation
 - Information Universe

❖ New way of working

- Low birth rate – the aging society
- Productivity
- Saving energy consumption
- Work while moving

❖ You do not enter a company, but you become a professional

❖ Multiplayer : freelancer

❖ New network infra

- Realtime
- High speed
- Conferencing
- Cloud
- Smart work center

❖ New mobile and fixed devices

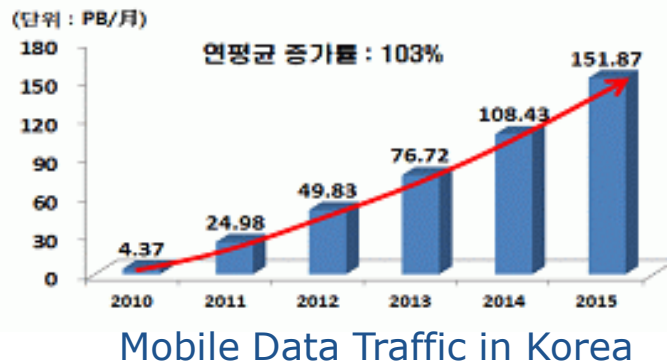
- Telepresence
- Video conferencing
- Virtual office

❖ New applications

❖ Collective intelligence

- ❖ Man-to-man
 - ❖ Man-to-machine
 - ❖ Machine-to-machine
 - ❖ Content-to-content
 - ❖ (virtual) group-to-group
- ❖ **New mode of communication, collaboration, and computing is required**
 - Redundancy handling – filtering
 - Provenance verification – trust
 - Aggregation, abstraction, and visualization

Traffic Explosion : Korea



- In 2010, **1000% traffic increase**
(Electronic Times, 30 Dec. 2010)

이석채 "5년내 데이터 트래픽 1000배 는다"

이석채 KT 회장, IPTV 콘텐츠 공급가격 인하 주장도

강희종 기자 mindle@dt.co.kr | 입력: 2010-11-25 23:33

[2010년 11월 26일자 4면 기사]

앱스토리, "아이폰4 수십대 제발 좀 찾아가세요."

-3월까지 아이폰 수십대 증정 소식 밝혀...

이석채 KT 회장이 향후 5년내 데이터 트래픽이 1000배 이상 늘어날 것으로 예측했다. 또, 방송사들이 IPTV 콘텐츠 공급 가격을 내리야 한다고 말했다.

이 회장은 24일 여의도클럽이 주최한 '모바일 컨버전스 박람회'에 따른 방송의 미래'라는 주제의 조찬 강연에서 "지난 한해 데이터 트래픽이 20배 증가했다"며 "향후 5년 안에 데이터 트래픽이 1000배 늘어날 것으로 예측하고 네트워크를 구축하고 있다"고 밝혔다.



- **KT Chairman "In 5 years, data traffic will increase by 1000 folds"**
(Digital Times, 15 Nov. 2010)

Traffic/Data Explosion!!

❖ PyeongChang (near my hometown) in 2018 ; *NEW IT SOLUTIONS*

- Personal Broadcasting
- 4D broadcasting
- >100,000 mobile video cameras



Mobile Personal Broadcasting

❖ Millions of PB stations uploading live video contents

- Events
- Generation X, Y, Z

❖ Social Community

❖ Clever delivery mechanisms

- Peer-to-peer
- Multicast
- Content-aware network

❖ Wibro + camcorder + afreeca.com

인터넷이 가능한 곳에서는 누구든지 아프리카 B(Broadcasting Jockey)가 되어 방송을 진행할 수 있습니다. 방송을 진행할 컴퓨터(노트북), 와이브로 단말기와 영상을 촬영할 장치(캠코더, 화상캠 등)만 있으면 누구나 시민 기자가 될 수 있습니다. 와이브로에 접속된 노트북을 이용해 아프리카 스튜디오를 실행하고, 사용하실 방송 장치를 노트북에 연결합니다. 방송 장치에 따라 방송 세팅 방법이 달라집니다.





Video Diary : Motivation

Video is the king

- ❖ Video traffic will be the dominant traffic type
- ❖ Mobile video explodes

Social Network Service

- ❖ SNS will be the king
- ❖ Mobile SNS explodes

New app = Mobile + Video + SNS

Called "Video Diary"

Developed at Seoul National Univ.

- ❖ 1. Collect user location, time, and related info from user's smartphone
 - 2. Send the user info to Diary Server
 - 3. The server collects recorded video data from nearby cameras (e.g. CCTV), and puts tags about the user
 - 4. Later, the video clips for the visited sites are shown on a "Video Diary" web page at the user's request
 - 5. User can add texts, send the diary to Social Networks etc.
-
- ❖ Benefit
 - Rich information sharing
 - Automated and intelligent system
 - Advanced application scenarios

Internet Video Diary System

Seoul National University

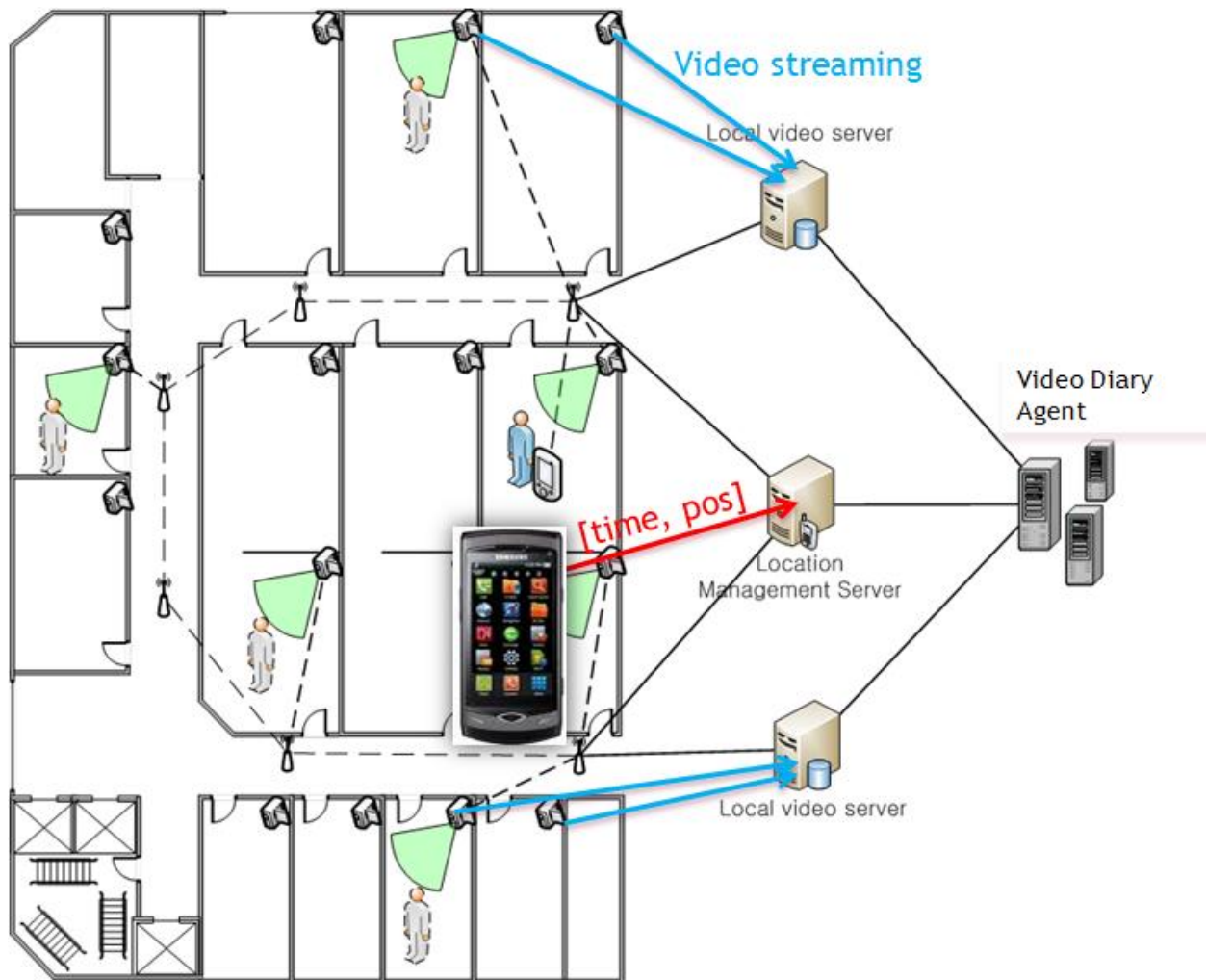
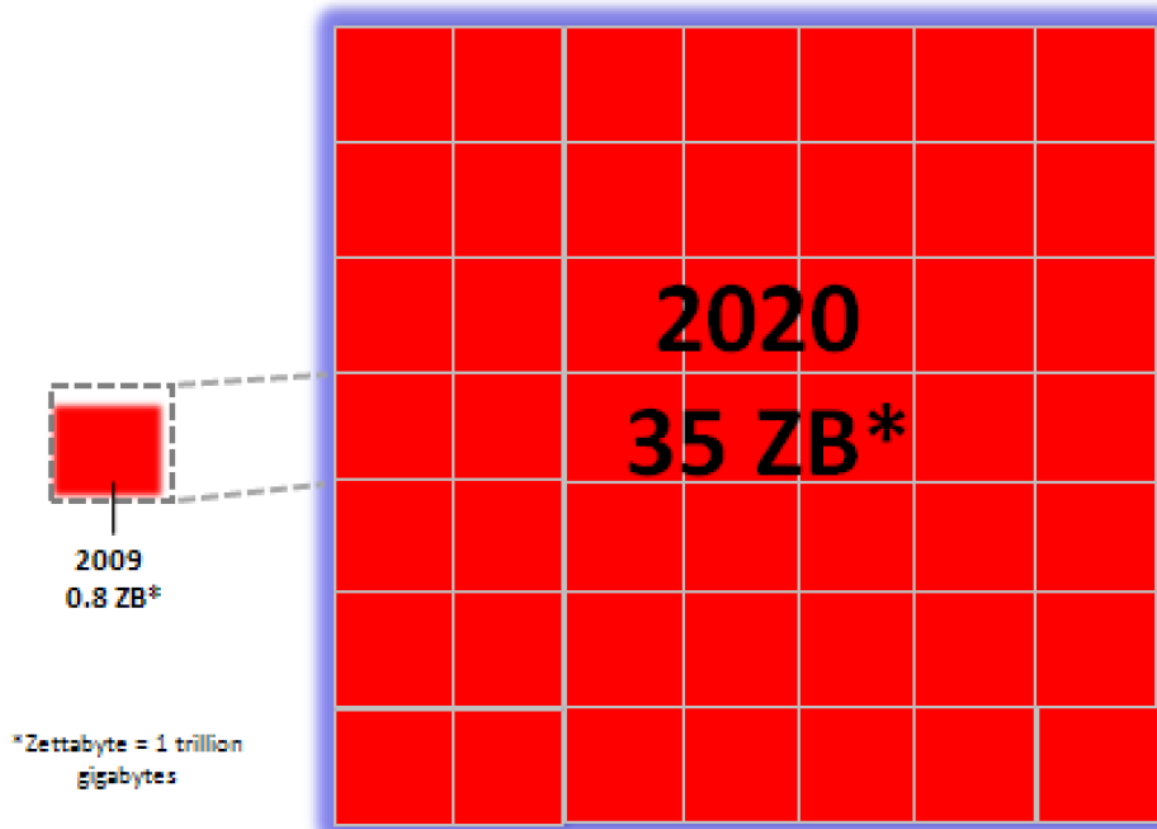


Figure 1: The Digital Universe 2009 – 2020
Growing by a Factor of 44



*Zettabyte = 1 trillion gigabytes

Source: IDC Digital Universe Study, sponsored by EMC, May 2010



IU : 아이유



Famous Korean Singer



How do you

- Capture
- Store
- Move
- Process

All these data?



- ❖ Data collection
- ❖ Data preprocessing
- ❖ Indexing
- ❖ Search methodologies
- ❖ AI, machine learning
- ❖ Data analysis
- ❖ NLP
- ❖ Language Translation
- ❖ Data aggregation
- ❖ Large scale systems
 - Clouds
 - Many core processors
 - Parallel machines
- ❖ New network architecture
- ❖ Visualization
- ❖ User participation

❖ Devices

- Hundred Billions

❖ People

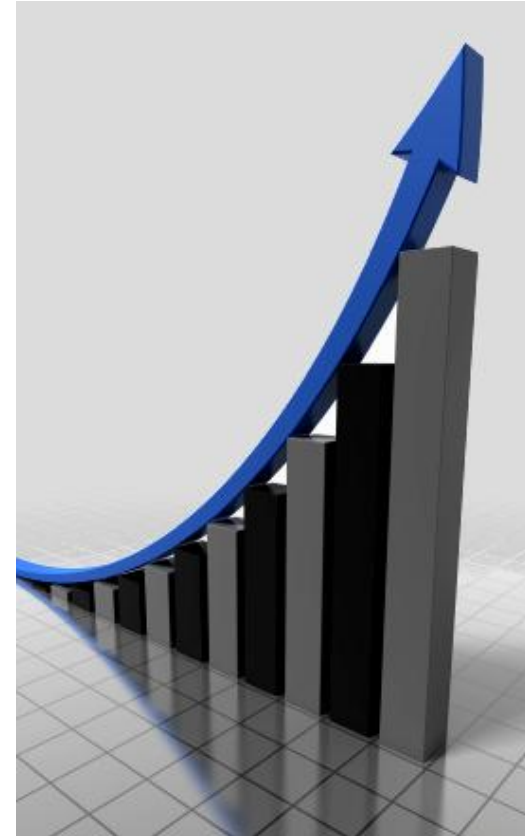
- 1000 % penetration

❖ Speed

- Generation X

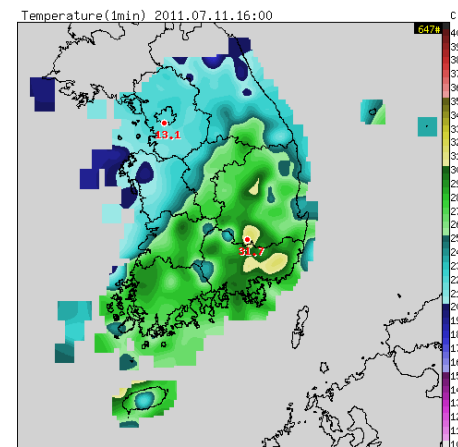
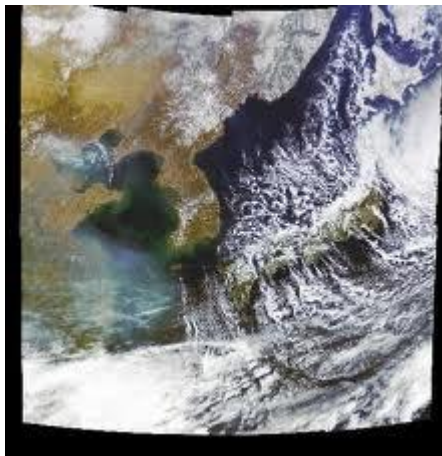
❖ Quality

- Availability
- Level of comfort



- ❖ Nano-devices
- ❖ Grid

- ❖ Weather forecasting
 - Measurement grid
- ❖ Earth monitoring
 - Ocean
 - Underground



- ❖ Electricity, water
- ❖ Free access
- ❖ Technology for 80%
- ❖ Fair use
- Low cost
- Simple and easy
- New apps

Long reach Ethernet
Low cost Smartphone
35 \$ pad computer
Digital Multimedia Broadcasting

- ❖ Realtime Internet
- ❖ Quality Internet
- ❖ Knowledge Internet



Image from Impactlab

❖ Internet as tools for

- Time shift
- Place shift
- Content shift

❖ Place shift

- Very small delay is required for interactivity

❖ Realtime in Internet

- Changes in network
- Changes in device
- **Paradigm shift**

❖ Quality : best case

- Ubiquitous
- Always there
- Safe and dependable
- No divide
- **Are the users satisfied ?**

❖ Adaptive Quality

❖ Measuring quality in Internet

- Contract ?
- Quality Parameters
 - Depending on usage
 - People vs. machine
 - Individual vs. group

❖ Architectural changes are required

- Service description
- Interaction model

❖ Internet as a tap for knowledge

- Information Universe
- More than Search engine
- **Are the users satisfied ?**

❖ Useless and stale information : we need a decaying model

❖ FI vs. IU

- Separate layer or integrated architecture ?
- IU : more than cloud



Search in the video era

❖ Text-based search

- Ranking
- Preference
- Measurement-based

❖ Multimedia search

- Technology for indexing
- Massive data
- Privacy and security issues
- Personalization



❖ Integrated Architecture for Device-Network- Application/service

- Battle of Architectures
- Reduced role of networks
- Closely related to business models
- Powershift ?



❖ 2030

- Information Universe : 1000x
- Internet Infra is ubiquitous

❖ Paradigm shift for new Internet

- Realtime
- Quality
- Knowledge

❖ Future Internet

- Architectural changes
- New business models
- Reach out for newcomers