

The Wireless Broadband Market and NEC's Activities

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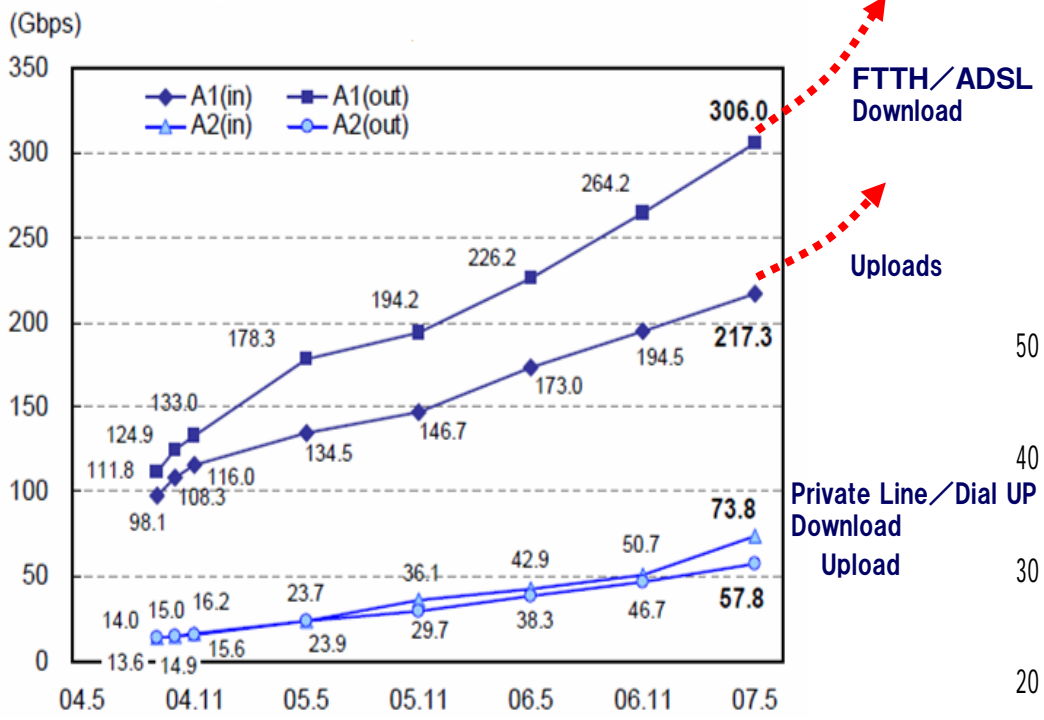
1. Outlook for the wireless broadband market



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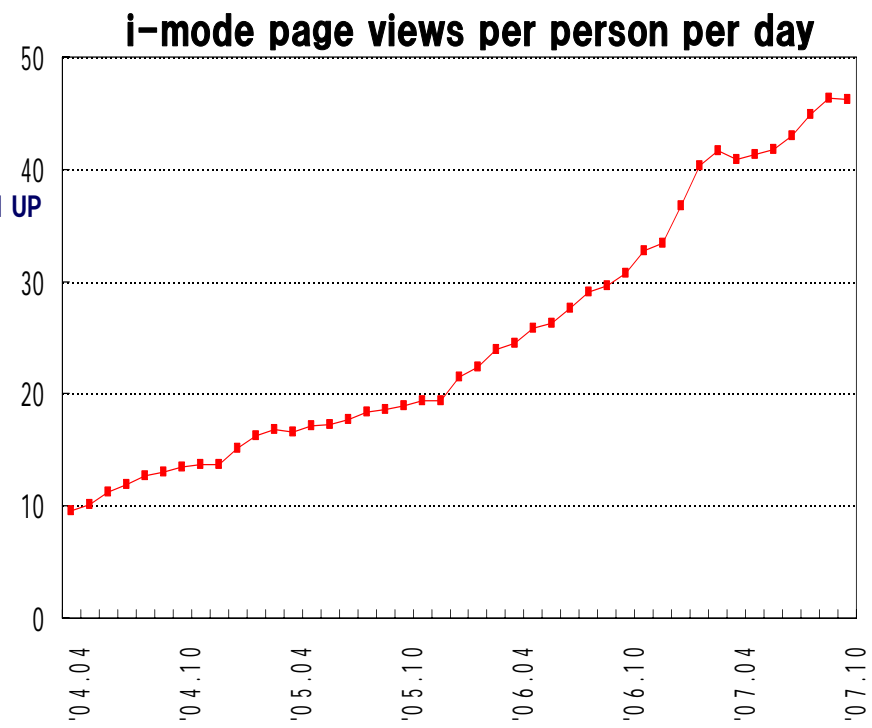
Growing Demands in Data Traffic

Movement in traffic (monthly average) by subscriber type



Source: Ministry of Internal Affairs and Communications "Grasping overall Internet traffic volumes in Japan"; (August 2007)

Traffics are rapidly increasing in both fixed-line and wireless communication



Source: Created based on NTT DoCoMo Inc. homepage "Monthly data on number of subscriptions; past i-mode usage status"

Services and Applications in the Broadband Era

Services and applications

Broadcasting

Communication

Finance

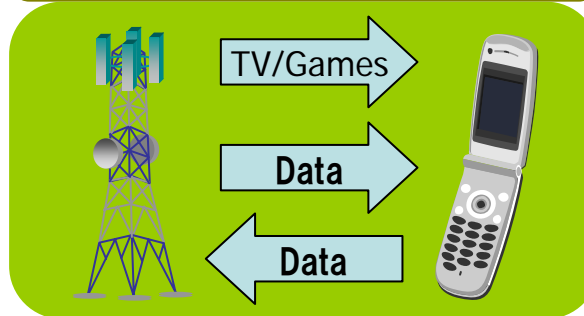
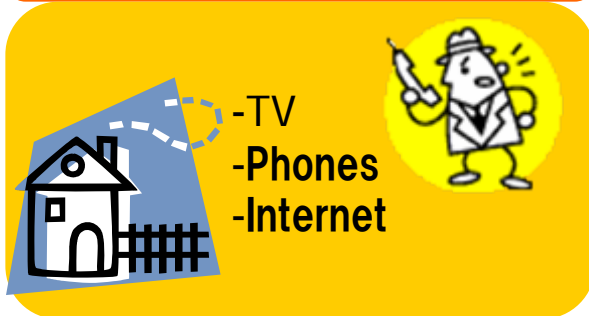
Contents

E-commerce

Communications/broadcasting
– Triple Play –

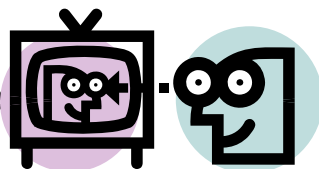
Broadband communications
– Mobile applications –

Finance and communications
= Electronic wallets =



New business opportunities

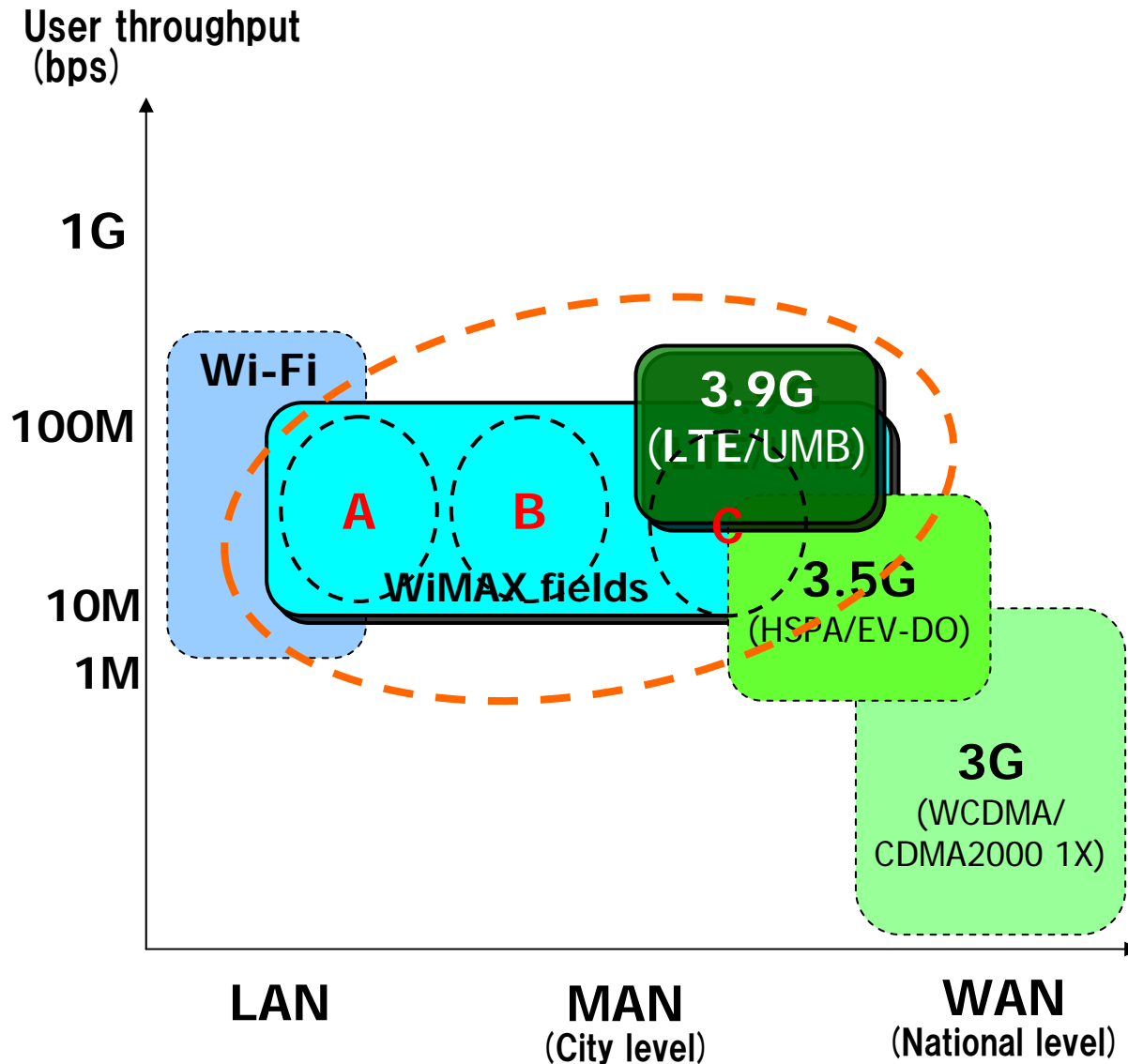
- Paid broadcasts
- Video viewing
- Game transmission
- TV phones



- Home security
- Home health services
- Broadcasts combined with Internet shopping
- E-learning/Internet schools



Wireless Broadband Market Opportunities



- Broadband characteristics
- Area coverage
- Economy
- Convenience
- Service (Voice, data, video, etc.)
- ...etc.

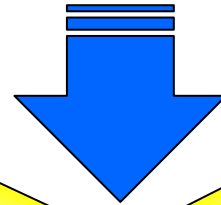
- WiMAX fields**
- A:** High-speed LAN with expanded areas (post Wi-Fi)
 - B:** Economical BB-MAN (Elimination of broadband digital divide)
 - C:** High-speed cellular phones

Wireless Broadband's Impact on Business

Wireless innovation capabilities
Wireless1.0
(Ubiquitous, Personal)



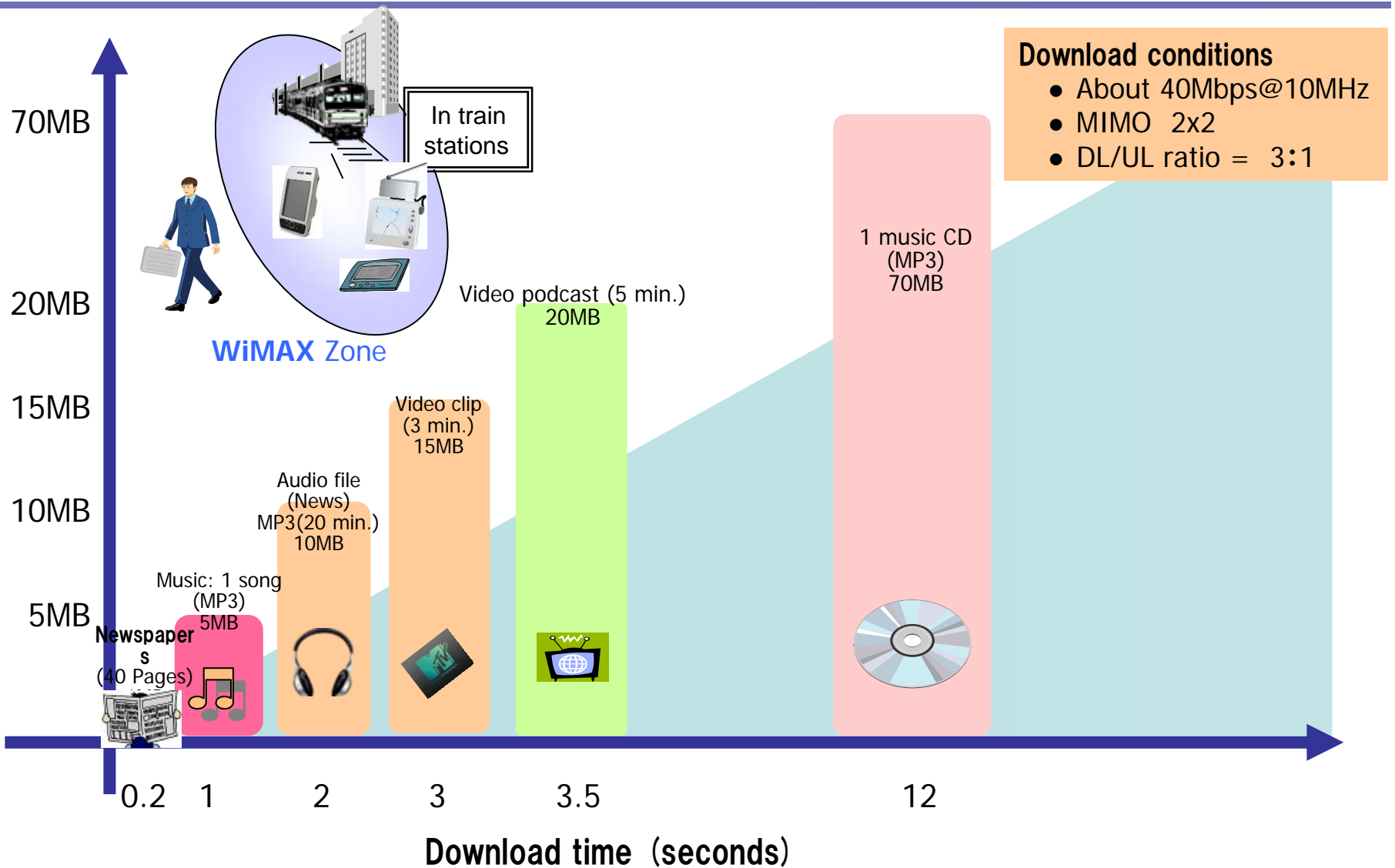
Broadband innovation capabilities
Broadband1.0
(Web2.0, Enterprise2.0)



Wireless Broadband Innovation Capabilities
Wireless2.0 & Broadband2.0

Full-scale shift to user-centered business

Downloading via WiMAX



Untethered

Increased freedom in information reception locations



The needs of increasingly demanding users

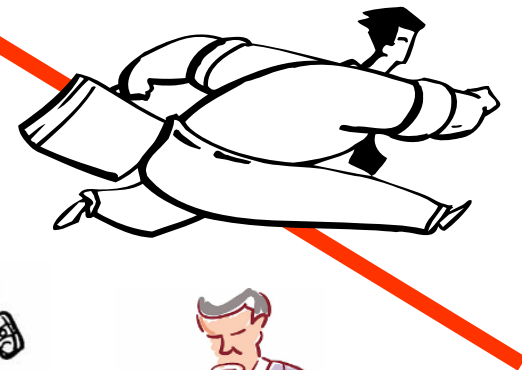
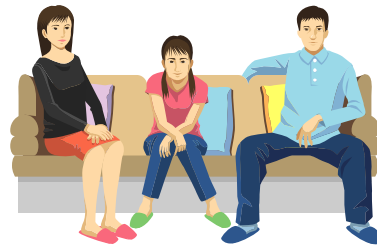


Gives rise to diverse services and applications



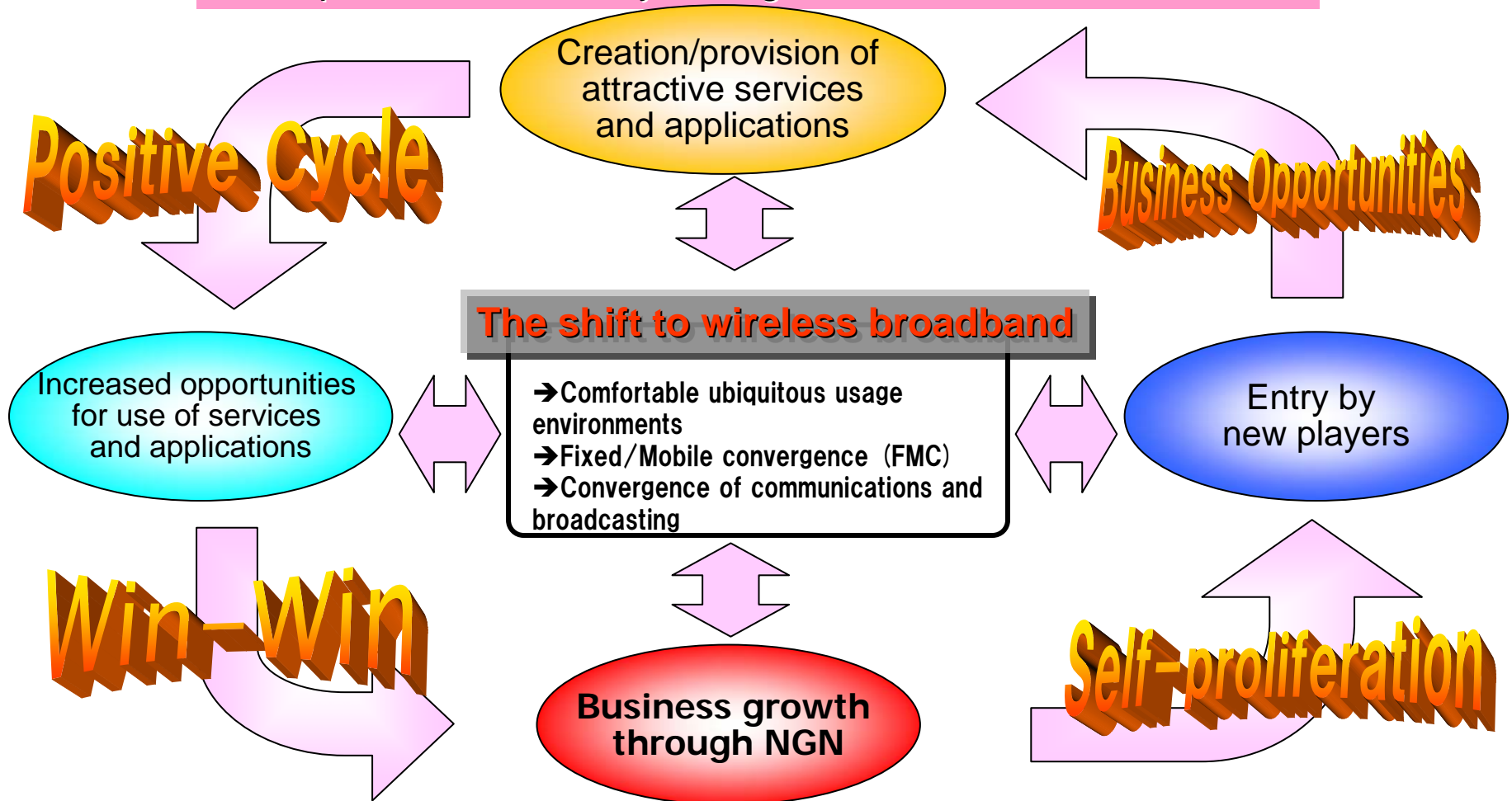
Access the contents you want, whenever you want, wherever you want

Take the work you were doing at home outside



Telecommunications business innovations brought about by the shift to wireless broadband

The shift to wireless broadband (changes in volumes) will bring about innovations (changes in quality) for individuals, companies, and society through NGN



2. Main wireless broadband technologies



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The two main trends targeted by wireless broadband

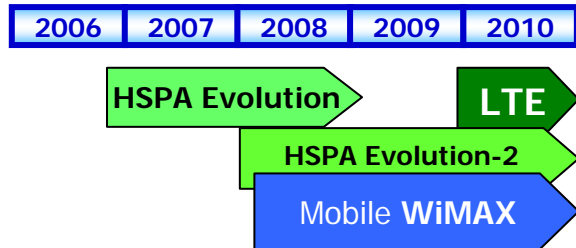
The two main trends targeted by wireless broadband

Evolution of 3GPP wireless communications

- W-CDMA, HSPA, **LTE**, etc.
- CDMA2000, EV-DO, UMB, etc.

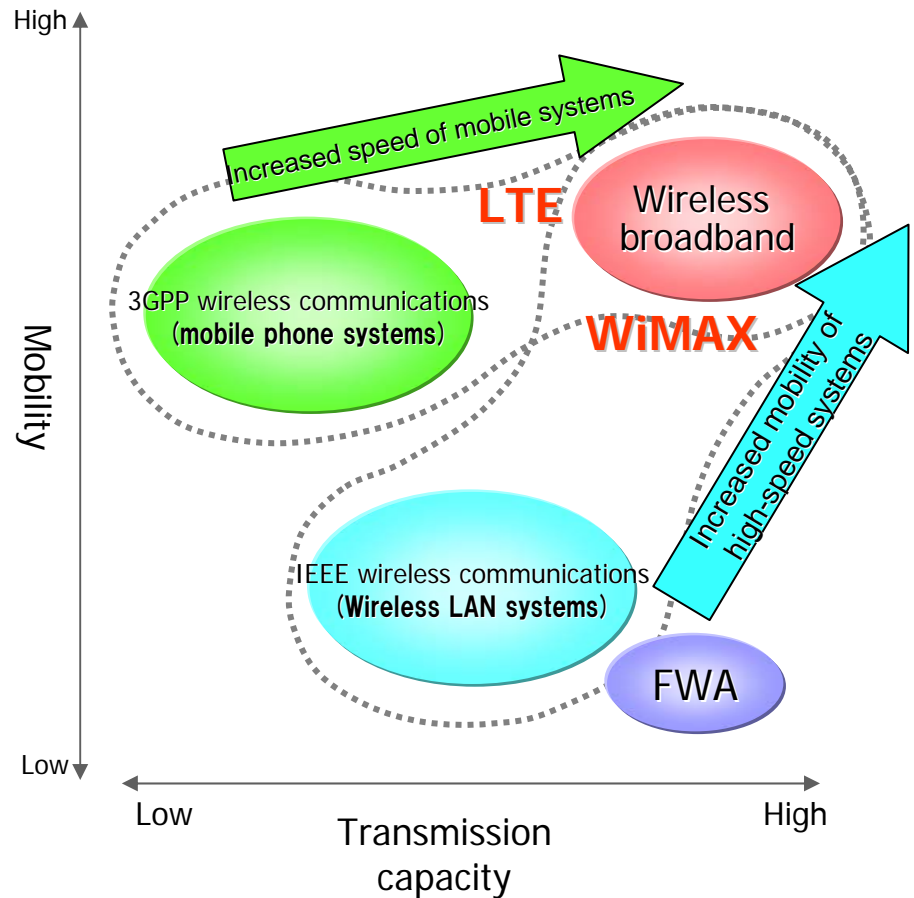
Evolution of IEEE wireless communications

- Wi-Fi, **WiMAX**, etc.



Mobile **WiMAX** is more advanced than **LTE**

Making wireless broadband a reality



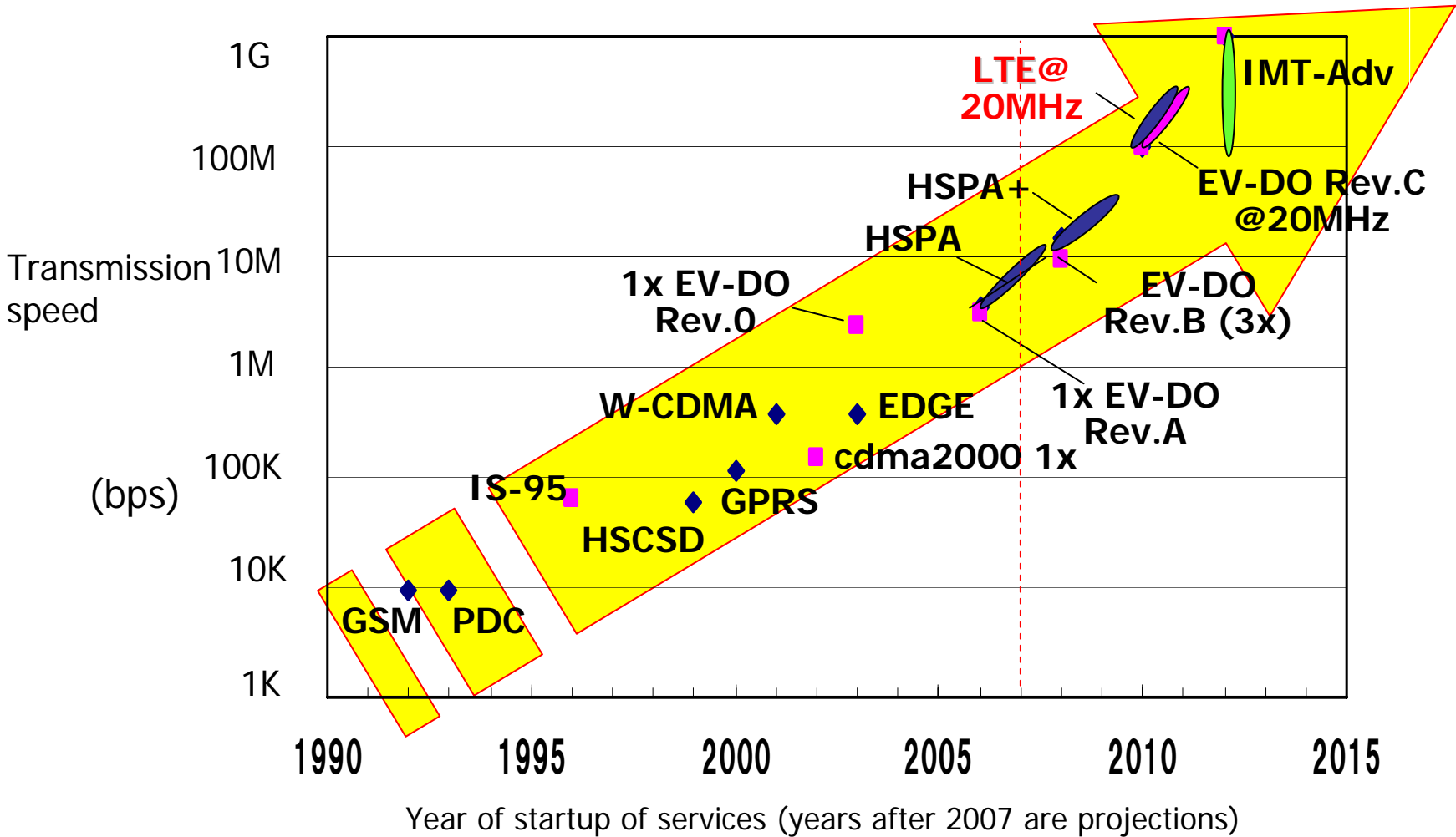
① Trends from 3GPP



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Changes in high-speed mobile phones

Moving toward broadband



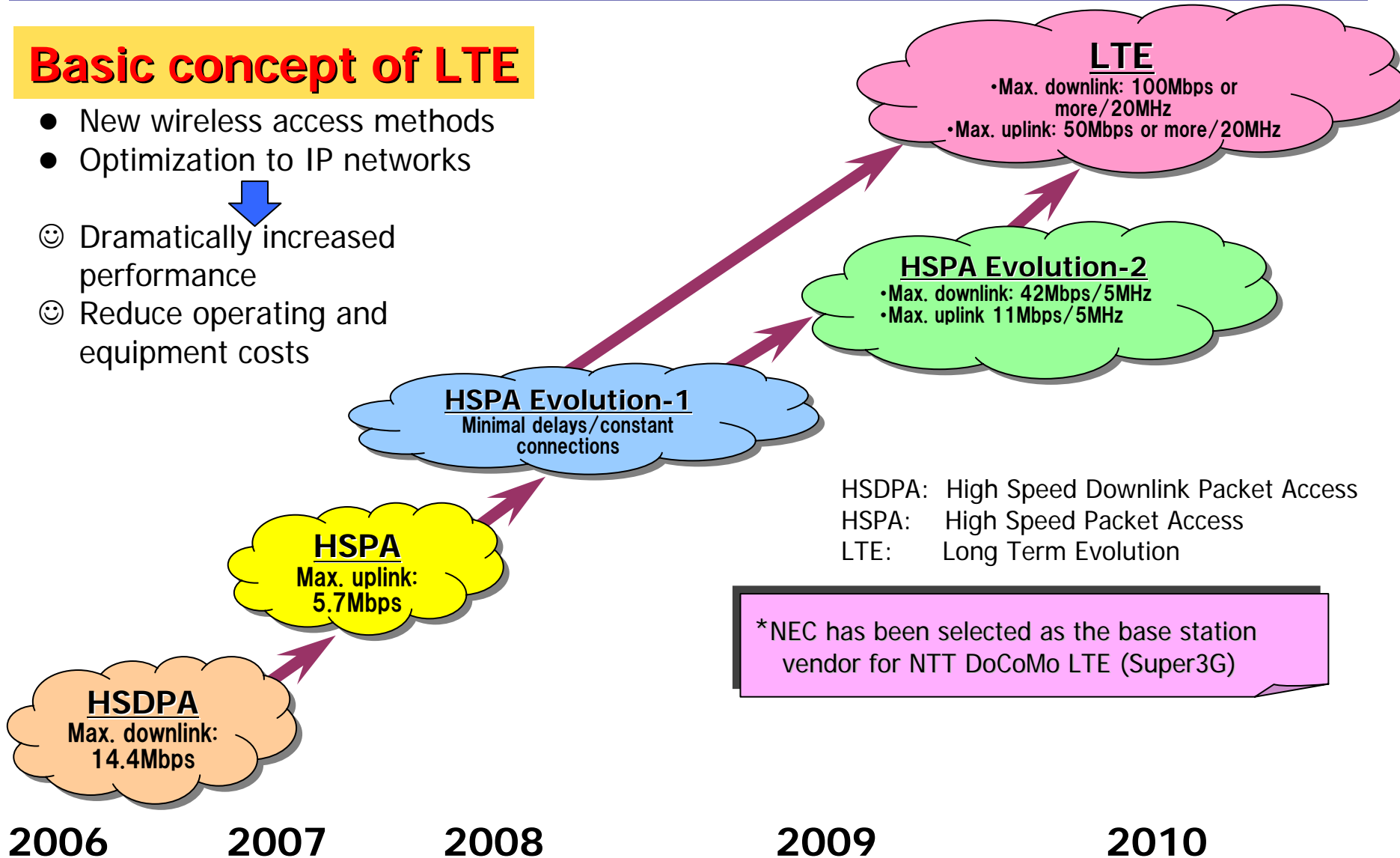
Moving toward LTE (Long Term Evolution)

Basic concept of LTE

- New wireless access methods
- Optimization to IP networks

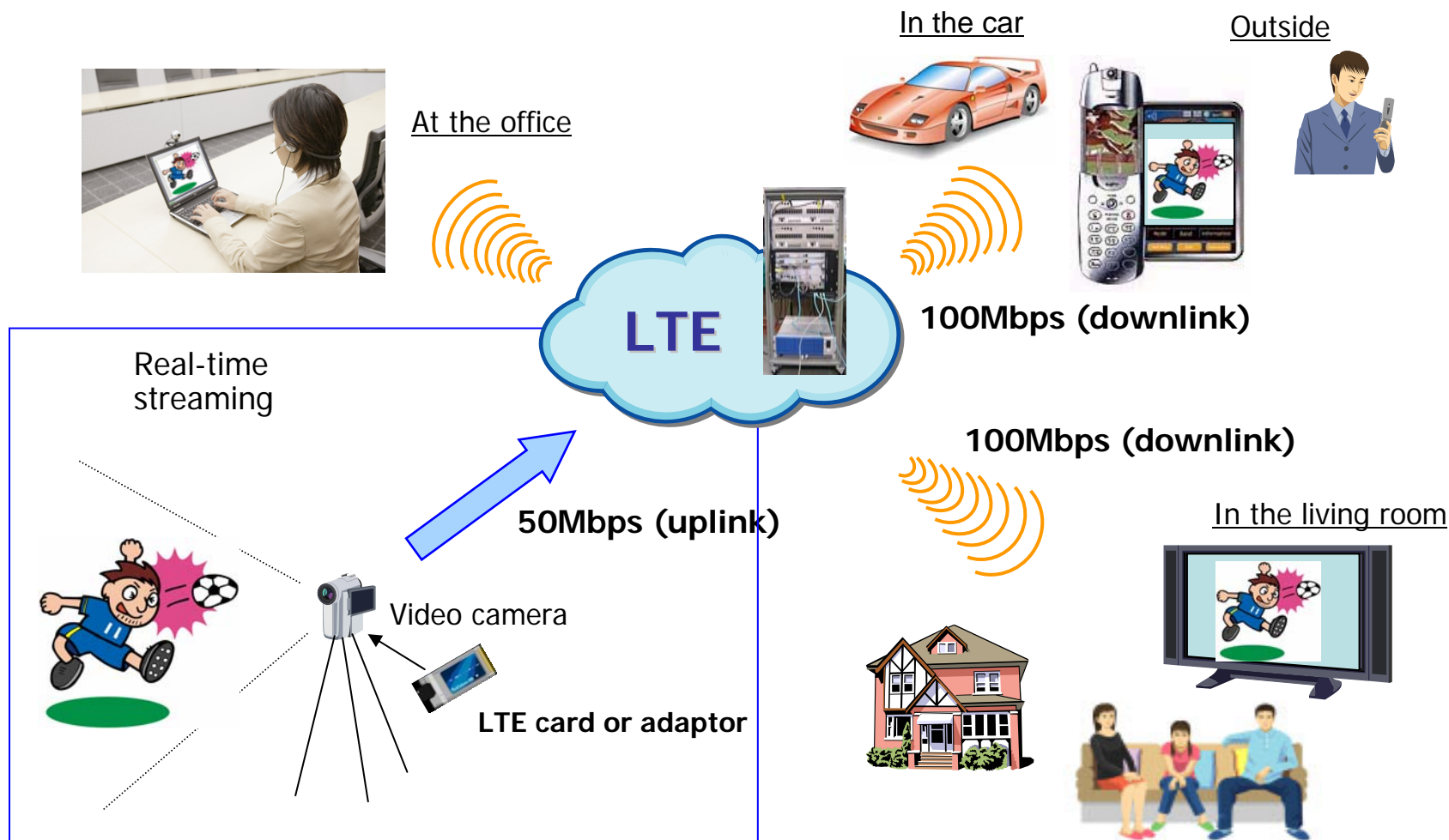


- ☺ Dramatically increased performance
- ☺ Reduce operating and equipment costs



With LTE, even video transmissions are a breeze

(E.g.) Watching a video of your son's soccer game in real time



② Trends from IEEE



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What is WiMAX?

- **WiMAX** : Worldwide Interoperability for Microwave Access
- Originally envisioned usage in the “last one mile” (Wireless MAN)
Specifications for mobile applications were added later
 - Fixed communication (FWA) systems **IEEE802.16-2004**
 - Mobile systems **IEEE802.16e** (Mobile **WiMAX**)
..... Functions added for handover to **IEEE802.16-2004**, etc.
- Main specifications

	IEEE802.16-2004	IEEE802.16e
Frequencies used	2 - 11GHz	2 - 6GHz
Frequency bandwidth	1.25 - 28MHz	1.5 - 20MHz
Transmission speeds	1 - 75Mbps	15Mbps/5MHz
Max. transmission distance	50km	3.5 - 7km
Compatible areas	Fixed: Non-Line-of-Sight communications is possible	Moving (<120km/h) Non-Line-of-Sight communications is possible

Activities targeting WiMAX

- Ministry of Internal Affairs and Communications Hokkaido Communication Station participates in WiMAX verification tests
- Moving exhibits at various trade shows
- Mobile WiMAX Tamagawa Test Station opens
- Trials conducted in Taiwan*¹ and other countries worldwide
- **Order received from** Tatung Co. (Taiwan) for mobile WiMAX system (M-Taiwan Project)*²

*1 Announced on May 8

*2 Announced on Dec. 6



Participation in "M-Taiwan" Project
President Yano; Dr. Ferng-Ching LIN, Policy Committee
Member; Minister of Economic Affairs Steve Chen



3GSM World Congress 2007
(Feb. 12-15, 2007; Barcelona)



CTIA Wireless 2007
(2007. March 27-29; Orlando)

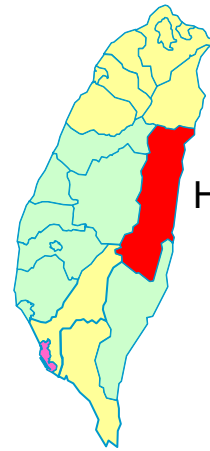
Moving exhibit of Mobile WiMAX

Mobile WiMAX Trials (Example)

Mobile WiMAX Tamagawa Test Station



Antenna



Hualian

Mobile WiMAX Trial in Taiwan



IDU
(Indoor Unit)



ODU
(Outdoor Unit)

NEC Begins Global Sales of Mobile WiMAX

NEC has created a mobile WiMAX product, and began Global Sales as of today. Product name: **PasoWings**

PasoWings

End-to-End Solutions, from Terminal to Application Server:
NEC is conducting or planning trials for the implementation of WiMAX in more than 15 countries around the world.

Coverage to meet user needs

Femto Pico Micro Macro

Throughput



Femtocell

Picocell



Microcell



Macrocell

Ubiquitous and Seamless

Cell radius



* Femto-cell
 "Femto" is a prefix expressing
 the unit 10^{-15}

Femtocell

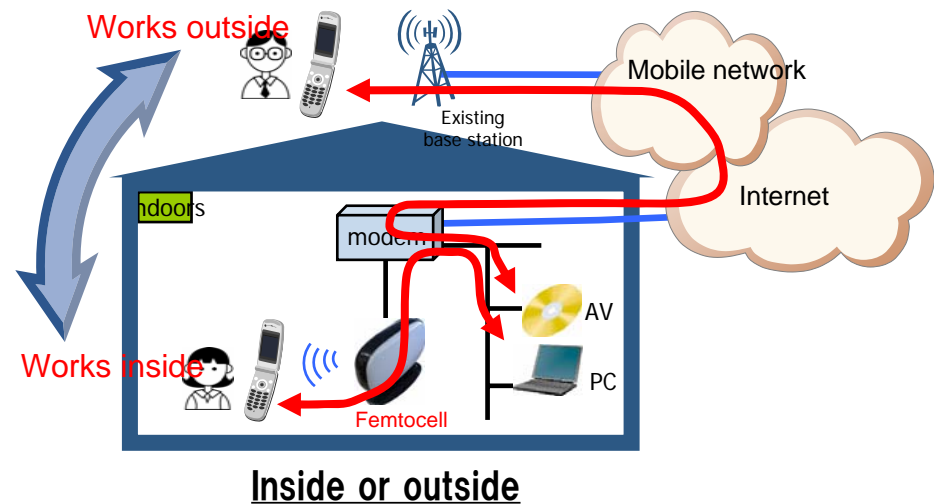
What is a Femtocell?

- Ultra-miniature wireless base stations installed in homes
- Connections to mobile networks through broadband lines installed in homes
- Uniform services on the same terminal even outside, using a common interface
- In the future, diverse services will be offered through Femto HGW networks



Image of services using femtocells and Femto HGW

- One Phone services
- High-speed, high capacity mobile services achieved through monopolization of a band
- Remote viewing (DVD recorders)
- Remote access (PCs)



NEC is participating in standardization activities as a member of the "Femto Forum."

3. Summary



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Moving toward wireless broadband

NEC will continue to actively contribute to the shift to wireless broadband as an NGN innovation through LTE and WiMAX.

The shift to wireless broadband will increase the freedom of data communications and expand opportunities for data services.

It also holds the potential to change business models through “positive cycles.”

NEC has been selected as the base station vendor for NTT DoCoMo LTE (Super 3G) and received order for commercially based mobile WiMAX from Tatung Co. in Taiwan, and will actively promote wireless broadband based on this growing track record.

Abbreviations & Acronyms

Acronym	Full spelling	Meaning
EV-DO	Evolution-Data Only	A wireless data communication system established by 3GPP2 and incorporated into CDMA 2000. started with Rev. 0, and standards extended to Rev. A, Rev. B, etc.
FMC	Fixed Mobile Convergence	The convergence of fixed phones and mobile phones.
FWA	Fixed Wireless Access	The general term used to refer to systems that connect communication carriers and users with fixed wireless technologies.
HSPA HSDPA/HSUPA	High Speed (Downlink/Uplink) Packet Access	The high-speed standard called "3.5G." Maximum transmission speeds: Downlink: 14.4Mbps/ Uplink: 5.76Mbps.
IEEE802	Institute of Electrical and Electronics Engineers 802	IEEE 802 is a committee within IEEE established to promote the standardization of LAN systems. The name refers to the date of establishment, in the 2 nd month of 1980.
IMT-2000	International Mobile Telecommunications-2000	The 3-G (3 rd -generation mobile communication system) standards established by the ITU. There are currently six formats, including W-CDMA and CDMA2000.
LTE/UMB	Long Term Evolution/ Ultra Mobile Broadband	A high-speed standard called "3.9G". Maximum transmission speeds: Downlink: 100Mbps; Uplink: about 50Mbps. In 3GPP, it is referred to as "LTE", and in 3GPP2 as "UMB".
ITU	International Telecommunication Union	A specialized international agency in the field of telecommunications.
MAN	Metropolitan Area Network	A type of LAN that extends to the level of large cities. It is expected to be able to cover areas of around 50km in diameter.
MIMO	Multi Input Multi Output	Multiplexing technology that uses multiple antennas. Simultaneous communications are achieved over multiple channels using multiple antennas, so it is possible to increase the throughput in keeping with the number of antennas without increasing the band.
NGN	Next Generation Network	A new generation of communication networks.
WAN	Wide Area Network	Communication networks that operate over wide areas. Generally, this refers to wide area networks that use communication line services such as ISDN, packet exchange networks, and dedicated lines provided by communication carriers.
Wi-Fi	Wireless Fidelity	The logo given to products certified by the "Wi-Fi Alliance," an industry organization that confirms interconnectibility of wireless LAN products conforming to IEEE802.11a/11b.
WIMAX	Worldwide Interoperability for Microwave Access	The general term for wireless LAN standards as standardized by the IEEE802.16 committee.
3GPP/3GPP2	3rd Generation Partnership Project / 2	Both standardization organizations. 3GPP is in charge of standardization for W-CDMA systems, and 3GPP2 is in charge of standardization for CDMA2000 systems.

Empowered by Innovation

NEC