



# **The Future of All-IP Broadband Wireless Mobile Networks**

**ASWN 2004 Presentation  
August 11, 2004**

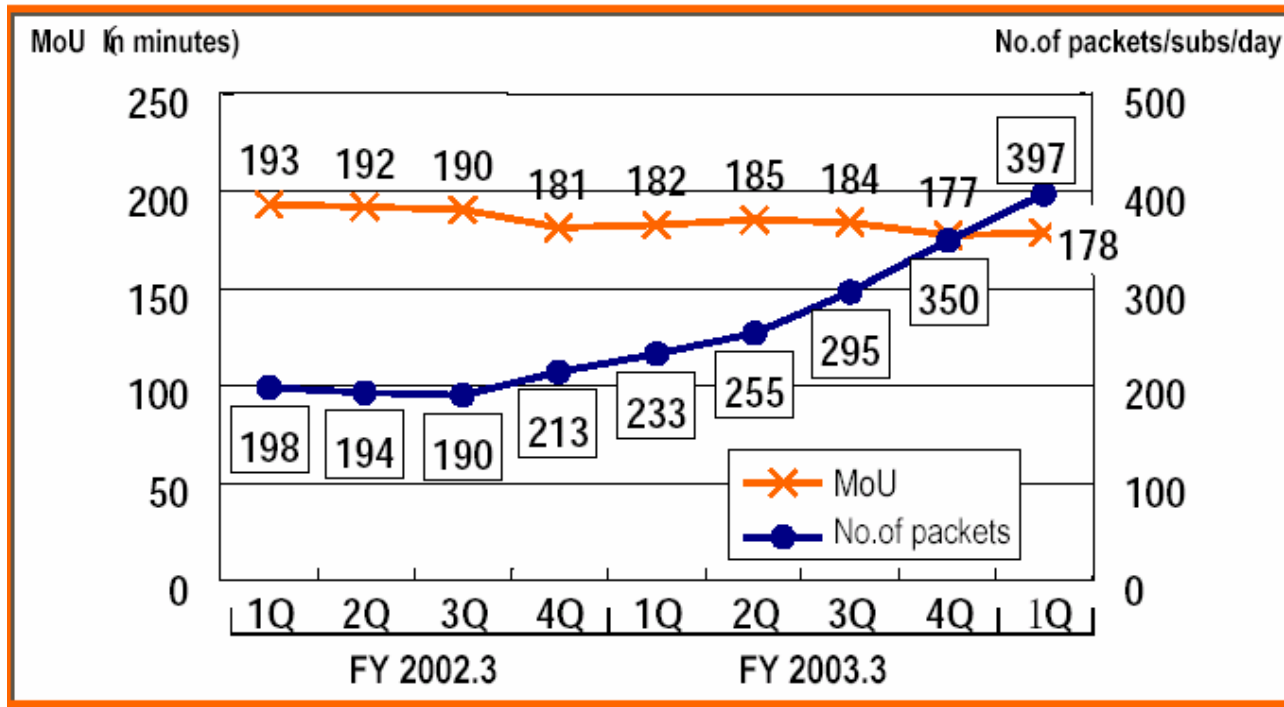
# Outline

- Market Trends
- Technology Evolution
- Emerging Services and Applications

# Market Trends

# The Growth of Data Traffic

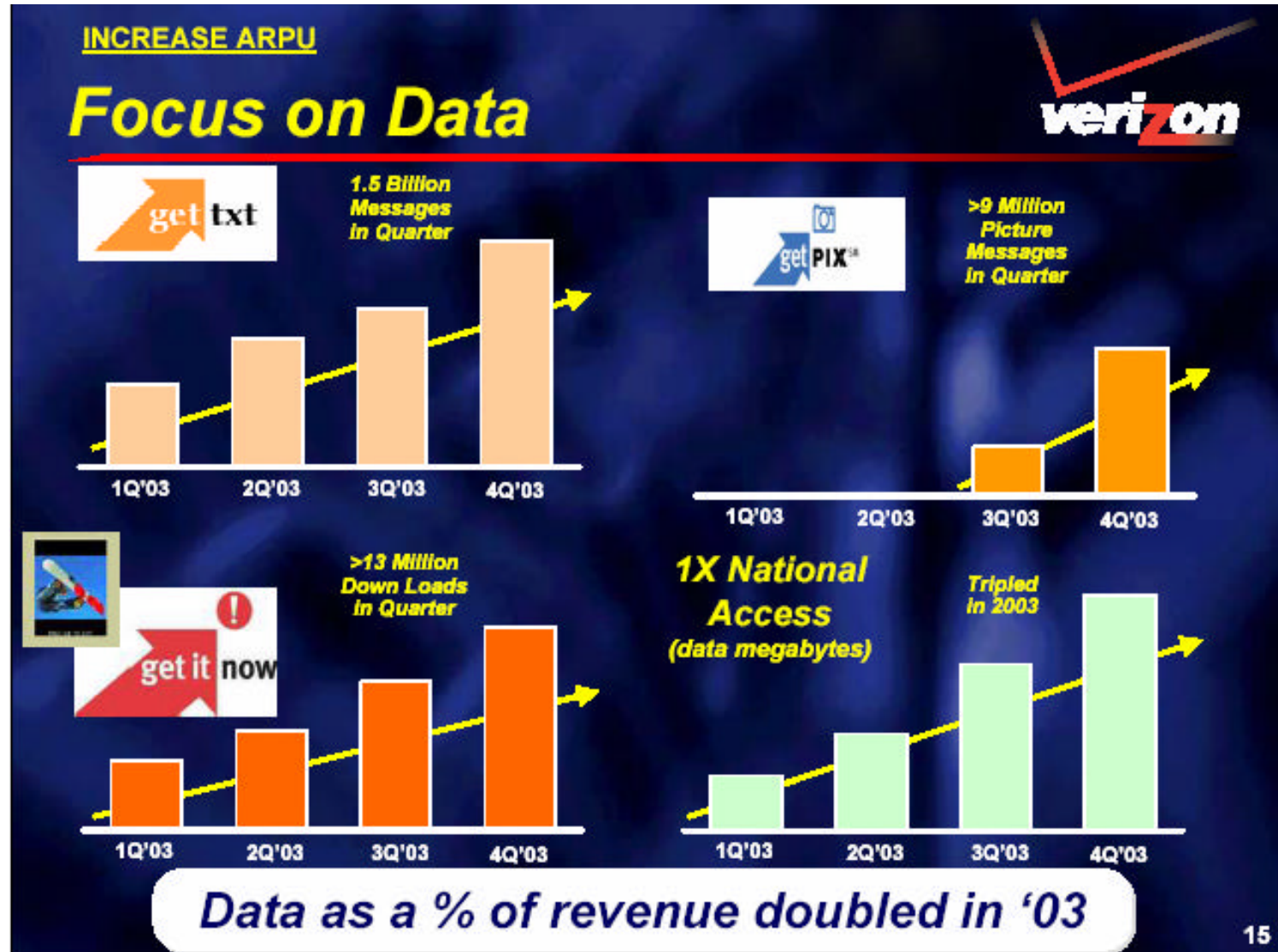
- Data Traffic is Growing. Voice Traffic is Stabilizing.
- It is not all about voice !!



Full-year <MoU: 189mins > <No. of packets: 202 >      <MoU: 182mins > <No. of packets: 286 >

Source: KDDI Q2'03 Investor Presentation  
A KDDI Packet = 128 bytes

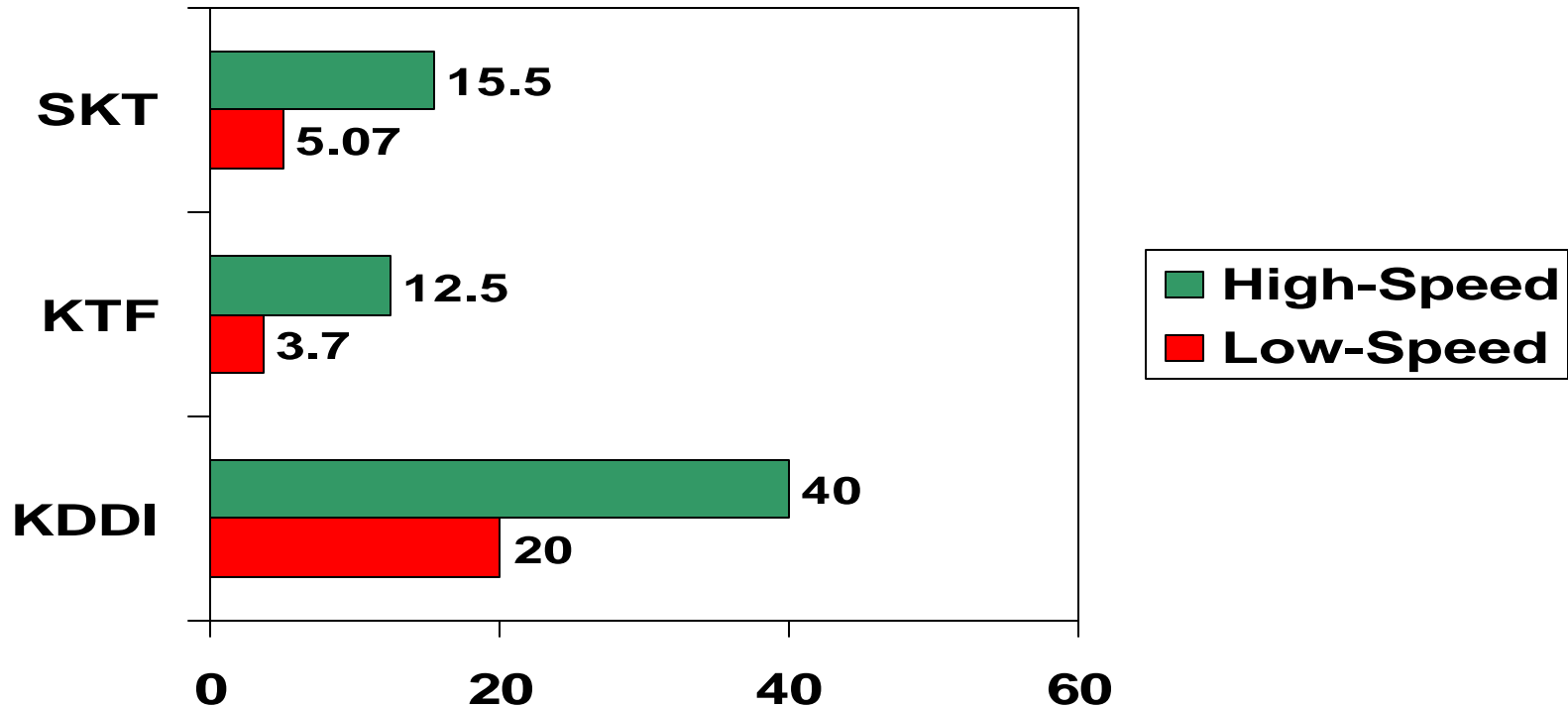
# The Growth of Data Traffic (Cont'd)



# The Growth of the ARPU

- Average Revenue Per User (ARPU) is Growing.
  - But: ARPU/MByte is declining.
  - While: Data Traffic Per User is Growing.
- ➔ Wireless Network Cost-Effectiveness is Key.

# The Growth of the ARPU (Cont'd)



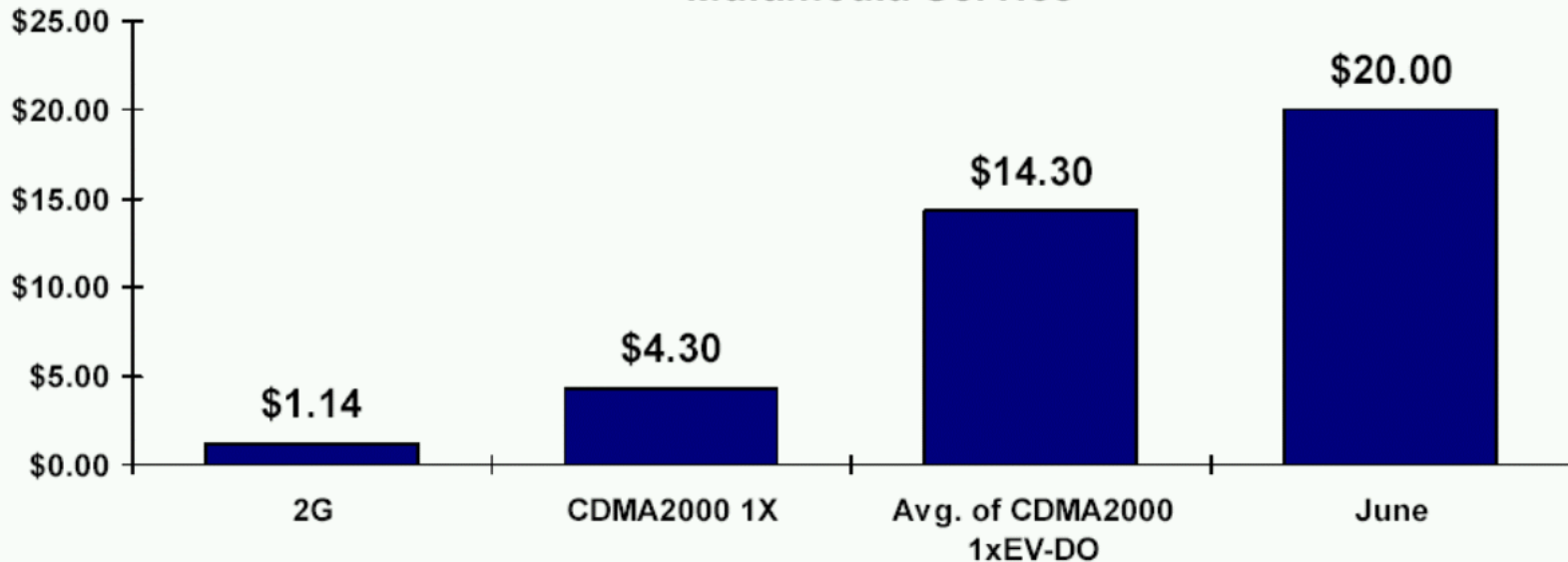
Source: Company websites and Q4'03 Investor presentations. ARPU converted to USD.

• High-Speed (1xEV-DO) ARPU of SKT, KTF and KDDI compared to each company's Low-Speed (1xRTT) data service.

# High-Speed Delivers 4-5X ARPU of Low-Speed Subscribers

## SKT's Data ARPU by Handset Type

'June' Data ARPU \$20.00, a CDMA2000 1xEV-DO-based Multimedia Service



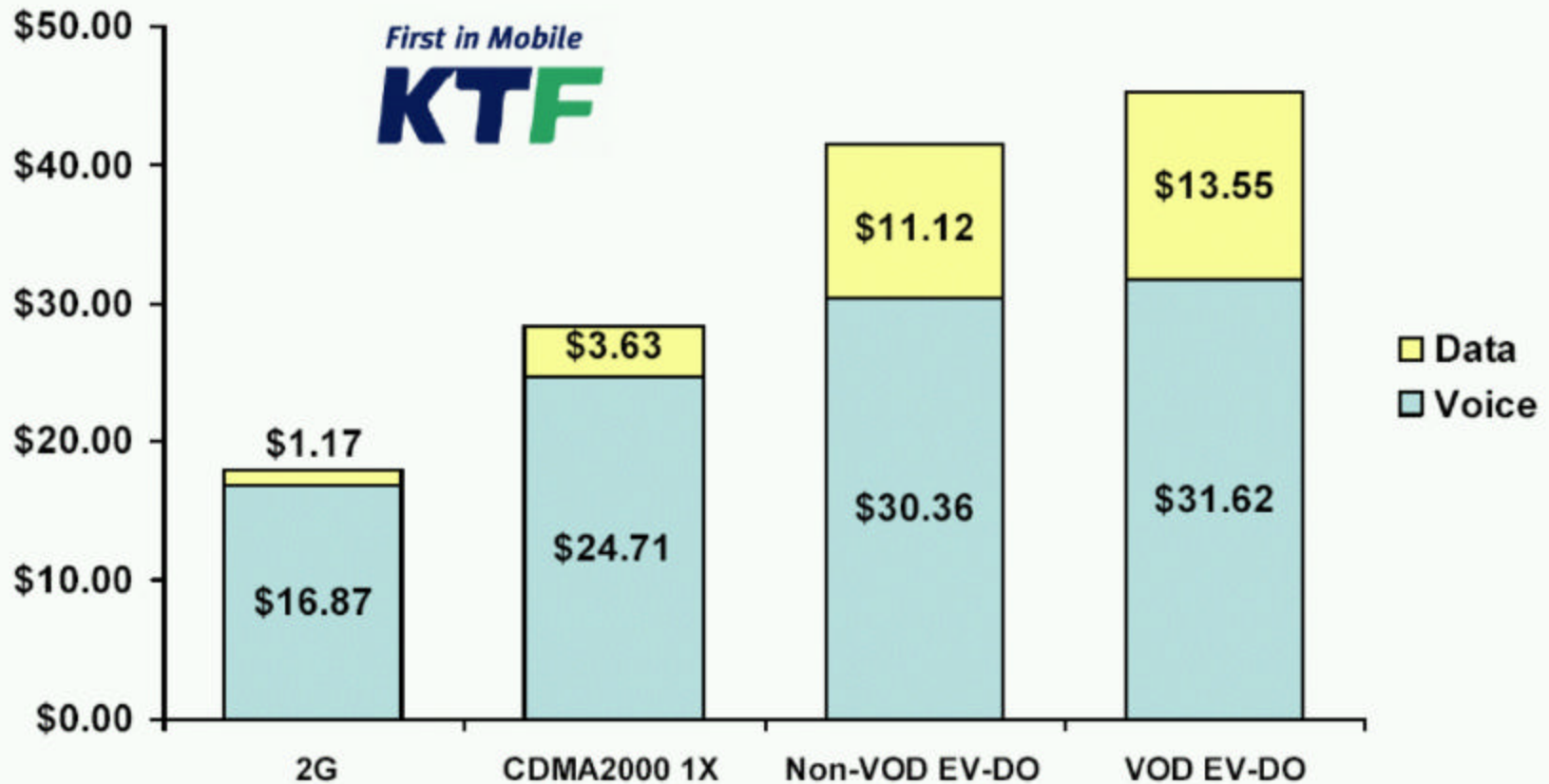
- SKT June users posted almost 4.5 times higher data ARPU than average data ARPU of CDMA2000 1X
- June subscribers use CDMA2000 1xEV-DO handsets with VOD or MOD function enabled
- June phones account for about 50% of SKT's total CDMA2000 1xEV-DO handsets

Source: 2003 SKT Company Presentation



# High-Speed Delivers 4-5X ARPU of Low-Speed Subscribers

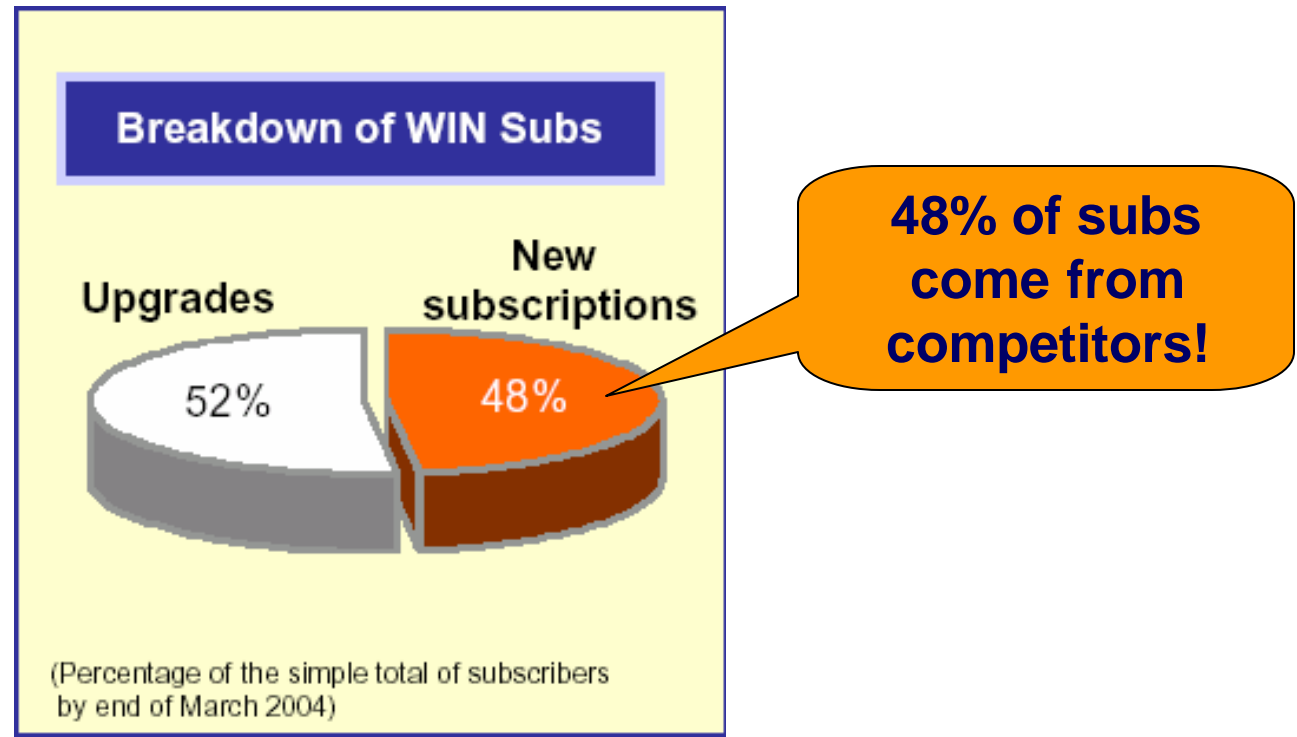
## KTF Monthly Voice and Data ARPU by Device Type Q4'03



Source: KTF Q4'03 Earnings Release

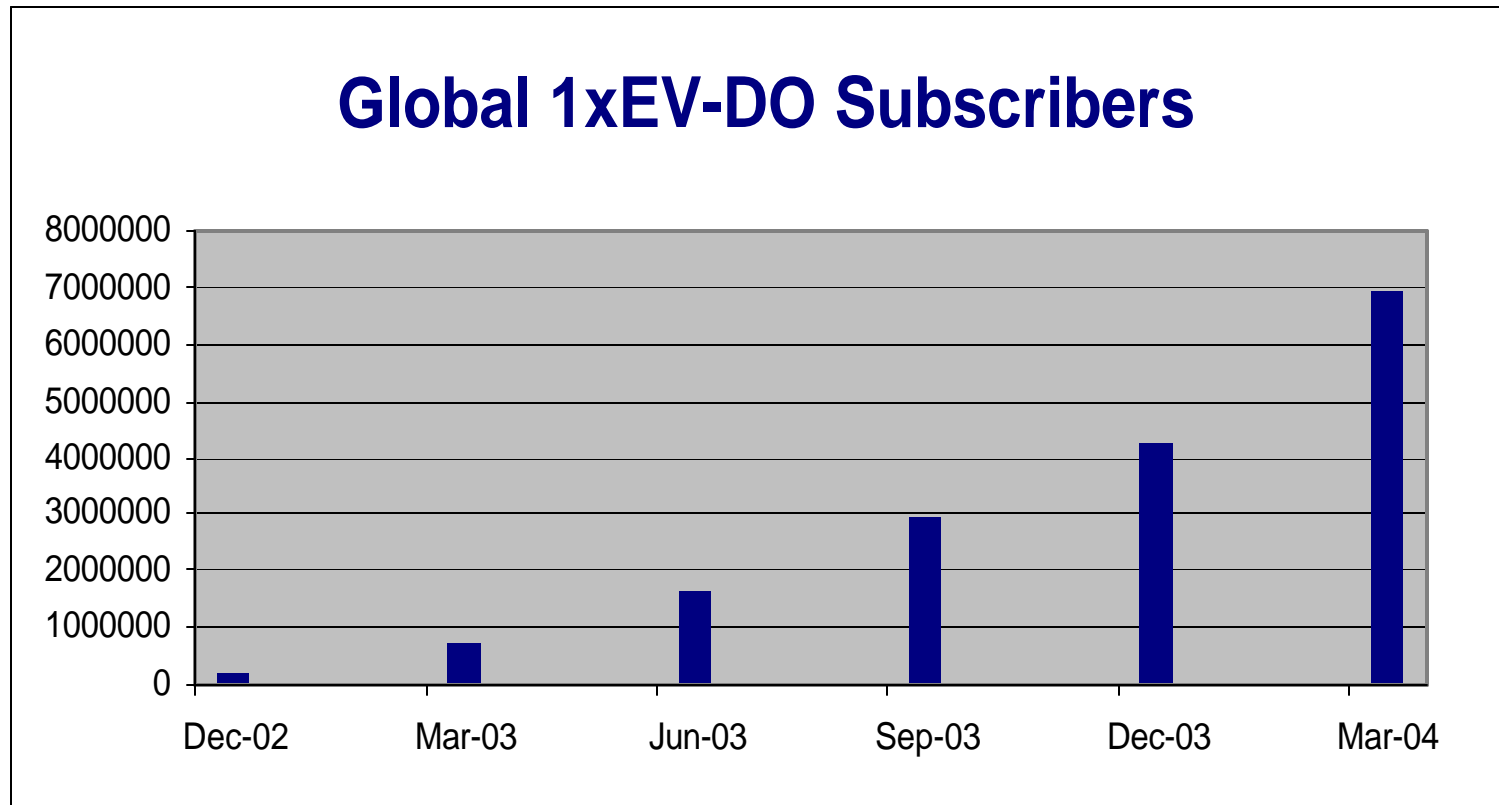
# The Effect of High-Speed on Subscriber Growth

- High-Speed data is attracting subscribers.
- High-Speed data is a major competitive advantage.



\*Source: KDDI Financial Results of the Fiscal Year ended March 2004, presented on Apr 28,2004

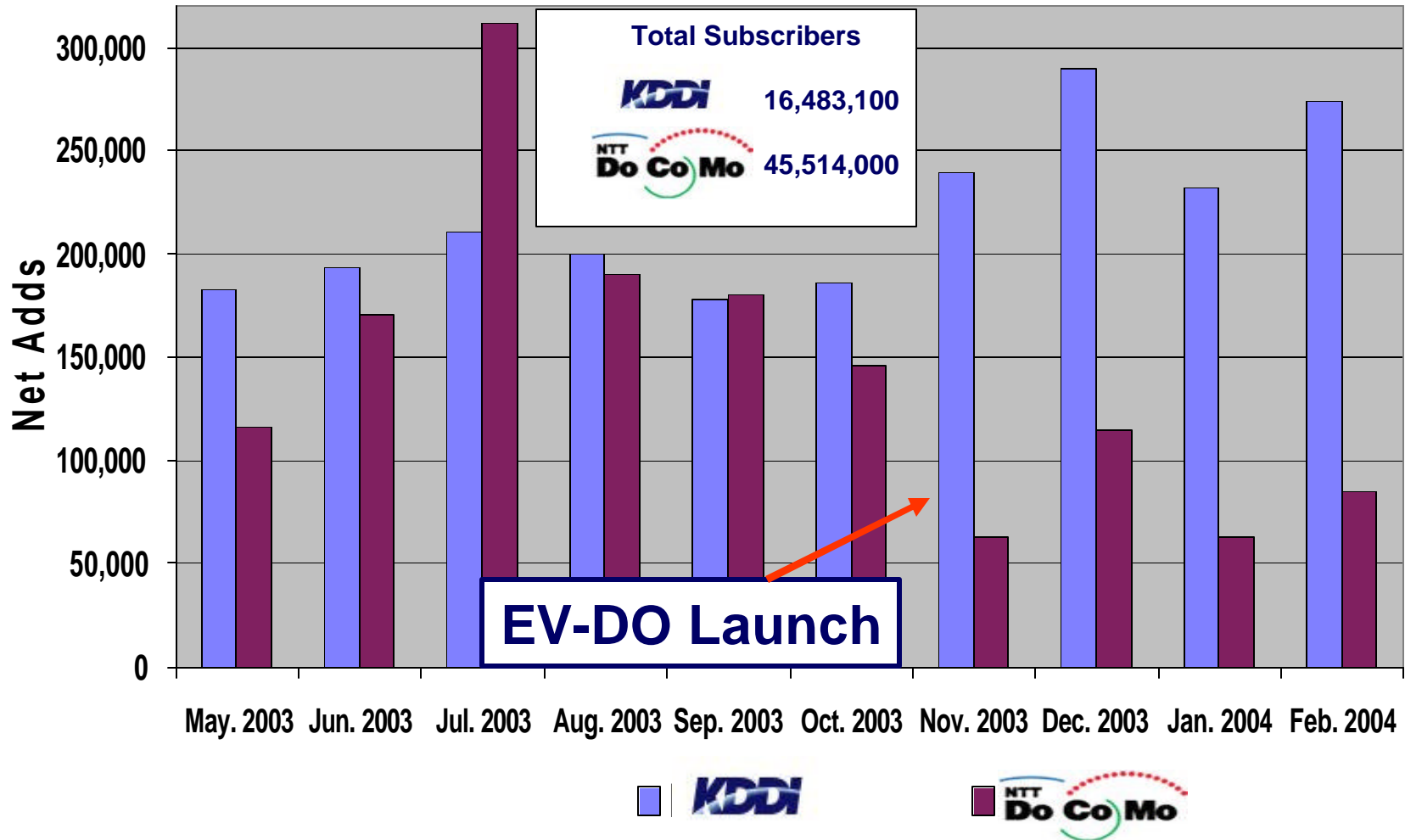
# The Effect of High-Speed on Subscriber Growth (Cont'd)



### Highlights

- Almost 7 million by March 31, 2004.
- KDDI added 350,000 subscribers within 4 months of launch.

# The Effect of High-Speed on Subscriber Growth (Cont'd)



# Technology Evolution

# 3G Technology Summary

Description	CDMA (1xEV-DO Rel-0)	CDMA (1xEV-DO Rel-A)	CDMA (1xEV-DV)	WCDMA (Rel-99)	HSDPA (Rel-5)
Downlink Speed	2.4 Mbps	3.0 Mbps	5 Mbps	2 Mbps	14.4 Mbps
Uplink Speed	300 Kbps	1.8 Mbps	1 Mbps	384 Kbps	384 Kbps
Voice Support	No VoIP	VoIP	CS, VoIP	CS, No VoIP	VoIP
Spectrum Used	1.25 MHz	1.25 MHz	1.25 MHz	5MHz	5 MHz

CS: Circuit Switched

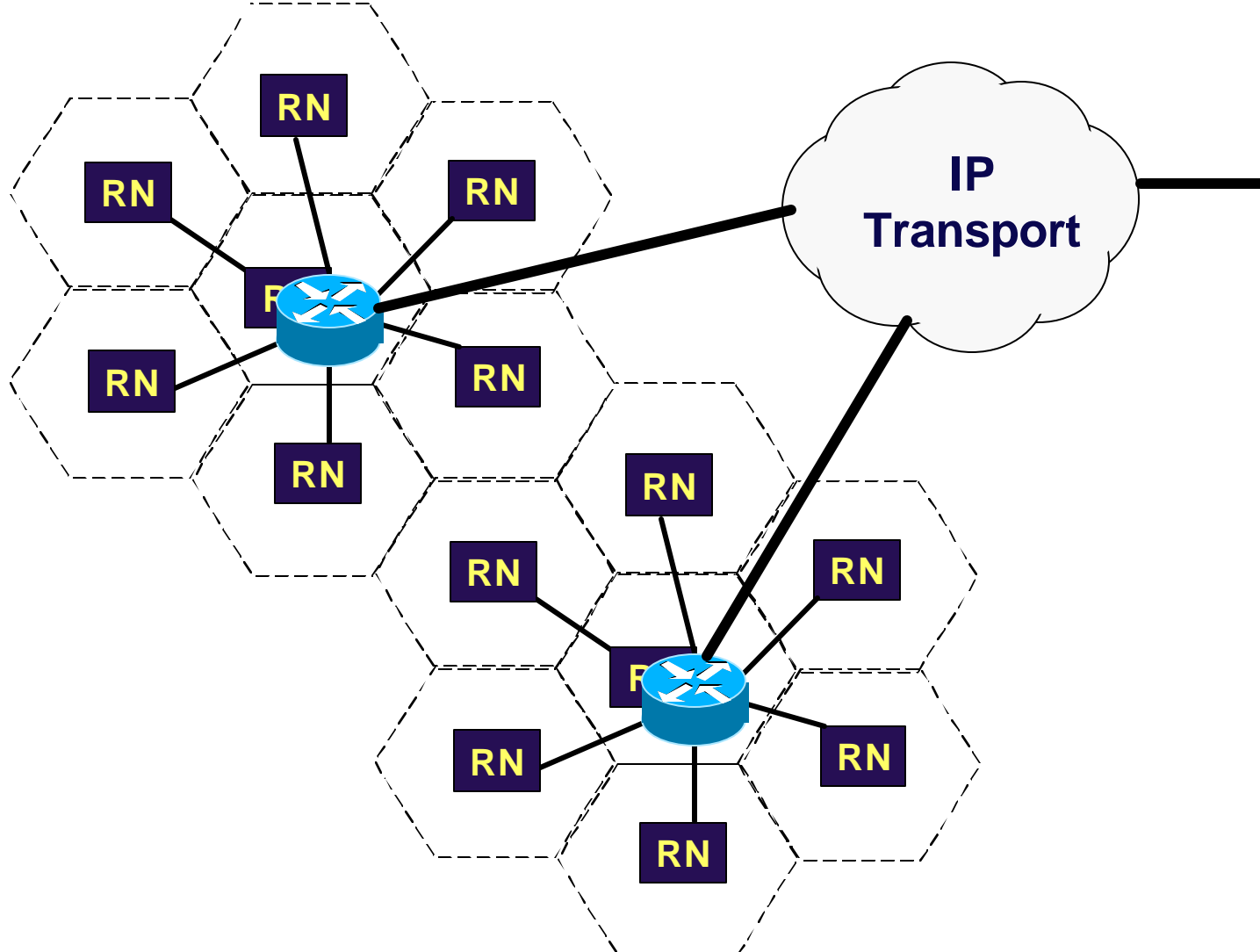
# The All-IP Architecture

- The traffic on broadband wireless networks is increasingly IP.
- A huge number of companies develop IP software.
- Standardization yields cost effectiveness.
- No single company can or needs to develop all the software needed for a broadband wireless network.

➔ The All-IP Architecture.

# AI-IP Architecture Benefits

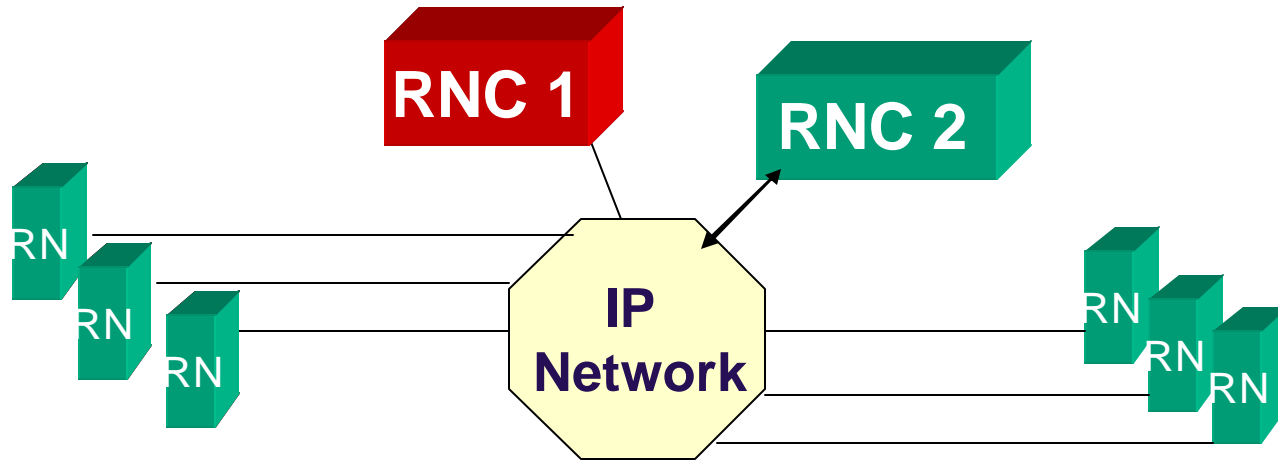
- IP reduces the cost of the Data Backhaul Network





# All-IP Architecture Benefits (Cont'd)

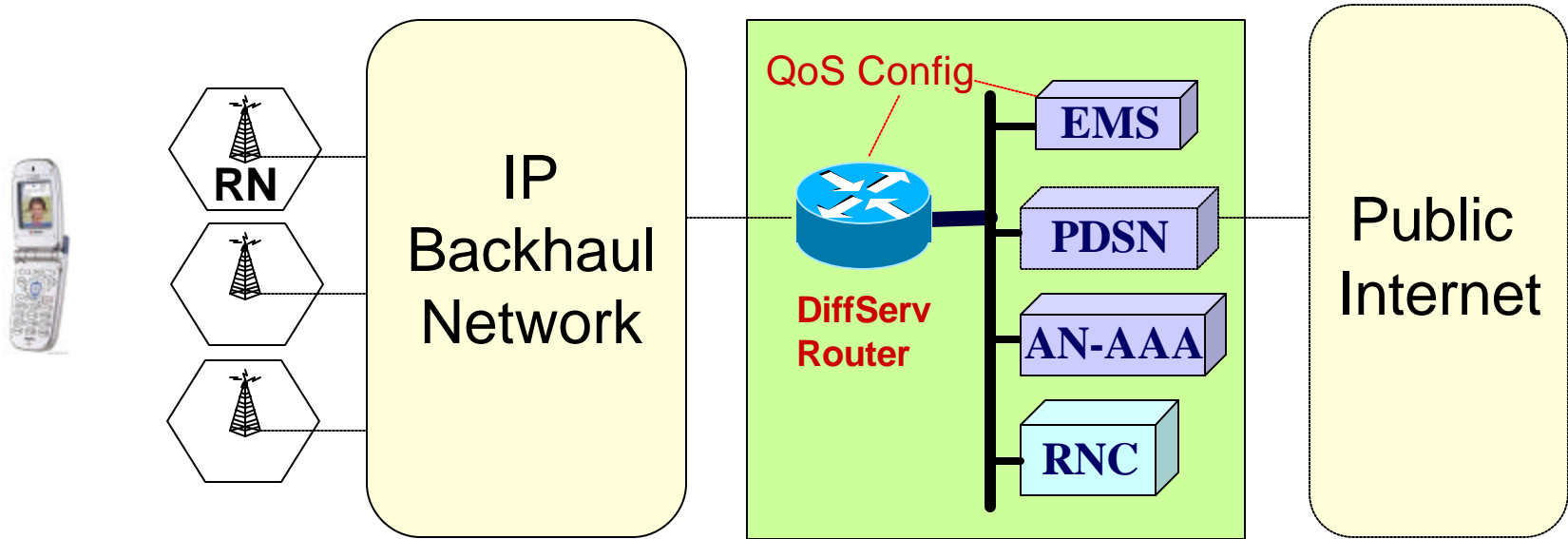
- IP Routing Increases Network Reliability/Availability



**Dynamically connect to an alternate Radio Network Controller (RNC) if an RNC fails**

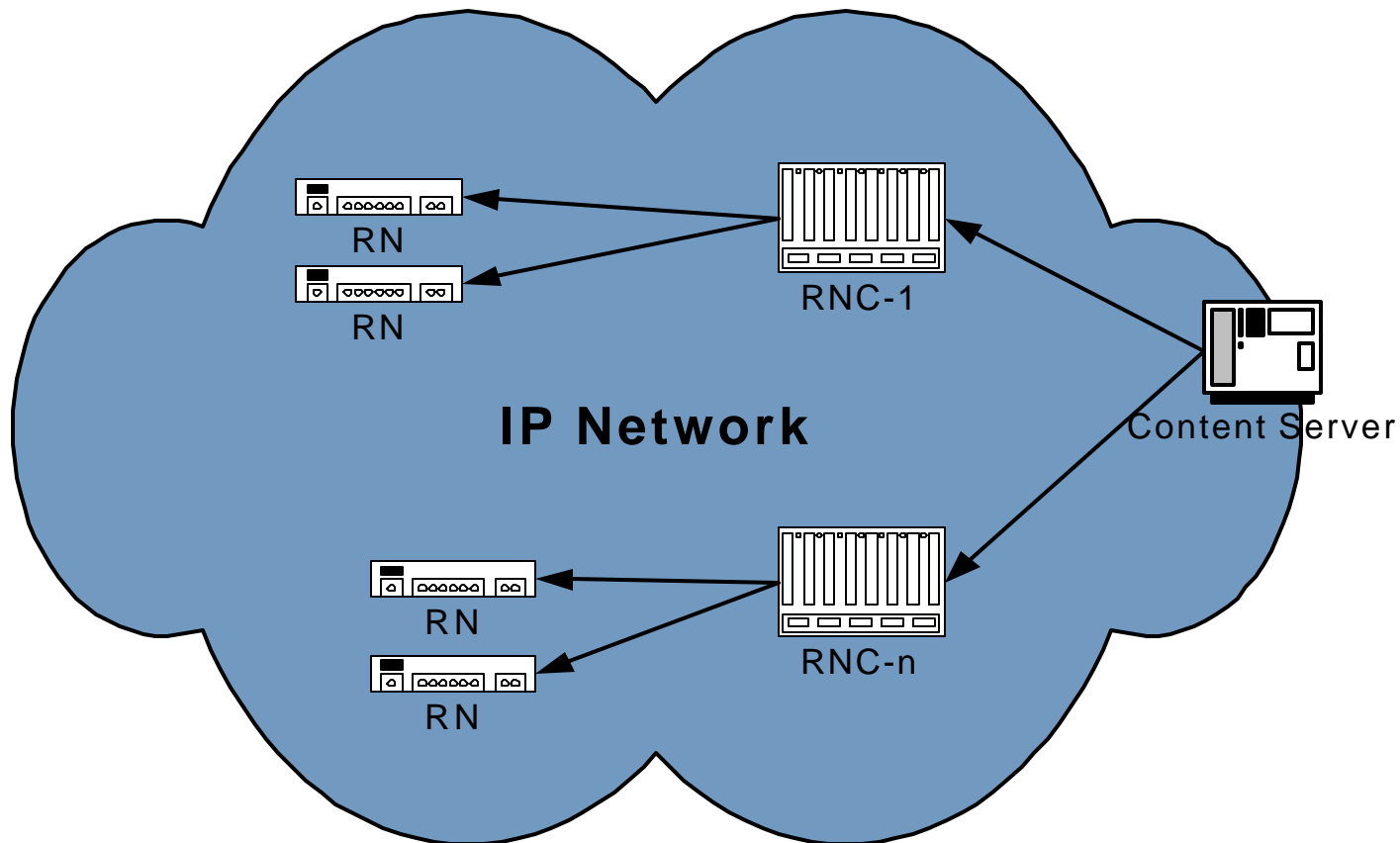
# All-IP Architecture Benefits (Cont'd)

- An All-IP Architecture enables network operators to leverage existing IP-based QoS technologies.



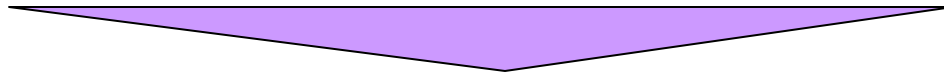
# All-IP Architecture Benefits (Cont'd)

- An All-IP Architecture enables network operators to leverage existing IP-Multicast technologies to provide Multimedia Services.



## Technology Summary

- Allow the system to apply different treatment (e.g., retransmission overload control and scheduling) strategies to different flows.
- Control latency during heavy load by prioritizing delay-sensitive traffic over other traffic.
- A single subscriber can simultaneously use different applications with different QoS rating.



## Value Proposition

- Enables operators to launch delay-sensitive services such as Push-to-talk (PTT) and Push to Media.
- Enables operators to launch carrier-grade VoIP.
- Subscribers can simultaneously use PTT (or VoIP), access the web, and email.
- Enables operators to offer preferential network performance to customers who pay more (e.g. enterprise laptops over handsets).

# QoS Benefits

## ■ Customer Segmentation

- Deliver different services and network performance to different customer segments.
- Gain flexibility in creating data pricing plans.



### \$50/month: Enterprise Plan

- Unlimited data access
- No Rate Limit
- Priority in scheduler
- Priority in overload conditions
- Not delay sensitive



### \$15/month: Handset Plan

- Unlimited data access
- Max Rate = 300 kbps
- Not delay sensitive
- Low priority in scheduler
- Low priority in overload conditions



### \$20/month: PTT and Multimedia Plan

- Unlimited data access
- Max Rate = 300 kbps
- Support for PTT traffic

# QoS Benefits (Cont'd)

- Enables operators to introduce New Applications:
  - Industry-leading Push-to-talk
  - Voice over IP (VoIP):
    - With performance comparable to that of circuit-switched voice
    - With capacity exceeding that of circuit-switched voice.

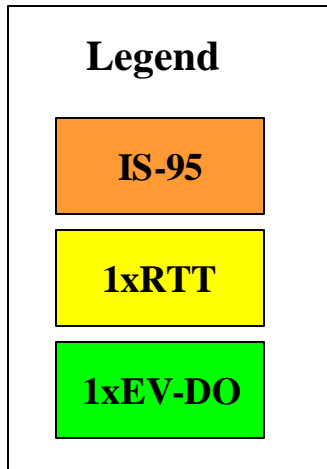
# Emerging Services and Applications

# Evolution of Personal Communications





# Outlook: CDMA Applications & Services



Telephony

Push-To-Talk  
 Camera Phone  
 Notebook PC Access  
 Web Content  
 Telephony

Video On Demand  
 Fixed Broadband  
 Push-To-Talk  
 Camera Phone  
 Notebook PC Access  
 Web Content  
 Telephony

On-Line Gaming  
 Broadcast Video  
 Multimedia Messaging  
 Video On Demand  
 Fixed Broadband  
 Push-To-Talk  
 Camera Phone  
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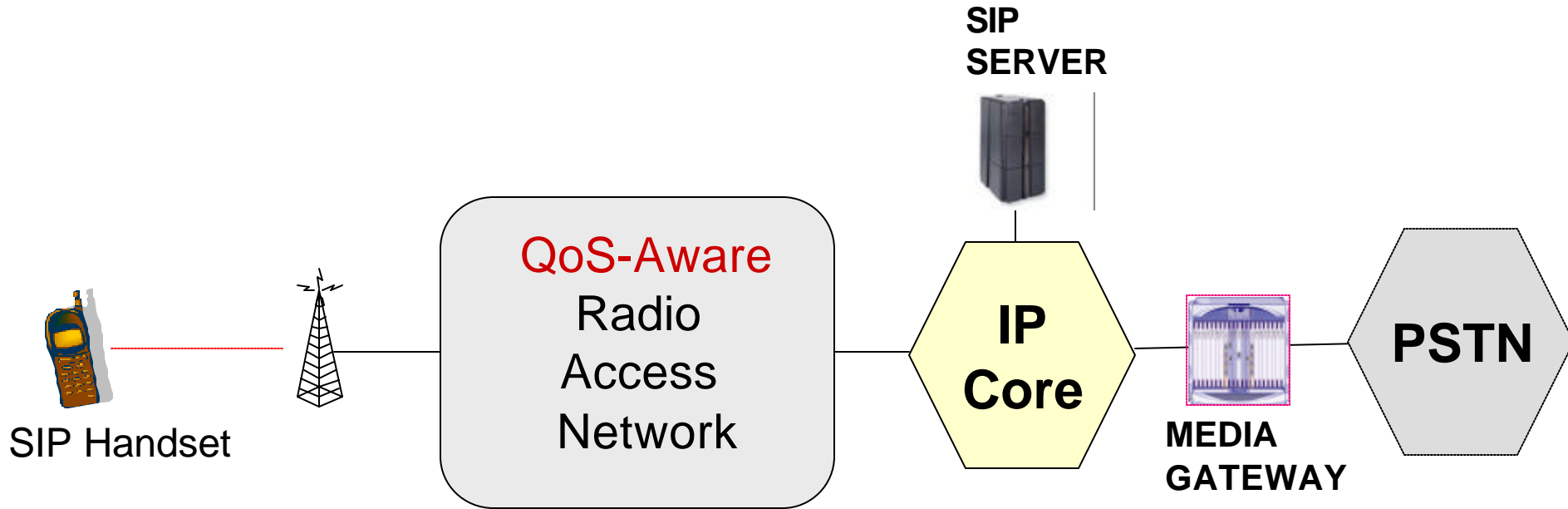
On-Line Gaming  
 Broadcast Video  
 Multimedia Messaging  
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 Camera Phone  
 Notebook PC Access  
 Web Content  
 Telephony



# Why Push to Talk on 3G Wireless Networks?

- **Push-to-talk (P2T) is a differentiated service**
  - Nextel, the only operator to have P2T for over 10 years, leads US Wireless Industry in ARPU and churn.
  - P2T is being launched by operators worldwide as a packet data application on 2.5G (1x and GPRS) networks.
- **Push-to-talk over 2.5G Packet Data Networks**
  - 2.5G networks have limited data capacity – insufficient if application takes off.
  - Consumers expect P2T calls to cost less than regular voice calls but 2.5G networks deliver packet data at the expense of voice capacity.
- **Push-to-talk over 3G Wireless Networks**
  - Offers a high-bandwidth, spectrally efficient, data channel to deliver P2T.
  - Enables operators to offer enhanced P2T services – like Push-to-Media – that leverage the high-bandwidth and the proliferation of multimedia devices.

# Voice over IP (VoIP)



- QoS with Flexible Priority Scheduling
- Fast Physical Layer Retransmission for Reliability with QoS
- Fast Sector Switching for Mobility
- Efficient Multiplexing & Header Compression for high capacity

# Why VoIP on Future Wireless Networks?

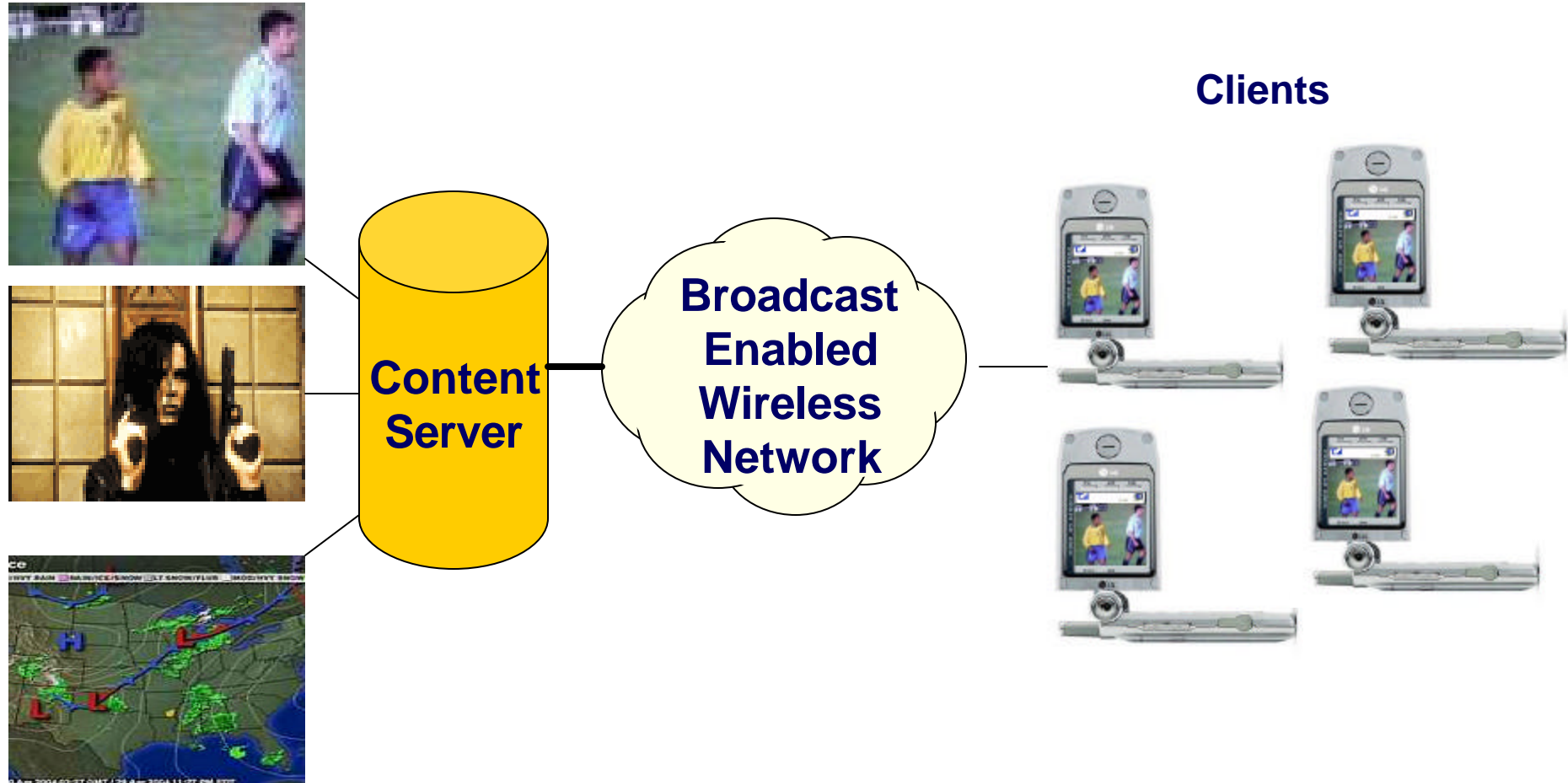
- **Carrier VoIP has very strong momentum on wire-line networks.**
  - **Enhanced Voice Services.**
  - **Common services platform across all markets.**
  - **Lower Operating Expenses.**
  - **Competition from Cable and Startups.**
- **Operators want VoIP to work over Wireless**
  - **Operators with both wired and wireless networks want to offer unified suite of enhanced voice features.**
  - **Operators with both wired and wireless networks reduce operating expenses.**
  - **Wireless-only operators need VoIP, if their competitors launch it.**

# VoIP Delivers Feature-Rich Voice

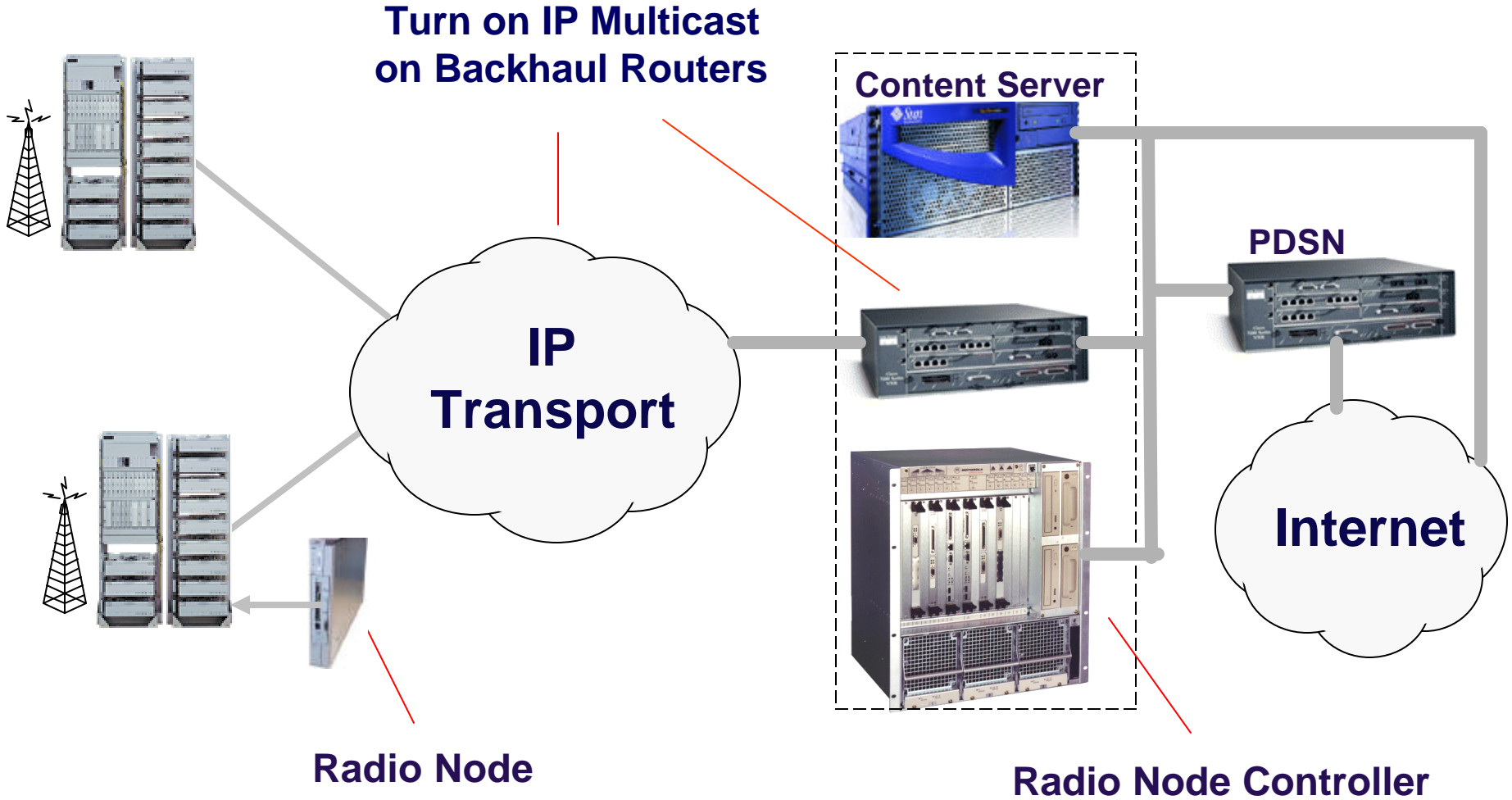
## Exemplary features enabled by VoIP

<i>Enhanced Voicemail</i>	<ul style="list-style-type: none"><li>▪ Retrieve voicemail as email.</li><li>▪ Group voicemails and “talking emails”.</li></ul>
<i>Call Logs</i>	<ul style="list-style-type: none"><li>▪ Online personal call manager.</li><li>▪ Remembers phone numbers, for organization.</li></ul>
<i>Do not Disturb</i>	<ul style="list-style-type: none"><li>▪ No incoming calls.</li></ul>
<i>Locate Me</i>	<ul style="list-style-type: none"><li>▪ Home phone will ring up to five phones in sequence to find subscriber.</li></ul>
<i>Personal Conferencing</i>	<ul style="list-style-type: none"><li>▪ Conference call for up to 9 people (9-way calling).</li></ul>
<i>Speed Dial</i>	<ul style="list-style-type: none"><li>▪ Network-assisted speed dial.</li></ul>
<i>Number for Life</i>	<ul style="list-style-type: none"><li>▪ Phone number independent of location.</li></ul>

# Broadcast Services



# Broadcast Services Deployment



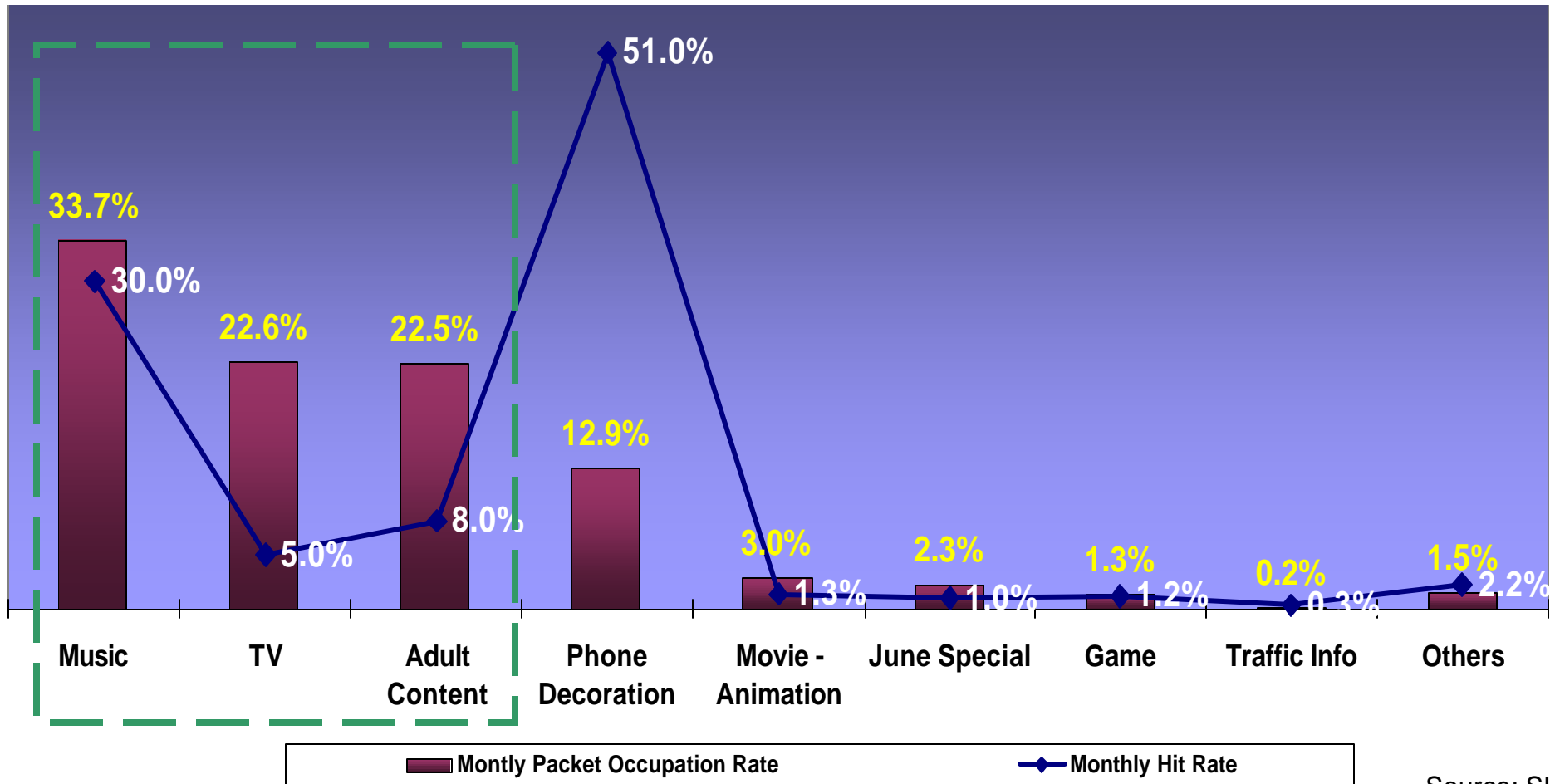
# Why Broadcast on Future Wireless Networks?

- Multimedia Traffic over High-Speed Networks increases the Average Revenue Per User.
  - SK Telecom: In 2003, Premium Multimedia increased 1xEV-DO ARPU from \$13.9 to \$19.45.
  - KTF: In 2003, Video on Demand (VoD) increased 1xEV-DO ARPU from \$10.50 to \$17.3
- Multimedia brings Differentiation.



# But Multimedia Downloads are Bandwidth intensive

In South Korea, Music, TV and Adult Content account for 43% of hits but 78.8% of network usage



Source: SKT

# Broadcast Transforms Economics of Multimedia Business Model

- Operators can push multimedia to mass audiences or large groups
  - Makes multimedia-content delivery over wireless links scalable, provides Cable TV-like business model.
  
- More efficient compared to unicast on-demand access
  - Efficient over the air.
  - Efficient in network nodes.
  - Efficient in backhaul.
  - Efficient in servers.
  
- Broadcast increases the profitability of the wireless multimedia delivery business model.
  
- Instant delivery of event-triggered content (breaking news, sports, emergencies, weather advisories).
  
- Store and Playback Content models in which time-insensitive content (Soap operas, music videos) is broadcast at off-peak hours.

# The Future

- ARPU: ↗
  - ARPU/Mbyte: ↘
  - Circuit-Switched Voice Traffic: ↘
  - IP Traffic: ↗
- 
- Services and Applications will become All-IP.
  - Wireless Networks will become less Air-Interface-Specific and more IP-based.

**Thank you!**