Traffic Patterns & Applications
Impact to 3G High Speed Data Network

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Outline

- Objectives
- 3G HSD - Supply vs. Demand
- What marketing folks predicted?
- What field traffic data revealed?
- How is the traffic and usage patterns affect the network design?
- Closing Remarks

Disclaimers:

1. Vendors' names, markets/service areas, etc. have been removed from the charts to avoid infringement of IP.
2. Opinions expressed do not represent company's policy or business strategy.

Objectives

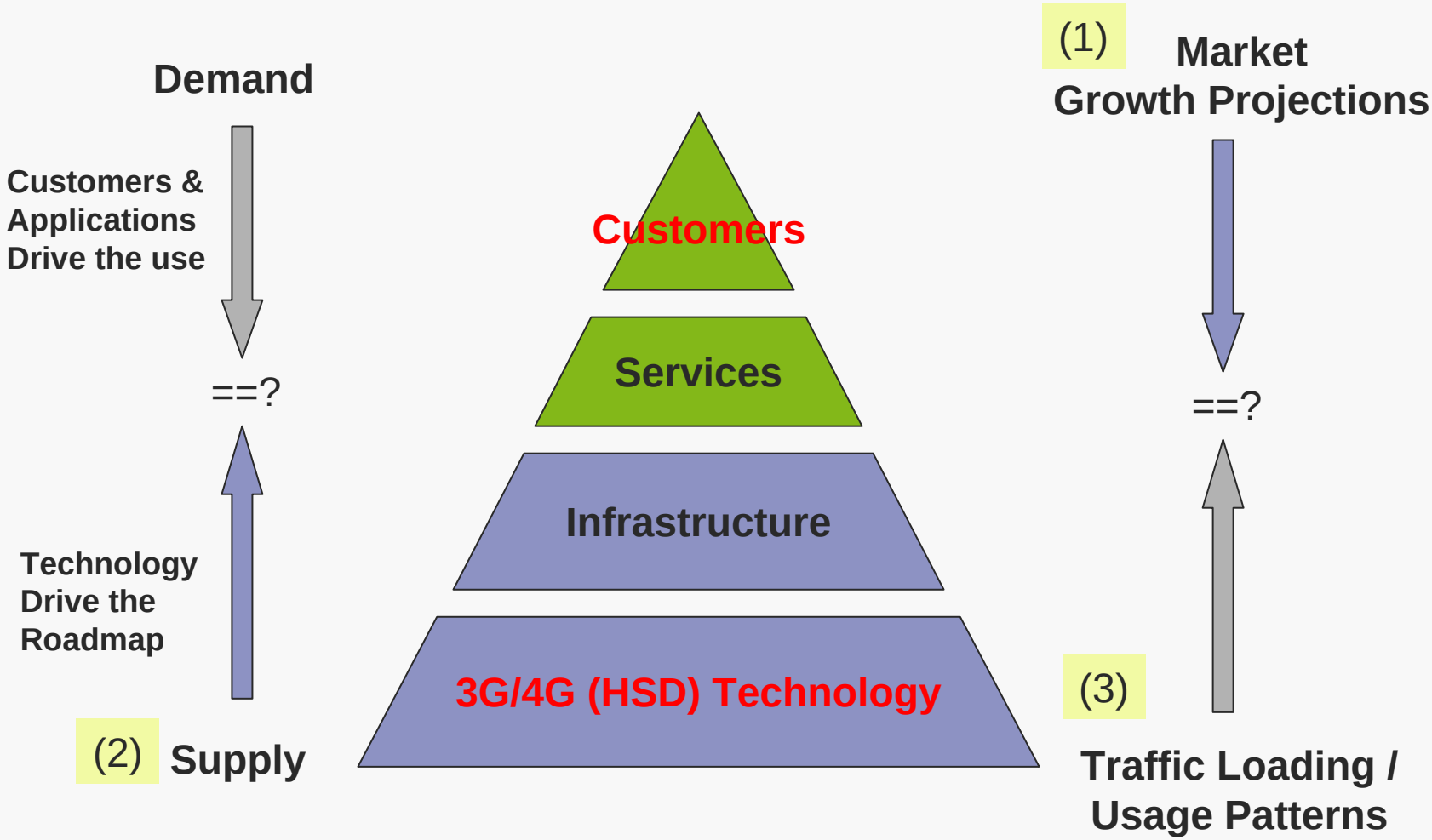
In this talk, I will NOT -

- Talk about the history of wireless
- Discuss the 3G standards or network designs
- Compare the two competing 3G technologies

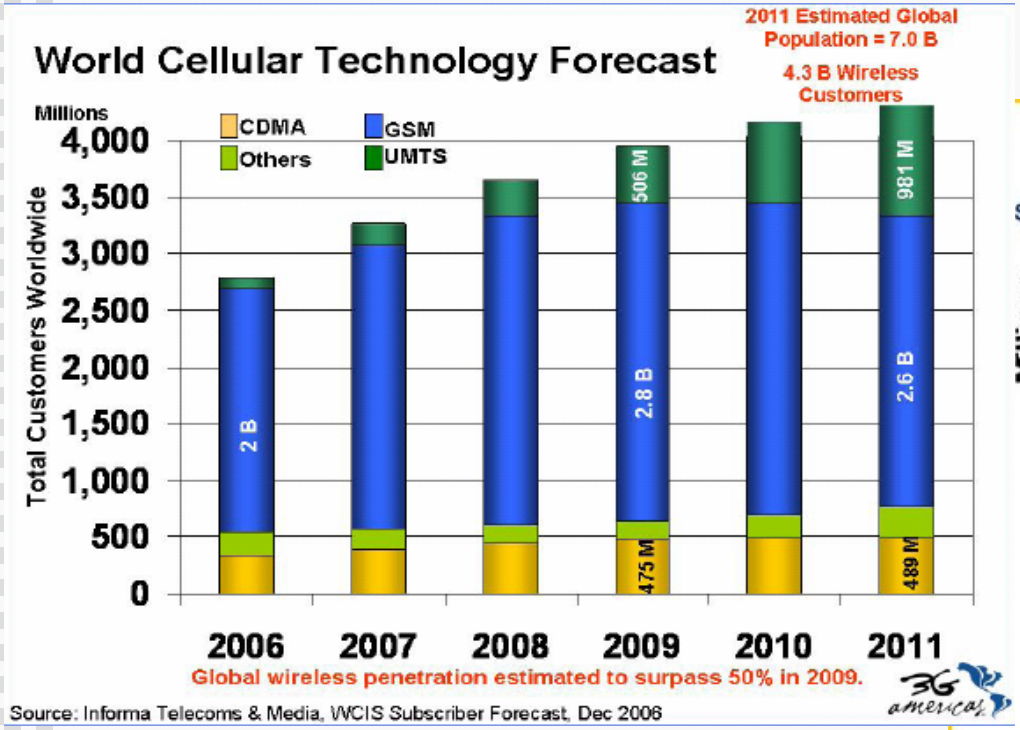
What I will talk about IS -

- 3G network deployment
- 3G data traffic/usage patterns
- Impact to the 3G data network due to usage pattern

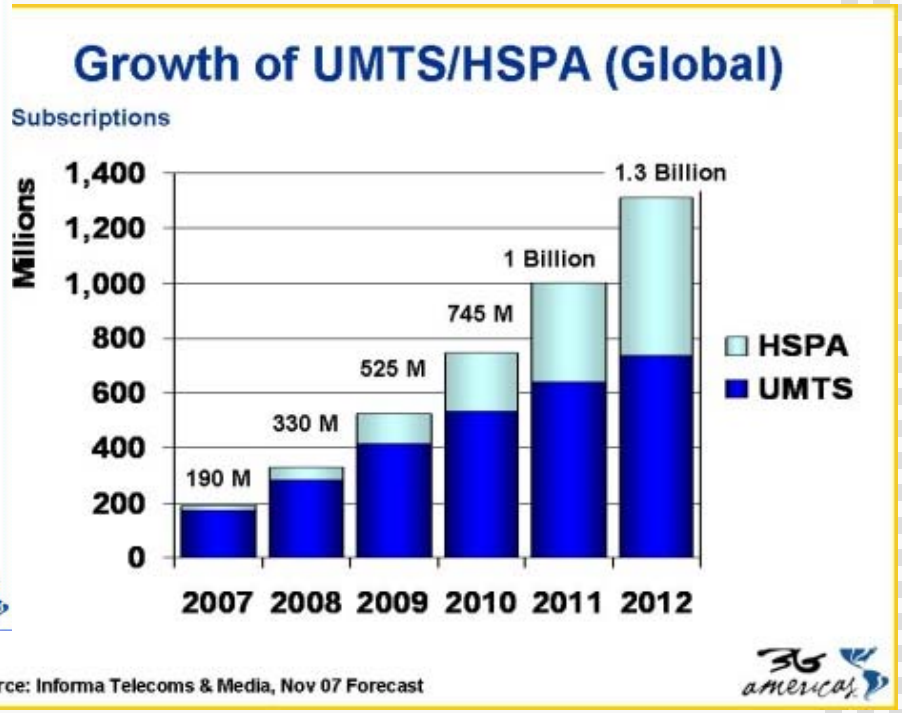
3G HSD - Supply vs. Demand



(1) - What Marketing Folks Said? (Market Growth Projections)



(Subscriber growth =? Usage growth)



Wireless business continue to grow as projected. Switching from 2G to 3G takes place as service providers start migrating their networks. As the voice traffic is approaching the saturation stage, service providers are depending on Mobile Broadband (HSD) Service to bring in new revenue.

(1) - Data Service Plans

How does service providers charge data users?

- By data volume: eg. $$$/MB or all-you-can-eat data plan (most common)
- By # of messages: eg. SMS
- By service types: eg. Mail, Music download, GPS Navigation
- By # of calls: eg. PTT, VoIP

So, what applications dominate the services?

- Mail
- Text Messaging (Short Message Service)
- Value Added Services, eg. Music/Ring Tone download

Successful market stories point to the high call volume (text messaging, email, etc.)

(2) - 3G/4G (HSD) Technology

3G Data Common Design Goals:

- Data Rate: **Higher data rate** (better user experience), Better efficiency
- Cost: **Lower deployment cost**, All IP-based core networks
- Service Quality: Support **QoS**, Support delay-sensitivity applications

UMTS(3G) / LTE(4G):

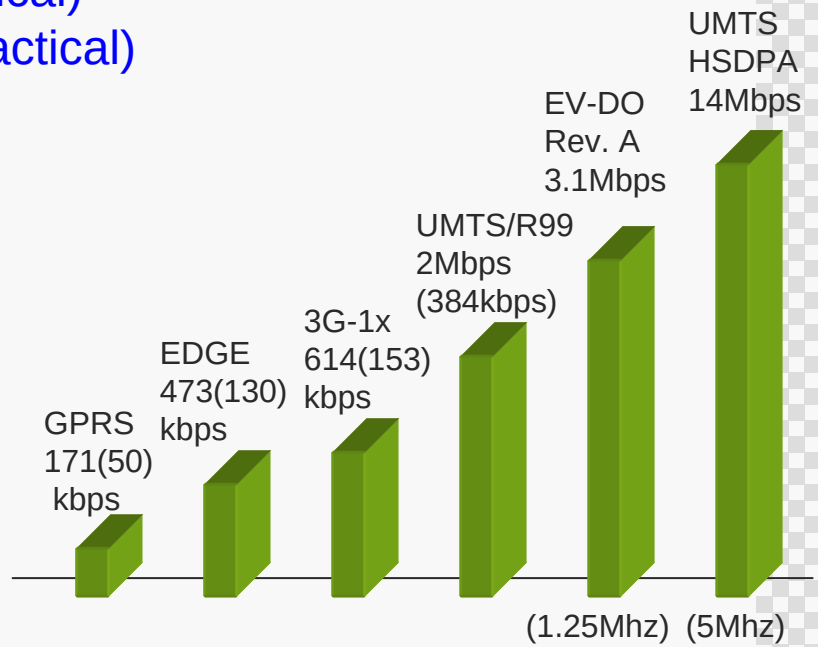
- R99: 2Mbps(peak) / 384kbps(practical)
- R5-HSDPA/DL: 14Mbps / 3.6Mbps(practical)
- R6-HSUPA/UL: 5.76Mbps / 1.5Mbps(practical)
- R7-MIMO/OFDM: HSPA+
- R8-LTE: 100Mbps (DL) / 50Mbps UL

1xEV-DO(3G) / UMB(4G):

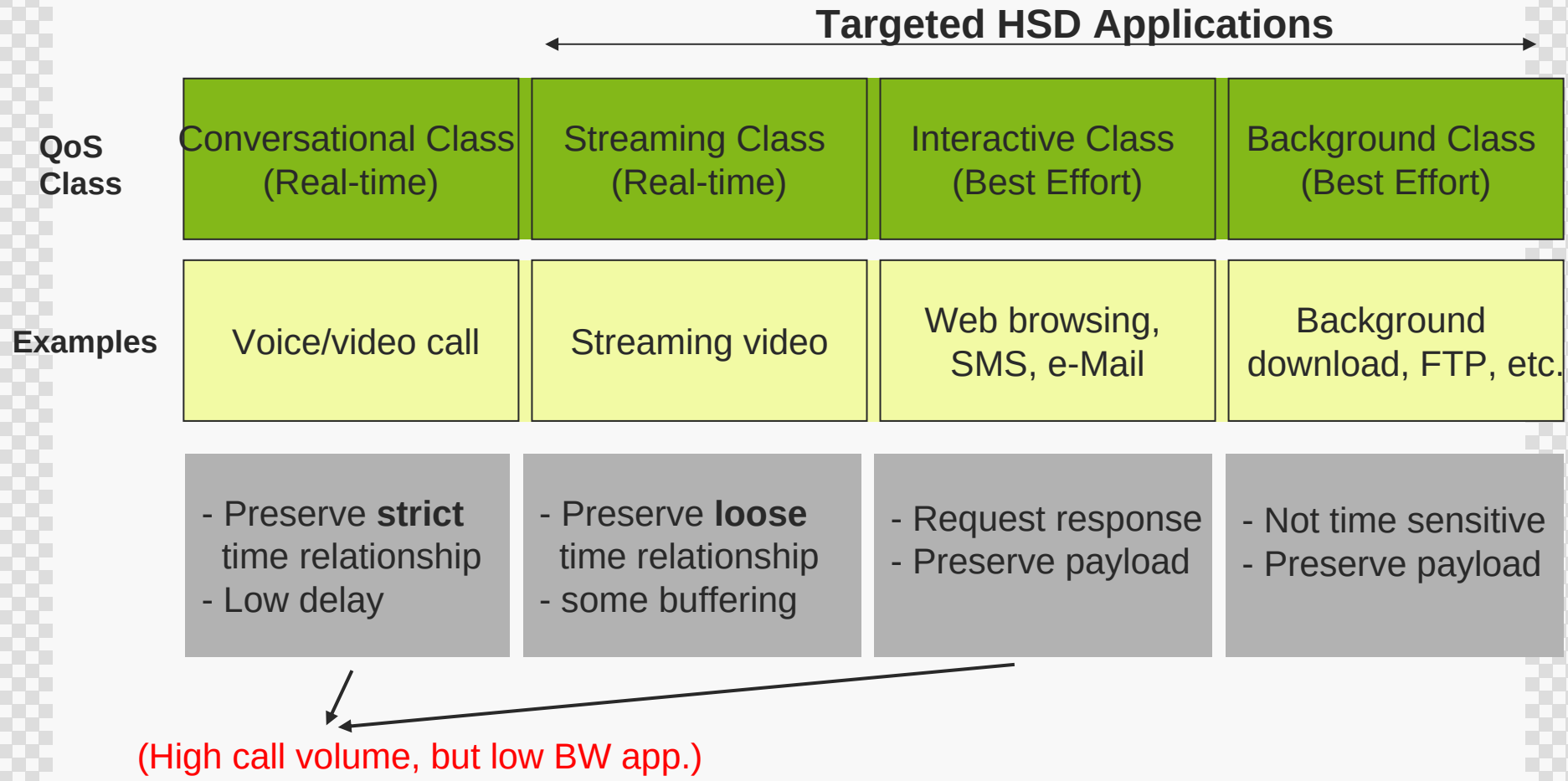
- Rev.0: 2.4Mbps DL / 153kbps UL
- Rev.A: 3.1Mbps DL / 1.8Mbps UL
- Rev.B (MC-DO)
- UMB: 100Mbps (DL) / 50Mbps UL

WiMax(4G):

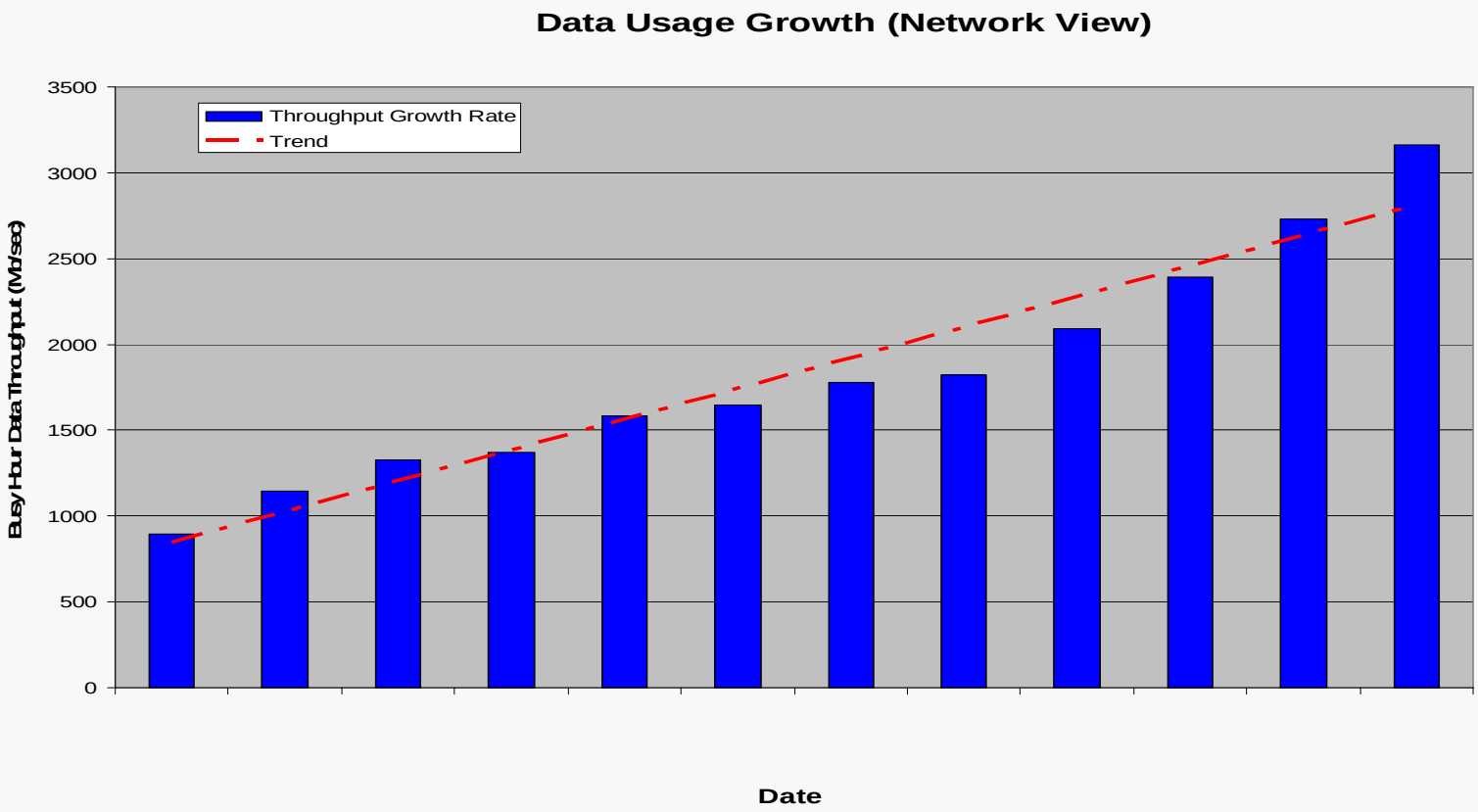
- 802.16e: 78Mbps (DL) / 20Mbps UL



(2) - QoS Classes and HSD Targets



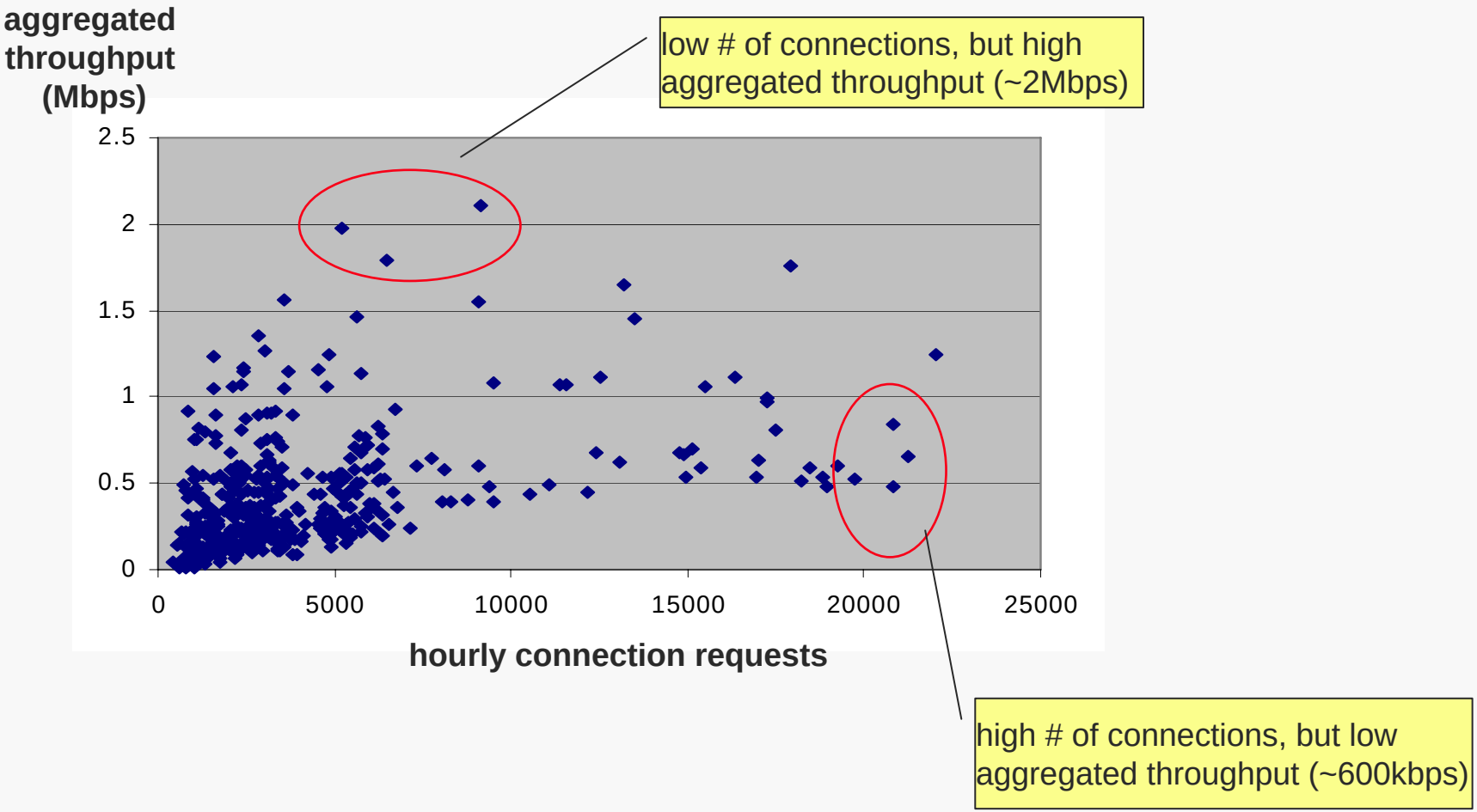
(3) - Data Usage Growth Pattern



3G data usage growth is steady; annual data usage growth rate is ~3x.

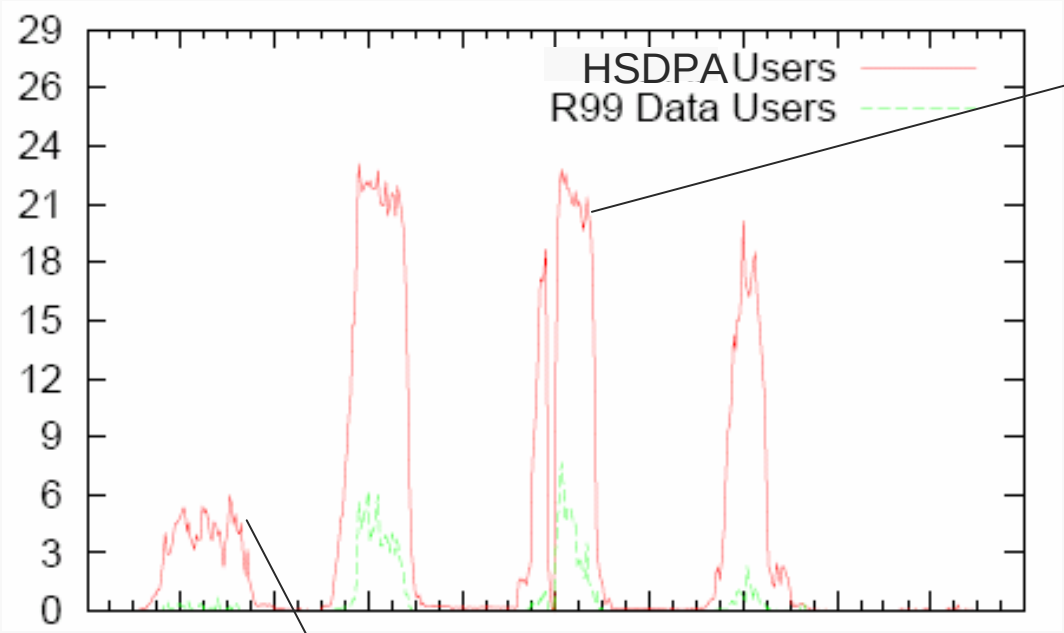
Data Usage Pattern Example (1)

of users vs. aggregated throughput



Data Usage Pattern Example (2)

HSDPA Data vs. CS Data User



(sector data; x3 for carrier loading)

HSDPA data service usage is much higher than CS data service usage

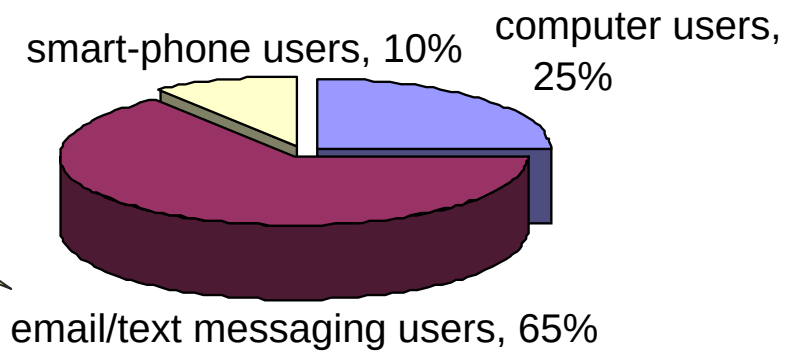
# of HSDPA data user vary depend on hour and applications running on the mobile data devices.

Data Usage Pattern Example (3)

Data Usage & Mobile Devices

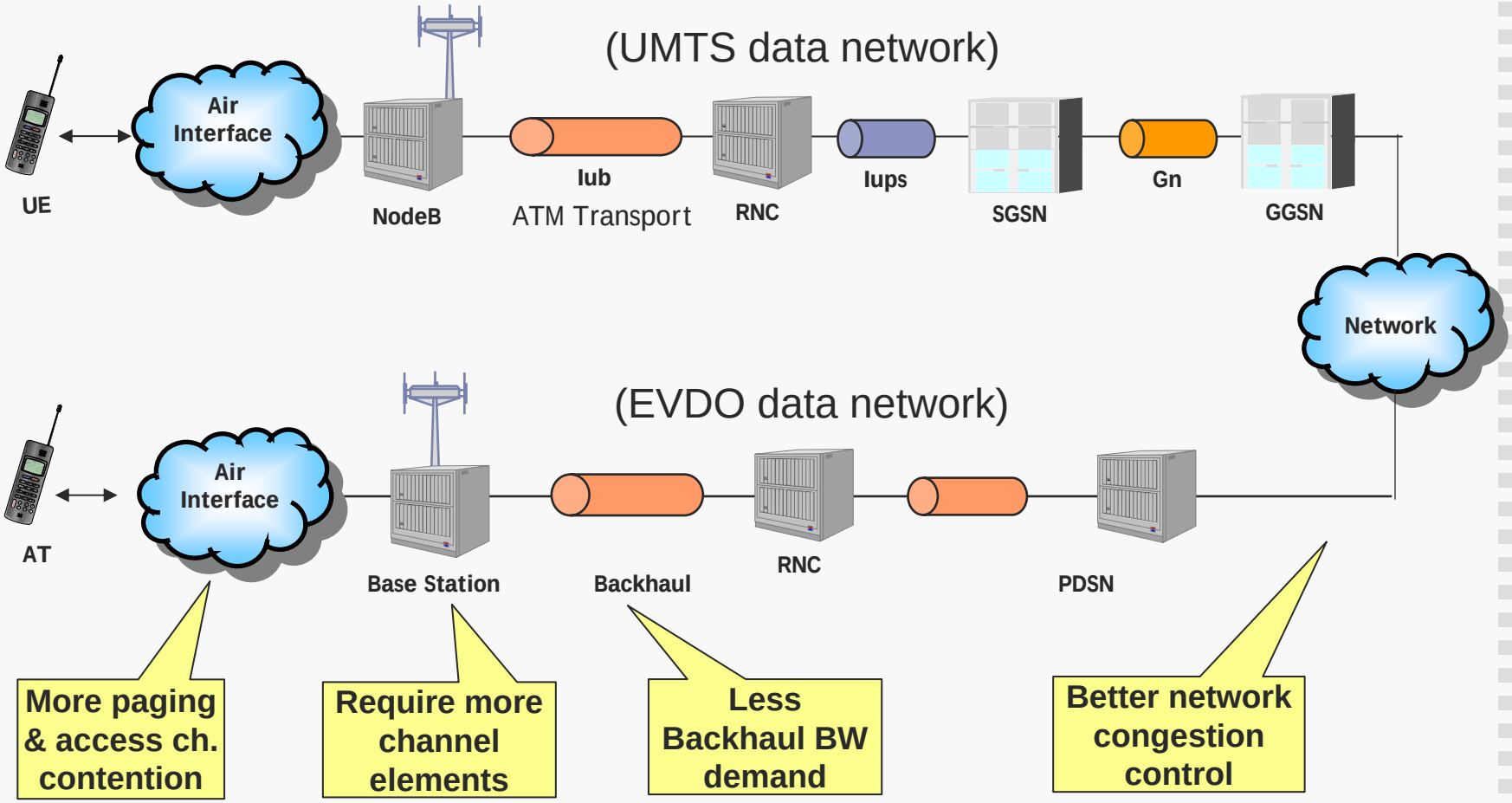
For the email/text messaging services, mobile data devices in used are predominately PDA type of devices, e.g. Blackberry, iPhone.

Data Mobile/Service Type Distribution



*** example only, numbers can vary from market to market, and from service provider to service provider.**

3G Data Network Impact



Closing Remarks

Is 3G HSD a hype or a reality?

- Market updates have showed that the 3G HSD is a successful story. With the rapid 3G subscriber growth, tremendous data usage growth is observed.
  - The 3G HSD technology enables many new broadband mobile media services; 3G network design is aimed to provide the capacity for high user throughput experience.
  - While the cost maybe the # 1 considerations for consumers, many newly created media data service, eg. MobileTV, Picture/Video sharing, etc., can attract more broadband data users.
  - E-mail & Text Messaging service are the two top data applications consuming the available data bandwidth.
  - With more low bandwidth data applications dominate the 3G markets currently, design for call capacity is more critical than for data capacity.

It's clearly that the application/service (not the technology) is driving the market. Over the time, 3G network design need to be tuned for dominated applications to ensure the service quality