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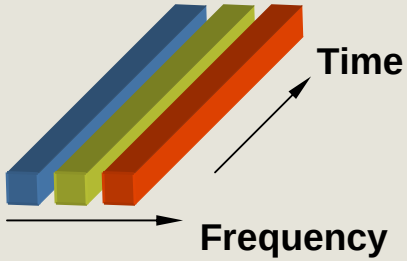
IP över 3G - Vad kan man förvänta sig?

Paul Stjernholm, Ericsson

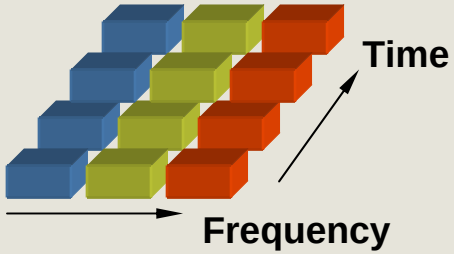
Some WCDMA fundamentals

Radio Access Technologies

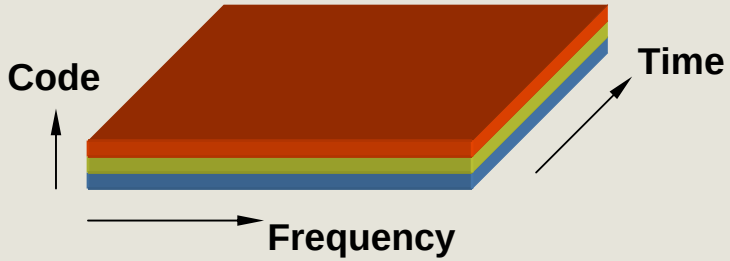
FDMA
- Frequency



TDMA
- Frequency
- Time



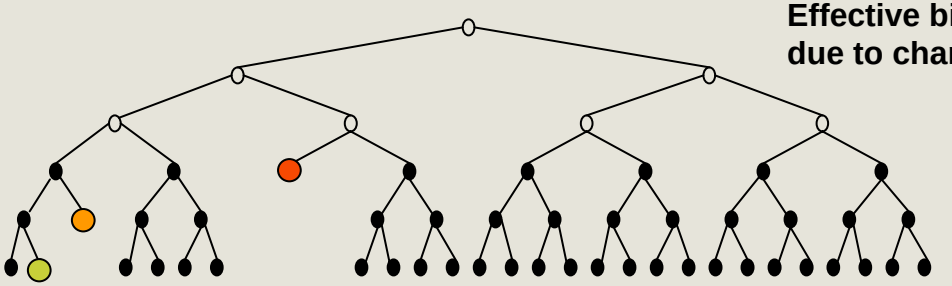
CDMA
- Frequency
- Code



WCDMA shared resources

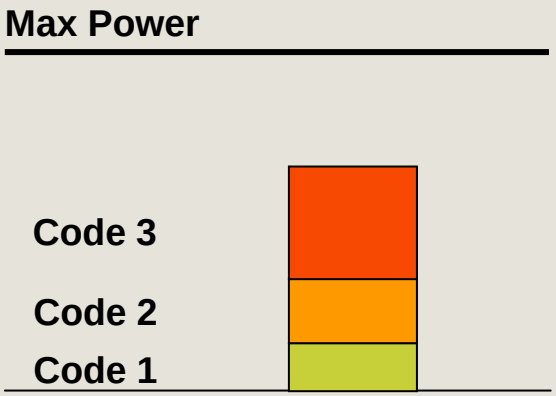
Codes (Orthogonal)

kbps*	SF
3840	*1*
1920	*2*
960	*4*
480	**8**
240	**16**
120	**32**
…	**…**
15	**256**



- **Gross bitrate. Effective bitrate is less due to channel overhead**

Power

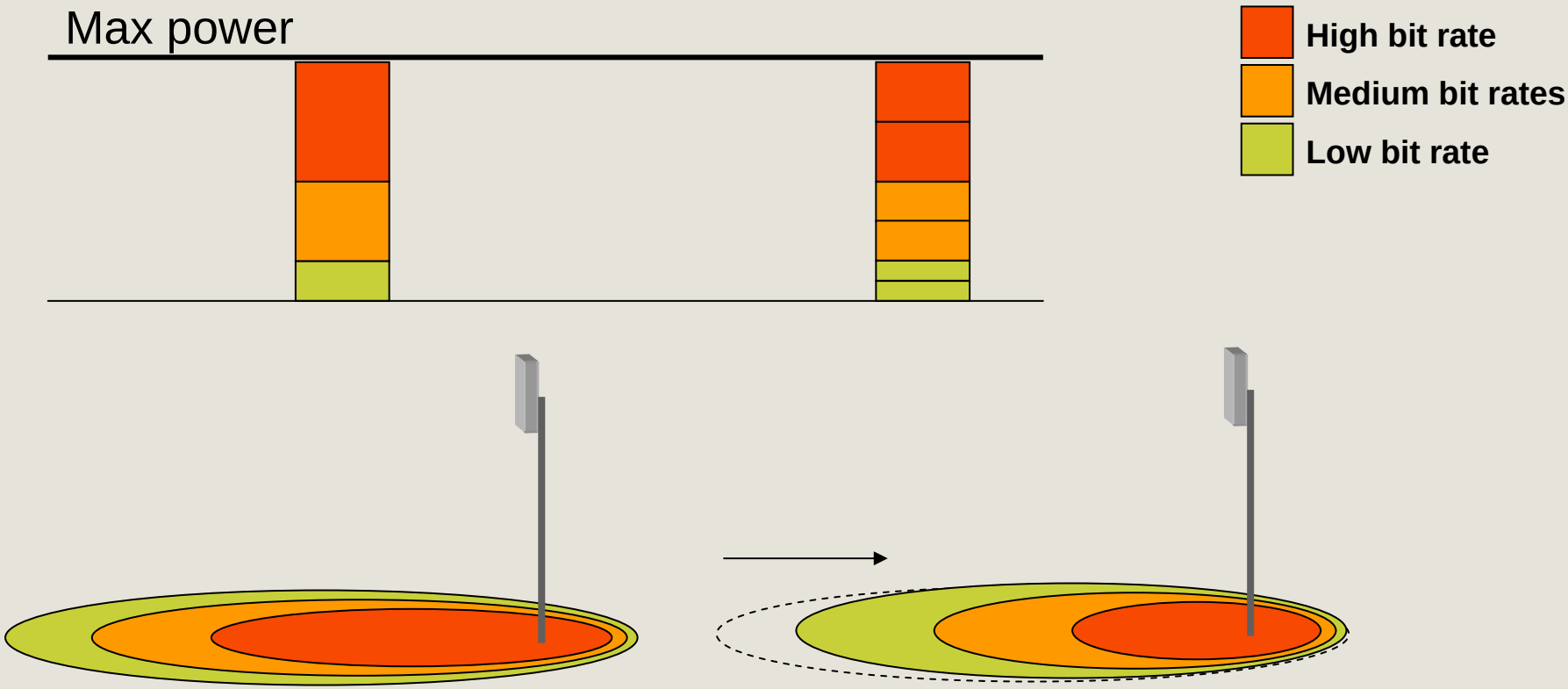


Service coverage

- WCDMA high bit rate
- WCDMA medium bit rates
- WCDMA voice and low bit rate
- GSM voice

The power requirement determines the service coverage in WCDMA

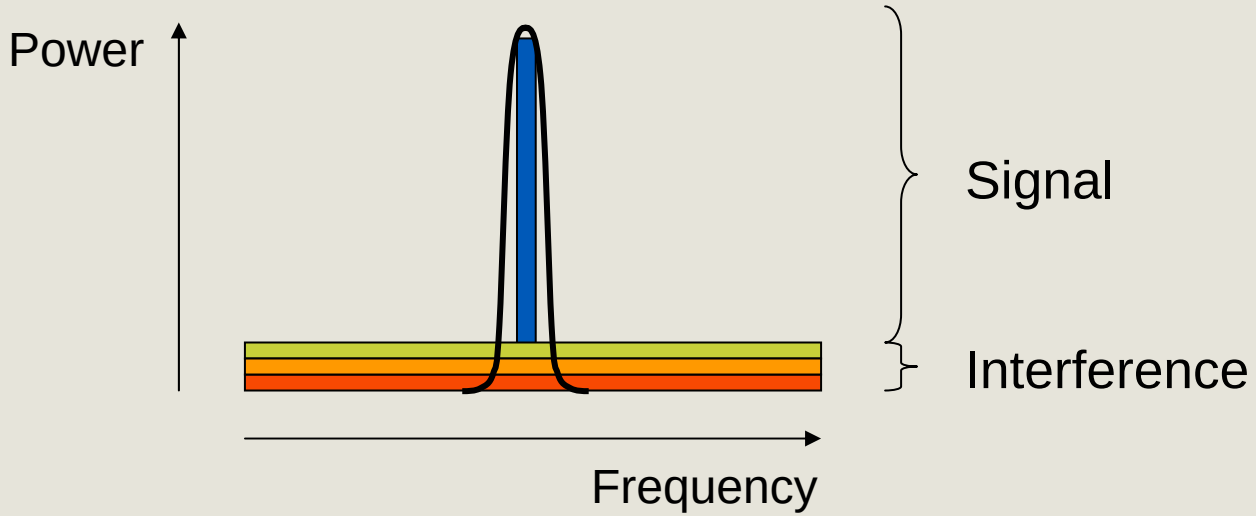
Cell breathing



The service coverage shrinks with increasing traffic in the cell

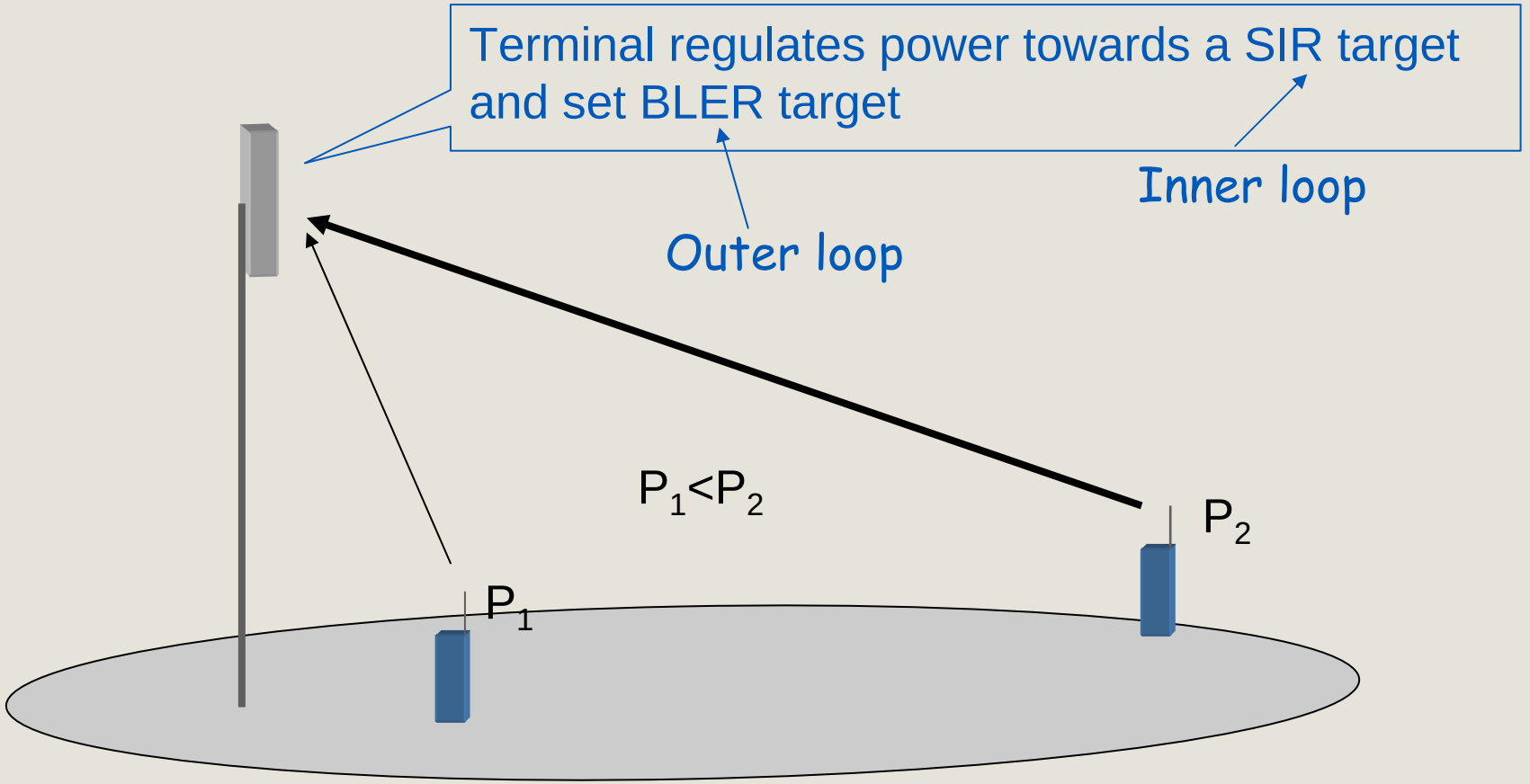
CDMA

- Correlation of channel codes in receiver
- Own channel correlates well, i.e. peaks (Signal)
- Other channels appear as noise (Interference)
- More users → increased interference



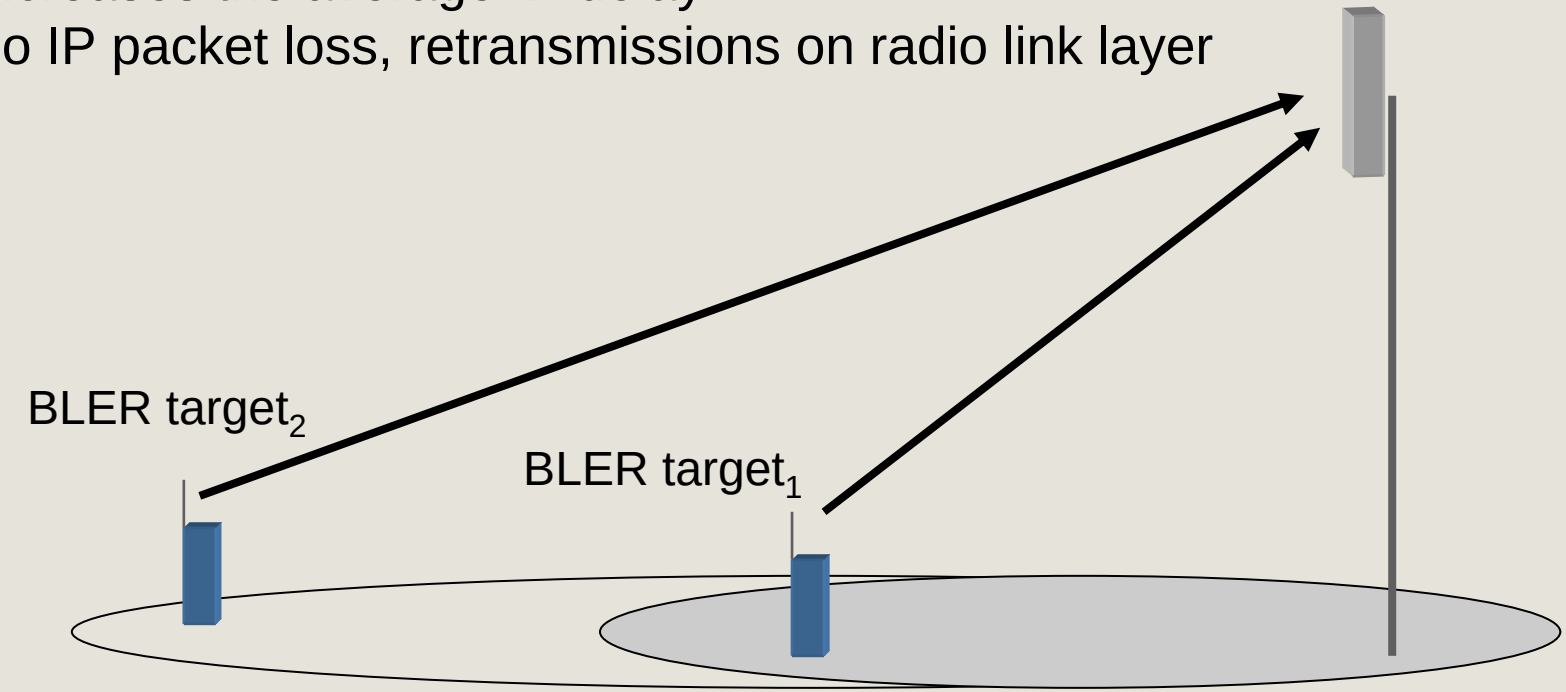
Power need to be adjusted to retain the Signal to Interference Ratio (SIR)
- “Cocktail party effect”

Power control

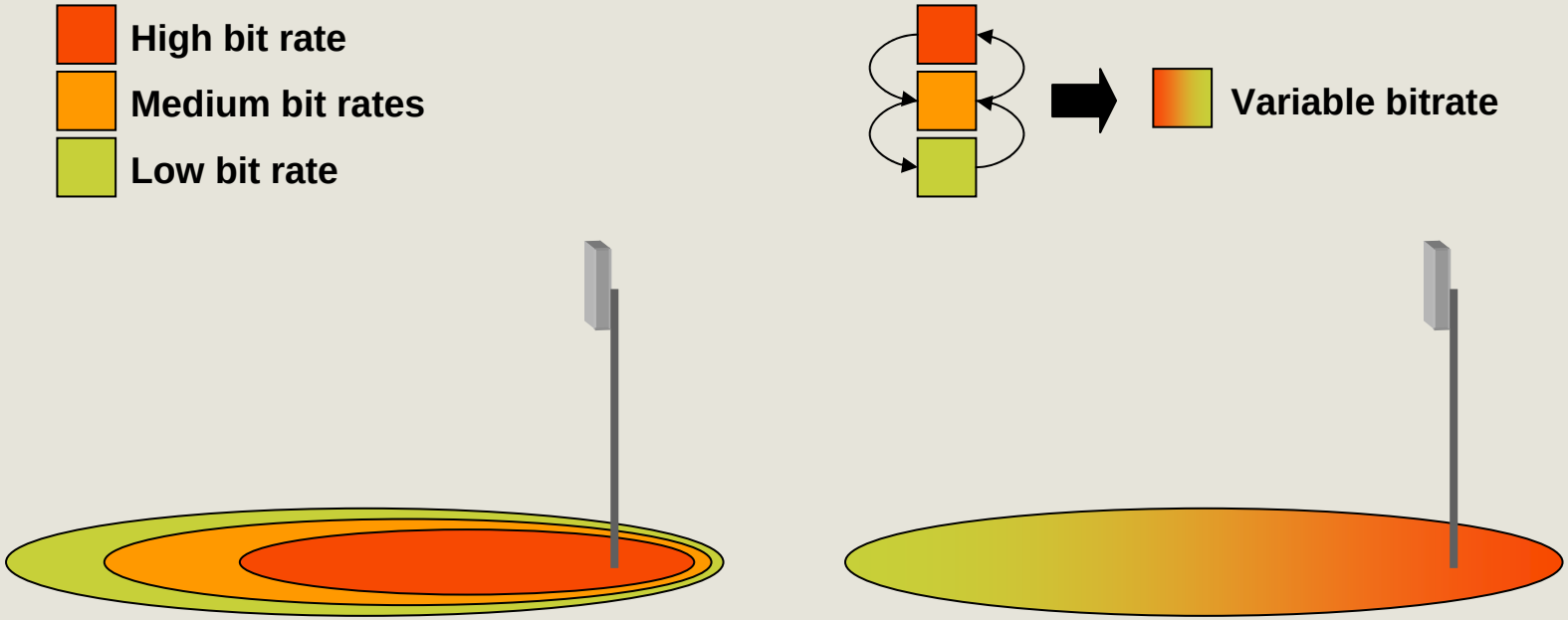


Block Error Rate (BLER)

- BLER target set by operator
- A higher BLER target (BLER target$_2$ > BLER target$_1$)
  - increases the coverage
  - decreases the average throughput
  - increases the average IP delay
  - no IP packet loss, retransmissions on radio link layer

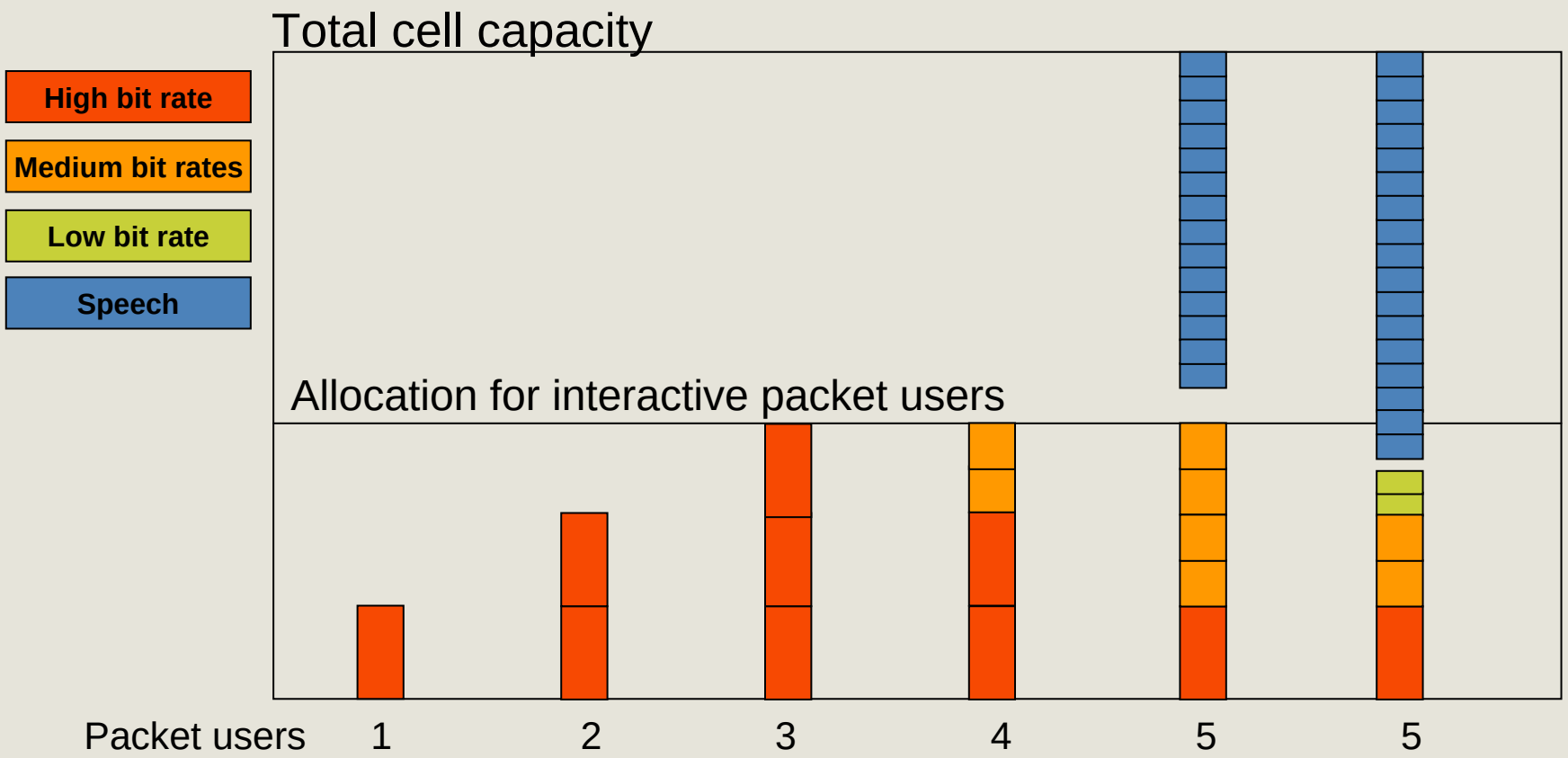


Interactive Packet Service
- Channel rate switching

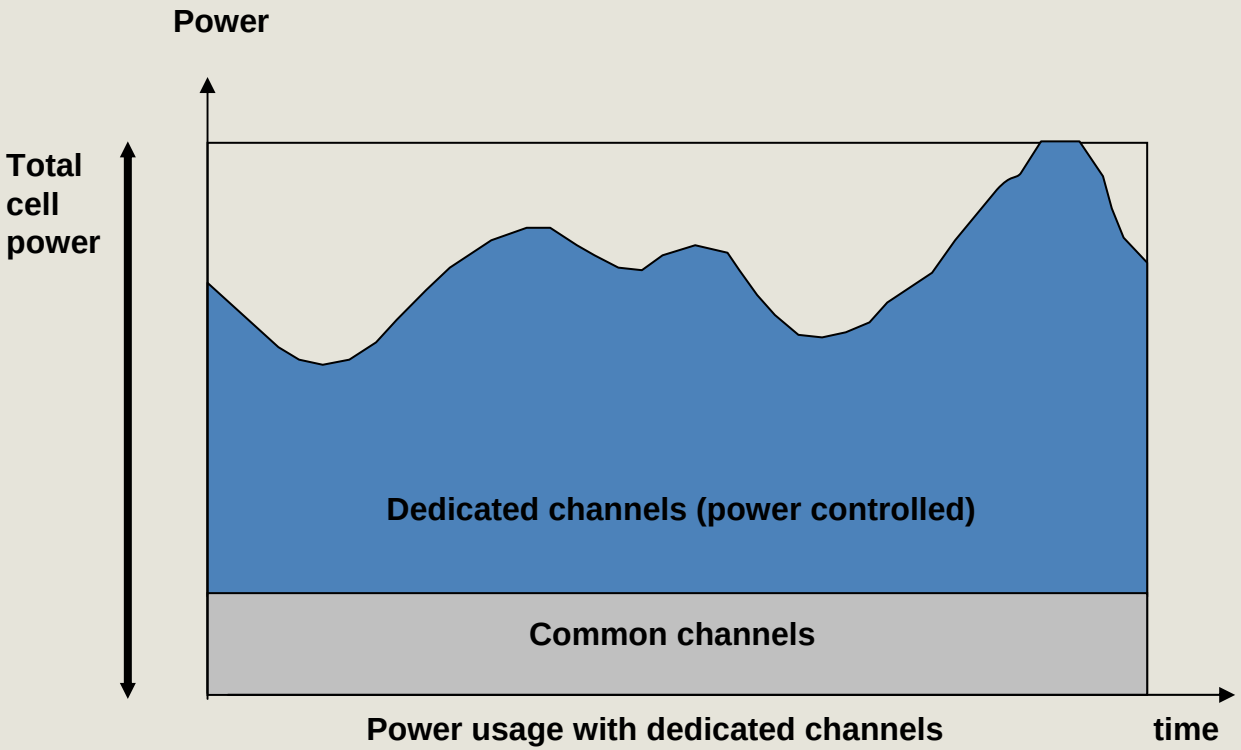


- Channel rate switching provides contiguous packet service coverage
- Provides high bit rates when possible
- Provides robust service delivery

Capacity Management



Radio network planning and dimensioning



The cell need to be planned and dimensioned to accommodate peak traffic

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Some results

WCDMA

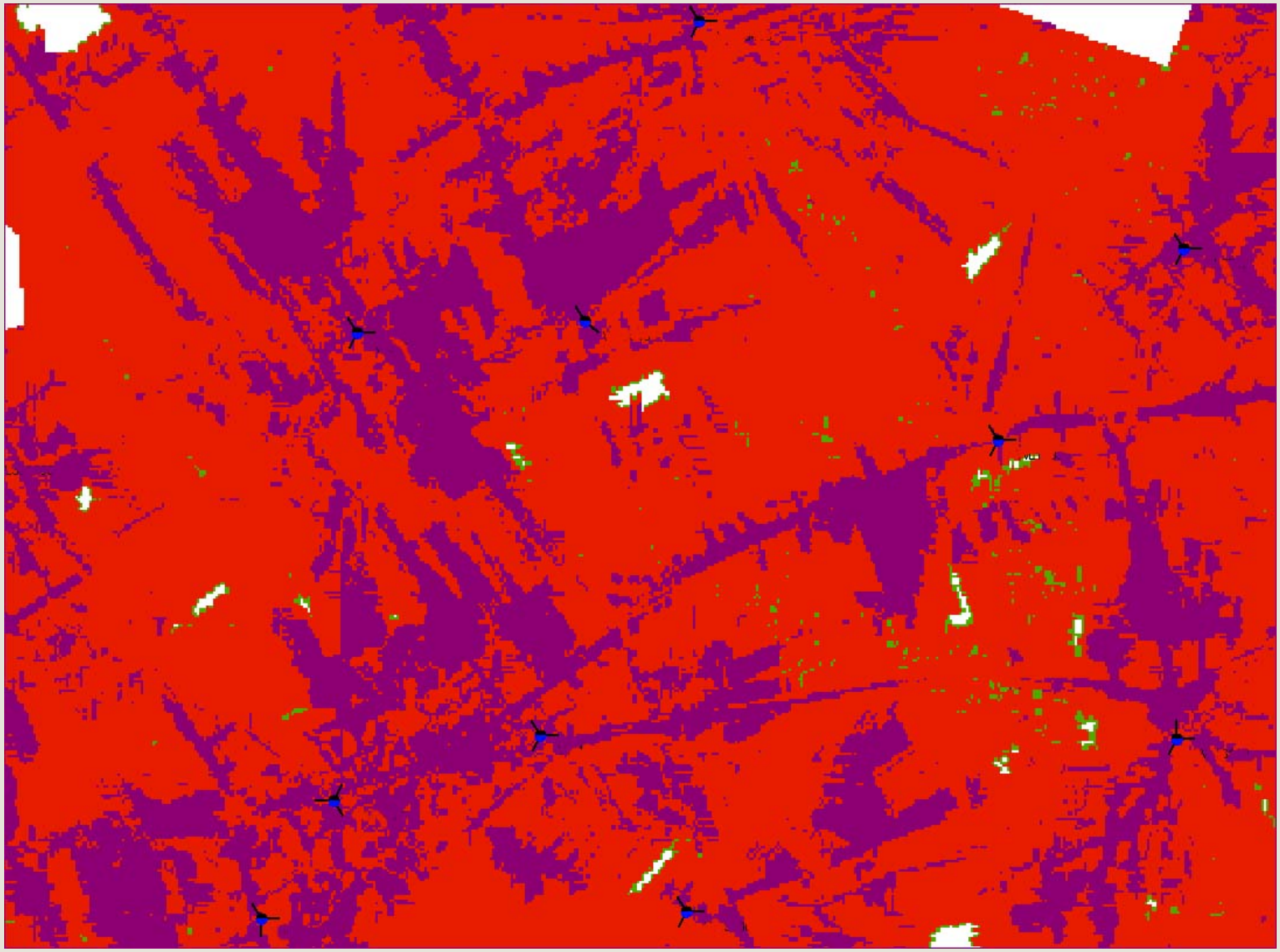
Packet Interactive coverage

Scenario:

~40 subs/cell

- **Speech (>90%)**
- **Video (<5%)**
- **Interactive (<5%)**

High bit rate
Medium bit rates
Low bit rate



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WCDMA

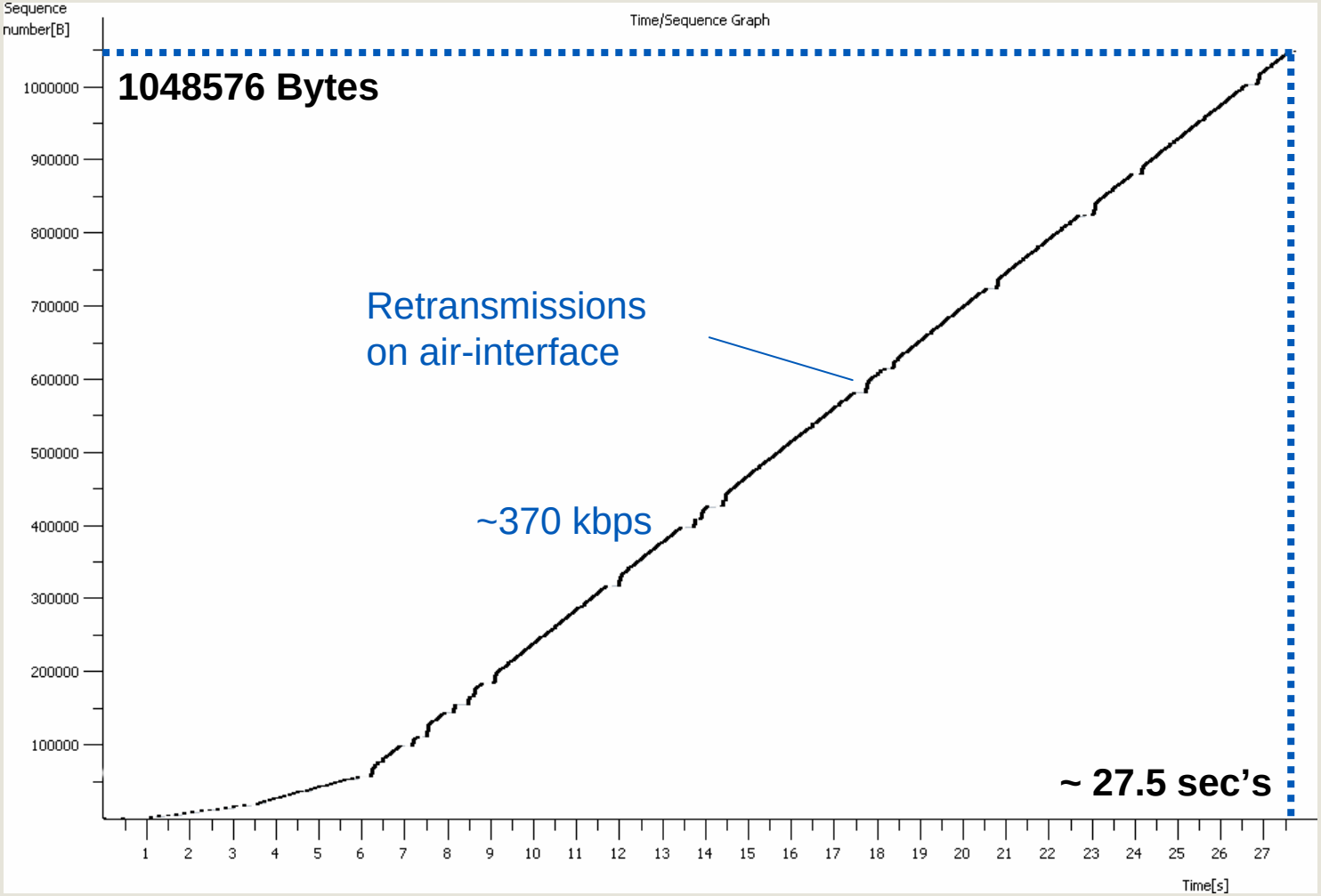
Packet Interactive coverage

Scenario:

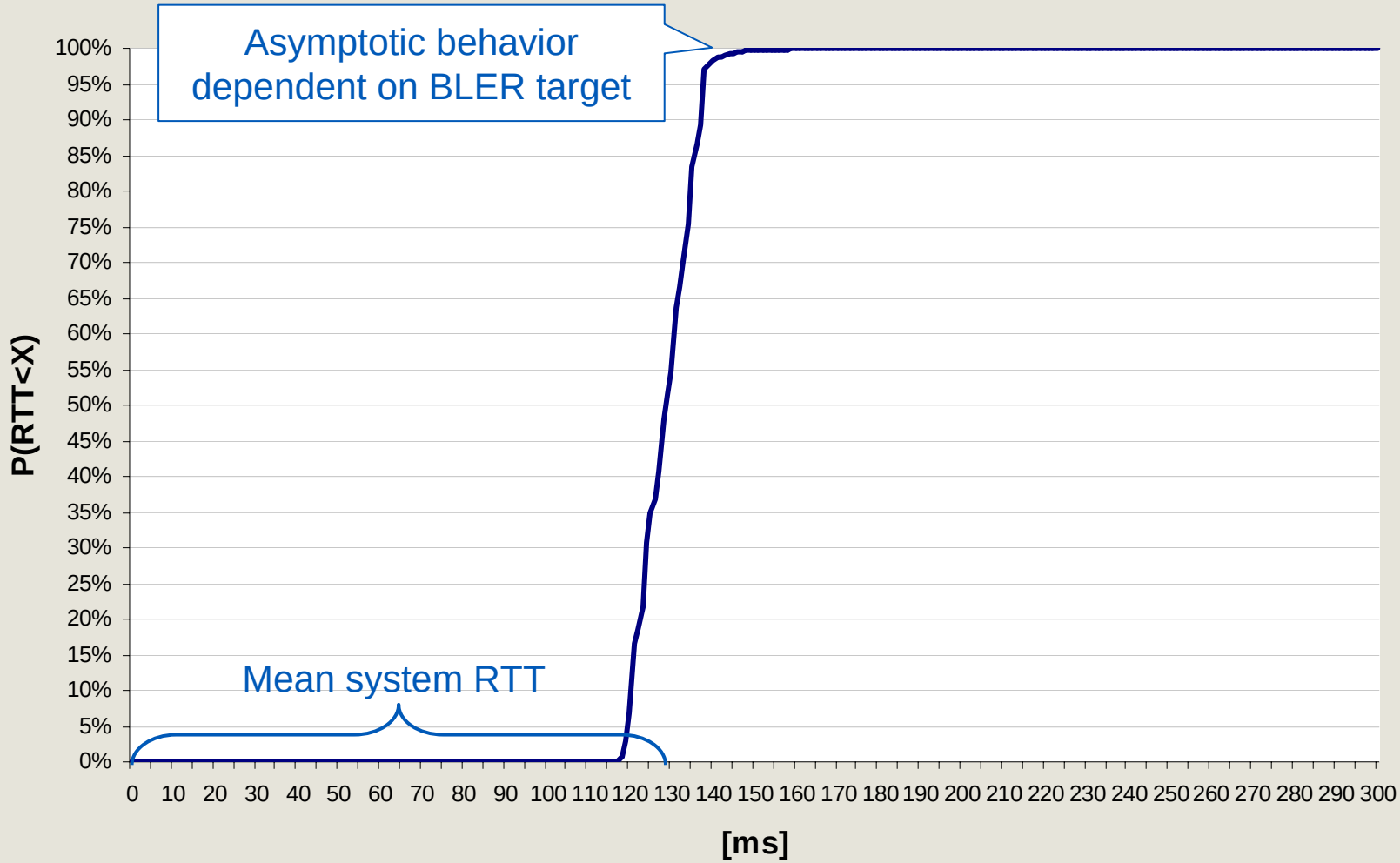
~200 subs/cell

- **5 time increase**

1 MB FTP download time
- Example with mobility and soft handover



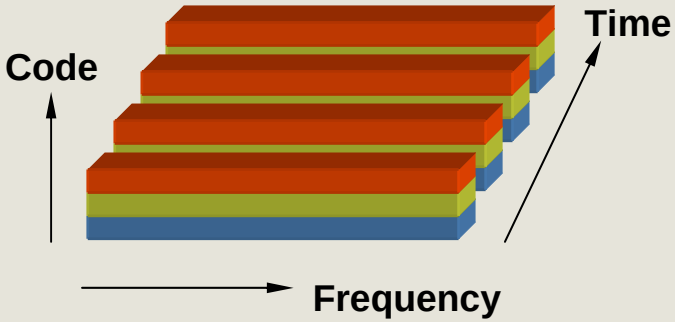
Ping 12 RTT on a medium bitrate
- Stationary example



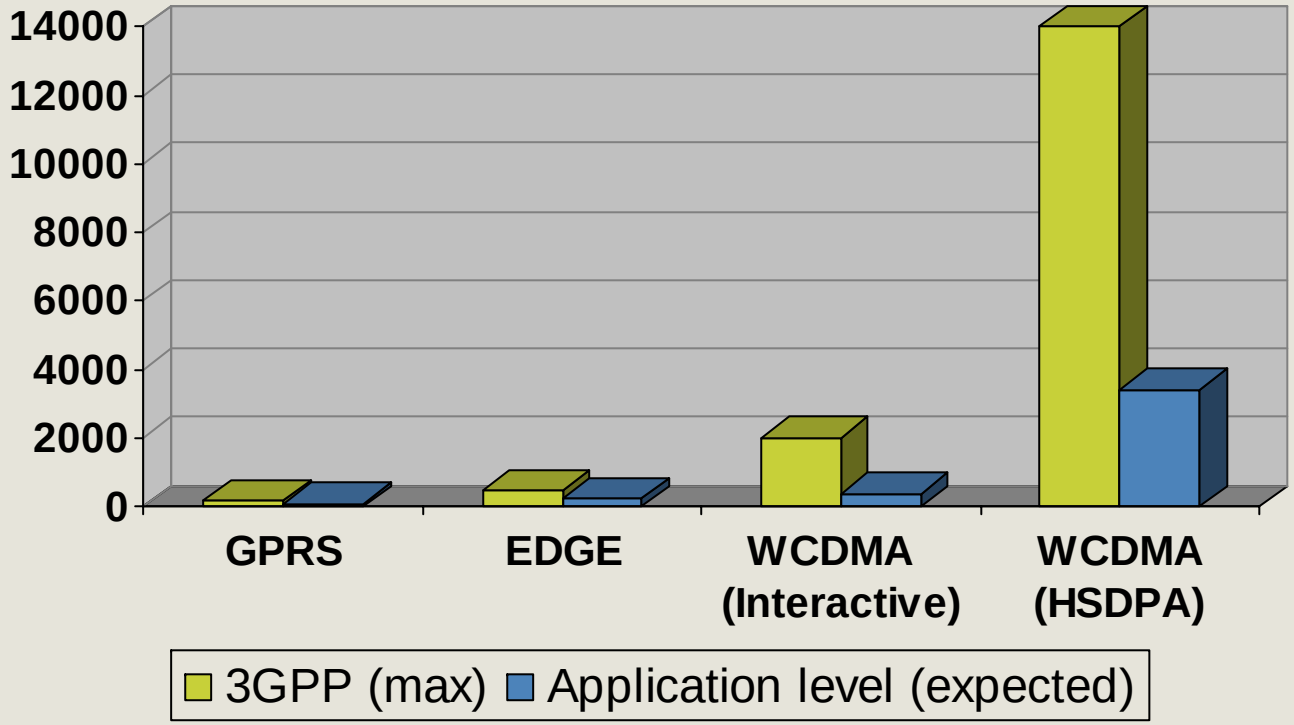
Trend and future

WCDMA evolved

- **HSDPA** = High Speed Downlink Packet Data
  - Frequency
  - Code
  - **Time**
- Shared downlink channel
- Benefits:
  - Higher bit rates up to 14 Mbps in downlink
  - 2-3 times higher system capacity
  - Quicker response times



Trend and future
- Peak downlink FTP throughput (kbps)



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mmary

/CDMA is an evolving 3G radio access technology

volution towards higher bandwidths

- Current WCDMA allows 370 kbps peak rate on application level
- WCDMA/HSDPA will allow around 3.4 Mbps peak rate on application level for a 5 code terminal

acket data performance always dependent on

- Radio network planning and dimensioning
- Traffic load, traffic distribution and traffic mix