

Wireless Data Technology overview

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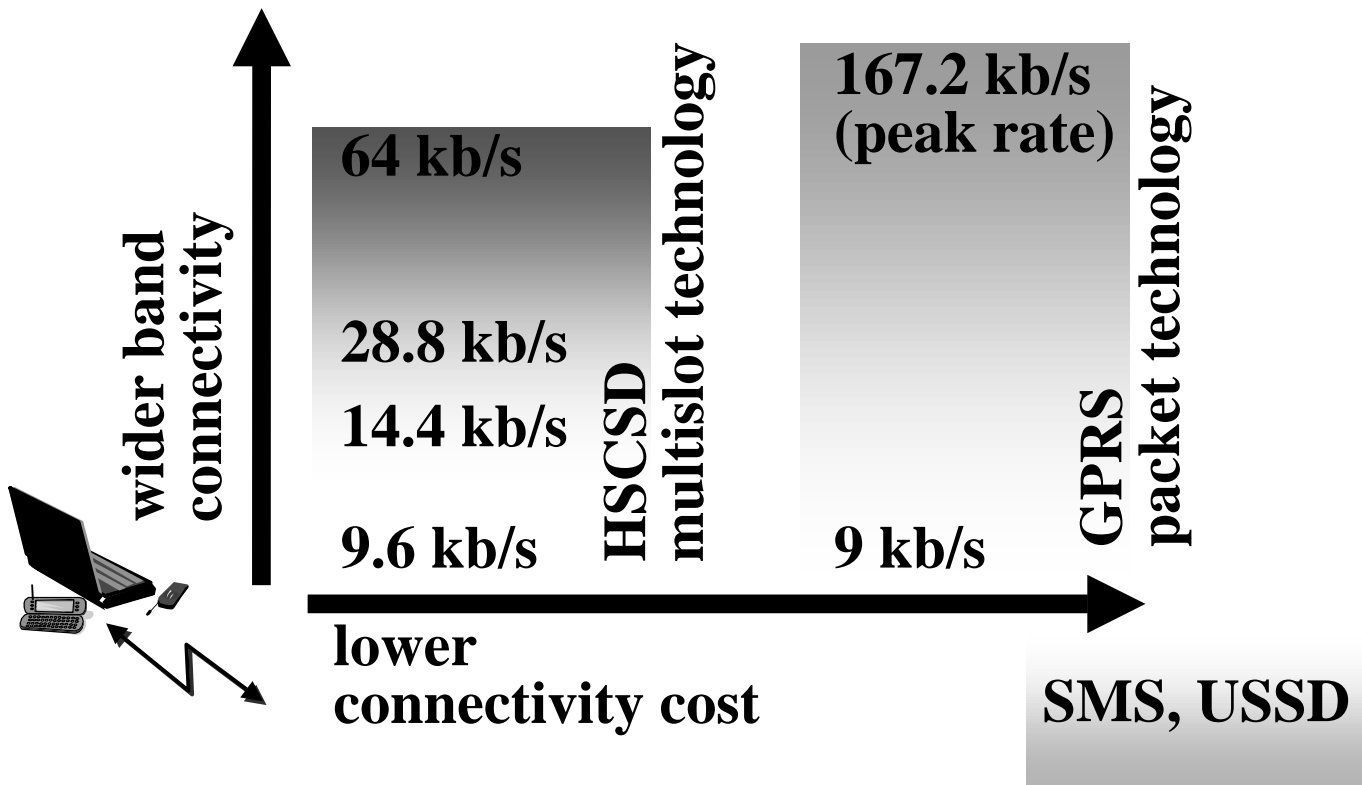
GPRS ... packet connectivity in GPRS ... the biggest news since GSM ... why ?

- GPRS enables *instant IP* access on-the-move, no call set-up waiting time
- operating the GPRS backbone means becoming a *major IP network operator*, the first public IP service
- GPRS enables *transparent IP, true IP* end-to-end (no remote access emulating modem connections)
- *3rd Gen* will be "just" an incremental access improvement on top of GPRS, GPRS is the target, 3rd Gen just a tail wave
- the biggest (the last ?) opportunity for *challengers* to outplay incumbents
- a better value proposition for the end-users (*pay for data volume* instead of session connection time)

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Evolution of GSM data connectivity



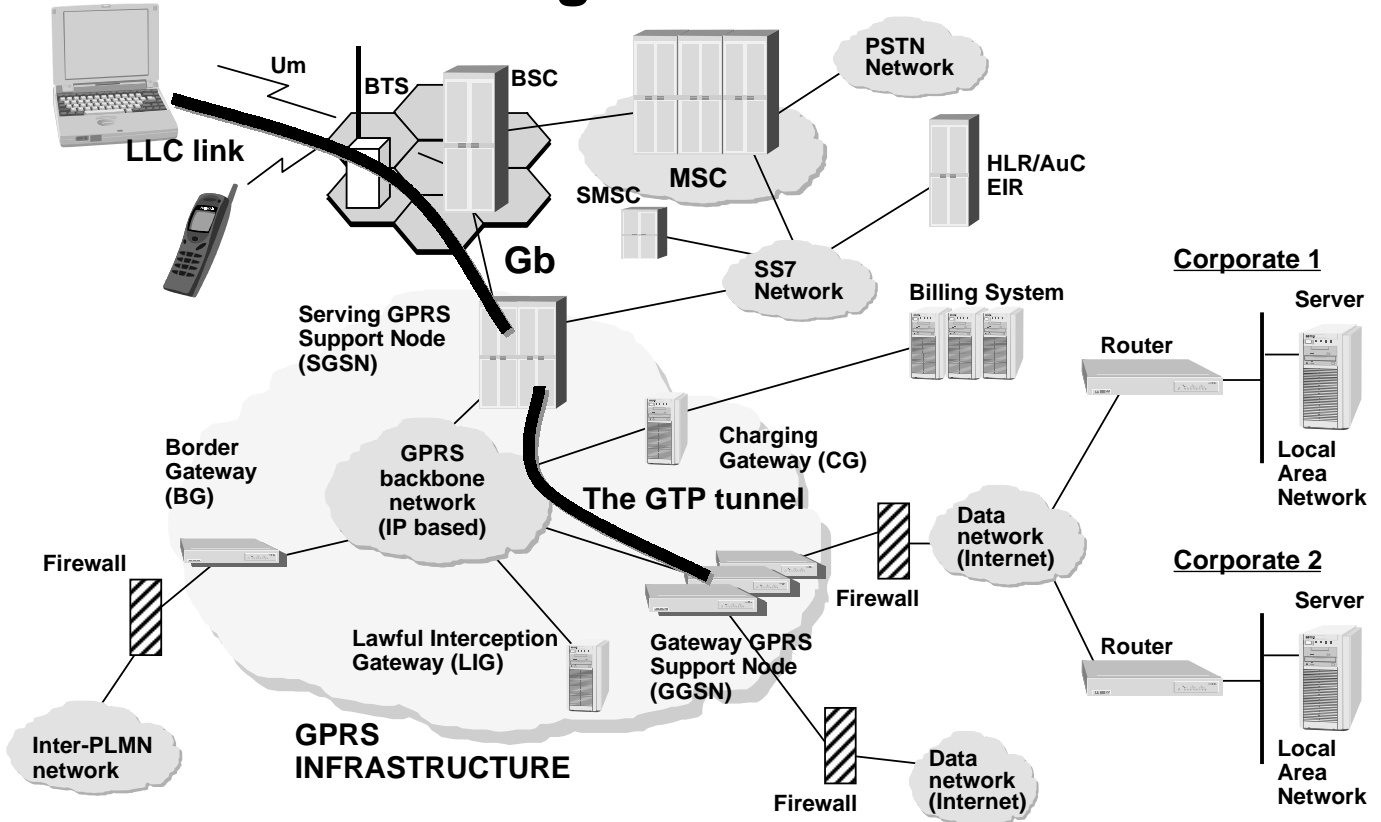
GPRS bit rates (kbit/s) revisited

coding	# of timeslots							
	1	2	3	4	5	6	7	8
CS-1	9.05	18.1	27.15	36.2	45.25	54.3	63.35	72.4
CS-2	13.4	26.8	40.2	53.6	67	80.4	93.8	107.2
CS-3	15.6	31.2	46.8	62.4	78	93.6	109.2	124.8
CS-4	21.4	42.8	64.2	85.6	107	128.4	149.8	171.2

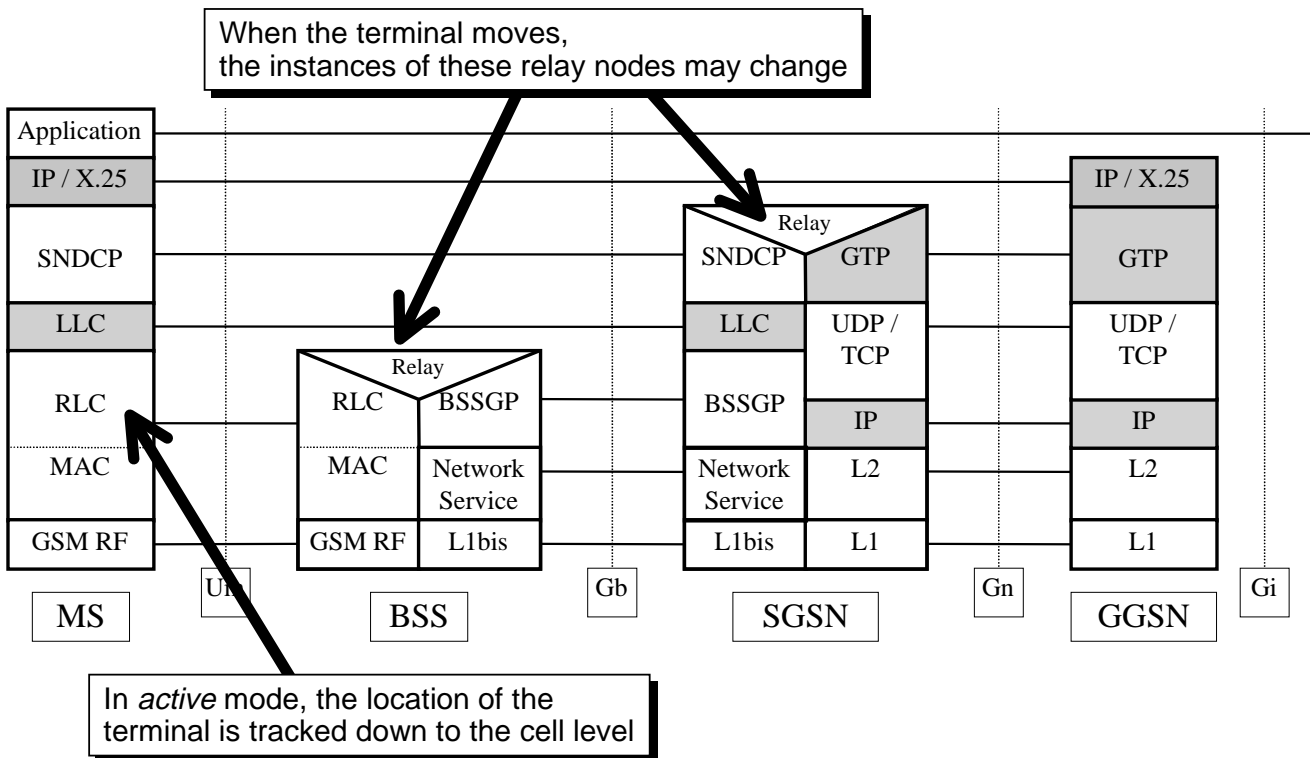
Early terminal implementations expected to operate in this area

EDGE	69.2	138.4	207.6	276.8	346	415.2	484.4	553.6
(assuming ideal C/I)								

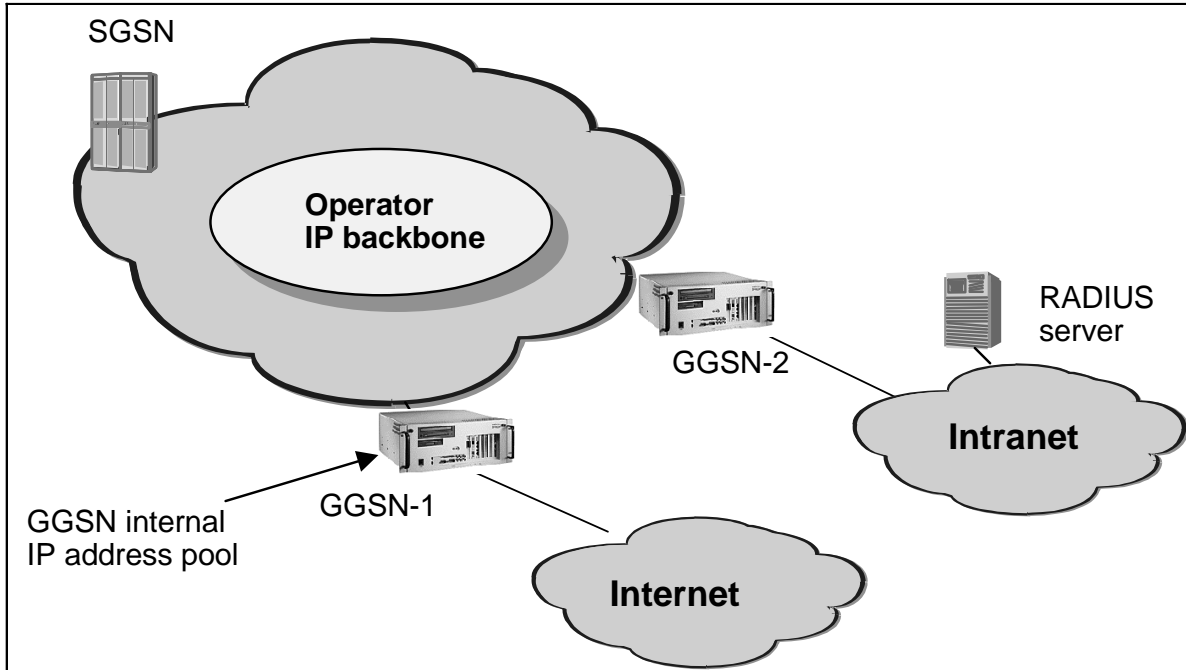
GPRS logical architecture



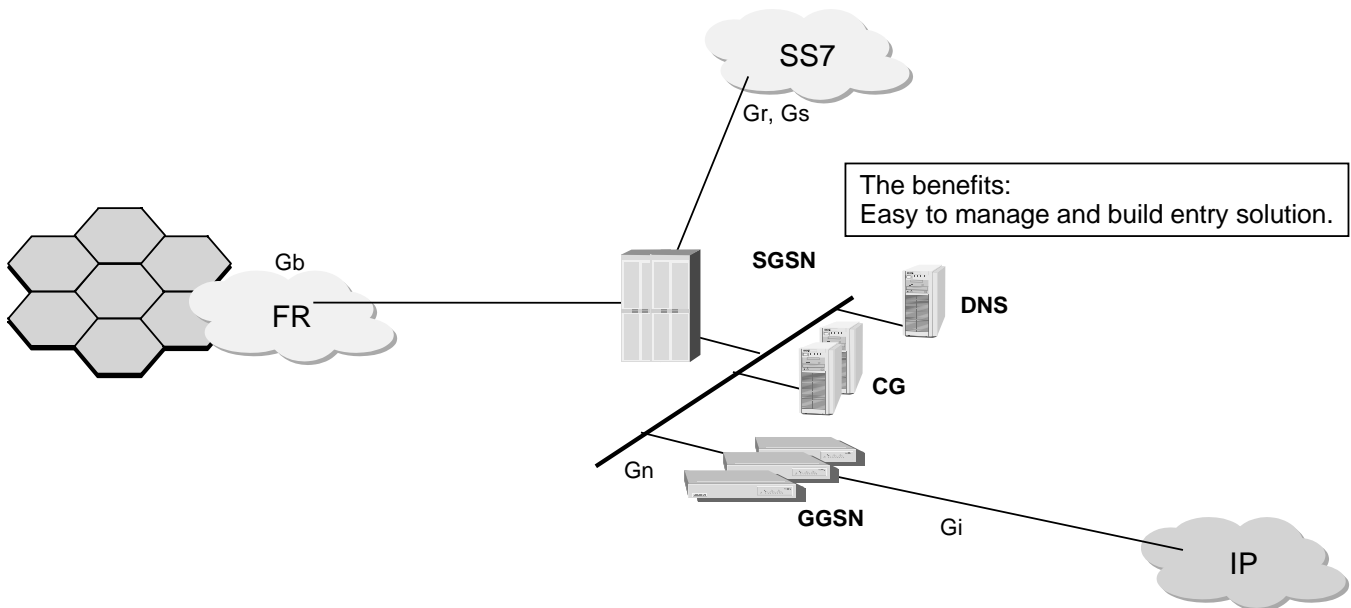
GPRS Transmission Plane (GSM 03.60)



GPRS internetworking



GPRS growth, GPRS core single site



Voice over GPRS ?

... may be ,

BUT

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GPRS Quality of Service (QoS) Profiles (GSM 03.60)

- Precedence class (high, normal, low)
- Delay class (1-4, 4=best effort)
 - defines mean transfer delay and 95 percentile delay for 128 octet and 1024 octet packet size
- Reliability class (1-5)
 - The reliability classes are used in GTP, LLC
 - class 1 for non real-time traffic, error sensitive application that can cope with data loss
 - class 4 for real-time traffic, error-sensitive application that can cope with data loss or out-of-sequence delivery
 - class 5 for real-time traffic, error non-sensitive application that can cope with data loss
- Peak throughput class (1-9)
 - class 1: 8kbit/s, class 4: 64kbit/s, class 9: 2048kbit/s
- Mean throughput class (1-19)
 - class 1: best effort, class 2: 0,22kbit/s, class 13: 1,11kbit/s, class 19: 111kbit/s

QoS capabilities of GPRS may not be sufficient.
Unpredictable **packet delay** due to the
very nature of packet reservation is one serious concern.

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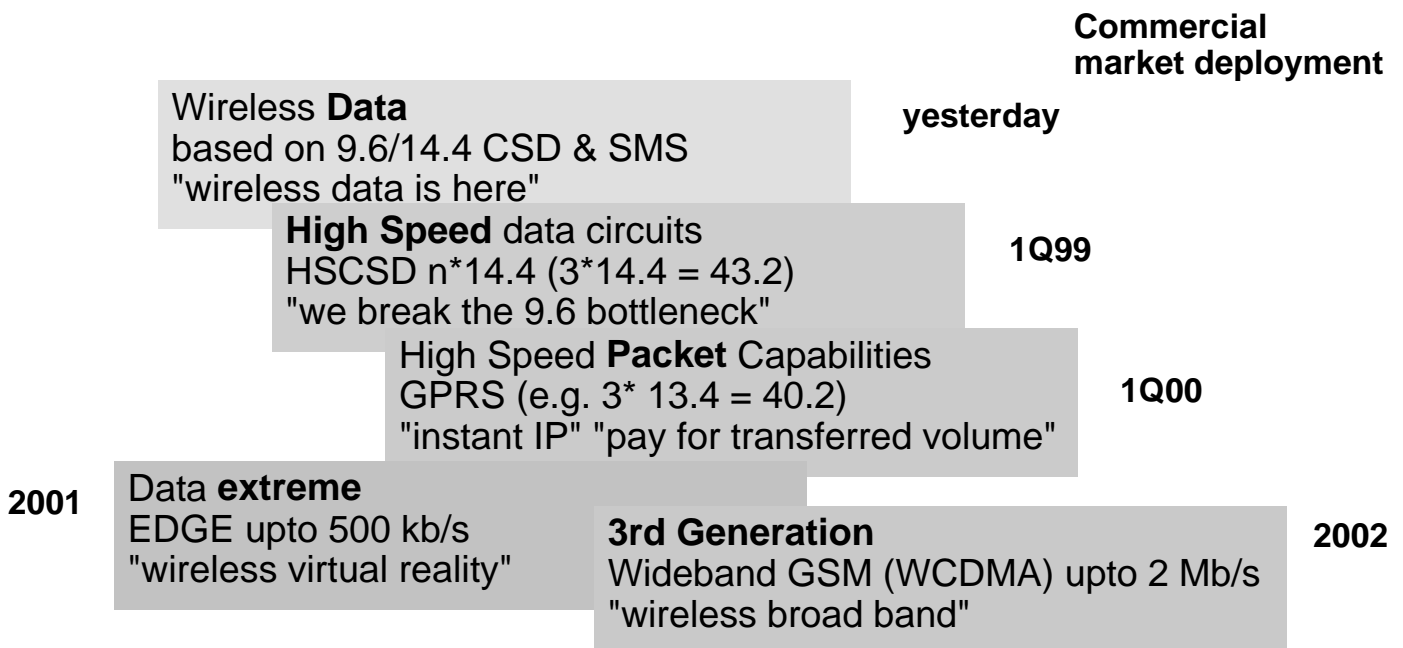
Voice over GPRS

Can possibly be done with somewhat worse *spectrum efficiency* than circuit switched voice.

May be commercially viable if end to end *Internet connectivity* is very important.

Further work is required to *verify the feasibility*.

The wireless data deployment steps



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