What is ahead for mobile operator

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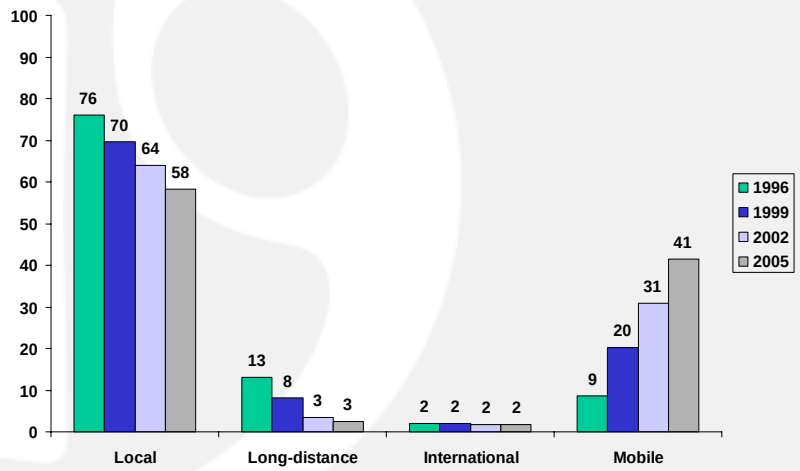
Finnish mobile market

- Radiolinja placed world's first GSM call in 1991
- High penetration: more than 3 M subs out of 5 M inhabitants
- High SMS usage:
  - 650 000 000 SMS messages (1999)
  - 1 000 000 000 SMS messages (2000)
  - 1 400 000 000 SMS (estimate 2001)
- Average spent 50-60 USD per month

Usage of networks - minutes (%)



Source: Ministry of Transport and Telecommunicatios

Oy Radiolinja Ab

Radiolinja services

Voice
- since 27th March 1991
- several subscriptions/services for corporates + consumers

SMS-service and value added SMS-services
- SMS-services to all RL customers 27.4.1998
- key force to make this business fly was SMS “roaming” between Sonera and Radiolinja.
- 10 % share in revenue 2000, 7% in 1999…

WAP
- 1st services launched in November 1999
- 100% data service penetration free of charge for all customers

GPRS
- Launched september 2001, data volume based pricing
- pricing 85% less expensive than i-mode

3G

Wireless motivation?

•The third generation of telecommunications is wideband and mobile

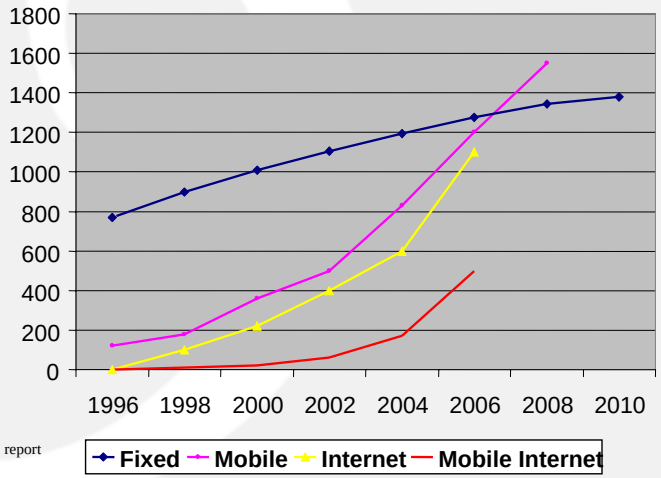
•Internet and IP is dominating

•IP on desktop, IP on TV, IP in your frigge …and in your mobile phone

•i-mode has shown the potential

Worldwide Telecommunications Growth

millions of customers



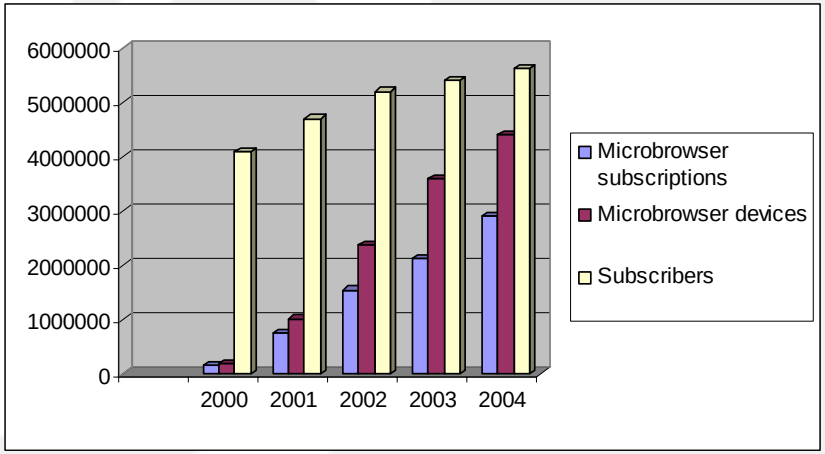
source ETSI GMM report

Today

Forecasts - Finland

Ovum Global Mobile Markets 2001-2005, February 2001					
Finland	**2000**	**2001**	**2002**	**2003**	**2004**
Subscriptions	4 093 000	4 708 000	5 203 000	5 409 000	5 616 000
Penetration %	79 %	90 %	100 %	103 %	107 %
ARPU $/year	435	432	439	448	458
UMTS subscriptions	0	0	19 000	319 000	793 000
Investments, $	214 000 000	374 000 000	466 000 000	370 000 000	353 000 000
Microbrowser subscribers, pcs	155 000	742 000	1 543 000	2 119 000	2 914 000
Microbrowser devices pcs	185 000	1 013 000	2 377 000	3 589 000	4 410 000

WAP devices - forecast, Finland



Source: Ovum

Check the chat...

Mobile operator Business

Mobile operator business

Licenced
- licence cost
- safe environment
- choice of technology

Unlicenced
- no licence cost
- easy to start operating
- vulnerable to competition

Different technologies

Faster and faster...

New wireless technologies:

GPRS	~~171~~ kbit	20 kbit
EDGE	~~384~~ kbit	60 kbit
UMTS	~~2 000~~ kbit	144 kbit
WLAN	~~11 000~~ kbit	6 Mbit

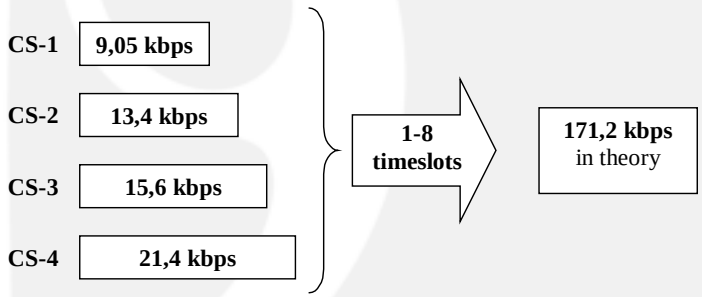
GPRS Performance

GPRS performance is put on the terminal

- Technically cheaper to receive than to send
- Fits well with internet browsing
- No need for Full duplex radio

Transmit		Receive
1	+	1 Timeslots
1	+	2 Timeslots
1	+	4 Timeslots
2	+	2 Timeslots

GPRS Transmission speeds
Radio Link layer



Enhanced Data rates for Global Evolution

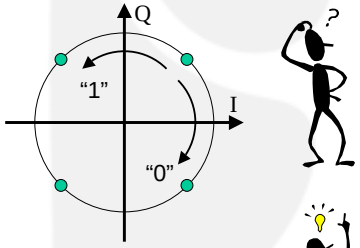
EDGE - basic parameters

	GSM	EDGEGSM
Modulation	GMSK	8-PSK (also GMSK)
Symbol rate	270 ksym/s	270 ksym/s
Modulation bit rate	270 kbit/s	810 kbit/s
Radio data rate per time slot	22.8 kbit/s	69.2 kbit/s
User data rate per time slot	9.6 kbit/s or	48 kbit/s
	14.4 kbit/s	up to 69.2 kbit/s
User data rate (8 time slots)	115 kbit/s	384 kbit/s

Source: Ericsson

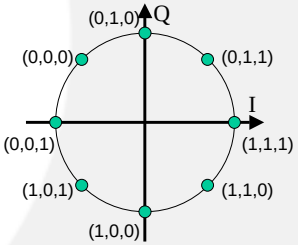
EDGE principle

GSM:
GMSK Modulation



"1 bit per symbol"

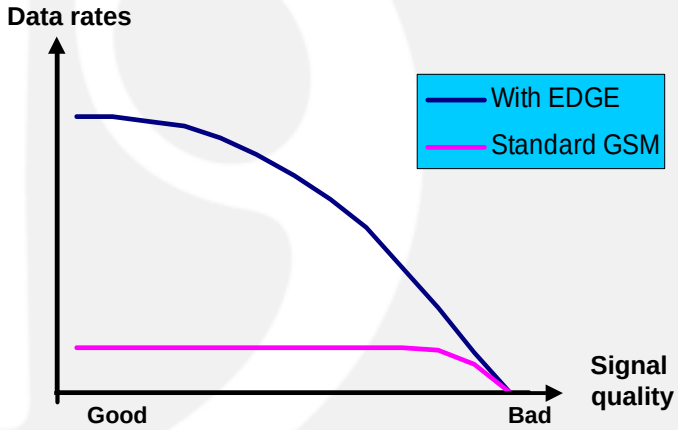
EDGE:
8PSK Modulation



"3 bits per symbol"

Source: Ericsson

EDGE Radio Link Adaptation



Source: Ericsson

EDGE terminal complexity

Complexity has impact on manufacturing cost

High data rates in downlink only

Impacts mainly receiver part compared with existing terminal - increased complexity low

Typical application: Internet browsing&LAN access

High data rates in both up & downlink

Impacts both receiver and transmitter part - increased complexity larger

Typical application: File transfer etc.

UMTS

UMTS

Universal **M**obile **T**elecommunications **S**ystem

UMTS = European variation of the WCDMA technology
FDD and TDD bands
New licences
”GSM combatible”

What is new?
•Wideband data access and multimedia support
•Open service creation environment
•Videophone

Picture: Nokia

What is new with UMTS radio?

In shot: everything

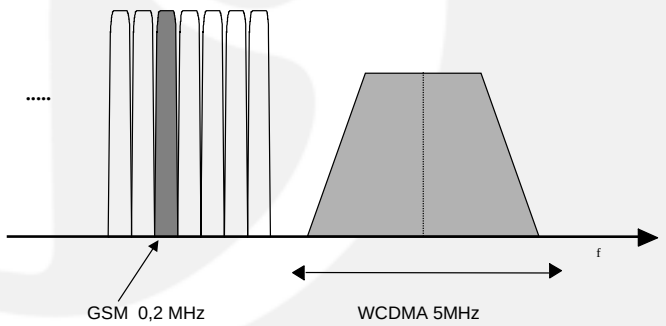
•New frequencies 2100 MHz = 2,1 GHz

•Later other frequency bands (900, 1800, 2600...)

•Cell planning is changed from frequency planning into capacity planning

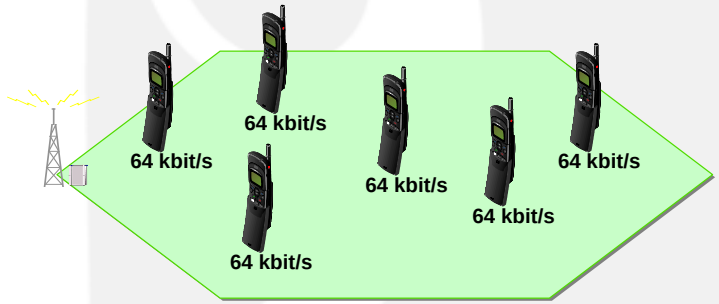
WCDMA Frequency use

2 times more effective than GSM
1 WCDMA channel = 28 GSM channels



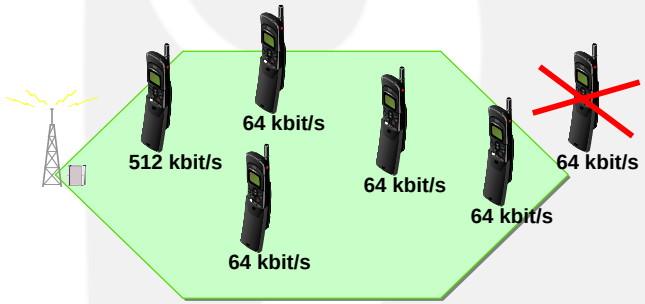
UMTS and 2 Mbit/s

WCDMA - cell breathing 1



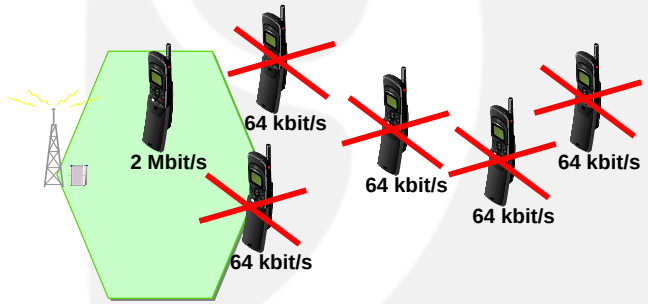
WCDMA- cell breathing 2

More load...



WCDMA- cell breathing 3

Serving 2 Mbit user



WCDMA- cell breathing 4

Several 2 Mbit users?

Cost of building UMTS

Cost of UMTS...

As many answers as there are experts…

In principle two basic categories:

Core network:	Traffic relaying nodes
Radio network:	Coverage and capacity

But significant costs occur also from:

- Licence
- Branding, Marketing…
- Customer care/management
- Billing

…building coverage

Approximate cost for basestation hardware:

250 000 Euro

Number of sites needed to cover country size of Finland

5000

Cost for radio hardware:

1 250 000 000 Euro

This is not enough:

- installation engineering
- transmission buildup
- optimisation and traffic planning..

…with GSM

Approximate cost for covering Finland with GSM technology

500 000 000* Euro *all inclusive

What you get:

- Coverage
- Tested environment
- Choice of suppliers

What you do not get:

- Data traffic flexibility
- Open service creation environment
- ability to offer all-IP services

…with EDGE

In principle EDGE tranceiver is replacement in base station cabinet

IF:

Your base station is newest generation/product line!

Best introduction practice for EDGE is with the expansion of the network

Investment collides with UMTS rollout

”Free for competition”

Most popular technology today IEEE 802.11b

Well suited for indoor and office applications

For larger systems installation cost exceeds the cost of hardware

Total terminal cost very expensive:

- WLAN radio card + PC/PDA + popular operating system

No good method for billing for usage

No good practise for roaming to other service provider networks

Open security problems

Commercial feasibilty low in hotspot scenario

Operator considerations

3G for mobile operator

New set of subscribers: IP devices

Number of IP connected devices will be greater than number of individuals in the network

Penalty for using the airtime: no fixed fee access

If users get time/volume independent charging scheme it can be exploited easily

Several service networks

APN concept supports multiple network connections and service networks

New security challenges in IP: Everything cannot be blocked out, IP has more flexibility

Addressing

•Today people have phone number as their “primary network address”

– Uniform addressing globally, not too easy
– Real person
– Difficult to change operator

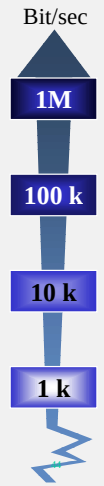
• Today people have email as their “secondary network address”

– Easiest: real.name@operator.country
– Bogus identities
– Several email accounts, easy to change operator

• Tomorrow we have future IP service user - who has his identity?

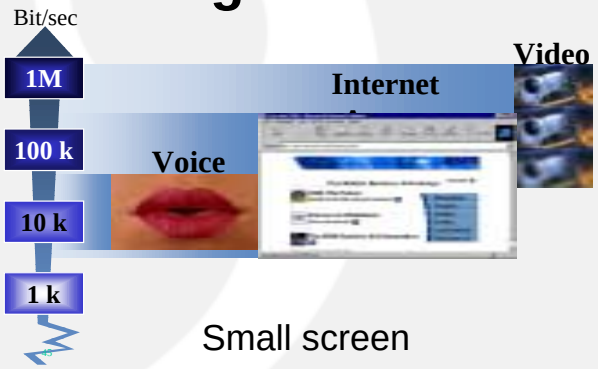
This is what market wants

•Unlimited bandwidth for internet browsing
•100% compatibility
•All internet
•Virtually free access
•Easy connection, configuration
•Low terminal price



Data Requirements

Big screen

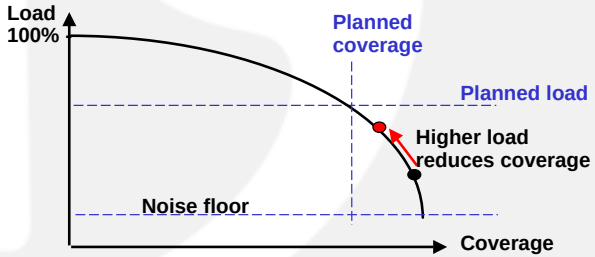


Small screen

Source: Ericsson

Radio bandwidth is ”natural resource”

- Not a ”unlimited bandwidth” - world
- Cost is propotional to the delivered bandwidth
- There must be ”penalty” for the use of bandwidth



Effect of load in WCDMA systems

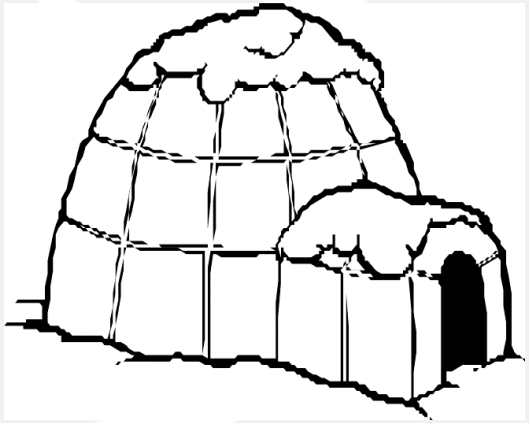
Conclusion

The financing climate for broadband providers

During the Dot.com / Internet/UMTS hype...

The financing climate for broadband providers

… and after.



The users will be ready...

- Today's usage of SMS
  - SMS has shown that users will use new services
- Choice of mobile technology
  - For commercial success terminal price is extremely important
- Mobile phone penetration is soon over 80 %
- Internet-access in mobile phones will be as usual as color-TV
- IP connectivity in mobile networks creates base for new "SMS wave"

Check the chat...

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