Shared networks
Lessons learned 2000 – 2010

What differences can we observe in Sweden?

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November 12, 2012
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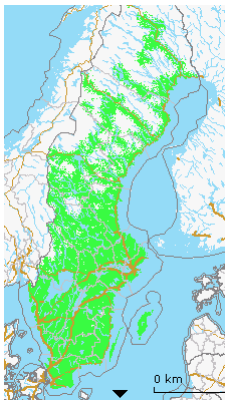
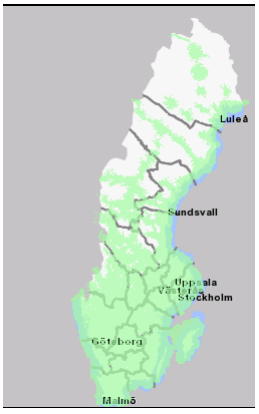
GSM coverage
Tele2 - Telenor - Telia



~70% covered area

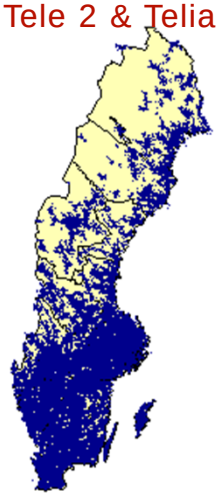


~65% covered area

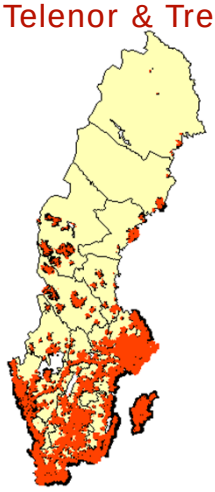
~90% covered area

3G Coverage
Turbo 3G, Turbo 3G+ (HSPA)

Tele 2 & Telia



Telenor & Tre



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Investments in mobile networks in Sweden 2000-2009 (Million SEK)

Operator	Investments
Telia	10334
Tele2	4006
SUNAB	5797
Telenor	2945
Hi3G access	13384
3GIS	8786

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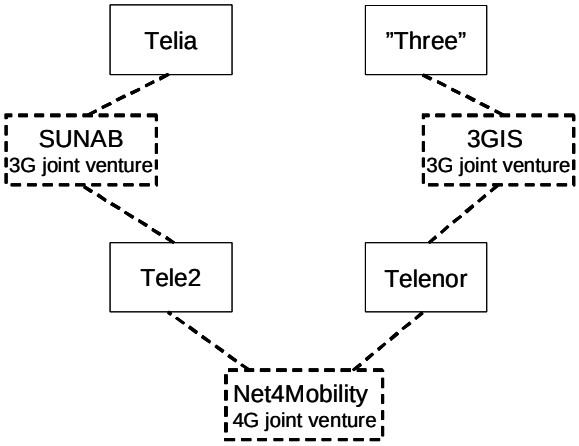
Many partnerships and joint ventures



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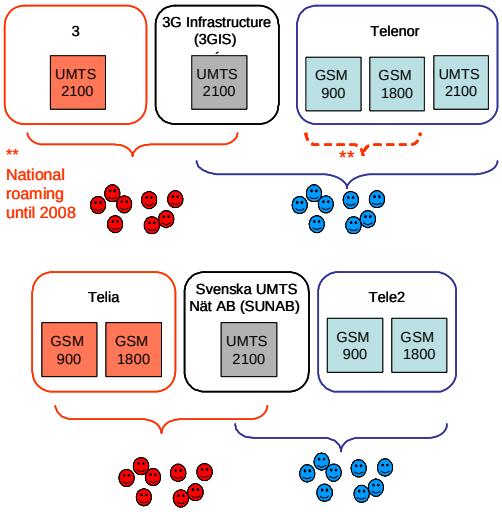
Network sharing in Sweden



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Multiple bands and technologies

Operators:
Telenor,´Tele2 and 3

2100
UMTS
HSPA

Operator: Telia

900	2100
EDGE	UMTS
	HSPA

Mobile broadband using 2G and 3G - 2007

Operator with potentially many frequency bands and technologies

800	900	1800	2100	2600
LTE	HSPA	LTE?	UMTS	LTE
	LTE?		HSPA	LTE

Mobile broadband using 3G and 4G - 2011

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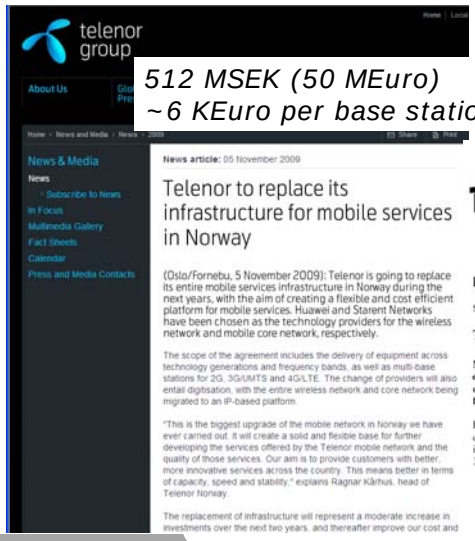
Cost of radio equipment is decreasing rapidly (from Bengt M)



512 MSEK (50 MEuro)
~6 KEuro per base station

Like this?

TELE2

telenor

~ 750 MSEK

Press release

Stockholm, 18th of December, 2009

Tele2 and Telenor select Huawei to deploy 4G network

Net4Mobility, the joint venture by Tele2 and Telenor, today announced that Chinese telecom equipment vendor Huawei will supply infrastructure and modems for next generation mobile communications, 4G, in Sweden. The agreement with Huawei comprises the deployment of the first nationwide 4G network in Sweden and modem services for the new network.

By combining the procurement of a network- and modem vendor, the operators secure an effective deployment and a commercial launch of high-quality 4G services in 2010. For customers, 4G enables increased mobility and use of high capacity services, with up to ten times the current speed of turbo-3G initially.

– Huawei provides high technology and cost efficiency, both vital components in our investments to build a nationwide 4G network. Tele2's customers will be able to access high-quality and affordable mobile services at speeds equivalent to some of today's fixed broadband connections, **said Niclas Palmstierna, CEO, Tele2 Sweden.**

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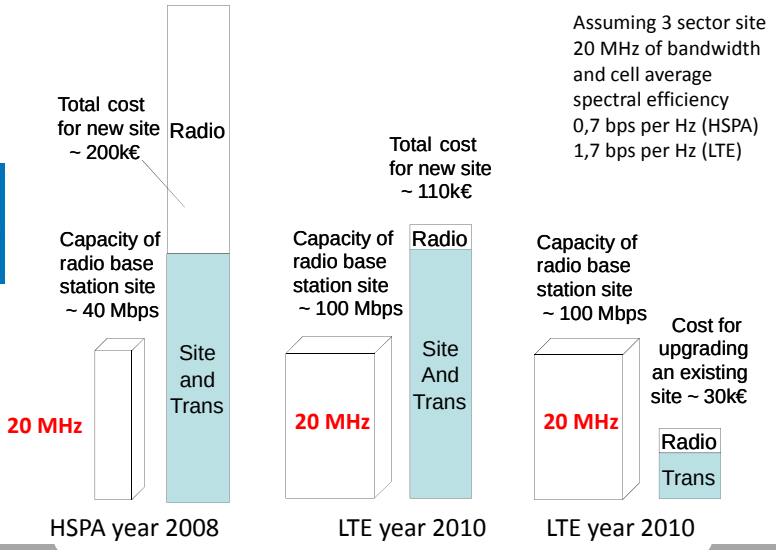
Capacity, cost and cost structure



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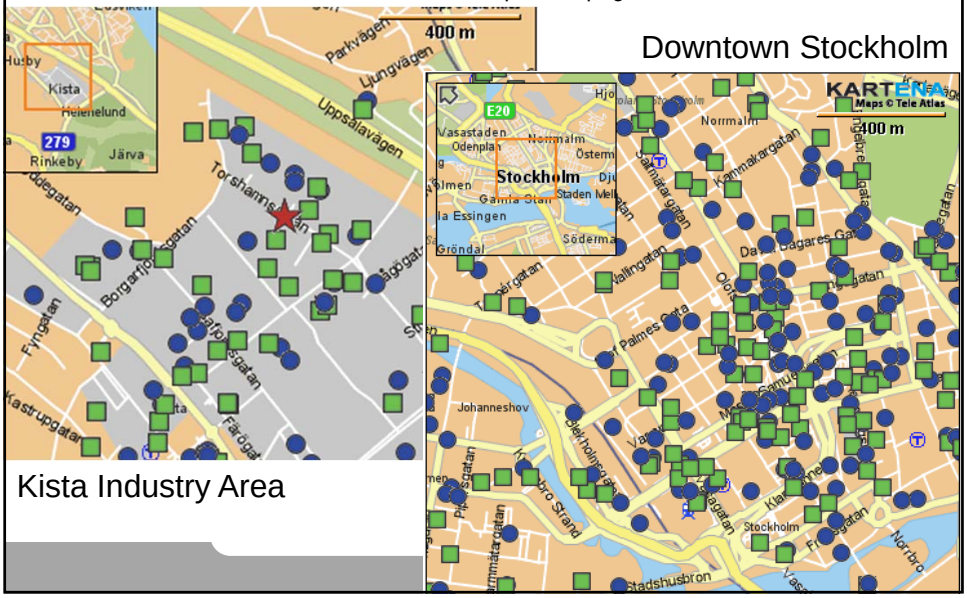
Base station site location in urban areas

from PTS "Transmitter map" web page, December 2009



Examples of Base station densities (Urban areas in Sweden)

Name and type of area	*Total density of sites*	*Typical densities for operators*
Residential area in Uppsala	~6 per km^2	1 - 3 per km^2
Residential area Akalla	~ 14 per km^2	3 - 5 per km^2
Central part of Uppsala	~ 20 per km^2	3 - 8 per km^2
Industry area Kista	~ 50 per km^2	7 - 20 per km^2
Central part of Stockholm	~ 130 per km^2	20 - 40 per km^2

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Network sharing - Why cooperation ?

- Drivers for network sharing
  - To reduce network costs
  - To get access to spectrum license
  - To get access to the competence and network of an established operator
  - Aggregated spectrum means that operators can ”offer more”, i.e. higher bit rates
- Anti-drivers for network sharing
  - Less independence
  - Decision making takes more time and effort

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Compare network sharing year 2000 and year 2010

- 2000
  - Many new base station sites were needed
  - Radio capacity relatively expensive
  - Capacity demand was relatively low
  - No shortage of spectrum
- 2010
  - Many base station sites exist
  - Cost of radio capacity has decrease dramatically
  - Capacity demand is increasing
  - Amount of spectrum is important

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