

# **NMT ASSOCIATION: TWO STEPS FORWARD IN 450 MHZ BAND**



NMT - Nordic Mobile Telephone  
NMT-450 & NMT 900

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**NMT Association**

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- ◆ What is NMT Association?
- ◆ Mobile network technology in 450 MHz:  
from analogue to digital
- ◆ Current deployments of 3G in 450 MHz:  
from trial networks to commercial launches
- ◆ Focus on Russia



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# The background: NMT standard

## NMT – Nordic Mobile Telephone

- Analogue mobile cellular network standard
- First deployments in 1981
- Deployed in the frequency bands 450 MHz (NMT450) and 900 MHz (NMT900)
- Roaming



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# NMT Association operators



<b>Sweden</b>	<b>Telia Mobile</b>
<b>Danmark</b>	<b>TeleDanmark Mobil</b>
<b>Norway</b>	<b>Telenor Mobil AS</b>
<b>Finland</b>	<b>Sonera Ltd.</b>
<b>Hungary</b>	<b>Westel Radiotelephone Ltd.</b>
<b>Romania</b>	<b>Telemobil S.A.</b>
<b>Croatia</b>	<b>Croatian Telecom Inc.</b>
<b>Czech Rep.</b>	<b>EuroTel Praha</b>
<b>Georgia</b>	<b>Iberiatel</b>
<b>Bulgaria</b>	<b>Mobikom</b>
<b>Poland</b>	<b>PTK Centertel</b>
<b>Belarus</b>	<b>BelCel JV</b>
<b>Russia</b>	<b>SOTEL (MCC, Delta and other 59 operators)</b>



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# NMT Association

NMTA – the former NMT MoU

Members:

- NMT network operators from 13 countries in Scandinavia, Eastern Europe and CIS
- Infrastructure and handsets suppliers
- Other interested parties

Totally 26 organizations  
from 16 countries worldwide

NMTA Chairman – Anders Lundblad, Telia, Sweden



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# NMT Association: from analogue to digital

- ♦ October 1998 – a need for digital technology for future migration of NMT networks was identified at the NMT MoU Plenary
- ♦ Digital Interest Group (DIG) was formed at the Plenary with an objective of selecting the digital technology for migration of the NMT analogue networks

## Framework for study:

- ♦ operators requirements
- ♦ benchmark network
- ♦ deliverables for decision by Plenary

## Candidate technologies:

- ♦ DNMT (RadioDesign)
- ♦ GSM400 (Nokia, Ericsson)
- ♦ CDMA450 (IS2000) (Qualcomm, Lucent Technologies)



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# NMT Association: from analogue to digital

- ◆ October 1999 – at NMT MoU Plenary the decision was made:

*to adopt two technologies for future migration of the NMT450 networks:*

*GSM400 and CDMA450 (IS2000)*

# Standards and terminology: CDMA450



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- ◆ CDMA450 or IMT-MC-450 – nicknames for IS2000 in 450 MHz frequency band
- ◆ Band Class 5 in IS2000 covers frequency arrangement in 450 MHz
- ◆ IS2000 is a part of Recommendation ITU-R M.1457 – one of the IMT2000 radio interfaces – IMT2000 CDMA Multicarrier - IMT MC



# Standards and terminology: GSM400



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- ◆ GSM400 – GSM technology in frequency bands around 450 MHz
- ◆ Developed by ETSI and included in GSM specification Release '99 in February 2000

Abandoned by manufacturers



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# CDMA450 Equipment manufacturers

## Network infrastructure

- Lucent Technologies (USA)
- Huawei Technologies (China)
- ZTE Corporation (China)
- Hyundai Syscom (S.Korea)
- Nortel Networks (Canada)

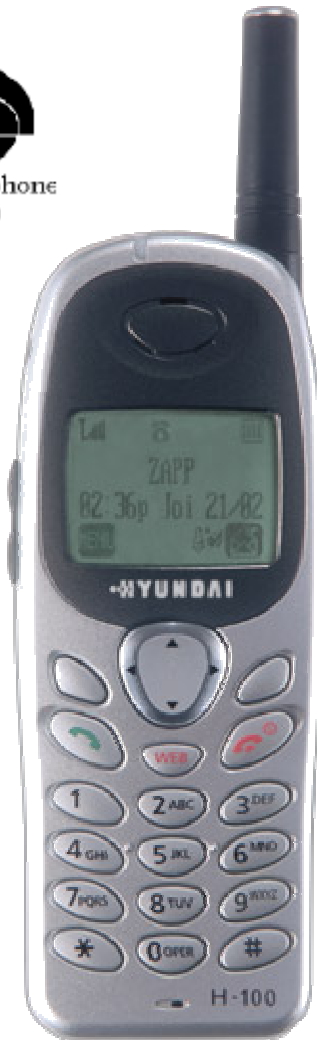
## Handsets

- Hyundai Curitel (S.Korea)
- Synertek (S.Korea)



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# CDMA450 Handsets



**Hyundai H-100**



**Synertek S-200**



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# CDMA450 Trial Networks

<b>October 2000</b>	<b>Budapest, Hungary</b>	<b>Westel</b>
<b>January 2001</b>	<b>Bucharest, Romania</b>	<b>Telemobil</b>
<b>December 2001</b>	<b>Moscow, Russia</b>	<b>MCC</b>
<b>March 2002</b>	<b>St.Petersburg, Russia</b>	<b>DeltaTelecom</b>
<b>April 2002</b>	<b>Öregrund, Sweden</b>	<b>ABNW</b>
<b>December 2002</b>	<b>Tbilisi, Georgia</b>	<b>Iberiatel</b>
<b>December 2002</b>	<b>Minsk, Belarus</b>	<b>Belcel</b>



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# CDMA450 Commercial Networks

**December 2001 Telemobil in Romania**



**December 2002 DeltaTelecom in St.Petersburg, Russia**



## Who is the next ?



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# CDMA450 Commercial Networks

**February 2003**

**Belcel, Belarus**

**3Q 2003**

**Moscow Cellular Communications,  
Moscow, Russia**



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# Focus on Russia

- ◆ Studies
- ◆ Trial networks
- ◆ Commercial launch

# Studies



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- ◆ Ministry of Telecommunications of Russia issued an Order #110 “Effective use of 450 Mhz frequency band by mobile cellular networks” that defined a framework for studies
- ◆ Studies carried out by leading state scientific institutes: NIIR, CNIIS, GSPI
- ◆ Report on technologies for the migration of NMT450: IMT-MC-450
- ◆ Report on Electro-magnetic compatibility (EMC) and sharing with other users of the band
- ◆ Reference document for type approval in Russia
- ◆ Trial network test program



# Trial Networks in Moscow and Moscow region



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- ◆ December 2001: First IMT-MC-450 trial network in Russia deployed:
  - Lucent Technologies: 7 BTS, MSC, IWF (high speed packed data equipment)
- ◆ December 2002: More trial networks for testing:
  - Huawei Technologies: 7 BTS, MSC, BSC, PDSN (high speed packed data equipment)
  - ZTE Corporation: 7 BTS, MSC, BSC, PDSN (high speed packed data equipment)



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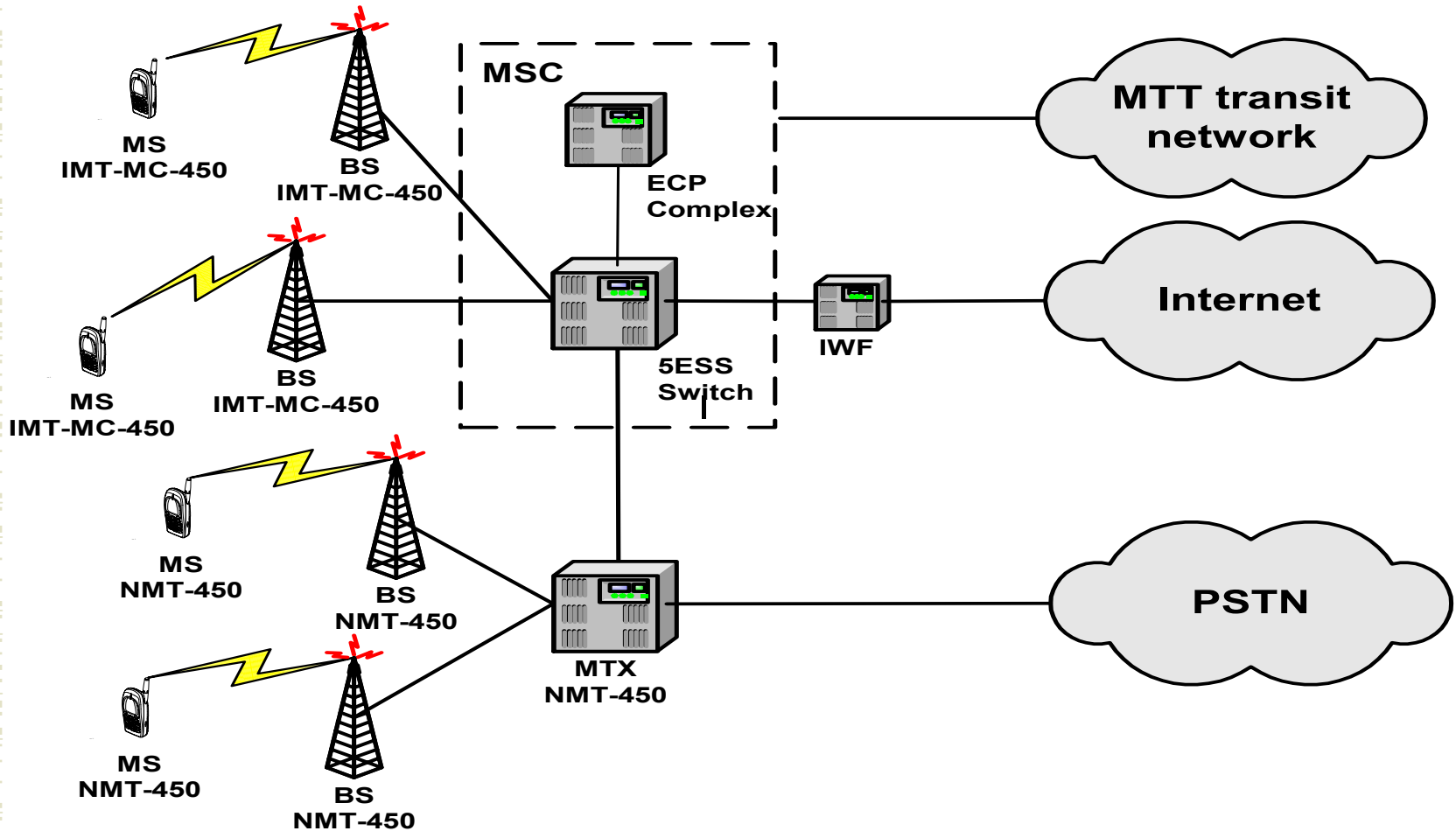
# Trial network objectives

- ◆ Coverage testing
- ◆ Capacity testing
- ◆ High speed packet data testing
- ◆ EMC and sharing with NMT450 network
- ◆ EMC and sharing with other users of the band - studies results approval
- ◆ Roaming testing



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# Trial network diagram: Lucent Technologies



# IMT-MC-450 trial network in Moscow testing results



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- ◆ Cell coverage up to 50 km achieved
- ◆ Capacity claims approved
- ◆ Packet data service tested: 100 kbps average transfer rate (download and upload) in urban environment, in movement
- ◆ Excellent voice quality experienced
- ◆ Roaming between MCC and DeltaTelecom was successfully tested
- ◆ EMC and spectrum sharing was tested
  - between IMT-MC-450 and NMT450 networks
  - between IMT-MC-450 network and other users of the band

Based on the studies results and trial network tests Russian Ministry of Telecommunications allowed the use of IMT MC technology in 450 MHz frequency band for migration of existing NMT450 networks



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# Ongoing tests in the trial networks in Moscow

- ◆ Type approval acquisition (certification) for Huawei and ZTE
- ◆ Comparative side-by-side performance testing of network equipment from three vendors: Lucent, Huawei, ZTE
- ◆ Interoperability between different vendors equipment testing (roaming, inter-vendor handoff (IVHO))



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# Commercial network launch in St.Petersburg: SKYLINK



- ◆ Launched on 16 December 2002
- ◆ Service in St.Petersburg and suburbs
- ◆ 63 base stations co-located with NMT sites provide better coverage than NMT
- ◆ 1200 subs in half a month
- ◆ Voice and data packages with data traffic included and per MB extra traffic charging
- ◆ Many advanced services are provided, more are being developed

[www.skylink.spb.ru](http://www.skylink.spb.ru)



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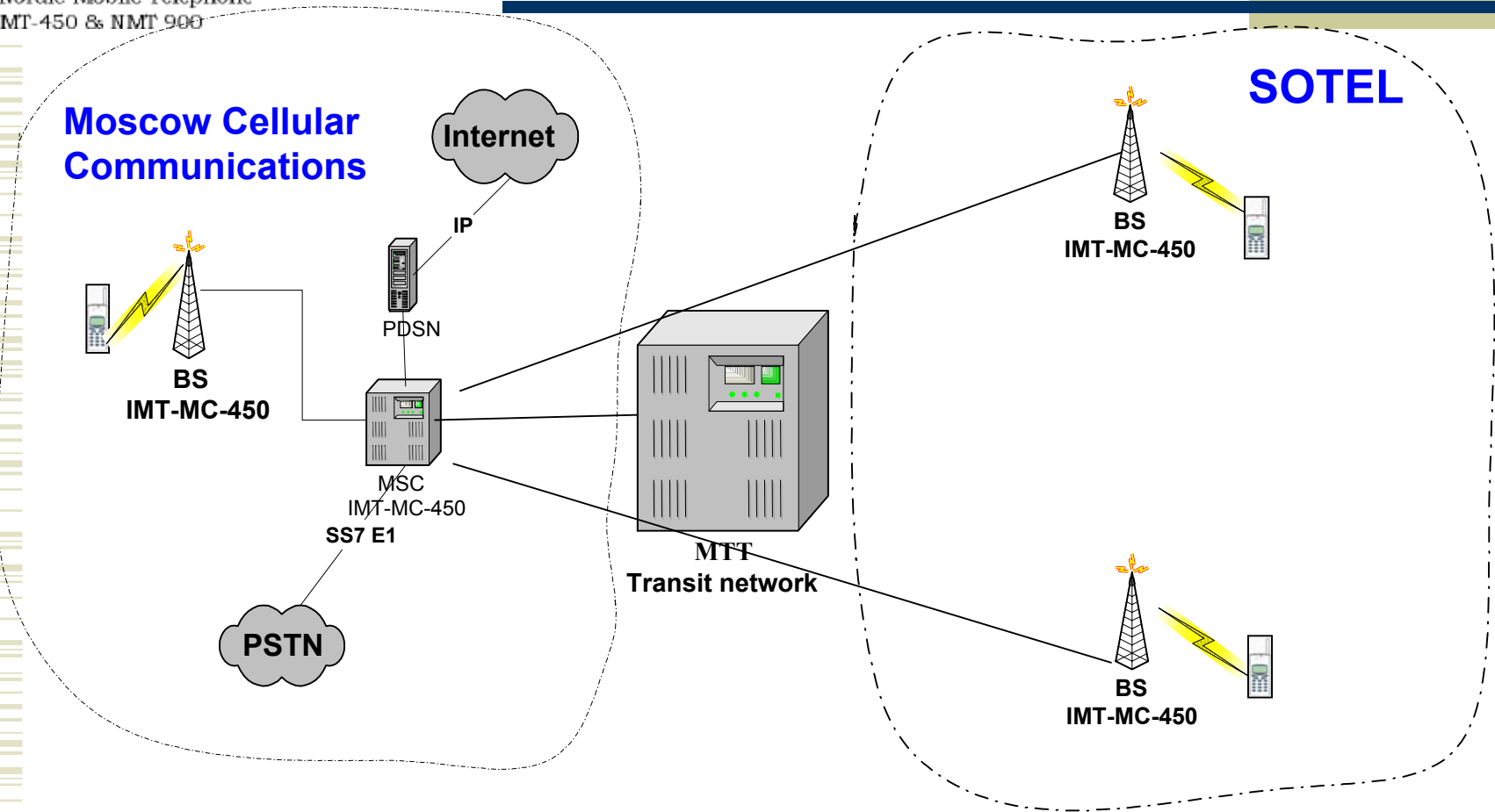
# IMT-MC-450 Deployment Strategy in Russia(1)

- ◆ IMT-MC-450 is the single technology for replacement of existing NMT450 networks
- ◆ Gradual deployment in the areas where the need for new services is identified
- ◆ Remote base stations connection over digital trunks to central MSC

# IMT-MC-450 Deployment Strategy (2)



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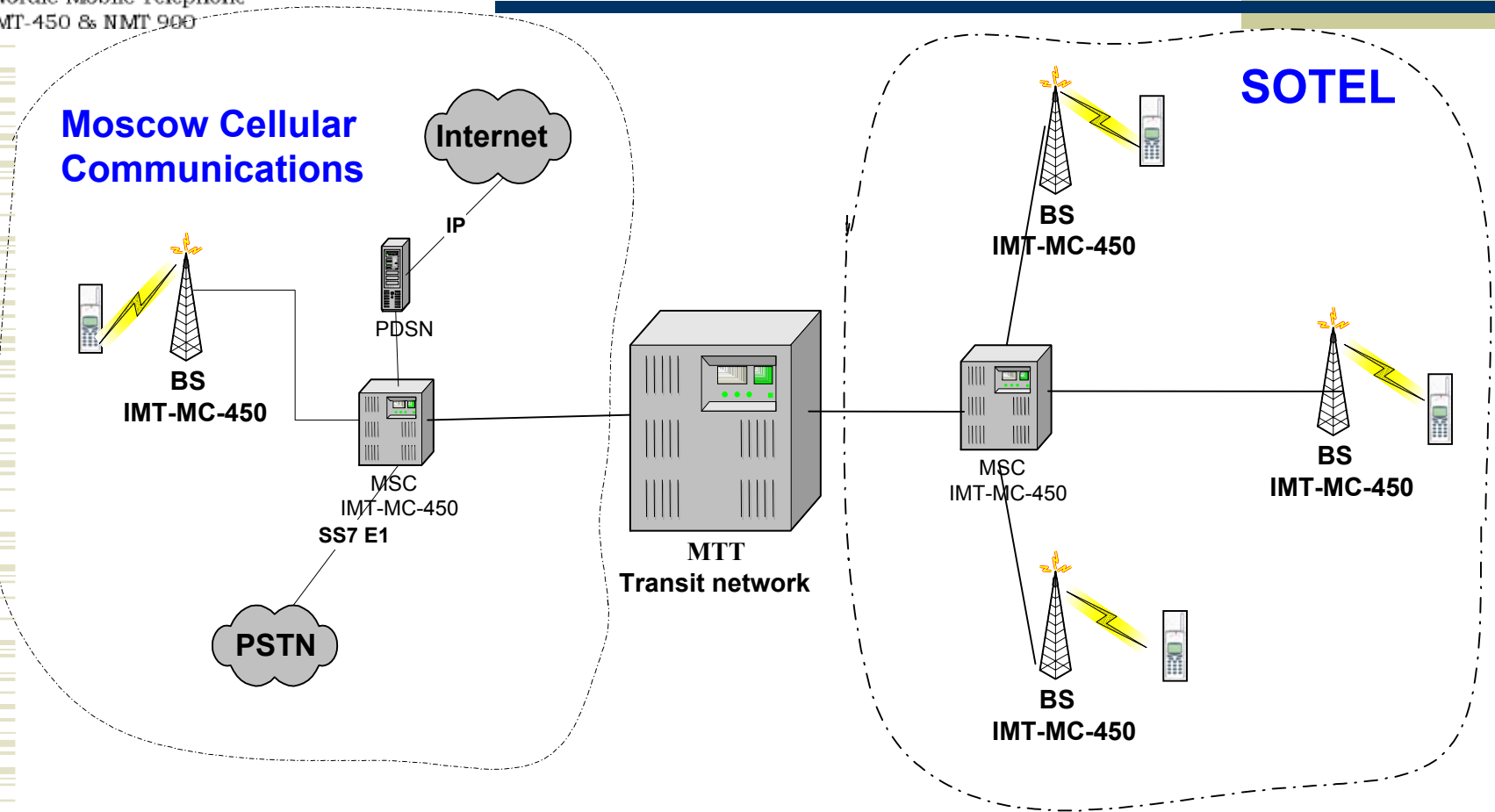




# IMT-MC-450 Deployment Strategy (3)



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# IMT-MC-450 Deployment Strategy (1st stage)

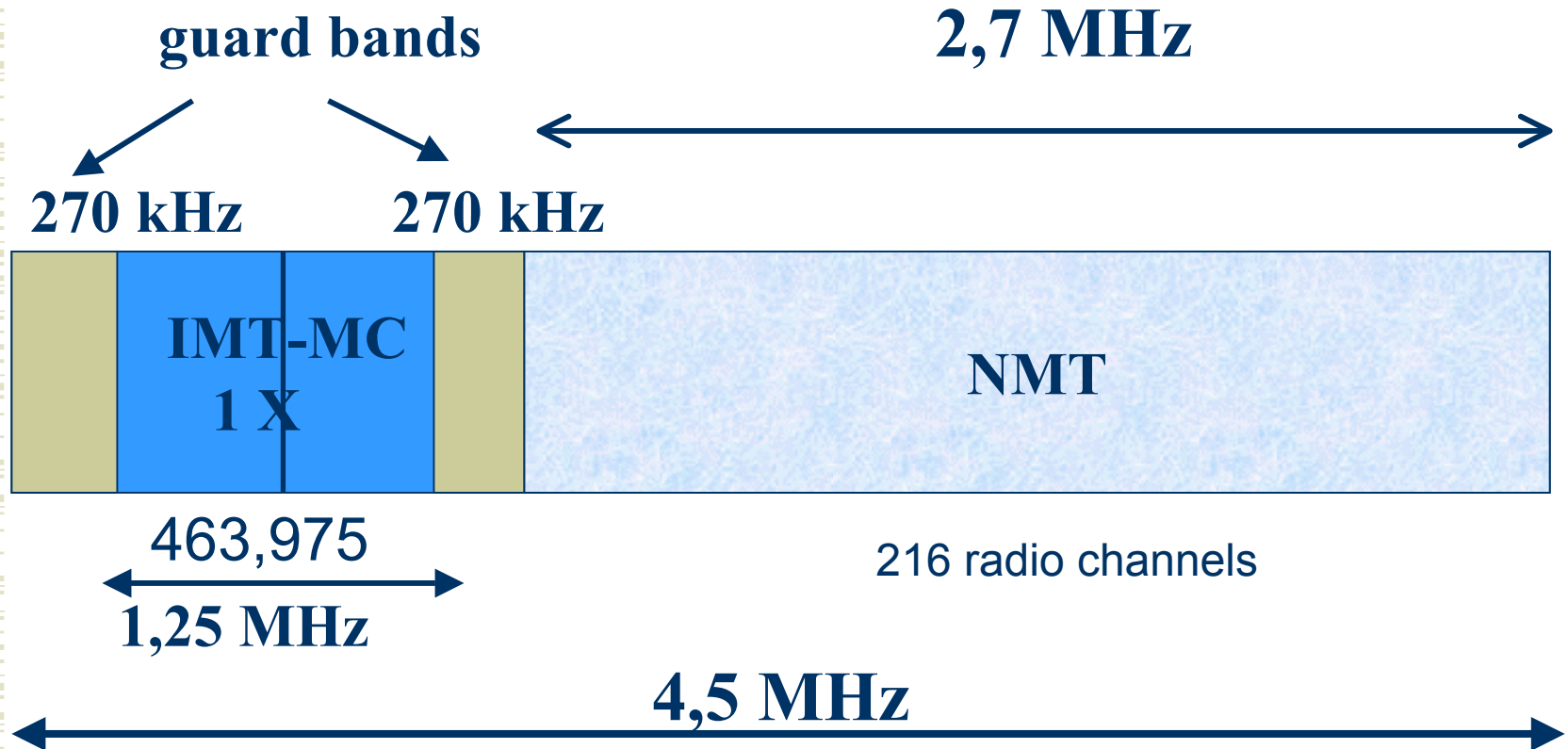
## I stage: 1 carrier - 1X RTT

- ◆ Coverage better than NMT
- ◆ Capacity gain 6-7 times over NMT
- ◆ Excellent voice quality
- ◆ High speed packet data service (163,2 kbps)
- ◆ Wide variety of advanced services



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# IMT-MC-450 Deployment Strategy (1st stage)



# IMT-MC-450 Deployment Strategy (2nd stage)



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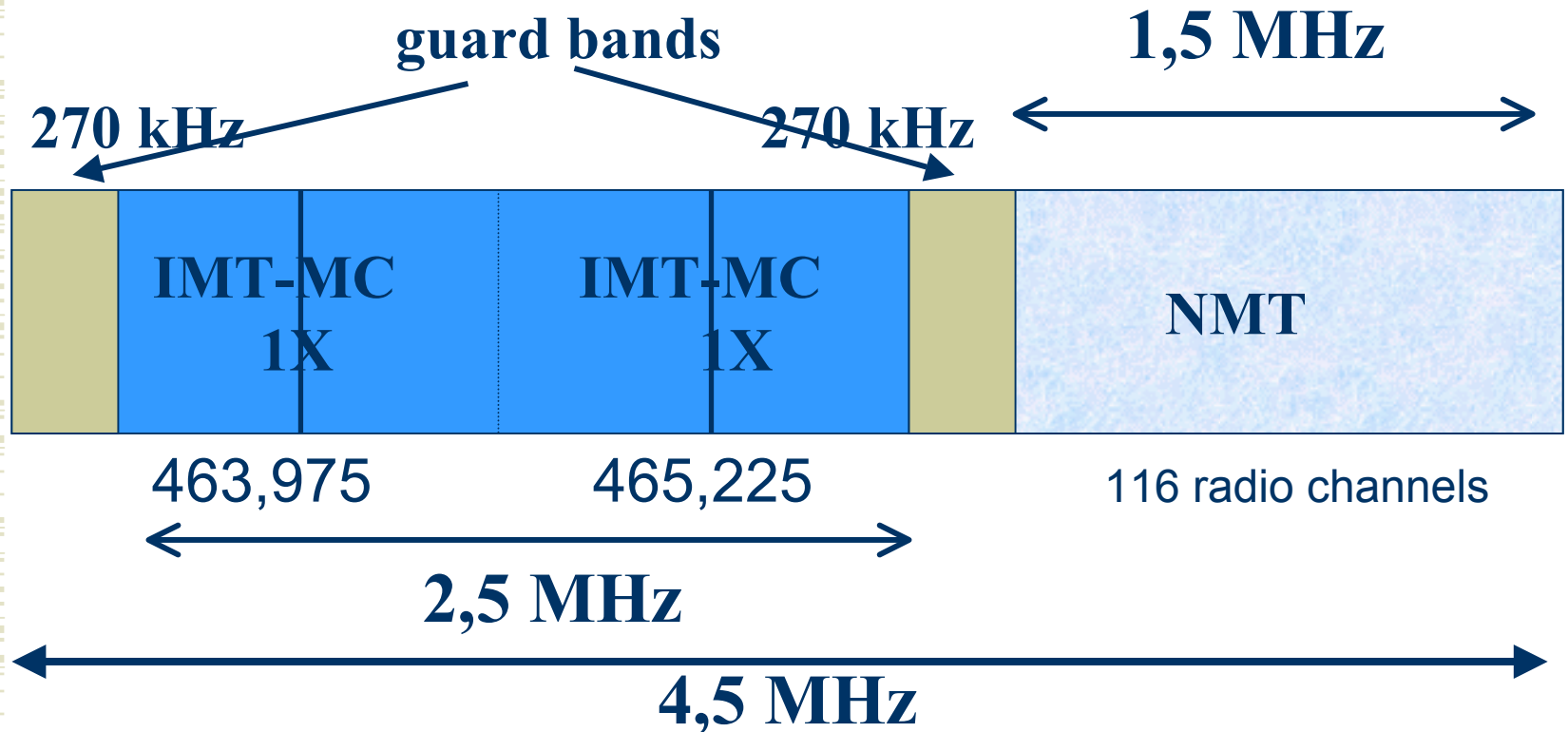
## II stage: 2 carriers - 1X RTT + 1X RTT

- ◆ Additional carrier for capacity
- ◆ Carriers may be assigned to voice and data users, e.g.:
  - Carrier 1 – mainly for voice
  - Carrier 2 – for voice and datadepending on traffic profile



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# IMT-MC-450 Deployment Strategy (2nd stage)



# IMT-MC-450 Deployment Strategy (3rd stage)



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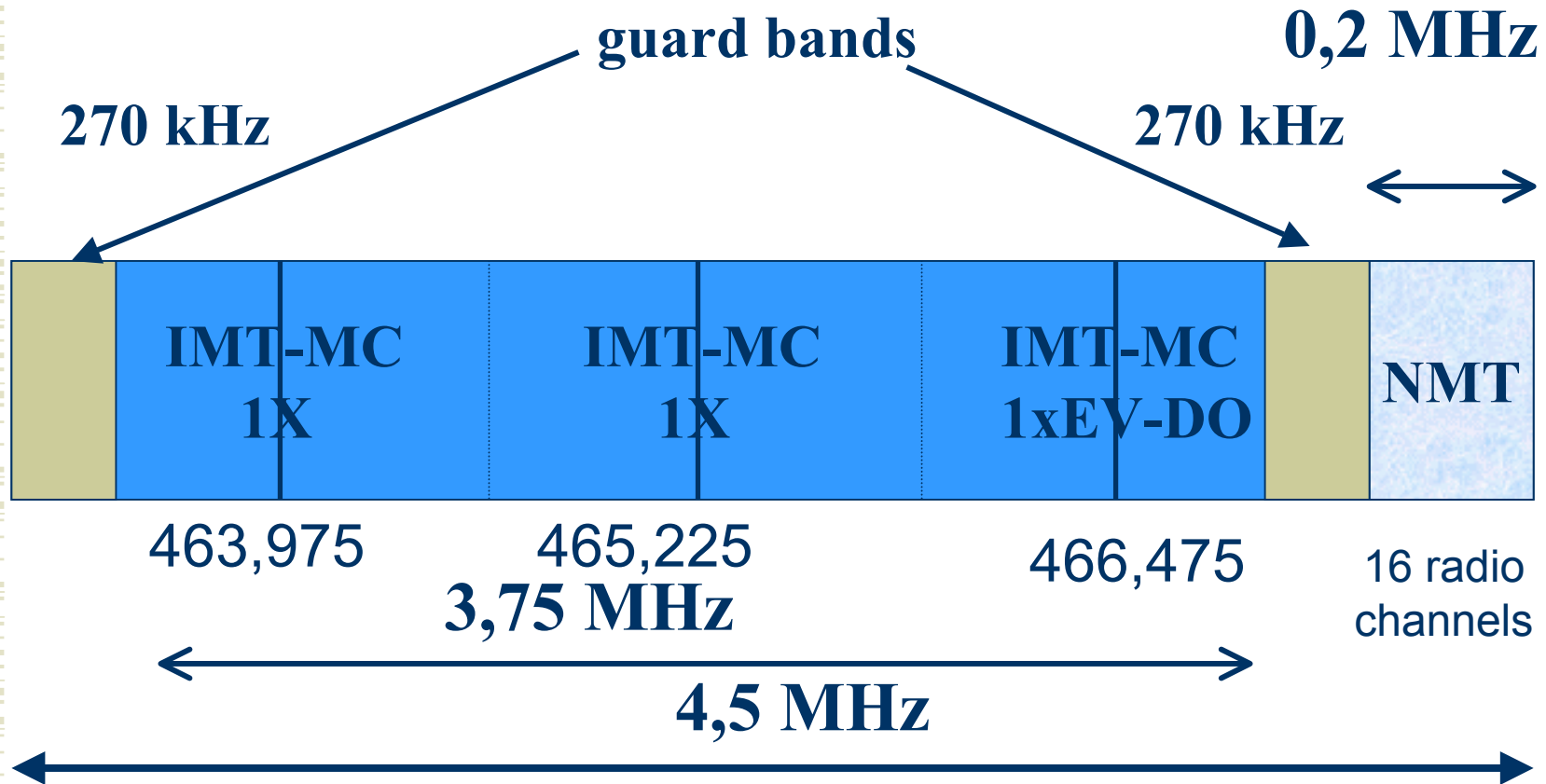
## III stage : 3 carriers - 1X RTT + 1X RTT + 1xEV-DO

- ◆ 1X RTT carriers for voice and packet data
- ◆ 1xEV-DO exclusively for high speed packet data: up to 2,4 Mbps



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# IMT-MC-450 Deployment Strategy (3rd stage)





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# Videostreaming over IMT-MC-450 demo







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# Conclusion

- ◆ Spectrum in 450 MHz frequency band is a very valuable resource
- ◆ Coverage of big land masses with fewer base stations – smaller initial investment, less operational costs – we can be competitive
- ◆ Two steps forward from 1G to 3G with advancing from NMT450 to IMT MC



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# Thank you

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