INTERNATIONAL UNION
OF RAILWAYS

unity, solidarity, universality

The potential of conventional rail
Business case of 220 – 250 km/h

TENT-T Workshop
Warsaw, 25 February 2014

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Agenda

- UIC & High speed
- Conventional and upgraded lines
- Basic issues of the speed on rails
- Tilting trains
- Examples of upgrades and services
- Concluding remarks

What's the UIC?

The UIC is a professional organisation serving the needs of rail transport through international cooperation at the global level

www.uic.org

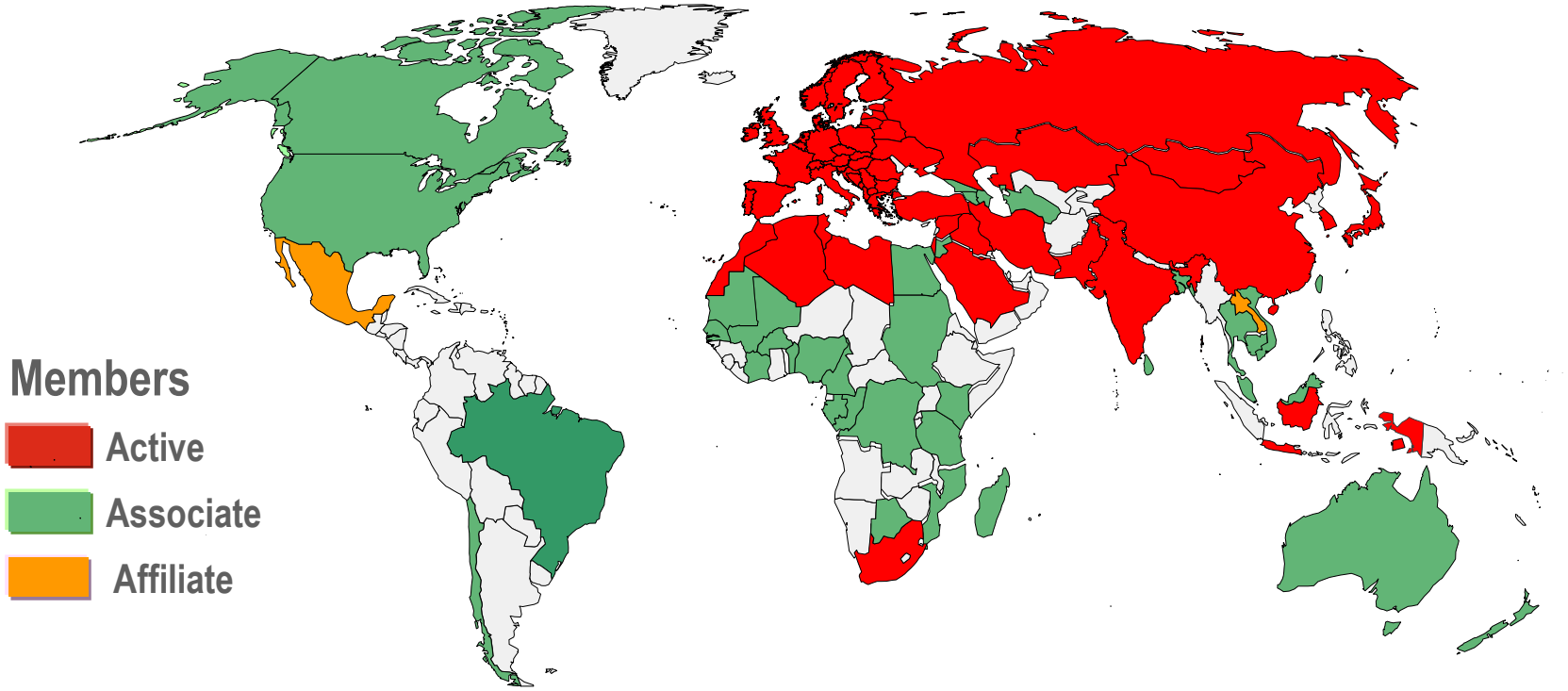
UIC Mission

Promoting the development of rail transport at world level,
in order to meet challenges
of mobility and sustainable development

UIC in 2014

Since 1922
240 members

Railways
Rail operators
Infrastructure managers
Railway service providers
Public transport companies



UIC – Intercity & High Speed

Working group in activity since 1995
Studies on strategic issues
www.uic.org/highspeed

Activities:
- Benchmarking & data bases
- System analyses & researches
- Technical workshops
- Training programs
- World Congress on High Speed

High Speed:
- Systems in operation
- Future developments

UIC – Intercity & High Speed

High speed reports. Recent examples:

- High speed and the City (I & II)
- High speed handbook
- High speed contribution to sustainable mobility
- Optimal speed on high speed systems
- Infrastructure cost for Intercity & HS services
- Etc.

Full Library of studies & reports available online: www.uic.org/highspeed

Tourist OPportunities on Rail Transport (TOPRAIL)

New activity to explore and promote the potential of traffic on rail for leisure: High Speed, seasonal, charter, safety on vintage trains, cruise trains,… New chairmanship (Catalonian Railways)

Training on High Speed Systems

THSS Basic **10th edition - June 2014, Paris**

One week (5 days) Training Seminar, in which all the elements involved in a high speed system are analysed.



THSS Advanced **2nd edition - March 2014, Spain**

One week (5 days) Training Seminar, focused on strategic aspects in a high speed system: traffic forecasting, station policy, environment, financing, etc.

Practical cases discussion.

Technical visits

www.uic.org/highspeed

World Congress on HS Rail WCHS

TOKYO 2015
HIGHSPEED
9th World Congress on High Speed Rail

July 2015 in Tokyo, Japan
Organized by the UIC & East Japan Rail

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“High Speed” or “Conventional rail”?

• Difficulties to implement high-speed rail systems (i.e. the cost) could suggest exploring the possibilities of improving the performances of traditional rail networks

• Traditional networks could **REPLACE** or **COMPLEMENT** the high-speed system, due to COMPATIBILITY between them

• This can also be a provisional solution

Why the speed is limited?

- Technical reasons — track quality, traction power, dynamic effects, CAPACITY
- Limits on curves — comfort of passengers, track lateral stability, derailment, overturning
- Environment — noise, vibrations
- Safety — braking distances, **other motives**
- Economy — energy consumption, maintenance costs

Some thresholds for conventional rail (magnitudes)

• Trains with axle vehicles:	100 km/h
• Without in cab help signaling:	140 km/h
• People on platforms:	160 km/h
• Lines with crossing levels:	160 km/h
• Trains with locomotive + cars:	200 km/h
• Limit for conventional lines & trains:	200/230 km/h
• High speed lines:	≥ 250 km/h
• Very high speed:	≥ *300 km/h*


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Time or speed?

- The objective is reducing the travel time
- Reducing travel time ≠ Increasing speed
- Travel time or speed but with
  - CAPACITY
  - RELIABILITY
  - ECONOMY
  - SAFETY

How to reduce the travel time?

- Improve performances — acceleration, braking, maximum speed, speed in curve (incl. tilting)
- Improve the track — geometry, structure, profile
- Improve the control — signalling, control system
- Change commercial policy — reducing stops
- …

UIC reports on Reduction on Time Travel on Classic Lines, Optimal Speed, High Speed Handbooks, etc. http://www.uic.org/highspeed

Don’t forget…

- The other elements: stations, time to get tickets, intermodality, etc.
- Efforts to reduce time travel must be coherent with obtained performance
- Take into account the period necessary to improve the infrastructure

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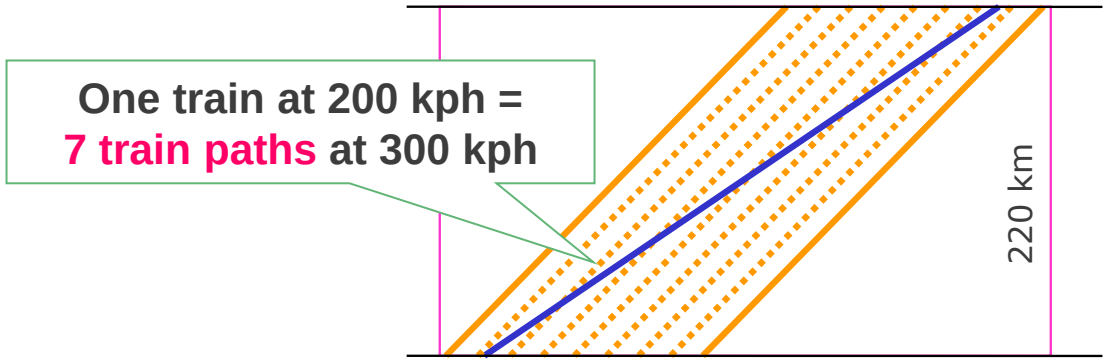
Basic ideas about speed on rails

For a single train:

- Maximum speed & minimum speed
- Constant speed as much as possible
- Commercial speed < 85 % maximum speed

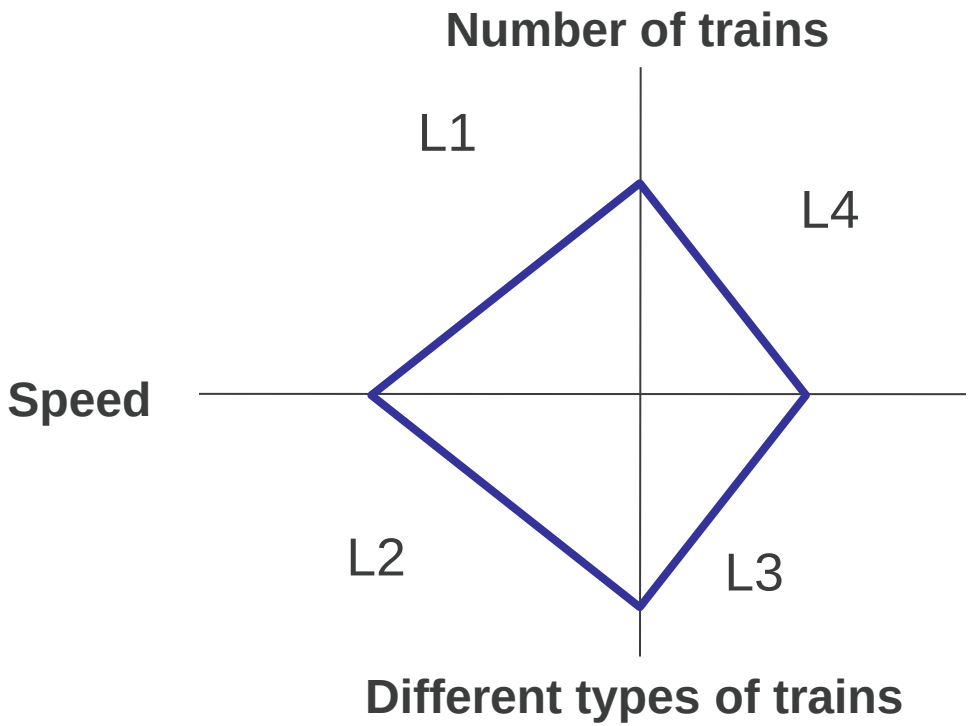
For all the trains on the line (traffic density):

- Homogeneity of speed = capacity
- Limit differences between the speed of different trains



50 km/h
maximum speed
difference
recommended

Balancing capacity



L1 + L2 + L3 + L4 = Constant

UIC Leaflet 406

Upgrading infrastructure

- Adjusting layout (modifying alignments)
- Actions on civil works
- Eliminating level crossings
- Renewal of existing rails
- Equipping or renewal of concrete sleepers
- Renewal switches
- Adjusting or replacing catenary
- Improving the signalling system
- …

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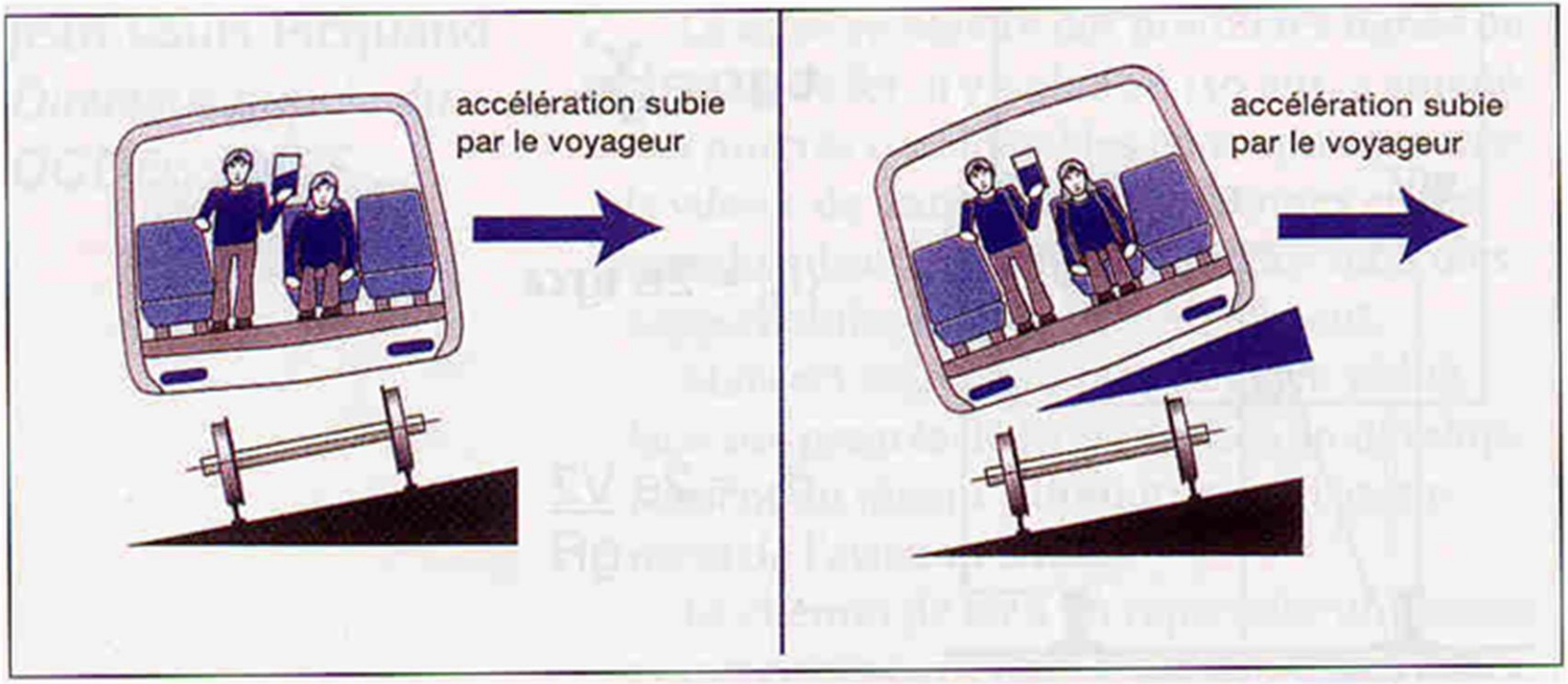
Tilting trains features

Application	• Speed ranges from 80 to 250 km/h • Lower tilting up to 320 km/h
Advantages	• Increases the comfort • Increases 30 to 35 % the speed in curves • Reduces journey time between 8 and 25 %
Economy	• Investment 5 to 8 % higher than conventional • Maintenance cost can be 3 to 5 % higher • Energy cost reduction depends on each case

Tilting trains principle

Conventional train (roll)

Tilting train



Speed in curve limited by passenger comfort.

Passengers perceive less lateral acceleration even running faster.

With sufficient tilting angle the speed is limited by track.

Tilting trains factors

Key factors to evaluate:

- Need to acquire special rolling stock (opportunity)
- Cost of the new rolling stock
- Cost of the maintenance
- Requirements for the infrastructure
- Performance to obtain and image

Two types of tilting trains:

- Active
- Natural or passive

Active

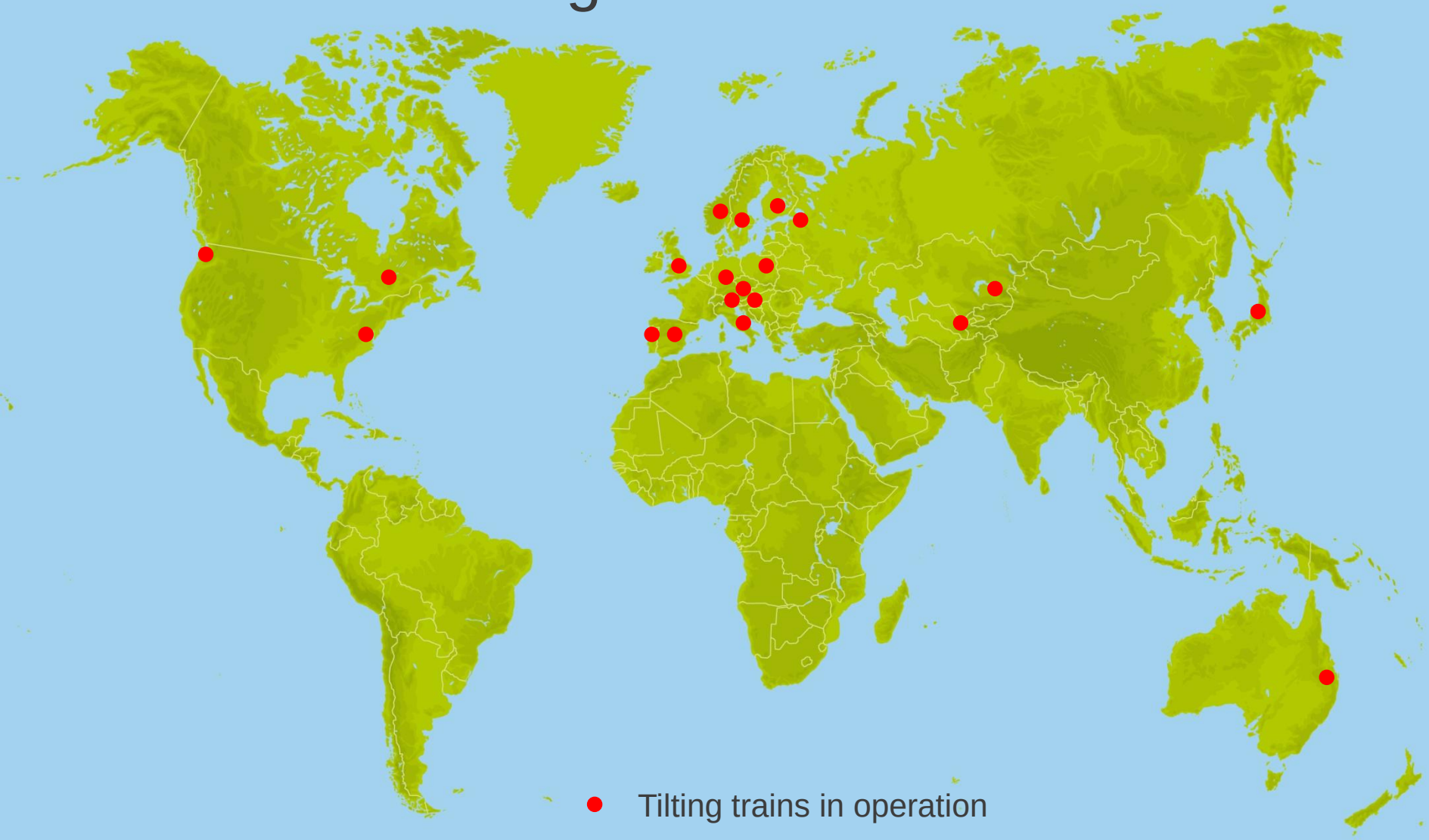
Active

Natural

Natural

Tilting trains around the world

Tilting trains in 2014



World rolling stock high speed fleet

High speed train sets* in operation in the world:

Maximum speed 200 km/h or more:	2 897
Maximum speed 250 km/h or more:	2 088
Tilting trains (estimation, HS & conventional):	1 000
High speed train sets manufacturing:	945

June 2013

* and trains operating on dedicated high speed lines

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Upgrading lines: 3 examples

- West Coast Main Line 640 km
  London – Scotland, UK
- Mediterranean corridor 480 km
  Barcelona – Valencia, Spain
- Lisbon – Oporto, Portugal 335 km

In all of these cases…

Upgrading lines: 3 examples

Upgrading lines: 3 examples

Upgrading lines: 3 examples

Upgrading lines: 3 examples

The maximum speed has been increased up to 220 km/h, by large infrastructure improvements

These improvements have been obtained by:
- Big investments
- Long times for works (up to 15 years)
- Traffic disturbances during this time

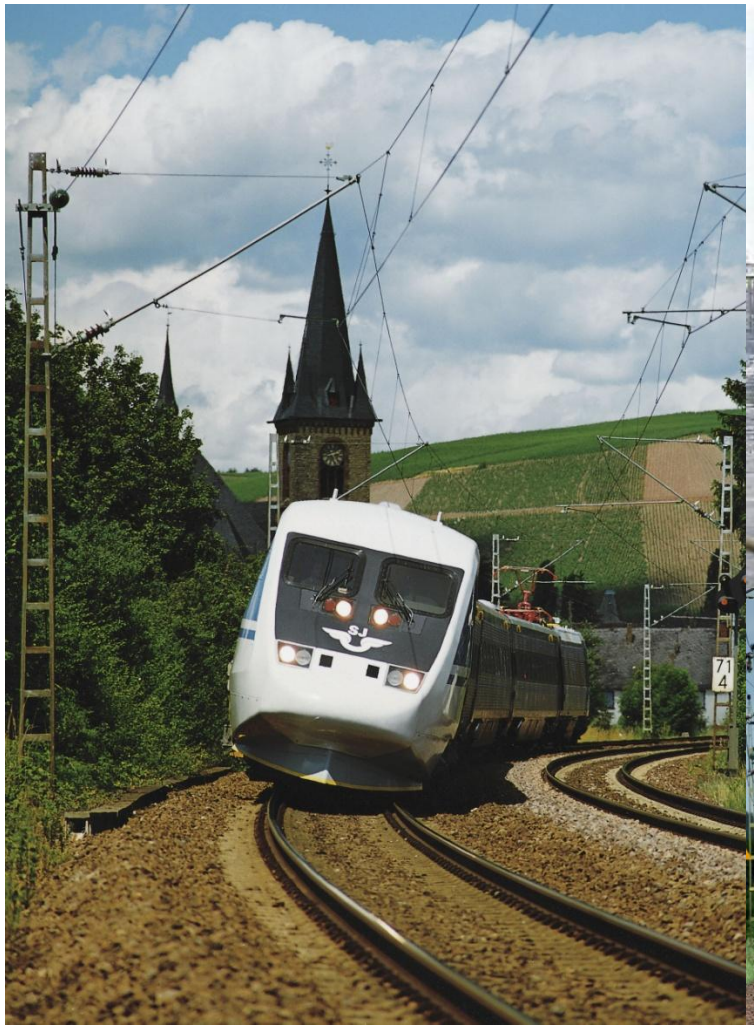
The result:
- Progressively, performance of rail services has improved
- Consequently, the traffic demand has been increased
- Consequently, a new high speed line has been planned

Implementing services: Sweden

Implementation X2:

- Infrastructure for 200 (upgraded)
- Tilting technology
- Image: X2000 service
- Extending lines and services at 200 km/h
  (even on single track lines)
- Model proposed to export
  (test trains in USA, Hong Kong, Australia)
- Future high speed / very high speed system

Implementing services: Sweden



Implementing services: Poland

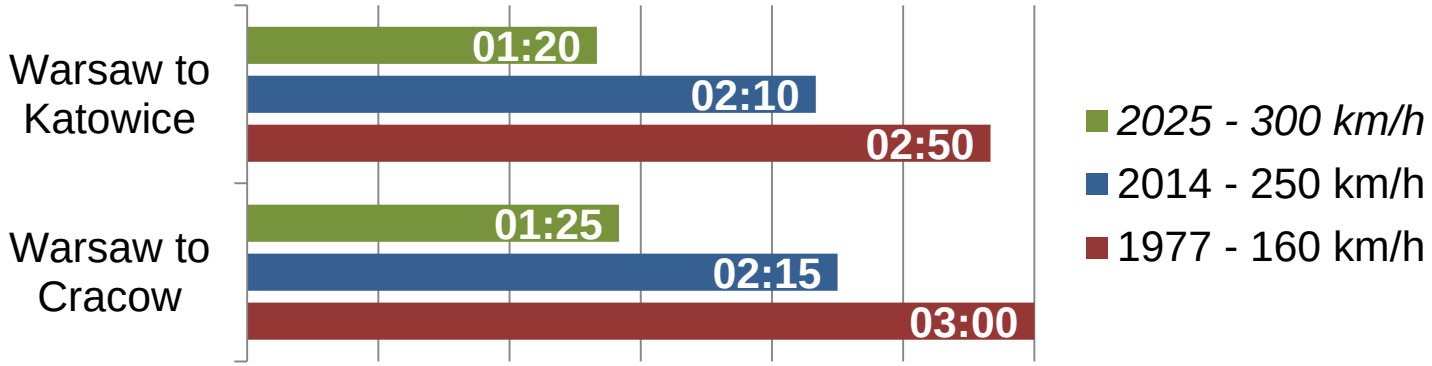
CMK “Central Magistrala Kolejeva”
(“Central Trunk Line”)
Warsaw – Katowice / Cracow:

- Length 224 km, opened in 1977
- Infrastructure layout for high speed, 300 km/h
- Operated at 160 km/h (no HS signalling, RS)
- Being upgraded for 250 km/h (switches & catenary)
- Operation with new train sets (“Express InterCity Premium”)

Implementing services: Poland

Future:

- Extension and upgrading for high speed
  (25 kV & signalling ETCS level 1)
- Operated as a high speed system
- Becoming a part of the Polish high speed network
- Becoming a part of the European HS network



Implementing services: Poland

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Conclusion

- Upgraded lines can replace or complement high speed lines
- Classic lines upgrade needs integrated global approach
- Required gain/costs balance (time, money, disturbances)
- Max speed for conventional line operation is 200-250 km/h
- Higher performances require high speed system

UIC reports

http://www.uic.org/highspeed

Thank you very much for your kind attention

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