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Integrating CBTC Green Field and Re-signalling Experience IRSTE/ IRSE International Convention, New Delhi

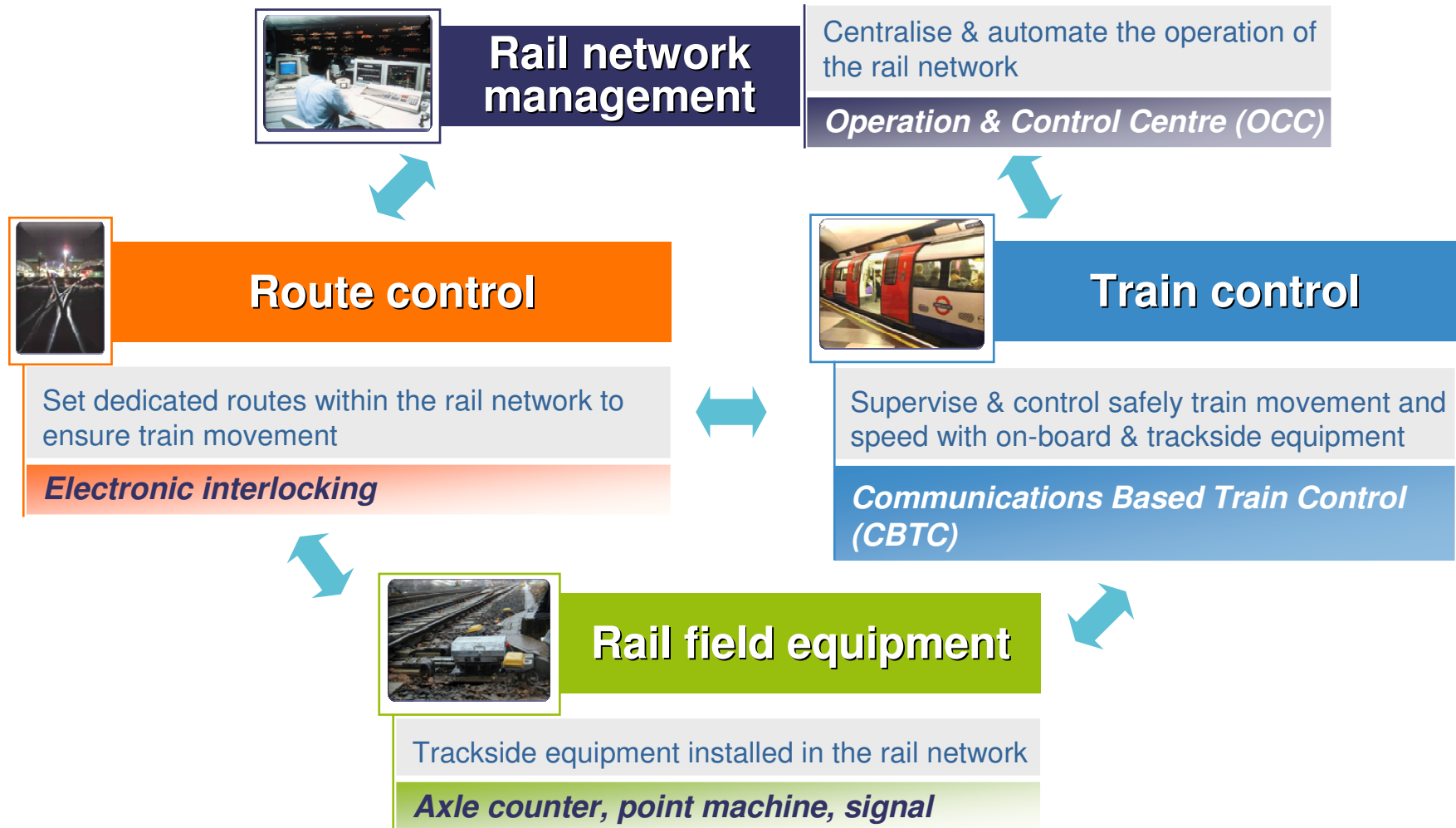
April 27th & 28th 2012

Hugo Ramos

THALES

- ◆ **Communication Based-Train Control**
- ◆ **Market requirements & implementation challenges**
 - Sharing experiences – project challenges & achievements

A complete portfolio of **systems and related services** enabling urban rail operators to take full advantage of the most **advanced signalling solutions**



The **most advanced signalling solution** available today for **metros and people movers**

CBTC as defined in IEEE 1474.1

- ◆ Train location determination to a high precision, **independent of track circuits**
- ◆ **Continuous, bi-directional** Radio Frequency (RF) communications between train and wayside, to permit the transfer of significantly more control and status data than is possible with conventional systems
- ◆ Vital train borne and wayside processors to provide continuous Automatic Train Protection (ATP)



Safety principles associated to Communication Based Train Control systems

- ◆ Operation is based on the stopping distance required for a train at its prevailing speed
- ◆ “Block” protecting a train is not associated with fixed segments on the track
- ◆ Safe distance of separation varies with speed of the train

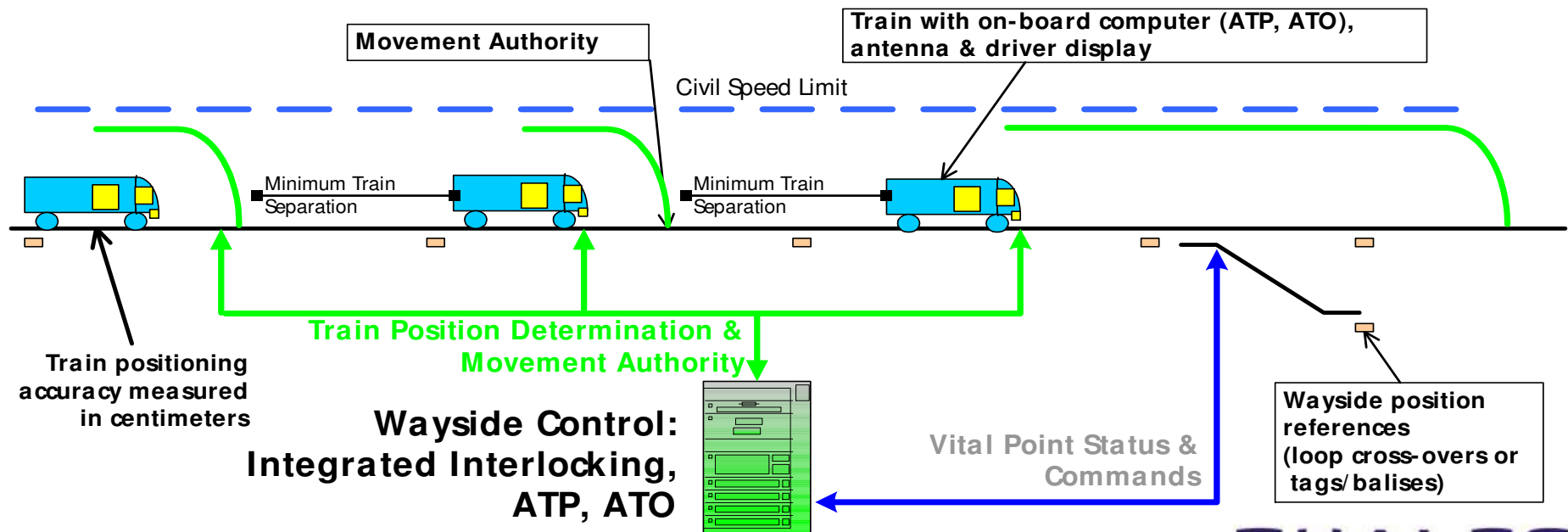


On-board computers drive trains based on continuous bi-directional communications

- ◆ Train location by on-board measurement reported via comslink
- ◆ “Moving Block” technology

Increasing Demand for Driverless Urban Transit

- ◆ More than 70% of new metro lines worldwide are CBTC based
- ◆ Resignaling projects are now also being considered for driverless operations



SelTrac® – Positioned for growth

- ◆ Can be deployed on **green field** projects or complete **resignalling** or as an **overlay** on existing networks
- ◆ Modular and scalable systems from Automatic train stop solution to full radio moving-block CBTC
- ◆ Flexible configuration :
 - ◆ Fully integrated control system → no external interlocking required
 - ◆ Overlay solution ; working with an external interlocking
 - New or existing interlocking
 - Relay-based or electronic interlocking
- ◆ Complete operation range from manual to full driver less





**Over 1 000 km, 50 CBTC systems provided
by Thales since 1985**

Beyond increasing safety

- ◉ **Flexibility** (respond to operation loads, traffic incident management, 24 hour operations)
- ◉ **Reduce operating costs** (energy, staff, maintenance)
- ◉ **Added value** services to passengers
- ◉ **Efficient capacity** management (near and long term)
- ◉ **Optimize capital investment** costs (reduce civil construction and train acquisition costs)
- ◉ **Increased security**
- ◉ Decision aid and crisis management tools

Intelligent Safe Reliable systems

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Short Schedule

- ◆ Can you go live in 14 months?

Opening for Special Events

- ◆ Has to happen by this date no matter what

Reality of the projects

- ◆ Murphy applies

E&M Systems are the last on the chain

Case study: Al Mashaer Al Mugadasah Metro Mecca, Saudi Arabia

Customer Challenge

- ◆ Improve transit in and around Mecca to facilitate The mobility of 2 million people in the annual Hajj pilgrimage to Mecca.
- ◆ Build a driverless 20km Metro in record time

Thales answer

- ◆ Turnkey Thales solution including signalling (SelTrac CBTC solution), communications, operation control centre, CCTV, SCADA, automatic address and information system



Key dates:

- Awarded 2009
- Revenue service 1st phase end 2010

**Integrated Signalling and Communication
System fulfilling Customer needs**

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Project Delivery Challenges

- ◆ Schedule, with hard deadline HAJJ 2010
- ◆ Build local signalling expertise
- ◆ Site accessibility restrictions
- ◆ Multicultural environment
- ◆ Ensure flawless HAJJ 2010 revenue service from day one

Thales answer

- ◆ **Flexibility** to adapt to construction deliveries dynamically allocating shifts and resources
- ◆ **Training** well in advance to create experts and overcome site accessibility restrictions
- ◆ **One team** approach Customer, End-Customer, consultants and Safety Assessor
- ◆ Strong continuous **communication** to address the multicultural environment
- ◆ **Resident** emergency response team during Hajj



Al Mashaer Al Mugadasah Metro Mecca, Saudi Arabia

Project Achievement

- ◆ Successful delivery on time for Hajj
- ◆ Successful operation during Hajj 2010



IN THE NAME OF ALLAH, MOST GRACEFUL MOST MERCIFUL

KINGDOM OF SAUDI ARABIA # 186/A
MINISTRY OF WORKS DATE: 29/11/1431HIGRI
CENTRAL DIRECTORATE FOR PROJECT DEVELOPMENT
MASHAER RAIL PROJECT

Dear respected Thales Company

Peace and Allah's blessing upon you

We would like to thank you on your efforts in the execution of your assigned tasks represented in the Singalling and Communitaion of the Mashaer religious rail project – South line.

We sincerely appreciate your effort and the continuous work around the clock to complete the necessary work required for this year operation. Hoping that this effort will continue until the completion of all necessary required tasks to operate the project 100%, God's willing.

Please accept our best regards

Dr. Eng. Habib Zein-Alabideen
First Deputy Minister
Central Directorate for Project Development



Thales delivers again on time for special event
Outstanding performance and quality

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Customer Challenge

◆ Growth of the metro system network is deemed necessary to improve mobility of 17M citizens. The government's intent was to introduce the latest signalling technology and implement the "interoperability" on new lines. The three lines will need to enter into revenue service at the same time!

Thales answer

◆ SelTrac CBTC

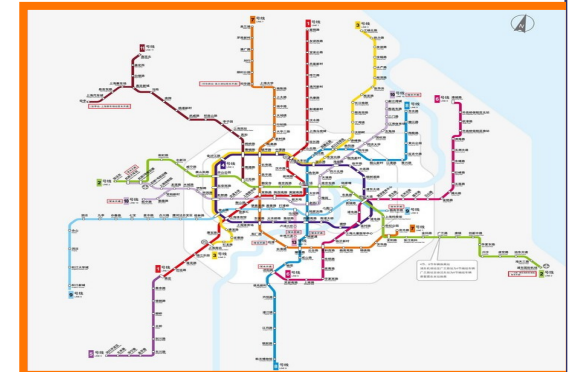


Thales SelTrac providing ATO for mixed train sets

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Thales Projects in Shanghai

Line	Line 8	Line 8x	Line 6	Line 9	Line 9x	Line 7	Line 11	TOTAL
Length	23km	10km	33km	32km	14km	34km	45km	191km
No. of Stations	21	9	28	13	10	28	21	130
No. of Trains	28	18	32	16	28	42	58	222



191 Km, 130 Stations, 222 trains

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Project Delivery Challenges

- Increase the scale of the network (new lines, extensions, stations, etc.) a.s.a.p. **open on-time !!**
- Increase the number of trains to service those lines, extensions
- Short project schedule (especially field schedule)
- External interfaces available late in schedule.
- Revenue date fixed, so need to work around delays.

Thales answer

- Customer is part of the **team**
- Freeze the **Design early**
- Hardware & Software **Design Optimization**
- Full in-house **test environment**
- **Early Field Integration** on a sample section
- Commission trains away from the main guideway

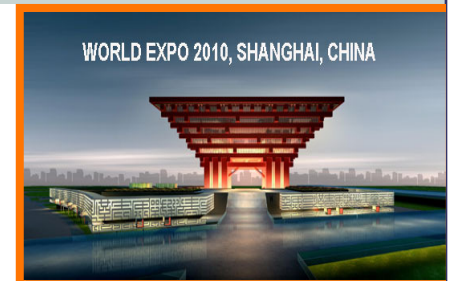


Flexibility of Solution for various Schedule needs

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Project Achievement

- ◆ Shanghai Line 6, Line 8 and Line 9 were **opened simultaneously** on 29-Dec-2007
- ◆ Shanghai Line 9 duration from NTP to Revenue Service was only **15 months.**
- ◆ Shanghai Line 9 Extension and Line 11 were opened **simultaneously** on 31-Dec-2009, despite some very late civil handovers on Line 11. (L7 was opened on 05-Dec-2009)
- ◆ Line 8 extension (to expo) - March 2010, **in time for World Expo**



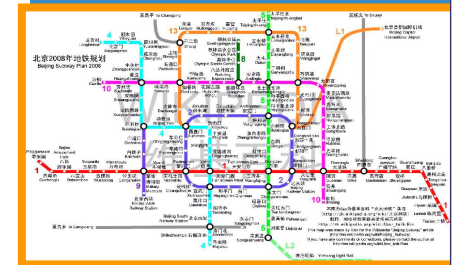
The ASB-Thales-SAIC Consortium received '2009 Outstanding Contractor for Major Infrastructure Project Contribution' award from Shanghai Government for Line 11

Customer Challenges

- ◆ Growth of the metro system network is deemed necessary to improve mobility of 10M citizens. The government wanted to strengthen its service capacity capability and passenger satisfaction.
- ◆ It is the trunk line in the urban traffic network in Beijing and is the main artery of South-North traffic in Beijing.

Thales Answer

- ◆ SelTrac CBTC



Line 4

- 28.177km
- 24 stations
- 33 trains
- 1 depot (with test track)
- 1 yard

Daxing Line

- 22 kms plus storage tracks
- Stations: 11
- Trains: 33
- Control Center: 1
- Depot: 1
- Maintenance Center: 1
- Training Center: 1

Safe, reliable, ATO high capacity

THALES

Project Delivery Challenges

- ◆ 17 month schedule for Daxing line
- ◆ Staged Delivery
- ◆ Cutover - upgrade existing line and integrate with the extension
- ◆ Interface with non Thales equipped lines (9, 10)

Thales Answer

- ◆ Detailed Cutover Plan
- ◆ **One team approach** by working day to day with the Customer to re-align resources and logistics to the project reality



Line 4:

- 28.177km
- 24 stations
- 33 trains
- 1 depot (with test track)
- 1 yard

Daixing Line:

- 22 kms + storage tracks
- Stations: 11
- Trains: 33
- Control Center: 1
- Depot: 1
- Maintenance Center: 1
- Training Center: 1

Thales working with the Customer and End-Customer

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Project Achievement

- ◆ Maximum achievable headway from day 1 of revenue service
- ◆ 700,000 passengers per day initial revenue service
- ◆ Customer satisfaction
- ◆ Both Line 4 and Daxing line Provisional Acceptance Certificate obtained within one month



Initial Line:

- 28.177km
- 24 stations
- 33 trains
- 1 depot (with test track)
- 1 yard

Daixing Line:

- 22 km plus storage tracks
- Stations: 11
- Trains: 33
- Control Center: 1
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Safe, reliable, ATO high capacity

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Can be implemented in record time

Easy line and fleet expansion capabilities

Low operation and maintenance costs

Low overall project CAPEX (less trains and smaller platforms for the same capacity)

Energy savings

Operational flexibility

Improved reliability and availability

Excellent safety record

Thales SelTrac CBTC systems are proven solutions

THALES

- ◆ **Good Quality Systems can be implemented on time on demanding conditions**
- ◆ **Flexibility and proactive adaptation to project reality is a must**
- ◆ **The “One Team” approach always delivers**

Thales Proven Record of Quality, on Time CBTC Projects

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Get the most out of your infrastructure

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