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METRO AUTOMATION: A leap ahead

The UITP Observatory of Automated Metros held its 3rd Seminar in Paris in March 2012, where it presented its 2011 Atlas of automated metros – a detailed overview of the metro automation landscape and an analysis of future trends. This article presents a selection of the Atlas data, as well as a snapshot of some of the discussions held during the Seminar itself.

Worldwide automation landscape

Unattended Train Operation (UTO) is a widespread, proven solution. Twenty-five cities have opted for automated metros, in all four continents. The highest prevalence is in Asia and Europe – but North America, and more recently Latin America and the Middle East, are also developing automated metro systems.

UTO is associated with innovation, and sometimes the public belief is that this is a very recent development. However, the first UTO lines date from 1981. With 30 years of operating experience, automated systems have proven their maturity and accumulated extensive operating experience.

There are currently 588km of automated metro in operation, on 41 lines that together serve 585 stations. Some of the longest metro lines in the world are actually automated.

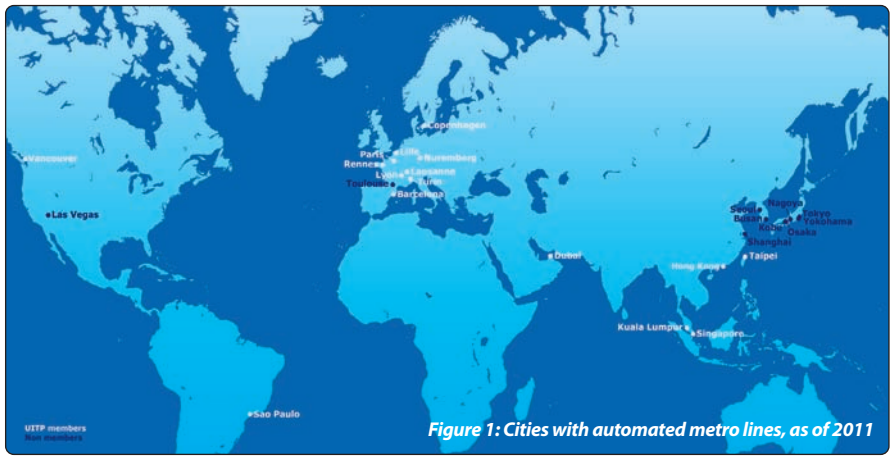

Figure 1: Cities with automated metro lines, as of 2011

Of the 25 cities with automated metros, 13 have more than one automated line: Barcelona, Busan, Copenhagen, Dubai, Kobe, Lille, Nuremberg, Paris, Singapore, Taipei, Tokyo, Toulouse and Vancouver.

However, a number of other UTO systems are not included in these figures because they do not fully comply with the Atlas criteria, as defined by the Observatory. Nevertheless, they do deserve a mention, as they point to a strong uptake of automation in significant areas. For example, the 30km-long Shanghai Metro Line 10 was designed for UTO, but is currently operating in manual mode. This indicates the Chinese interest in UTO. Two other lines in the Middle East confirm UTO as the preferred option in this region: the 18km-long Makkah line was conceived as a UTO line, but is not yet operating as such, and represents the choice of UTO as the solution to one of the most critical mobility issues in this region. A 12km-long line in Riyadh cannot be classified as a public transport system as it only serves a university campus, but it is worth mentioning due to its capacity and scale.

Taking these developments into account, total UTO figures reach 648km and 644 stations.

Automation in 2011…

2011 brought the greatest growth in the history of UTO, with over 100km of automated lines inaugurated in a single year. Significantly, 83% of this growth took place outside Europe with Asia standing out with 70km. The Middle East also showed strong growth (22.5km in Dubai alone, which adds up to 52 new-km if we also consider the particular cases of Makkah and Riyadh).

New, extended and converted lines

Four new lines joined the UTO club: in Busan, Lines 4 and the Busan-Gimhae LRT, the Green Line in Dubai, and Shin Bundang in Seoul. Projects to extend tracks also added an extra 21km to existing lines. In 2008, Nuremberg completed the first conversion project, but in 2011, Paris Line 1 demonstrated that it is possible to convert high capacity lines without service interruption, paving the way for many more projects. This is Paris Metro's most frequented line, with 725,000 passengers per day. Line 1 has 25 stations, 13 of which offer connections to other major transport lines.

…and future trends

The UITP has accompanied and supported pioneering metro automation projects since the very beginning (the first UITP studies on this topic date back to 1963). With the founding of the Observatory of Automated Metro Lines in 2007, the UITP consolidated this work offering a permanent platform for metro operator experts in automation. As part of their activities, they monitor automation development, and in cooperation with the UITP Industry Committee, have identified the following key trends for the sector:

Accelerated dynamism and growth

In the last five years, the number of kilometers in service has doubled, with the opening of as many kilometres of automated lines as in the previous 30 years. During the next decade, the yearly average growth is expected to be five times the rate achieved during the last 10 years.

Global reach

UTO is no longer limited to Europe; in the last three years, UTO lines have entered into service in new regions, such as the Middle East (Dubai and the particular cases of Riyadh and Makkah) and Latin America (São Paulo), bringing automation to four continents. The top three cities by number of automated kilometers are actually outside Europe: Dubai, Vancouver and Singapore.

The preferred choice for new lines and systems

Hard data confirms the projections – for new lines, UTO is the predominant choice. Asia is the largest region in terms of km-growth for UTO. UTO is also the preferred option for cities building a new metro system – this was the case for Dubai and Vancouver (a few years ago) but also for mid-sized European cities such as Toulouse, Turin and Rennes.

A high capacity transport solution

In recent years, new automated lines have been implemented to respond to high capacity demand, such as in São Paulo with a very high density and Makkah (which as noted is not in full UTO mode yet, but which will reach record levels during pilgrimage periods). Paris' most frequented line (L1) has also been automated to increase service levels for its customers. These examples confirm that UTO is a solution that brings together capacity and safety.

Figure 2: Cities that inaugurated new lines and extensions in 2011

Those who try, repeat

In general, cities that have already implemented a UTO line will opt for automation again when planning further new lines. A good example is Vancouver: this pioneering city built its first UTO line in 1986, and has twice since opted for automation for new lines – in 2002 and 2009. Another similar case is Singapore; since the inauguration of its

first UTO line in 2003, it has consistently continued with this option.

Conversion of existing lines

Paris has demonstrated that conversion is feasible, even in complex and key lines, such as L1. The proliferation of conversion projects is a clear trend linked to the renewal of signalling systems and/or the rolling stock.

Organisational opportunities

Most automation projects integrated into existing metro systems take advantage of the UTO line to make significant changes within the operating model, characterised by an improvement in job profiles. Staff are relieved from the most monotonous tasks and can be redeployed in positions with a higher professional value and satisfaction. In general, staff obtain more responsibility and autonomy, as well as acquiring a more technical profile.

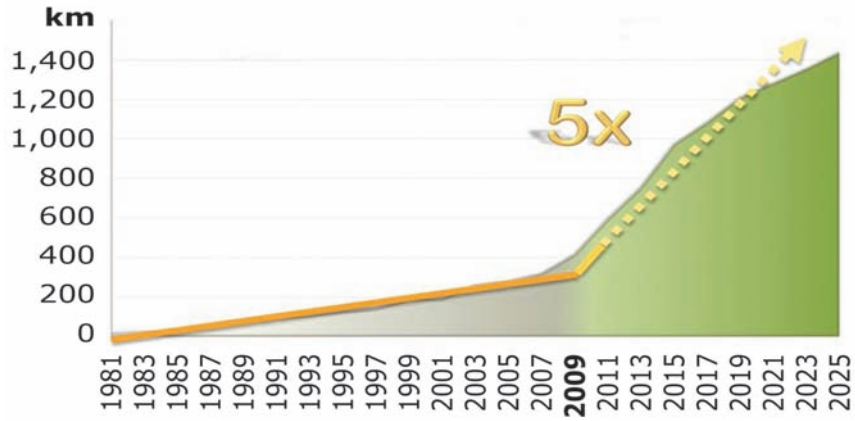

Figure 3: Automated lines will see strong sustained growth during the next decade

Signalling technology: CBTC

Automated, safe train movements are possible thanks to signalling technologies. Radiofrequency-based signals are increasingly chosen as the technical solution for data exchange, over induction loops, leaky cables and guided microwave beams. CBTC (Communications Based Train Control) allows for the bi-directional exchange of information between on-board and wayside equipment. It simplifies the deployment of systems on the track, and opens up new options such as facilitating other functions beyond signalling.

Customer focus

For new systems, there has been a significant increase in the investment of technology to facilitate the contact between customer and operator. Beyond the compulsory intercom systems to attend to critical on-board communication requests from passengers, new lines integrate on-board CCTV systems that send images to the OCC in real-time.

Metro automation at UITP

The Observatory of Automated Metros is a UITP body composed of worldwide leading operators in this sector. Its mission is to disseminate and share knowledge with a cross-cutting approach to all the business perspectives of automated line operation. It also analyses the global evolution identifying future trends, presenting them in periodical reports and events. Observatory members represent the main UITP references in automation: Barcelona, Copenhagen, Dubai, Hong Kong, Lausanne, Lille, Lyon, Nuremberg, Paris, Rennes, Roma, Sao Paulo, Singapore and Vancouver.

The Atlas

A yearly report produced by the Observatory, the Atlas, presents a synthesis of the information contained in the Observatory's automated metro lines database. The diversity of the existing systems requires a clear definition of the criteria to be considered in the 'Atlas', including:

- UTO: Only metro lines without staff on-board are considered. (Level GoA4 according to IEC 62267)
- Public transport service: Private lines have been left aside (airport services, people movers, etc.)
- Train capacity: Only trains with a minimum capacity of 100 passengers have been considered.

The UITP Automated Metro Seminar

The UITP Automated Metro Seminar is an annual meeting open to all public transport professionals interested in metro automation. Sessions are designed by the Observatory members, with a particular focus on practical information for operators starting their own automation projects.

Seminar snapshot

The 3rd UITP Automated Metro Seminar was hosted by RATP in Paris in March 2012 – three months after the landmark conversion of Line 1 – and attracted over 150 participants from 33 countries. The Seminar gave a platform to debate with experts from the Observatory about all aspects relevant to the implementation of automated lines; from the strategic design and project management to the operation and long-term maintenance of the system. Just five of the discussions that were discussed include:

- The operator's involvement is key from the early stages of UTO line conception
- A UTO project should be embraced as an opportunity to improve the organisational model of a traditional metro operator
- In conversion projects, social aspects are essential and should be addressed from the beginning
- We can still obtain more operational benefit from UTO performances. Similarly, UTO lines bring a great potential for energy saving, which still has to be fully realised
- IT is increasingly relevant for UTO, and has an impact on maintenance. Management of technological obsolescence is a key challenge for UTO lines.

The Seminar concluded with a detailed workshop on the Paris Line 1 conversion experience and extensive technical visits. All Seminar presentations and documents are available to UITP members through Mobi+, UITP's online library (www.uitp.org).

BIOGRAPHY

Miryam Hernández joined the International Association for Public Transport in 2006 and is responsible for all metro activities within the Association, coordinating members' work on the Metropolitan Railways Committee and Division, its five Technical Subcommittees and the Observatory of Automated Metros.