IN THIS EDITION

In today’s fast changing urban landscape, city administrators require technology solutions to help them improve security levels, accelerate traffic throughput, monitor the environment and better coordinate support services. From crowd control to intelligent multi-modal transportation, we look at how Thales can help improve the urban experience.
THE CHALLENGE OF SMART CITIES

Creating a smart city infrastructure requires insight in all major urban support functions. We look at how Thales’ understanding of information consolidation and position in the infrastructure protection market can be a strong driver in the smart city panorama.

Is your city smart? Whatever the answer may be at this stage, it is an accepted fact that a number of converging factors are pushing large metropolitan areas to rethink the way they manage their critical information and offer services to citizens. Increasingly frequent natural disasters as well as geopolitical instability are creating new terrorist and climatic risks that call for an improved ability to anticipate and react to potential crisis situations.

At the same time, rising energy costs and environmental concerns are creating new requirements both in energy control and environmental monitoring. Furthermore, the amount of information available to citizens is growing fast, creating new expectations. With a better understanding and assessment of events surrounding them, citizens are demanding even more efficiency from a city’s administrative bodies.

Overall, the level of service offered to citizens as well as overall public safety is set to grow in many major metropolitan areas across the world. And this will happen by encouraging systems interconnection and information exchange between a city’s major support functions.

“"There is a growing need for large cities to improve the way they monitor their key business applications (KBAs), such as transportation, security, energy distribution, water distribution, waste management and communication networks, to name a few," says Yan Lévy, Business Development Director, Citizen Security, at Thales’ Defence & Security C4I Division. "Yet, until now, most of the administrative bodies in charge of these key business processes have been operating independently, with dedicated IT systems and limited information overlap."

The smart city concept aims to bridge the gap by allowing all these key business applications to feed real-time information into a centralised administration platform. "A city’s KBAs all require a security layer," explains Yan Lévy. "By linking these security layers together, it is possible to create a powerful management platform, to improve monitoring, decision making and coordination of actions by all services involved." The benefits are multiple, ranging from smarter energy management, improved environmental monitoring and optimised resource allocation, to better planning and anticipation, as well as a faster response to crisis situations.

Improving a city’s attractiveness Beyond optimising a major metropolitan area’s existing support
infrastructures, the smart city concept is also considered as a way of improving the attractiveness of new urban developments. "New cities are being built from scratch, particularly in Asia and in the Middle East", emphasises Yan Lévy. Examples include Nusajaya City in Malaysia, King Abdullah Economic City (KAEC) in Saudi Arabia, Masdar Eco-City in Abu Dhabi, Incheon Songdo U-City in South Korea, as well as Dongtan and Wanzhuang eco-cities in China.

"These new urban developments are competing to attract both businesses and investors" adds Yan Lévy. "They all put forward a specific theme, such as environmental efficiency (eco-cities) or cultural, intellectual and business hubs (knowledge and economic cities). The smart city concept is seen as a strong differentiator in this respect and is expected to motivate dynamic investment as part of these new urban projects."

Selecting the right technology Thales offers a number of high value technologies and concepts for the smart city market, including the Thales Hypervisor environment. Introduced in October 2009, Thales Hypervisor brings together technology and services to share, aggregate and correlate information from all security systems involved in mission critical operations. Thales Hypervisor produces real-time situation assessment reports to allow coordinated action by all parties involved, from police units to fire brigades and ambulance services.

"Beyond the Thales Hypervisor technology, Thales' added value is in its experience accumulated by serving all major components of a city ecosystem, from transportation, energy distribution and airports, to all forms of critical infrastructure and security forces operations" stresses Yan Lévy. "Where many vendors are specialised in one category of IT systems or infrastructure, Thales has the relevant market insight to offer compelling bespoke solutions that focus on the specific features and needs of these infrastructure components." A major advantage, that positions Thales as a cornerstone of smart city development.

"End-to-end smart cities are a necessity, if we want to meet the many challenges posed by fast growing urban areas"
Usman Sindhu, analyst, Forrester Research

Within Forrester Research, Usman Sindhu focuses on the challenges and solutions involving smart grids and smart cities. He is the author of the "Securing Smart City Infrastructure" report.

"The concept of smart cities started taking shape more than a year ago, as a possible means of dealing with one of the most visible consequences of globalisation: accelerated urban growth. By 2050, there will be 3.3 billion more people living in urban areas than there will be living in rural areas, on a worldwide basis. The purpose of smart cities is to find ways of dealing with this fast growing urbanisation, through the use of smart computing technologies applied to seven core infrastructure components and services: healthcare, education, real estate, transportation, utilities, city administration and public safety.

Vendors with a technology and solutions offering that spans several of these core infrastructure components will hold the upper hand in the smart city revolution that will take place over the next ten years."
Improving the public transport user experience is a strong research focus for Thales. It is also a compelling inroad into the smart city paradigm. Through its Theresis research laboratory, Thales is taking an active part in a pan-European collaborative research project called 'Instant Mobility', within the European Commission’s Future Internet programme.

The 'Instant Mobility' project also involves a number of strategic partners including France Telecom, Valeo, Continental, Volvo and Nokia. “The purpose is to design novel public transportation management technologies”, says Patrick Gatellier, in charge of transportation technologies at Theresis. These technologies will leverage users’ permanent mobile internet connection to track commuters on a real time basis and offer personalised guidance, information and transportation options, to improve the comfort and reliability of their journey.

Public transport operators will gain the ability to better manage their fleet in real time. City authorities will get a clearer view of urban traffic and be in a position to anticipate and react to traffic jams. Finally, users will spend less time commuting and will be more likely to get to their destination on time, thanks to an intelligent multi-modal transportation infrastructure.
Working towards smarter cities: Thales' building blocks

Thales has field proven its technology and support services on a number of advanced infrastructure projects, now perceived as valuable stepping stones into the smart city marketplace.

Nusajaya City, Malaysia
Thales conducted the preliminary survey for the Nusajaya Intelligent City Management Platform (NICMP), that will coordinate all support services in the Nusajaya urban development in Malaysia.

Mecca pilgrimage, Saudi Arabia
Thales supplied Mecca's information system, incorporating smart image analysis technology for guidance of pilgrims and protection against accidents caused by overcrowding during the pilgrimage (see the Focus article).

MTR rapid transit railway, Hong Kong
Thales has worked with MTR, Hong Kong’s rapid transit railway system, for nearly 20 years, delivering signalling and supervision systems for the company’s growing network, serving four million passengers daily.

National Oil Company, Saudi Arabia
Thales designed and implemented the security infrastructure for the world’s largest oil terminal. The solution provided enhances both personnel and asset security, as well as business efficiency, within a 22 km security perimeter.

Dubai, Doha, Durban airports
Thales designed and implemented the ICAO-compliant security & safety systems and communication systems for three major airport construction projects in Dubai (UAE), Doha (Qatar) and Durban (South Africa).

Gazprom, Russia
Thales provided a gas pipeline process control supervision system covering 40,000 km of pipeline, as well as 2 regional and 46 local control centres, for Russian gas giant Gazprom.
Crowd management systems and state-of-the-art transport solutions, provided by Thales, mean safer journeys for Mecca’s three million Hajj pilgrims

Pilgrimage to Mecca – Hajj – is an obligation for Muslims and the number of pilgrims visiting Saudi Arabia’s holy sites continues to grow. In the last 15 years, the number of non-Saudi pilgrims has risen by nearly 70% and today, Hajj represents one of the world’s biggest religious gatherings.

Making sure the pilgrimage runs smoothly is a priority for the Saudi authorities. But this presents a number of challenges. These include the need to ensure safety for huge crowds. And it means providing secure, efficient transport links between several different sites spread out over a wide area.

Smother, faster journeys
The Saudi government has responded to these challenges with major investments in both physical and electronic infrastructure. The new al-Mashaaer al-Mugaddassah Metro is a case in point: opened in time for the Hajj pilgrimage in 2010, it makes use of Thales’ advanced driverless technology to provide safe, smooth journeys for Hajj pilgrims. Phase 1 of the metro project – the first of its sort in Saudi Arabia – entered revenue service in November and connects the holy sites of Mount Arafat, Muzdalifah and Mina. Using the new metro link, a journey that once took five hours can now be achieved, in comfort, in just ten minutes.

Thales’ world-leading communications-based train control (CBTC) solution – SelTrac – was chosen to optimise safety, capacity and efficiency on the new 18km line. Trains on the network are currently capable of carrying 25,000 pilgrims each hour, with capacity rising to 72,000 for Hajj 2011, thanks to the new system.

In tandem with the SelTrac deployment, Thales has also provided a fully-integrated communications solution for the metro, which includes an operation control centre (OCC) and an automatic information system for passengers.

A safer pilgrimage
Thales’ solutions are also enhancing crowd safety at Jamarat, one of the busiest points on the Hajj pilgrimage. Located in the city of Mina, near Mecca, Jamarat is where pilgrims gather to perform the ritual of the stoning of the devil, in which three columns are pelted with pebbles.

Overcrowding at Jamarat has caused several major incidents in recent years: between 1994 and 2006, stampedes at the site claimed more
than 1,000 lives. To improve safety, the Saudi authorities launched a major site improvement programme, including the construction of a new multi-level bridge, completed in 2009.

**Early warning**

To further improve the level of safety for pilgrims, Thales was selected to provide an innovative crowd monitoring and information system for Jamarat. A similar solution is also used to monitor and manage crowds on the new metro (please see Customer perspective p. 10).

Crowd counting is at the heart of the Jamarat solution, with more than 100 fixed cameras feeding an intelligent video analysis system. Real-time crowd data generated by the system allows the security services to pinpoint potential problems and to provide pilgrims with an early warning.

“The innovation here is that each camera provides individual counting, but the data is aggregated on the central servers” says Chokri Aroud, Deputy Programme Director and Operations Manager, Thales. “On each floor of the bridge, for example, you can see how many people have entered and how many have left.”

Crowd density is a critical factor. “You can have 120,000 people moving smoothly” explains Mr. Aroud. “But if you have 10,000 people at high density, say three or four people per square metre, you need to act quickly. So the software not only counts, but it also measures density – this is extremely important.”

Thales’ solution for Jamarat incorporates control rooms where police officers monitor the crowd and give real-time instructions to soldiers in the field to redirect pedestrian flows. Thales also supplied a complete communications solution – including a data network, so different control rooms can share the same view. In addition, Thales has provided comprehensive video surveillance with more than 600 cameras, a mass messaging system, including giant LED screens, and a dedicated DVB-T television service, with channels for pilgrims in four different languages.

**Future perspectives**

Thales’ expertise is also set to enhance security around the Prophet’s Mosque at Medina, where a new 1,500-camera system, with crowd monitoring, will supervise gatherings of up to one million during the Hajj period.

And on the metro, 2011 will see the implementation of Thales’ Hypervisor. This will allow operators to supervise everything from train operations to crowd management, all achieved using a unique single-screen interface.

Advanced electronic solutions of this sort allow operators to actively manage the way that physical infrastructure is used. And in an increasingly crowded world, the ability to manage assets in this way could have important implications: not only for major events, but also – potentially – for entire cities as well.
UNDERSTANDING CROWDS

What makes crowds so dangerous? A moving crowd, even a large one, has the capacity to ‘self organise’ safely if the density is low enough. Under normal conditions, crowds have a spontaneous intelligence of their own, developing ‘laminar flows’, or streams, that keep everyone moving.

But as density increases, these smooth patterns start to disintegrate. To understand why this happens, scientists at Dresden University of Technology worked with Saudi government officials on a unique research project based on video analysis of the 2006 Hajj stampede in which more than 300 people died.

The team came up with some unexpected findings. As crowd density rose, researchers identified the onset of stop-and-go waves similar to those found in road traffic jams. This was followed by transition to a much more chaotic state, with outbreaks of panic as individuals lost control. This phenomenon – known as crowd turbulence – can trigger disaster.

Thales’ solution for Jamarat, one of the busiest pilgrimage sites, builds on this new understanding. The system provides real-time crowd counting, density measurements and communications, making it possible for the security authorities to spot potential problems early – and to intervene – to reduce the risk to pilgrims.
What was the main challenge at Jamarat?
Before construction of the new Jamarat building, the main problem was overcrowding and lack of planning. People were approaching the site from all directions and converging on a single point.

The new Jamarat building is a multi-storey structure, with each level serving one side – north, south, east and west. This allows us to distribute the mass and there are 12 entrances rather than one, and 13 or 14 exits.

As well as this, we’ve developed a scheduled programme (departure timetables) for groups of pilgrims. We organise this with a signage system and guidance notes. We monitor and control the site with cameras, with software for counting. For this, we use the system provided by Thales. New technology means we can control the flow and reduce the risk of critical overcrowding and accidents.

Why did you choose Thales for this project?
Thales has long experience in Saudi Arabia. They did the Jamarat project with MOMRA, Central Directorate of Development of Projects, under the leadership of H.E. Dr. Habib Zain Al Abideen, so they know the infrastructure in the Hajj area, they know the conditions and we have good cooperation with them. And also, the contract was awarded as part of a normal competition with another company. Thales won it because of their experience, their offer and level of experience in Hajj.

How does this technology help with the new metro?
The difference between this metro and metros in other big cities is the Hajj conditions. People arrive at the stations in very large groups, so it’s a very big challenge.

It’s important to control how many people are on the platform and how many are in the station. The capacity of each train is 3,000, so we have to transfer that number from the platform to the train. And I need to have the reserve for another 3,000 when the next train comes, so we need a smooth flow.

For this, we use the Thales system, with cameras counting the people at the entrance to the platform and controlling the crowd around the station and the surrounding area – we start to control the mass coming to the station from some distance away.
Virtual reality is transforming the way critical infrastructure is designed, built and operated

From computer games to Hollywood blockbusters, just about everyone is familiar with digital versions of reality. But the technology that makes this possible has applications that stretch far beyond popular entertainment.

Virtual worlds, real needs
Virtual reality, and 3D modelling in particular, is also reshaping the way that critical infrastructure is designed. ‘Synthetic environments’ – 3D models that incorporate simulations of real-time processes, make it possible to replicate and test systems – even entire buildings – while they’re still on the drawing board.

Thales’ 3D solutions are already helping designers to build better infrastructure. “In the case of a metro station, modelling helps you to optimise the position of sensors and other assets, such as fire detection equipment, CCTV and escalators” explains Olivier Flous, Technology Director for Security Solutions & Services, Thales.

Modelling offers operational benefits too. “It helps you to define security procedures. What sensors do you have to observe the scene? What sort of staff will be available to intervene? There’s a loop between procedure definition and the sensors that you choose” says Mr. Flous.

Recreating reality
3D technology is also the driving force behind Thales’ next generation of supervision and training interfaces. From metro systems to airports and sensitive sites, 3D promises enhanced visualisation and new levels of situation awareness.

Thales’ 3Dchrono solution is a case in point: developed to support rescue and evacuation operations, it allows users to build a 3D model of a building in a matter of hours, so emergency personnel can rehearse life-saving missions.

3D models of this sort serve as powerful visualisation aids and they’re created by integrating maps, plans and photographs. Because they can be ‘explored’, they provide an immersive environment for training of all types.

Integrated training
By linking a synthetic environment – such as a station or a city street – with an advanced supervision solution such as Thales Hypervisor, it’s possible to experiment with a huge number of hypothetical scenarios. This has the potential to transform training.
“Clear visualisation is critical in a crisis

“Integrating Thales Hypervisor with a metro simulation allows the supervision system to interact with simulated equipment” explains Mr. Flous. “So when you perform an action, you see the effect immediately.”

A clear vision

3D models provide life-long value. “What we’re doing now is to use the same model for the concept, design and build phases, and then for operations” says Mr. Flous.

The next step will see the creation of a 3D human-machine interface (HMI) that will put infrastructure staff at the heart of real-time operations.

“Operators will use a joystick to navigate the 3D environment to get an overall situation awareness” says Mr. Flous. “Clear visualisation is critical in a crisis and 3D is the most effective way to provide it.”

The urban dimension

3D technology has major implications for urban administration too. Thales is leading the collaborative Terra Numerica and Terra Dynamica projects to build an electronic 3D model of Paris – and then bring it to life with authentic simulations of moving people and vehicles.

“When you have created a real 3D model of a city, the number of applications is infinite” observes Mr. Flous. Proposed uses include urban and environmental planning, tourism and heritage development. Thales will use the 3D model of Paris as a base for future urban security systems.

Building better infrastructure

Developments like this underline the potential of synthetic environments to reshape infrastructure design. Simulations – of moving crowds, floods, smoke propagation and even different weather conditions – can be plugged-in to a 3D base to recreate and test any combination of events.

This allows planners to fine-tune designs so that they work at optimum efficiency. It also provides a unique opportunity to enhance safety, with realistic scenarios that would be too expensive or too dangerous to test in real life – all at the click of a mouse.

Thales is launching a full-scale demonstration of its 3D solutions at its Vélizy Security Briefing Centre near Paris in 2011.
The future of professional mobile radio (PMR) involves not only voice and text messaging, but also data, images, video, live feeds, face recognition and database queries. By offering all of these services, Thales’ TeMax system takes PMR a major step forward.

New services are the name of the game. Over the past ten years, PMR and LMR (land mobile radio) systems used by public safety and law enforcement professionals all over the world, have migrated to digital technologies, paving the way for rich media transmissions, well beyond just voice and short messages. “Police units, fire brigades and ambulance services, not to mention airport safety or other critical infrastructure security staff, have an increasing need to communicate varied data streams over PMR, in an effort to better assess a field situation, design a response scenario and coordinate actions” says Sébastien Sabatier, Strategy and Marketing Manager, Thales. “We have seen this type of request clearly gaining momentum in calls for tender by major organisations since 2008.”

**Broadband PMR**

In response to these growing needs, Thales designed TeMax, an innovative broadband communication system, that adds a data layer over standard PMR communications. “TeMax is to PMR networks what 4G is to consumer GSM networks” explains Sébastien Sabatier. “TeMax offers PMR communications with industry standard PTT (push to talk) features, as well as live video feeds of up to 2 Mbits/s per user.”

From a practical standpoint, TeMax offers the bandwidth required by new applications designed to centralise rich data and video feeds transmitted by field agents to the control hub and send back the support information needed to take relevant action. TeMax also enables new services such as intelligent area monitoring or remote medication.

TeMax uses WiMAX and LTE base stations on a Thales IP distributed architecture. With major investments committed to these network technologies as part of government stimulus plans, on both sides of the Atlantic, TeMax users may take advantage of interoperable network technologies that are set for long-term growth.
Building on existing TETRA technologies

From the start, Thales made the choice of developing its PMR offering based on TETRA technology and IP standards. Today, customers electing to migrate to TeMax have an easy upgrade path, that allows them to build on their existing core networks.

As a matter of fact, a number of major customers, such as the French rail system SNCF and South Africa’s King Shaka Airport, in Durban, made the decision to invest in TETRA-based Thales PMR systems, with the aim of migrating to TeMax in due course.

"The potential for TeMax is enormous" emphasises Sébastien Sabatier. "It is a technology breakthrough that will completely change the way PMR is used by public safety professionals of all categories." The WiMAX implementation of TeMax was released in May 2010. The LTE implementation is expected in 2011.

WHAT IS…

PMR (professional mobile radio): a field radio communication system that uses portable, mobile, base stations and dispatch console radios.

LMR (land mobile radio): LMR is the US terminology for PMR. Both acronyms relate to the same concept.

TETRA (terrestrial trunked radio): a PMR specification specifically designed for use by government agencies and emergency services. TETRA is a European Telecommunications Standards Institute (ETSI) standard.

PTT (push to talk): a method of conversing on half-duplex communication lines, including two-way radio, using a button to switch from voice reception mode to transmit mode.

WiMAX (worldwide interoperability for microwave access): a wireless telecommunications protocol that provides fixed and fully mobile internet access, offering up to 40 Mbit/s of bandwidth.

LTE (long term evolution): a mobile communication standard, formally submitted as a candidate 4G system in late 2009, and expected to be finalised in 2011.

4G: stands for the fourth generation of cellular wireless standards. Peak download speed requirements are 100 Mbit/s for high mobility communication (such as from trains and cars) and 1 Gbit/s for low mobility communication (such as pedestrians and stationary users).