

# Dubai Harnesses IoE to Make Roads Safer and to Increase Usage of Public Transportation



## EXECUTIVE SUMMARY

### Objectives

- Improve the traveler experience by making Dubai's roads safer and less congested
- Increase usage of public transportation
- Make all city services available 24/7 via handheld devices

### Strategy

- Evaluate each initiative at project inception, as well as throughout implementation

### Solution

- Dubai Smart City Initiative includes plans to implement 100 programs and 1,000 Smart Services by 2015 across all government services, including transportation.
- Initiatives include driverless metro service, uniform ticketing and easy payment for public transport, no-stop toll gates, and smart parking meters

### Impact

- Reduced traffic fatalities from about 20–22 per 100,000 citizens in 2005 to fewer than 4 per 100,000
- Increased percentage of citizens using public transportation – from 6 percent at start of program to 12 percent today
- Improved traveler experience by reducing traffic congestion

## Background

In January 2014, Cisco released the results of an in-depth analysis of the economic benefits of the Internet of Everything (IoE) for the public sector. Cisco's model revealed that some \$4.6 trillion in "Value at Stake" would result from the adoption of IoE capabilities across 40 key public sector use cases over the next 10 years, including smart water, smart buildings, smart energy, smart parking, and more (<http://bit.ly/1aSGIzn>).

As a next phase of its analysis, Cisco engaged Cicero Group, a leading data-driven strategy consulting and research firm, to undertake a global study of IoE capabilities across these 40 use cases – how the best public sector organizations are "connecting the unconnected," as Cisco terms it. To that end, Cicero Group conducted interviews with dozens of leading public sector jurisdictions – federal, state, and local governments; healthcare organizations; educational institutions; and non-governmental organizations (NGOs) – to explore how these global leaders are leveraging IoE today.

The research examined real-world projects that are operational today, are being delivered at scale (or through pilots with obvious potential to scale), and that represent the cutting edge of public sector IoE readiness and maturity. The aim of the research was to understand what has changed in terms of the jurisdictions' people, processes, data, and things, and how other public sector organizations can learn from (and replicate) the trail blazed by these global IoE leaders. In many cases, these jurisdictions are Cisco customers; in others, they are not. The focus of these jurisdictional profiles, therefore, is not to tout Cisco's role in these organizations' success, but rather to document IoE excellence, how public sector entities are putting IoE into practice today, and to inform a roadmap for change that will enable the public sector to address pressing challenges on multiple fronts by drawing on best practices from around the globe.

Mr. Al Madani describes H.H. Sheikh Mohammed's Dubai Smart City announcement in 2013 as a large-scale plan to incorporate smart technology through all government services, including public transportation. One key goal is to make all city services available 24/7 via handheld devices.

## About the Dubai Smart City Initiative

The Dubai Smart City Initiative was established in 2013 by His Highness Sheikh Mohammed with the charter to transform Dubai into one of the world's smartest cities. In an aggressive strategy, the city plans to implement 100 initiatives and 1,000 Smart Services by 2015 across all government services, including transportation. The goal is to automate government services as much as possible, and make transactions – including those involving transportation – conveniently available to the people of Dubai using mobile technology.

Initiatives undertaken by the Roads and Transport Authority (RTA) include driverless metro service, uniform ticketing and easy payment for public transport, no-stop toll gates, and smart parking meters, all of which are currently in operation. Ultimately, all areas of RTA governance – including buses, metros, taxis, marine transportation, parking, roads, and traffic – will be centrally monitored and controlled at the Enterprise Command and Control Centre, currently under development.

Abdulla Al Madani is chief executive officer of corporate technical support services for the RTA. Mr. Al Madani holds a Bachelor of Science degree in management information systems from the University of Colorado, Denver.

Mr. Al Madani has been extensively involved in IT, including work as the head of operations and networks for Dubai municipality. He has chaired several important government committees, and is the current chair of the IT Higher Committee for Governance. Mr. Al Madani has worked with the RTA in a number of pivotal roles, including IT director and corporate IT director, prior to his current position. Under his management, RTA has won a number of local and regional awards, including the Best e-Government Award and Best e-Service Award in GCC.

He oversees 22 separate Dubai Smart City initiatives, and anticipates making more than 200 government services available via mobile apps. He has overseen development of apps providing taxi services, bus schedules, trip planning, parking payment, and uniform ticketing and payments for public transportation.

## Objectives

Mr. Al Madani describes H.H. Sheikh Mohammed's Dubai Smart City announcement in 2013 as a large-scale plan to incorporate smart technology throughout all government services, including public transportation. One key goal is to make all city services available 24/7 via handheld devices.

"Dubai was facing a huge issue with regards to traffic, the number of accidents, and the unfortunate deaths resulting from these accidents on the roads," said Mr. Al-Madani. "The vision of the Roads and Transport Authority is safe and smooth transport for all."

According to Mr. Al-Madani, in addition to increased safety, RTA initiatives are designed to promote the use of public transportation.

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Abdulla Al Madani,  
Chief Executive Officer of Corporate  
Technical Support Services,  
RTA

## Strategy

Mr. Al Madani cited eight core strategies by which he and his colleagues judge the effectiveness of each initiative in reaching Dubai Smart City goals:

- 1) Integrated Dubai
- 2) Dubai for the People
- 3) Customer First
- 4) From Cars to Public Transport
- 5) Safety and Environmental Sustainability
- 6) Financial Sustainability
- 7) Advanced RTA
- 8) Asset Sustainability

RTA evaluates each smart initiative based on these eight goals. This evaluation is done both at the project inception phase, as well as throughout implementation. This allows RTA to determine success of the project and the degree to which its initial assessments with regard to potential benefits were accurate.

Mr. Al Madani states that safe and smooth travel is the objective in all transportation initiatives. “One of the ways to achieve this is by adopting technologies and innovative approaches,” he says. “We have from day one considered technology as an important tool to achieve our vision.”

United Arab Emirates government entities fund all Dubai Smart City initiatives. Mr. Al Madani commented that transportation department operations are self-funding given passenger revenues, but that the government typically provides funding for capital investments required on large-scale infrastructure projects.

RTA owns and manages each of the transportation initiatives outlined, as well as the infrastructure associated with the system. In some cases, it has contracted with private firms to provide certain services. Taxis, for instance, are franchised, and the metro is operated by a private operating firm.

## Solution

Key technological initiatives implemented by RTA include the following:

### Uniform Ticketing and NOL Cards

Central to Dubai’s public transportation system is the NOL card, an automated payment system that operates as a debit card for public transportation and parking. NOL cards can be purchased at more than 2,000 locations in the city, and can be loaded with transportation credit at metro stations, bus stations, water bus stations, parking meters, and with certified agents, including major supermarkets and some banks. Banks also offer automatic topping of card accounts when they reach a minimum balance. Passengers can also load the card using mPay, Dubai Smart Government’s e-payment app.

Passengers can download a free application, *Wojhati*, which interfaces with the AVM for schedules and alerts, and for assistance with journey planning.

Mr. Al Madani indicated the NOL card uses tap-and-pay technology for buses, water buses, taxis, the metro, and parking. “The technology behind [the NOL card] is to provide a contactless wallet using the different modes of transport,” he explained. “For the customer, it is just coming to the gate or coming to the check-in or checkout bus device, and just touching the card or showing the card to the sensor.”

Near field communication (NFC) capabilities and GSM technologies also facilitate payments of fares among those with compatible mobile devices. For this payment option, passengers can “smart-swipe” a phone with the NOL app installed in proximity to the payment device in buses, water buses, or the metro to complete payment.

Fares for multi-leg travel are calculated remotely at a data clearing house. “If [the customer] is using multiple modes of transport, like using a bus and then a metro, then the calculation happens in our clearing house, as to how much of this fare should go to the bus operator, how much should go to the metro operator, and so on,” Mr. Al Madani explained. “Once you tap, immediately it gets back into the clearing house.”

For the metro, Mr. Al Madani stated that data transfer occurs via fiber-optic cables. For taxis and water taxis, data transfer is facilitated by a GPRS connection. Currently, each bus stores fare data until the bus returns to the station, at which point the data is automatically downloaded via a Wi-Fi connection. RTA anticipates in the future connecting buses via GPRS as well, but currently has not due to the cost of GPRS bandwidth and the large number of bus payment transactions. Buses, however, are connected through GPRS to transmit location data via the Automated Vehicle Management System.

### **Automated Vehicle Management System and the Wojhati App**

City and water bus schedules, notifications, and some fare calculations are managed through the Automated Vehicle Management System (AVM). Passengers can download a free application, *Wojhati*, which interfaces with the AVM for schedules and alerts, and for assistance with journey planning. The AVM system tracks each bus along its journey and transmits that data to displays at bus stops, to the *Wojhati* app, and to an RTA command center.

According to Mr. Al Madani, the Automated Vehicle Management System integrates with four different systems: the NOL ticketing system, the real-time bus location system, the *Wojhati* journey planner app, and the automated passenger accounts. The AVM system provides the exact location of the buses and the routes, along with feedback if there are delays – information that can be sent to passengers via the *Wojhati* App or SMS if they have an established passenger account.

### **Driverless Metro**

Dubai is one of the first cities in the world to implement a fully automated, driverless metro rail system. Two lines transport passengers along 75 kilometers of rail, the world’s longest driverless track. The system sends and receives data via its own fiber-optic cabling.

Mr. Al Madani indicated that Dubai has installed solar-powered smart parking meters throughout the city. Parking can be paid using the NOL card or mPark, a free parking app that allows payment via SMS. The application also offers text notifications when parking time is about to expire, allowing motorists to refill the meter remotely.

The Dubai driverless metro is a closed system that is managed from a central command center staffed and operated by RTA. Onboard train communications also include video surveillance, and each car is Wi-Fi-enabled for passengers.

### Smart Parking

Mr. Al Madani indicated that Dubai has installed solar-powered smart parking meters throughout the city. Parking can be paid using the NOL card or mPark, a free parking app that allows payment via SMS. The application also offers text notifications when parking time is about to expire, allowing motorists to refill the meter remotely. Meter attendants also receive wireless communication from meters, and are notified when meters are full or out of order.

The meters use GPRS technology for data transfer, including NOL and mPark payments, and notifications to meter attendants. "Parking inspectors have handheld devices and know automatically if a car has paid the fee or not," says Mr. Al-Madani. "It is well-connected through GPRS, and it is real time." The system also alerts meter attendants when a particular meter's cash box is full, or if something is not working correctly, simplifying maintenance of the system.

Mr. Al Madani indicates that data security in all initiatives is paramount. Developers are ISO 27001 certified, and Mr. Al Madani and his colleagues have taken additional measures to maintain secure data. "Security is an important thing for us, like any other organization," he said. "We are using the best possible standards."

"The most important thing when it comes to security is governance," Mr. Al Madani explained. "In RTA, we have the IT Higher Committee for Governance, which I'm chairing. All the systems, all the technologies, all the strategic decision making regarding the technology has to be presented in this committee, and we look at it from different areas. Lastly, we have a dedicated security team in RTA."

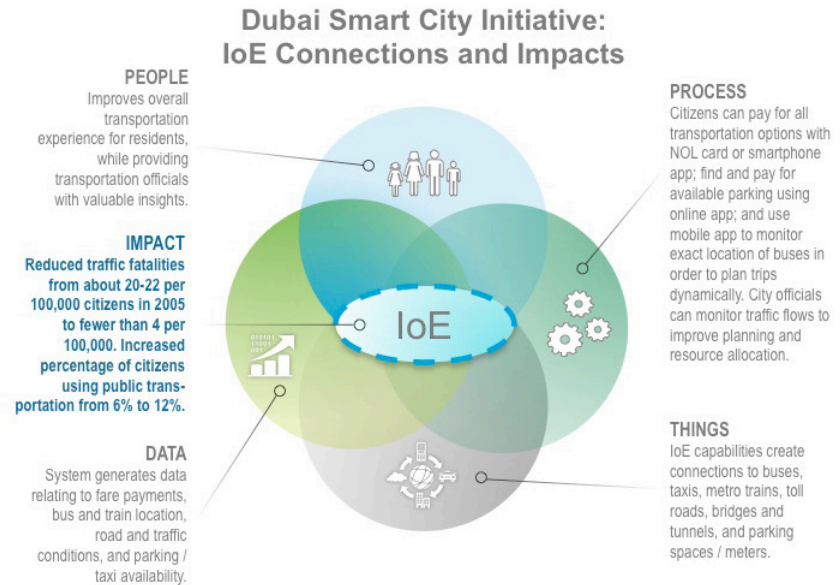
### Salik Toll System

In an effort to reduce traffic congestion, Mr. Al Madani and the RTA implemented Salik, an all-electronic system that allows drivers to pass through toll plazas without stopping. Motorists procure a prepaid card that is affixed to the windshield. The card acts as a passive RFID tag, and allows the driver to pass under the toll gates. An appropriate toll is automatically deducted from the balance on the card at each plaza.

### Taxi Applications

Other applications popular in Dubai are the Water Taxi and Uber Taxi apps, which allow taxis to be ordered via mobile devices. They provide real-time information about the vehicle, journey, and cost, and allow for automatic payment via the NOL system.

Figure 1. Dubai Smart City Initiative: New and Better Connections.



Source: Cisco Consulting Services, 2014

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## Impact

According to Mr. Al Madani, the RTA has made significant progress toward its primary goal of increased traveler safety. Since the RTA was established in 2005, traffic fatalities have dropped dramatically. “We have [increased] the most important thing: safety,” he said. “We have managed to reduce fatality rates in the city from something in the range of 20-22 per 100,000 when we first started in 2005 to around fewer than four.”

Another important goal for RTA initiatives has been encouraging residents to use public transportation, and these efforts are also showing positive results. Says Mr. Al Madani: “One of our goals was moving people from cars to use public transport. When we started eight years ago, the percentage of people using public transport as only 6 percent. Today, we have reached more than 12 percent, and our goal is to reach 20 percent by 2020 and 30 percent by 2030.”

Traveler convenience is yet another benefit of Mr. Al Madani’s work. The jump in customers using public transport means fewer cars on the road and smoother traffic. Smart parking and automatic toll payments have also simplified the travel experience in Dubai, and the driverless metro system is one of the most advanced in the world. Purchases of NOL cards are robust, and downloads are steady for the NOL app, the Wojhati trip planner, and the taxi apps, further contributing to efficient travel.

“Most of our initiatives are going to move into the hands of the customer, on devices that they hold in their hands. They are all geared toward making Dubai smarter and providing a better quality of life. There are a lot of machine-to-machine services that we have introduced to reduce the involvement of human beings and provide services in the most efficient way to our customers.”

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## Lessons Learned / Next Steps

Mr. Al Madani feels that one of the most important decisions made during early development was to include customers in the planning stages of each project. “You need to understand and involve the customer as much as possible,” he said, “because something that you think is right might be something that the customer really doesn’t want.”

Mr. Al Madani is planning a central management hub for all transportation services – the Integrated Transportation Information Centre, or ITIC – which he expects to begin operation in 2015. Within two years, he expects to open an even larger facility, the Enterprise Command and Control Center. The Center will centralize monitoring and management of all aspects of public transportation, including buses, metros, taxis, marine transportation, parking, roads, tunnels, bridges, and traffic.

Mr. Al Madani continues to oversee development of mobile technology to facilitate the incorporation of government services into easy-to-use mobile applications per the goals of Dubai Smart City. “We will have around 22 new projects or enhanced projects to move towards a smarter city,” said Mr. Al Madani. “Most of our initiatives are going to move into the hands of the customer, on devices that they hold in their hands. They are all geared toward making Dubai smarter and providing a better quality of life. There are a lot of machine-to-machine services that we have introduced to reduce the involvement of human beings and provide services in the most efficient way to our customers.”



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