

The road to smart highways

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Created by: Firas Almajdalawi
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Description

Smarter highways get you where you're going more quickly, safely and comfortably, says Nokia's Matthias Jablonowski. He looks at how we make them a reality.

One of the biggest challenges of urban living is traffic – with cars, taxis and trucks clogging every major roadway. In addition to the inconvenience and lost time, the hazards of increased pollution and roadway fatalities also loom large in the minds of today's drivers.

As a result, it is no surprise that city managers around the world are heavily focused on addressing these challenges, with traffic management emerging at the top of the agenda of many smart city initiatives.

Making highways smarter

Adding mission-critical information and communication technologies (ICT) to roadways offers tremendous potential to address these challenges. But how exactly can ICT networks be used to make highways smarter?

An approach with substantial momentum building in support is the development of Intelligent Transportation Systems (ITS). Many national and regional highway agencies are adopting ITS to support a wide array of applications and services, which promise to make travel on our roadways safer and more efficient.

At the heart of these systems are advanced communications networks that interconnect roadside equipment (i.e. tolling, video protection, emergency communications and digital signage systems), vehicles, travellers and roadside workers with each other and traffic control centres. This network provides real-time monitoring and control capabilities to achieve the following:

- Reduce travel time for drivers and lower pollution levels, while also making operations more efficient
- Heightening safety for workers and travelers with closed-circuit TV (CCTV) and always-on

communications across the entire highway network

- Gather real-time information to share with drivers, passengers and vehicles around current traffic conditions, potential construction delays, alternative routes, weather conditions and more

Making it work

To accomplish this, however, a wide variety of applications and data need to work together seamlessly – from CCTVs to licence plate recognition, weather stations, traffic monitoring systems and more. Historically, such applications were supported by individual, dedicated communications networks.

However, this approach can be costly and inefficient, particularly given the proliferation of applications highway agencies are looking to employ. Fortunately, modern communications networks can now support a multitude of services simultaneously, providing substantial operational and cost benefits.

Prioritising traffic

Of course, not every application deserves the same level of priority on the network – since each has specific requirements in terms of bandwidth, quality of service (QoS), availability and latency. As a result, highway agencies need a communications infrastructure that enables them to set parameters – critical, priority or best-effort – for each service and data type according to operational requirements.

For this reason, many highway agencies are turning to Internet Protocol/Multi-Protocol Label Switching (IP/MPLS) technology, which can provide the appropriate QoS levels for any given service. In practice this means that services on which lives may possibly depend (i.e. emergency and first responders) will get prioritised over more “nice-to-have” applications. This is a particularly important feature when a variety of services are running over the same network simultaneously.

Because they are IP-based, such networks are well adapted to support emerging services such as real-time video monitoring and analytics, which can be bandwidth-intensive.

At the same time, IP/MPLS networks offer the ability to support legacy applications, such as supervisory control and data acquisition (SCADA), which have typically been supported using networks that are quickly becoming obsolete. At the same time, the services running on these networks can’t necessarily be replaced all at once and it is often better to maintain the existing services on the new network infrastructure for a time. IP/MPLS networks provide this smooth evolution path, supporting existing services until the highway agency is able to replace them with newer, more efficient technologies.

Video

Another important consideration for highway agencies is the use of video, which is an increasingly important feature of ITS. CCTV feeds alone can consume a considerable amount of bandwidth and have the potential to adversely impact all services on the network.

Highway agencies need to ensure that their network is prepared for video, and can handle multiple, high-quality video streams concurrently.

Around the corner

Perhaps most important, highway agencies need to prepare for the dramatic changes that are just around the corner. Automated vehicles of all kinds will need to communicate with each other, drivers and passengers as well as the adjacent roadway infrastructure.

A variety of pervasive connectivity options are becoming available, from 5G wireless broadband to internet of things (IoT) technologies, that will enable highway agencies to deliver a wide array of smart, new services to drivers and driverless vehicles.

Smart cities deserve smart transportation infrastructure, and highways are no exception.

Deploying an Intelligent Transportation System (ITS) and employing the most advanced communications technology available can go a long way toward eliminating the traffic headaches that are keeping city managers — and drivers — awake at night.

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