3 Smart Cities:
Delivering Advantages for the Smart City

Introduction

Previous CTAM white papers covered the challenges facing modern cities, and a framework for thinking about the technological architecture of a smart city. This paper provides an analysis of how cable business service providers offer unique advantages and examples for the delivery of Smart City Solutions.

The technical architecture of a smart city is usefully simplified into four layers:

- Smart City Sensors – Support Beyond Point Solutions
- Smart City Connectivity – Best Of Breed Solutions
- Network Affordability – Advantage Cable
- Platforms and Analytics - Unlocking The Value Of Connected Sensors

> We're on a journey to re-think cable - not just 'the cable provider.' We are fully Invested in a community over time – the industry has contributed $3 billion in infrastructure over last 15 years, contributed $1.1 billion to cities economies.
>
> **Ken Kraft**
> Cox Communications

Smart City Sensors – Support Beyond Point Solutions

Previous white papers discussed the many smart city use cases enabled by the new generation of sensor technology. As a brief reminder, here's a short list that illustrates the wide range of use, but also underscores the unique technical demands of smart city applications.

Water Meters

Urban Logistics, Asset Management

Agriculture/Landscaping Moisture and Nutrient Monitors

Vehicle Traffic

Public Safety/Security Air Quality

The new generation of sensors offer great benefits – low unit cost and long battery life (10 years or more). The sensors' network characteristics of low data rates and intermittent data transmission allow cost-efficient connectivity to wide area networks.

Cable service providers are supporting the broadest array of such sensors available for use in smart city applications, even though the sensors place unique requirements on technology partners due to municipal budget cycles and planning schedules for roads and other infrastructure upgrades.

Sensor Scorecard For Cable

✓ Standards-based

✓ Low cost, long life

✓ Scalability

✓ Flexibility for city administrators

✓ Operational partnerships

Support for formal device and network standards is key to purchasing simplicity and flexibility across vendors. Service providers at the sensor and device level support standards like the ZigBee protocol. They also leverage the LoRa Alliance for networking, which has wide adoption and is currently deployed at scale in many European cities. Cable providers also offer flexibility with a modular approach to services – cities may choose a number of vendors with subject matter expertise - such as with water sensors- and can deliver can deliver the network connectivity that easily integrates with such devices and services. For example, Cox Enterprises' Cox2M unit launched its sensor management with its internal Cox Automotive business, connecting automobile asset tracking to more than 500,000 vehicles in the U.S. and Canada. (The largest such IoT deployment in North America!)

Finally, sensor deployment in any smart city application requires partnership in order to be most efficient and useful, while supporting multiple operational requirements. Cable service providers have been managing at scale, secure devices in wide area networks in the telecommunications world for more than fifty years. This deep expertise covers:

Device provisioning   ◎   Security   ◎   Monitoring   ◎   Analytics

Smart City Connectivity – Best Of Breed Solutions

Urban connectivity historically comprised wired and wireless options that were initially designed to serve mass market cellular or point-to-point institutional networks. But connectivity for a smart city needs to be purpose-built for IOT device communications. Such connectivity should efficiently support newer sensor device characteristics, including:

- Intermittent communications
- Low data rates
- Long battery life
- Wide area wireless connectivity
- Affordability
- Coverage and network maturity

> Cities should avoid vendors who bring a proprietary network or platform, as such "point solutions" will not scale.
>
> **Satya Parimi**
> Charter Communications

Network Affordability – Advantage Cable

Sensors may be inexpensive, but the sheer volume of available sensors is a connectivity challenge. Existing LTE or 4G cellular networks may be considered to support the connection of various sensor networks, but for many smart city applications with hundreds or even thousands of sensor connections, the overhead costs of cellular networks are usually cost-prohibitive, according to analysts like the Gartner Group. Next generation 5G cellular networks are as yet unproven for smart city types of deployments.

Low-power Wide Area Networks (LP-WAN), and in particular the LoRa (Long Range) protocol, is the emerging option of choice to meet the new economic and performance requirements of expanding sensor networks. Comcast and other service providers have built out LoRa

networks in many metropolitan areas in the U.S., which are in use by numerous enterprise customers. The use case for smart city sensor connectivity looks very similar to these enterprise deployments.

Further, these LoRa standard-based, wide-area sensor connectivity networks will also work seamlessly with urban residents' smart home capabilities. LoRa integration has been demonstrated with the cable industry's Reference Design Kit, or RDK-B, is an open source software platform specifically for broadband services, both inside and outside the home, and is used by several operators and is a core element for delivering services. As smart city managers want to integrate with the smart homes of their residents, a common, open source platform will pay dividends for city planners.

And cable's extensive wireline presence in urban areas will allow city planners even more flexibility and cost savings. Even if 5G networks are adopted for some applications, they likely will require the deployment of small cells much closer to the end-user than traditional macro cell networks. Cable's wired hybrid fiber/coaxial networks are well positioned to provide connectivity to mobile small cells. For example, CableLabs and Cisco recently demonstrated a proof-of-concept on the tighter integration of LTE and DOCSIS in order to reduce latency. Cable companies already have MVNO deals with Verizon and others and so cities can deal with a single connectivity provider even for niche cellular needs.

machineQ

machineQ is uniquely able to take advantage of Comcast's existing infrastructure to create gateway density without incurring prohibitive costs that would otherwise ruin the economics of most LPWAN solutions. In addition to tower and building-based gateways common to most LPWANs, Comcast's footprint offers the ability to bring gateways close to the sensors sending them data. Comcast's extensive local infrastructure will enable greater proliferation of wide area network gateways, adding to one of the world's largest dense LPWANs.

Network Coverage and Maturity – Advantage Cable
With 50 years of experience in network design, buildout and operations, service providers can offer software platforms that manage a variety of IoT device networks, addressing interoperability, security, connectivity and scalability needs. While these platforms were initially designed to support smart home, energy and other applications, the functionality is suitable for sensor networks deployed by cities.

Platforms and Analytics - Unlocking The Value Of Connected Sensors

Once sensor devices are deployed and interconnected, smart cities can develop applications that collect, manage and analyze data for myriad purposes. Cable service providers have set up focused businesses, such as the

Platform/Analytics Scorecard for Cable

✓ Consumer privacy

✓ Always-on cloud connection

✓ Data management and analytics capability

afore mentioned machine from Comcast and Cox2M from Cox Communications, whose very foundation is their deep knowledge of data analytics.

These focused business units employ the latest in machine intelligence for applications like predictive maintenance for roads and other infrastructure. Cox Communications can leverage synergies between the Cox2M unit and the Cox Automotive companies (e.g. such as Autotrader.com) to offer unique perspectives in the new urban world of connected vehicles, autonomous driving and ride sharing.

Cities are constantly generating data and must have access to that data through easy to use desktop or mobile dashboards. As one example, Cox2M offers city customers custom-built platforms, or can quickly integrate its data feeds and analytics with existing city agency tools and reports.

Similarly, machineQ's modular offerings allow a city to leverage preferred sensor partners, in a bring-your-own-sensor arrangement

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and use machineQ only for their advanced data analytics capability. It also is worth noting that cable's cloud-based platforms offer the advantage of quickly adding or updating applications that leverage huge numbers of embedded sensors at once.

City officials are especially vigilant about data security and privacy issues for their constituents. Many data management products now offer a systematic security perspective extending from device authentication to very strong encryption of the data flowing out of the devices. Cable reliance on LoRaWAN adds LoRa's end-to-end security model that protects the data "in flight" from sensors, as well as at the city's own IT locations.

At the end of the day, cable service providers have a long relationship with the communities where they operate, and cities have visibility and familiarity with these companies through franchise agreement oversight.

Recommended Reading

- Machine Q white paper
- https://www.multichannel.com/news/altice-usa-hawks-nest-smart-home-products-416250
- https://www.ptc.com/en/news/2016/altice-sfr-and-ptc-partner-to-deliver-global-iot-services-and-solutions