Independent market research and competitive analysis of next-generation business and technology solutions for service providers and vendors

HEAVY READING WHITE PAPER

Human-Centric Smart Cities: Service Providers the Essential Glue

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INTRODUCTION

The term "smart city" was heard for the first time 25 years ago, in association with the Rio Earth Summit. At the time, GSM was just beginning to be deployed in Europe; all fixed phones had different connectors; and dialup Internet, while travelling, was anything but easy. Times have changed, technologies have rapidly advanced, and citizen expectations have been radically altered by ubiquitous connectivity and unfettered access to the wealth of the Internet and social media. Against this background, this paper examines how the concept of smart cities has evolved, the influence of technology and the role that telecom providers will play in finding common solutions to the unique needs of each city and, most importantly, its citizens.

THE MARKET EVOLUTION

In 1991, the global population was 5.4 billion people, with 2.3 billion living in urban areas. By 2016, the number of people in urban areas had almost doubled to 4 billion, representing 54 percent of the 7.4 billion humans inhabiting the world. Today there are 37 megacities with more than 10 million people and 220 cities with more than 1 million inhabitants; of the 220 cities, 90 percent are in emerging markets. The 13 megacities in India and the 15 in China are all suffering from growth that is too fast for normal investment cycles. Consequently, congestion, energy reliability, waste management and pollution are resulting in severe economic and social implications for the inhabitants of these cities. As the pace of urbanization continues to increase in emerging markets, the need for smart urban planning will become essential, not only for the wellbeing of each city's residents, but also for the impact on global warming. It is against this backdrop that the C40 Cities Climate Leadership Group, consisting of 75 cities that represent 25 percent of the global GDP, has decided to focus on technical expertise and best practices required for smart urban solutions and combating climate change.

Fragmented Use Cases

Cities are complex institutions, systems and processes. They are managed by dedicated teams focused on delivering services ranging from utilities and mass transit to public safety, education and social/healthcare. However, these broad definitions hide the myriad of services that each city has evolved, with unique characteristics to meet the communities' varied and changing needs. Equally, as each city has embraced smart city projects over the last 25 years, they have sought to solve a specific pain point, usually delegating responsibility to the specific department with some support from IT, as required. Consequently, as each city faces its own unique challenges, this has resulted in a large number of tailored solutions, many of which are not scalable, upgradeable or interoperable.

Learnings & Frameworks

In the early days, the term "smart city" could almost be a euphemism for a dumb project – or smart marketing. The approach of early city pioneers was to choose a discrete project, often encouraged by enthusiastic vendors with proprietary technologies and software solutions desiring to leverage available government funding. The discrete solutions generated data that were trapped within city departments and was never shared internally or externally. In 2012, New York City set the precedent of aggregating the city's data and making it available as open data to everyone. This prompted the requirement for cities to think about data platforms as a mechanism to bring data together, share and analyze it. It also forced many to recognize

the need to understand how smart city projects could access, use and contribute to the data platform, as well as the necessity for an overall strategic plan to guide future investments – particularly with Internet of Things (IoT)-related projects. As these learnings were taking place in multiple cities, various bodies created frameworks to aid and guide cities on their journey. One of these is TM Forum's Smart City Forum that has identified five essential characteristics for success, based on project work by forum members. These success factors are:

1. A city strategic vision that considers the city context, issues and problems, and creates guidelines for small projects that are linked to an overall plan for digital services connected using smart solutions.
2. The appointment of senior leadership to be responsible for the creation, coordination and delivery of the vision, working across all areas of the city.
3. There must be commitment from the top of the organization to the plan, and alignment with every operational aspect of the city, to avoid impacting day-to-day operations, while at the same time progressing the initiatives to deliver planned outcomes.
4. Single-vendor, single-solution and 20-year contracts are not how you build a smart city. The city must own the creation of a smart ecosystem of vendors that supply a wide range of solutions and services to residents. This requires an open approach to partnering for a win-win, as well as a framework that defines the role of each company and the expectations regarding service and solution performance.
5. Agile engagement with the citizens of the city is essential to understand needs, issues and problems with existing and new services. They are the permanent beta testers; the key to success is creating an agile responsive organization to rapidly validate results of programs, amend them and evolve them even faster based on feedback.

To more practically aid city planners and administrators who were overwhelmed by the process, they used the learnings to create a downloadable smart city maturity and benchmark model. The model enables a city to rate itself across five smart city dimensions, gain insight across the city's functions, set clear goals for two to five years, compare themselves to similar cities and identify partners for collaboration.

Cross-Domain Solutions

Among those actively engaged with cities, there's a sense that there is a shift occurring, resulting from the confluence of multiple technologies that are increasing the capabilities of vendors and cities to link existing systems together as new solutions become available. For example, the availability of low-cost scalable data communications networks, together with distributed compute capability, has allowed utilities and cities to deploy smart energy solutions. By innovatively using data from different departments, it's possible to use the deployments of smart meters and distributed sources of alternative power generation, such as solar, to improve citizen experiences, lower costs and generate revenue. For example, some cities are measuring public building occupancy and closing parts of buildings to save energy. Others are using data from on-road and off-road parking sensors, linked with parking operations and consumer applications, to reduce search time for parking spaces. Going further is the possibility to promote available electric vehicle charging bays with flexible tariffs and billing services, based on alternative energy sources.

The humble streetlamp is the poster child of the future of integrated solutions. As many cities transition from traditional sodium lights to LED lights, to benefit from energy savings and lower maintenance, they are also realizing that this fixture of the urban landscape can be

used for other purposes, including mounting sensors to monitor air quality and listen for gunshots. By connecting them with wireless or wired connections, they are the perfect vantage points for video surveillance equipment to monitor pedestrian, cycle and vehicle traffic flows, and even drone activity for future online delivery services. They could enhance parking systems by monitoring parking spaces, notifying a control center when spots are vacated, checking parking times, providing billing information, and detecting illegal parking. As connected posts, they can also host small cell base stations to provide bandwidth and coverage for 4G and 5G cellular systems, and provide incremental revenue opportunities for city governments.

These same systems could be used for public safety and crowd management solutions, delivering information into emergency management and computer vision systems that can apply recognition software to identify people and vehicles. These systems require smart solutions to store data in ways that not only preserve data integrity, and can maintain chain of custody in criminal or terrorist incidents, but also provide data for predictive algorithms.

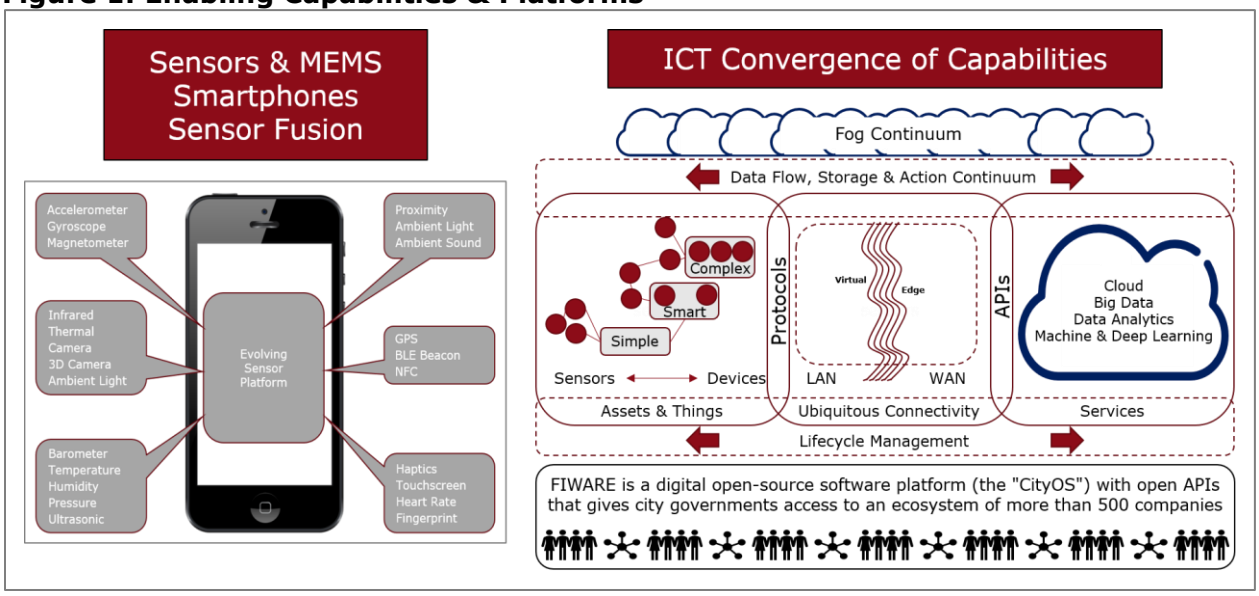
SMART CITY TECHNOLOGIES

As indicated earlier, the catalyst for increasing traction of smart city projects is not just the compelling needs of megacities and a desire compete in the global economy, but the collective impact of multiple technologies becoming accelerants of transformation of city processes, facilitating the disaggregation of global value chains that have traditionally serviced cities.

Enabling Capabilities

The constant reduction of sensor prices, and the enhanced integration of capability driven by the growth and adoption of smartphones, means that IoT devices are creating a world of sensor fusion, allowing everything to be sensed, monitored and coordinated. IoT has been further enhanced by cost-effective Internet and cloud compute capability, and by the advent of edge computing and fog continuum, placing low-latency ubiquitous intelligence at or close to the edge, as shown in **Figure 1**.

Figure 1: Enabling Capabilities & Platforms



These capabilities allow for the gathering and triage of operational data that can be used for predictive purposes in real time. At the same time, this data can be combined with vast quantities of other open source city data and social media to provide contextual intelligence that can be used by ecosystem partners to deliver and enhance city services.

City OS & Platforms

With all this data, as well as complex sensor, communications and data networks, it's critical for cities to have visibility and control. Some cities have sourced or built smart city platforms based on enterprise resource planning (ERP) solutions. An alternative approach adopted in Europe is to use FIWARE, an open source software platform with open application programming interfaces (APIs), formed by an industry foundation as a public private initiative. The initiative provides cities with access to more than 500 software developers and vendors.

Connectivity Solutions

Connectivity is at the heart of the smart city phenomenon. Increasingly, mobile technology has delivered ubiquitous high-speed broadband service to meet the expectations of smartphone users. The ongoing development of 4G LTE, and the rapid evolution of 5G with deployment plans beginning from 2020 onward, continues to enhance the networks. The wireless systems can deliver high bandwidth and low-latency capability with high quality, and are able to scale to meet customer demands for remote provisioning and asset management via end-to-end secure communications.

Adding to this is the development of low-power wide-area (LPWA) solutions based on 3GPP standards operating in existing licensed spectrum. These mobile IoT solutions support a range of different bandwidths and speeds that allow them to consume very low power and, consequently, operate for up to 10 years on battery power. They are: Extended Coverage GSM for IoT (EC-GSM-IoT); LTE Cat M1, a low-power enhancement to existing LTE radio; and narrow-band IoT (NB-IoT), which is a new radio interface that can be deployed "in-band" using existing LTE resource blocks.

In Saudi Arabia, Zain trialed the NB-IoT technology using smart meters to transmit temperature, humidity and air pressure. Orange sees EC-GSM-IoT as suitable for emerging markets that are heavily reliant on GSM, particularly in Africa, to support smart city and smart building applications. Currently, GSM accounts for 67 percent of networks in Sub Saharan Africa, and the GSMA estimates this will still be 41 percent by 2020. In contrast, North America and Europe will be at 12 percent and 14 percent, respectively, by 2020.

These licensed spectrum LPWA technologies were rapidly developed to effectively compete with a plethora of unlicensed spectrum alternatives, from companies such as SigFox, Ingenu and those leveraging LoRa Alliance technology. Additional companies, such as Silver Spring and Telensa, have evolved solutions to connect street lamps using mesh technology. Combined with the continued evolution of WiFi and Bluetooth to extend range and capacity, the result is that cities have a rich choice of communication options to deliver their ever-expanding collection of services.

Integrated Networks

The rich choice of communications options is a bonus in terms of designing and optimizing the network for each specific application, but it can also present huge problems in terms of

managing a diverse set of heterogeneous networks. Does the city want to manage a variety of different and often siloed systems of communications? The alternative is to outsource the management of the networks to a third-party integrator.

Interestingly, this is the scenario that 5G networks are being designed to address: the ability to efficiently manage different technologies across a broad range of spectrum to deliver a variety of services with variable speed and bandwidth requirements. This mixed network management capability also includes fixed delivery mechanisms, such as fiber, which will be critical to not only video and data traffic, but also high-data-rate x-haul (fronthaul, mid-haul and backhaul) of traffic from LTE and 5G small cell densification projects, distributed antenna systems (DAS) and enhanced city-wide WiFi access.

Another user of these small cells could be MulteFire, a technology for deploying standalone LTE data and voice service in unlicensed spectrum, with WiFi-like deployment and capable of interworking with external mobile networks for service continuity. It could provide the city with innovative public-private creative services and IoT solutions. Again, the street lamp is in many ways the catalyst for rethinking the use of fiber: from a single purpose market specific use case to thinking of it as a platform for emerging smart city use cases.

Existing 4G networks are already being enhanced with the deployment of software-defined networking (SDN) and network functions virtualization (NFV). These software approaches enhance the core network capabilities by decoupling the services from purpose-built physical equipment. This allows them to run on commercial off-the-shelf (COTS) compute platforms and be more agile and flexible to introduce and scale services on demand. However, the experience of this virtualization journey has been mixed. Virtualizing existing physical functions has been a good first step, but early experience shows that it requires a software-based core designed to run in the cloud with supporting operations capability, in order to be transformational. These are what are known as cloud native software functions.

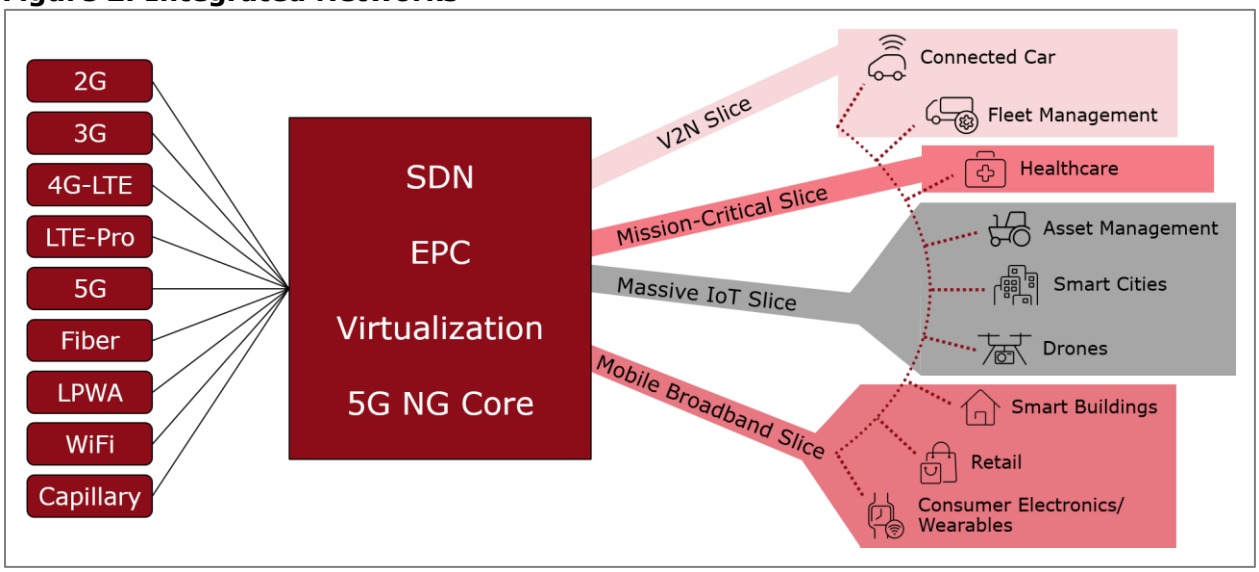
The 4G LTE architecture is based around the evolved packet core (EPC), which provides the mechanism to converge voice and data from 2G and 3G circuit switch systems and packet switched domains. The EPC unifies legacy voice and data services on an Internet protocol (IP) 4G network so they can be treated as just another IP application, while deploying just one packet network. The Virtual EPC (V-EPC) is taking the lessons learned from virtualization and, instead of replicating boxes in software, developing virtual network functions (VNFs) that can run in a cloudified environment in virtual machines (VM) or containers, subject to a management and orchestration system.

The combination of EPC and V-EPC network capability, with the broader deployment of SDN and NFV, has enabled the creation of dedicated core networks, sometimes known as network slices, and virtual networks. Both capabilities have been further enhanced for IoT applications, such as smart cities, by the development of a new core network function called the C-IoT Serving Gateway Node (C-SGN) in 3GPP Release 13.

This gateway node was developed for small-packet services, such as meter reading or environmental monitoring using sensors. There were two architectures specified but, in both cases, a dedicated IoT core would be deployed and connected to the RAN via the S1-lite interface. In each architecture, payload data is sent over the NAS channel. The logic of this approach is tailored to NB-IoT devices that are likely to use the control plane itself for small data delivery, and the requirements for the user plane relate to the occasional support for firmware over-the-air (FOTA) update scenarios.

Figure 2 depicts this integrated capability and shows the way this slicing capability tailors itself to smart city applications. At some time in the future it's probable that these micro-services can be combined with smart contracts and block chain payment systems.

Figure 2: Integrated Networks



SERVICE PROVIDERS & CITIES

Communications service providers in all forms – cable providers, fixed telecom and mobile operators, as well as cable operators – are looking to participate in the smart city opportunity. In many cases, they already have infrastructure and support functions deployed in cities, as well as a retail presence for interaction with city residents. They have billing and payment systems that could be an intrinsic part of a smart city services plan. In many instances they hold licenses and access rights, and are also familiar with the administrative processes necessary to secure further access rights and zoning permits. In other words, they are well positioned to help cities transition to smart cities.

While connectivity is an essential part of a smart city, it's not the only factor. An essential capability for success for any service provider will be the ability to build alliances and sustain relationships over many years with each city and the specific ecosystem of partners necessary to deliver the unique services that each city's circumstance requires. The most fundamental point to remember is that this is not the historic model of "build a common network, and sell devices and connectivity." In each city, the challenge is to solve its unique problems and provide a connectivity platform that can evolve within the context of that city. It requires not only general domain information, but also specific city domain knowledge, which requires partnering and close long-term cooperation. This is in addition to deploying the technology and software to deliver the network agility and flexibility, as defined in the previous section.

Partners – Different Models

Unsurprisingly, there is no proven or ideal partnership model for smart cities. Public-private partnerships are evolving and, with more than 250 smart city programs around the world,

each has an innovative twist in how they have come together. The partnership members usually include service providers, together with systems integrators and technology providers, as well as local, state and national governments, and even supranational institutions as in the E.U. Consequently, the funding arrangements are usually complex.

The complexity issue can be daunting for cities, particularly if they have limited resources. In the U.S. market, non-profit organization U.S. Ignite is trying to address this with its Smart City Corporate Partners Program. The intent is to match municipalities with private partners that are willing to bear the cost of grant applications and funding management. The arrangement allows the city and its partners to collaborate on project design, but the city doesn't have to find the administrative resources needed to apply for federal dollars. Several U.S. carriers are part of, or support, this program.

In Canada, another form of partnerships is where the government is encouraging citizens and communities to come together to create smart city ideas and enter a national smart city challenge. The winners of the challenge will receive financial prizes ranging from $5 million to $50 million in each round of the challenge. The program encourages municipalities, regional governments and indigenous communities to take part in the three rounds of the program that's due to kick off in the fall of 2017.

Other U.S. cities are raising infrastructure bonds and, as in the case of Atlanta, they show an openness to spend it on their own connectivity network. In their recent fiber request for information (RFI), Atlanta said it was open to considering joint builds and infrastructure swaps, as well as options that would involve having partners either lease fiber to the city or from the city, where excess capacity is available. They are aware of the options for potential new revenue, including leasing the fiber network to service provider partners, as well as leasing small cell antennas on connected utility poles to wireless carriers.

Kansas City sees the benefit of these hybrid public-private network sharing and financing projects. It has teamed up with Sprint and Cisco to provide free outside WiFi for more than 50 square blocks in its downtown area, as well as on the new street car platforms. This is service operated at no cost to the taxpayers because Sprint gets to use 50 percent of the network. Also, as part of the program, Cisco will install 125 LED streetlamps with sensors along the new downtown street car line, with the intention of saving money and providing a safe and high-quality ride environment. The street line platforms will also benefit from 25 interactive kiosks, providing services and information, as well as advertising revenue opportunities.

Connectivity networks can be thought of as three separate capabilities: fiber, wireless and sensor networks. In the case of fiber, access rights and permits can be an issue that deters new entrants from succeeding, as Google Fiber found out. However, the increasing willingness of communities to build their own networks is driving service providers to be creative. With its Boston and Sacramento deals, Verizon is driving a model of tying fiber rollout to small cell deployments and smart city projects supported by resources. In some cases, this model is extended to provide some of the incremental fiber capacity as free to the city, wrapped into services, such as free WiFi.

From a wireless network perspective, the traditional model of macro and micro cellular sites is going to be revolutionized by the requirement for dense deployment of small cells to support advanced LTE and 5G capabilities. For example, the relentless push toward autonomous cars will very quickly require cities and/or service providers to deploy vehicle-to-infrastructure (V2I) networks. It's not yet clear how this will occur. Apart from what forms of

partnerships might arise, there is the logistical issue of potentially hundreds of thousands of permits, and with that comes the challenge of what to charge.

The deployment of city sensor networks is a new frontier for service providers and cities. It is also the area in which new entrants and startups will likely shape both the future direction and partnership arrangements. Startups and cities don't tend to play well together. This is primarily due to bureaucratic timescales, and because many cities require companies to have been in existence for at least three years and be able to show the ability to perform and deliver on long-term commitments.

This is an opportunity for service providers to evaluate and tap into innovative solutions, and then partner with them and provide the risk mitigation that cities are looking for, while creating new revenue opportunities. Around the world we have seen operators partner up with alternative LPWA providers to deliver smart city solutions and evolve ecosystems of small device and solution providers.

U.K. company See.Sense is an example of where creative partnering with startups could be beneficial. It has developed a high-intensity light for cyclists that is smart and reacts to high-risk conditions around it, such as high traffic flows, roundabouts and junctions. When it detects these situations, it increases its flash rate and intensity. It also has sensors that monitor road surface, light condition, riding style, accidents and near misses. A version of this device is being trialed with cities on bike-share programs and, using LoRa, can transmit anonymized data to provide insight on the most frequent routes travelled and potentially high-risk accident areas. In the U.K., See.Sense is partnering with B.T. in Manchester. The company refers to these bike and light combinations as "mobile city sensors," and has in its roadmap the inclusion of air pollution sensors. When asked about the use of NB-IoT, as opposed to LoRa, See.Sense confirmed that it was trialing NB-IoT in Belfast, but was concerned about module pricing. Perhaps creative packages from service providers could bridge the gap.

In the Middle East, Dubai has initiated a green field project where mobile operator Du has partnered on creating a data platform to integrate existing data with IoT initiatives. The platform also provides the infrastructure for developers to support smart lighting, healthcare records and traffic management programs. The platform uses open source software and is vendor agnostic. It is supported by advanced technologies, such as LTE, NB-IoT and 5G trials, as well as blockchain. Blockchain is being used for visa verification, cross-department document exchanges and checking eligibility for utilities and the ability to pay rent.

Service providers can be good partners for global companies wanting to participate in smart city opportunities. They can initialize these efforts by providing access to key city decision makers and local businesses. This was the case in Denmark, where TDC joined with Cisco to provide the networking infrastructure, platform and solutions framework to deploy an array of smart city solutions for Copenhagen, a city intent on eliminating its carbon footprint by the year 2025.

Services

French operator, Orange, is a good example of a company that has recognized that a core capability of service providers is its depth of experience and proven history in running complex operations. This capability can be leveraged and monetized as a business service, as it has done with Orange Business Services (OBS).

OBS has undertaken many smart city projects in the Middle East, including the digital refurbishment of all buildings and infrastructure in Doha, Qatar. This approach is based on technology and business innovation, combined with a role as a master systems integrator that handles the design, procurement, implementation, integration, operation, maintenance and innovation phases of deploying ICT digital services. It draws on best practices from previous engagements to address the agreed requirements of the customer, to determine a framework of services and then deploy a delivery process based on four principles: time, quality, monetization and on-site presence. It also feeds its smart city projects with new ideas and services – to keep them smart on an ongoing basis – from an ecosystem of vendors and globally-spread R&D centers, labs and acceleration programs.

OBS has also recognized that cities require assistance with IoT and analytics, and it has developed Datavenue, which is a modular IoT and analytics solution that enables advanced analysis and decision-making. The solution is supported by IoT experts that help the city transform its equipment into intelligent objects that can be selected, connected and managed. It also provides customers with the necessary expertise to ensure end-to-end security, full systems integration capability, operations and a good customer or user experience.

Interestingly, Heavy Reading recently surveyed an IoT expert focus group comprising communications service providers from all major regions (Asia/Pacific, Central/Latin America, Europe/Middle East/Africa and North America). The focus group was asked whether they are offering professional services or IoT consulting to customers that are deploying IoT? The result was that 77 percent were not offering the capability, but 46 percent said that they were considering it. Clearly this is still a development area, and it takes time to acquire the relevant skills and capability, so the danger here is in starting too late.

DELIVERING SMART CITY SOLUTIONS

The smart city market is at the very early stages of development and, as the fundamental capabilities are created, so there will be innovative solutions that emerge. As service providers engage with cities, moving beyond delivering the three connectivity solutions and relatively simple applications, they need a game plan to engage the cities to move to more value-centric offerings.

The following seven considerations should provide a framework for their thinking and planning. Using this framework will ensure that their designs and architectures have longevity and, most importantly, address the primary objectives of city planners and administrators, making their cities globally competitive, sustainable, livable and attractive for their residents. Human-centric cities that apply technologies and solutions to enhance meaningful services and the lives of their citizens are the essence of smart cities 2.0.

Balancing Standards

Service providers are used to working with De Jure standards from a communications perspective, since this has been the basis for their growth and their ability to scale and interoperate. They are beginning to adjust to a world of open source standards as they embrace virtualization and cloud technologies. So they are in a perfect position to work with cities in this blended environment, where standardized networks underpin open date and services that are formatted in ways to facilitate sharing.

TM Forum and the GSMA, together with Open & Agile Smart Cities (OASC), are all resources available to help cities navigate this journey so that they can gain maximum benefit from the available open sources and standardized solutions. De Facto is the other standard, and in these early stages of market development every city in partnership with other cities can shape and craft these standards as they develop solutions and services and share them with partners.

Platforms for Orchestration

Cities are the original platform designed to connect people. Now they can be open and scale to improve operational effectiveness, reduce risk, create value and deliver flexible services for citizens. These services are often based around a digital platform that can deliver a set of tools and guidelines for delivering the smart city frameworks mentioned earlier.

It's the ability to standardize on a platform that will allow services and data to be shareable and transferable, as well as enable solutions to be replicated quickly and easily across domains. This is the mechanism by which open data collected from any device or sensor can be shared and ultimately monetized. It is the opportunity for service providers to use a service platform to help cities, by providing horizontal orchestration across the smart city verticals.

Cognitive Innovation

In most cases, the initial engagement between service providers and cities will be about connectivity; but very quickly the mass of data flowing through the network – needing to be assessed, deleted or stored – will require data tiering and management strategies. Rapidly following this will be the requirement to help develop and deploy analytics and AI platforms, to enhance operations and deliver predictive capabilities that can be used to create innovative services.

Disaggregation & Ecosystems

Because they are part of a global community at the cutting edge of technology, service providers are exposed to the disaggregation, disruptors and transformations that are affecting every business model in every industry, due to digitalization and IoT. If applied creatively, this knowledge has huge value in reshaping the ecosystems that have traditionally serviced cities. By bringing new ideas and companies to the attention of cities, service providers can accelerate the benefits of smart city projects and create new opportunities to benefit cities and provide additional revenue.

Monetization & Privacy

In this new space, few participants can definitively say they understand what cities want, and in most cases cities don't have the terminology or language to describe their needs and aspirations. There's a requirement to create a common lexicon and taxonomy that can be used to define problems, processes and outcomes, and that can be continuously updated as the market develops. Only in this way can progress be made toward monetization of services.

Simplistically, monetization is automatically associated with using or selling data, but the future could be a scenario where cities operate a market place in which entities, government

and citizens assign value to specific data and offer it in exchange for services. These automated exchanges could be facilitated by low-latency fog compute capability that would ensure instant contracts potentially validated, utilizing blockchain-based ledgers.

The architecture of these exchanges would need to be designed with security and privacy built in from the outset. A potentially useful tool that mobile operators could bring to bear is the GSMA's IoT Privacy by Design Decision Tree and set of tools, which helps cities assess if their services can win the trust of consumers. The other issue that must be front of mind of any company or service provider working with European cities is the implementation of the Global Data Protection Regulation (GDPR) that comes into effect in May 2018. Among other things, it governs how data is stored, what companies must do in the event of a security breach and the requirement to act on a citizen's request "to be forgotten."

Smart cities require a reshaping of service providers' business models, from traffic-based transactions and supply oriented thinking to a more outcome-focused orientation, based on a consumption needs driven model. In an increasingly services-driven world, service providers and their partners may own or share assets, deliver only what is demanded when it is required and make payments against service-level agreements that may extend over long periods of time.

Lifecycles & Mindsets

For many engaging in smart city projects for the first time, the challenge is balancing traditional business models of payback over two years or less, with the fact that most smart city projects are part of a plan with a 5-, 10- or 15-year time horizon. Addressing this issue, some cities have entered into long-term contracts outsourcing to urban operators services such as water, transportation, energy and facilities maintenance. CH2M, for example, is an urban operator that manages end-to-end public infrastructure for eight U.S. cities; while Amey, a subsidiary of the Spanish urban operation company Ferrovial, manages 30 percent of the outdoor street lighting in the U.K.

Urban operators and startups thrive when they can break processes and value chains into smaller parts and provide innovative value where others can't afford to. The more that smart city processes and services become transparent with open data and are in a continuous state of development, the more they will attract startup solutions, especially if there's an opportunity to leverage the solution in other cities and value chains. This is an opportunity for service providers to embrace and partner with these startups to lower the cost of delivering services, while also innovating on existing features and processes.

Partnering with urban operators provides service providers with the opportunity to deliver information and communications technology, which is changing on a 5 to 7-year cycle, to transform their business processes. This way, the urban operators can more efficiently and cost effectively deliver their service while leveraging traditional city assets that have lifecycles that are measured in decades.

This requires a change of mindset from all parties involved. Service providers must carefully plan platforms that can be enhanced and easily extended, while also being agile enough to respond to changes in requirements. Cities and urban operators must realize that their systems will be in a permanent state of beta; you can't future-proof the system, because technology is changing too rapidly, and therefore the project is never complete – just ongoing. To address these issues, service providers can deliver lifecycle management as a service.

Engagement & Expectations

Most people have been touched by the impact of mobile phones and, increasingly, smartphones with the benefit of access to mobile broadband. This has shaped the expectations of citizens about what's possible – from online purchases, to directions, ride hailing, social media, bill paying and virtual and augmented experiences. There's a huge gap between what cities currently provide and these expectations. The interesting thing is that mobile operators have vast experience of shaping and satisfying these expectations; they are the perfect partners for cities to work with to evolve mobile services, payment mechanisms and to engage with citizens via their devices.

The best way for smart cities to determine which services to develop is to create communities and engage with citizens on an ongoing basis. That means not only during the definition stage, but also during deployment, so that any issues can be rapidly addressed and the service enhanced based on feedback. Service providers and cities must deploy lean startup techniques, together with design thinking, to ensure that services are not only citizen-friendly, but also add value to the whole city experience. In partnership with service providers and Cisco, several cities have established living labs and centers of innovation to incorporate this mechanism in their smart city development plans.

Summary

Although the term "smart city" has been around for 25 years or more, real development of smart cities is still at an early stage. There is a growing realization that citizens must be at the center of all planning and execution of smart city services. Service providers are at the center of many of the technological advancements essential to delivering smart city services, and they are natural partners to deliver not only the connectivity networks, but also value-enhancing services.

To help service providers address this market, this paper highlights seven considerations that provide a framework for their thinking and planning:

1. Balancing de jure and de facto standards
2. Creating platforms for orchestration
3. Moving from connectivity to cognitive innovation
4. Leveraging disaggregation to enhance ecosystems
5. Outcomes-based monetization programs with privacy centric systems
6. Recognizing differential lifecycles and re-examining ecosystem mindsets
7. Leveraging consumer engagement to help determine citizen expectations

Using this framework will ensure that their designs and architectures have longevity and, most importantly, address the primary objectives of city planners and administrators, making their cities globally competitive, sustainable, livable and attractive for their residents.