

Smart Junctions – an urban private network for a Smart City application

What, when, where, why? – the riddle of 6G

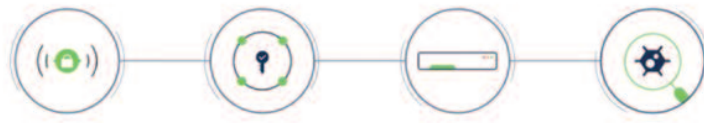
From rural to maritime Internet access – its application to fibre technology installation



Telecoms Professional magazine

- Call for entries: ITP 2023 Awards launch
- New partnership announced

Communities reimaged
Spotlight on smart cities



COMMUNITIES REIMAGINED: SMART CITIES

One way or other, cities have always been smart places; encouraging and enabling new ways of living, spaces for collaboration and the development of new ideas, a collection of people working out the best ways to live together and support each other. Until relatively recently none of this had anything to do with digital technology, as long ago as 500 BC, the Chinese used volcanic gas fed through bamboo pipes to illuminate the streets of Beijing and the Romans introduced many ‘technologies’ that made the UK a better place to live.

STU HIGGINS

Digital’s role in smart cities

A modern smart city (in fact any place where people live; a village, town, city or entire region) should be as frictionless as possible, reducing or ultimately removing everyday frustrations and annoyances. Most people if asked could readily think of at least three things that annoy them in the context of where they live. For example, getting hold of the best person to help them without being passed around by well-meaning people, finding a car parking space, getting a pothole fixed, getting access to high-speed, secure broadband, getting a mobile phone signal and so on.

In order for today’s smart cities to be

successful healthcare, local government and other agencies will need to be much more closely aligned and connected and will need to create a secure shared platform for access to, and delivery of public services for everyone. Education, Policing, Fire and Rescue, Transport and every other public sector organisation will be able to securely access and share information. And people will have access to services across different devices and networks to the public sector professionals best placed to help them.

Digital technology has a critical role in helping to develop cities to make them operate more smoothly and efficiently,

supporting everyone in whatever way they need, and ultimately creating nicer, safer, cleaner places to live that support everyone across society regardless of their status or circumstances.

It was all fine, then it wasn't!

Before the pandemic shut things down, noteworthy progress had been made across a significant number of projects around the globe. Although no place had yet reached the nirvana of being a truly digitally 'smart place' there are many examples of projects where digital solutions were making a real difference and helping address many different societal challenges. It had taken a while for the concepts to develop into real-world solutions, but lots of places were finally starting to deploy technology at scale and in the real-world. Real-world return on investment models were also emerging showing the value of doing things digitally.

Then, as the world shut down, so did many of these smart city projects. People had other priorities and it's only now as the pandemic fades into the distance that smart places are once again a priority for many municipal management teams, and the benefits are even greater than they were before Covid-19.

All change

Things really have changed. There is real focus to reinvigorate existing projects and after more than two years of stagnation also a sense of urgency, but supply-chain challenges and the events in Ukraine have made this difficult. People's priorities and attitudes to work have changed proving beyond doubt that it is possible for many people to work in different ways and from different locations. With more devolved control being given to regional governments and access to new funding sources, changes and advances in technology are leading to a much greater focus on sustainability.

According to IDC, "by 2026, 50% of midsize cities will use digital twins for sustainability and efficiency improvements and to gather operational data to meet climate targets." [1]

Not only that but smart city thinking has also

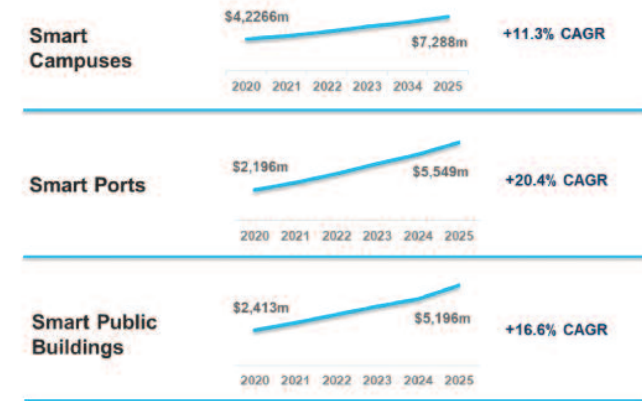


Figure 1: Forecasts of advanced urban digital transformation (courtesy IDC)¹

matured. Many digital providers are looking at how to help leadership teams reimagine places and support the outcomes that they want to achieve. Digital technology is now accepted by many, as fundamental to delivering better outcomes for everyone. There is a real focus on practical application for 'smart' solutions and genuine commercial opportunities for municipal authorities as they develop more connected communities. There is also broad recognition that 'digital' should be one of the foundational building blocks that underpin and enable the delivery of strategic objectives of every place.

As well as this recognition, the UK government continue to push the devolution agenda and provide funding through vehicles like the "levelling up programme" [2]. Regional networks are no longer a dream or aspiration, they are increasingly emerging in a number of locations across the UK and Ireland. With devolved regions and the implementation of Integrated Care Systems now well underway, many organisations are turning to digital solutions to seamlessly join-up different public sector bodies.

The "levelling up" white paper goes as far as saying "Cities, towns and communities must be physically and digitally connected if they are to thrive".

Figure 1 shows a selection of forecasts for growth across a number of specific 'smart' markets which will contribute to the predicted growth in smart cities.

A confluence of collaborative thinking, strategy, aspiration and technology

Over the next few years there is likely to be a much closer working between public bodies and these will not be able to fully succeed unless their planned outcomes are supported by digital strategies and technologies.

One example of where this is already underway is in Greater Manchester (GM) overseen by the Greater Manchester Combined Authority (GMCA). The 'GM One Network' is the catalyst for public sector bodies across the Greater Manchester region to deliver a truly joined-up public services delivered by GMCA and by many of the public sector organisations within the region.

When this project was announced in October 2022, Andy Burnham, Mayor of Greater Manchester said:

"This is a huge achievement for Greater Manchester's public sector and really demonstrates the value of collaboration. Through transforming our public services, we are boosting our towns and cities, cementing our position as a world leading digital-city region. Ensuring our services are more efficient supports our ambition that everyone in Greater Manchester, whatever their age, location or situation, can benefit from the opportunities digital brings."

Cisco and its partners, will deploy a high-speed, secure, self-monitoring, region-wide

¹ IDC Smart City Spending Guide 2021

“Ensuring that our services are more efficient supports our ambition that everyone in Greater Manchester, whatever their age, location or situation, can benefit from the opportunities digital brings.”

digital infrastructure to underpin public services across GM. Working in tandem with existing infrastructures already deployed, the platform will deliver continuous trusted access to everything and everyone across the public sector. It will allow local authorities to improve information sharing, reduce their carbon footprint, and introduce more intuitive and joined-up public services. In doing so, the digital infrastructure will also enable support for new technology solutions for indoor and outdoor connectivity, such as 5G, WiFi6, OpenRoaming and IoT.

The project will seamlessly integrate public services across a secure, high-speed core network using next generation connectivity technologies including Routed Optical Networking (RON).

Over time this network will enable improved services and innovative new public sector services to be delivered to 2.9m citizens making Greater Manchester a place where everyone can live a good life, “growing up, getting on, and growing old in a greener, fairer more prosperous city region”.

The GM One network will initially support local government, education, transportation, fire and rescue sites with the opportunity to expand in the future to other areas of the public sector including other emergency services, health and care.

A high-level view of the logical design for the

What is Routed Optical Networking?

Historically, scaling and operating a multi-layer architecture has been challenging. Routed Optical Networking (RON), part of Cisco’s Converged SDN Transport Solution [3], is an architecture that delivers improved operational efficiencies and simplicity. With an innovative approach that spans across silicon, optics and routing systems, complex layers now converge into a simpler and more scalable architecture. RON focuses all the switching at Layer 3 by leveraging Segment Routing for the service infrastructure. Routers are connected with standardised Cisco 400G ZR/ZR+ coherent pluggable optics. Developed by Cisco, this approach is now being adopted by other industry players.

With a single service layer based upon IP, flexible management tools can leverage telemetry and model-driven programmability to streamline lifecycle operations. This simplified architecture integrates open data models and standard APIs, enabling a provider to focus on automation initiatives for a simpler topology.

Network processing units (NPUs) in routers can now scale from tens to hundreds of Tbit/s, and 400 Gb/s optics are reduced in size and power, thus providing an opportunity to design and architect the network in very different ways than before.

Thanks to delayering there is an increase in network availability and because network port density is maintained, there is no trade-off between integration and capacity.

From a sustainability perspective, network modelling shows such a solution achieves up to 45% power reduction and up to 70% real estate (space) savings.

Perhaps most important are the OpEx savings from simplifying network management (some 57% over five years). And total cost of ownership for IP aggregation in mobile backhaul applications show savings of up to 50% in CapEx and 70% in OpEx.

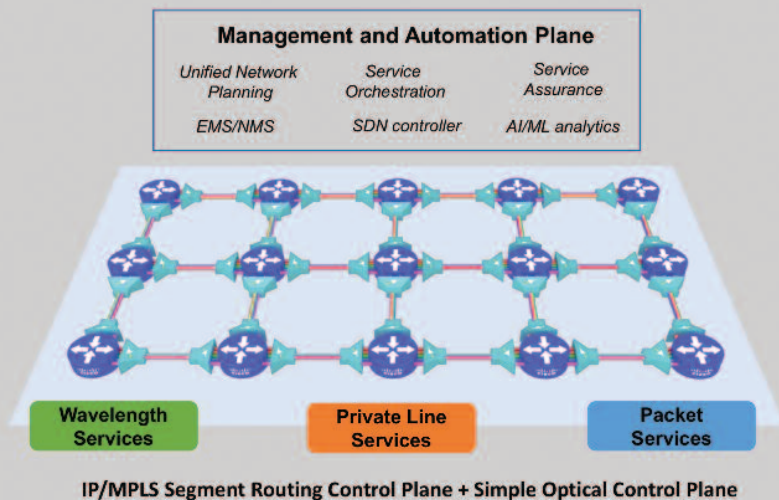


Figure 2: Cisco Routed Optical Network Architecture

GM One Network is shown in figure 3. A high-level view of the design elements of the GM One Network is shown in figure 4.

Ultimately the GM One Network aims to

deliver ‘Infrastructure as code’ with a ‘X’ as a Service (XaaS) consumption model, where ‘X’ could be; infrastructure, software, security, specific applications etc. An orchestration layer ‘front end’ will make it

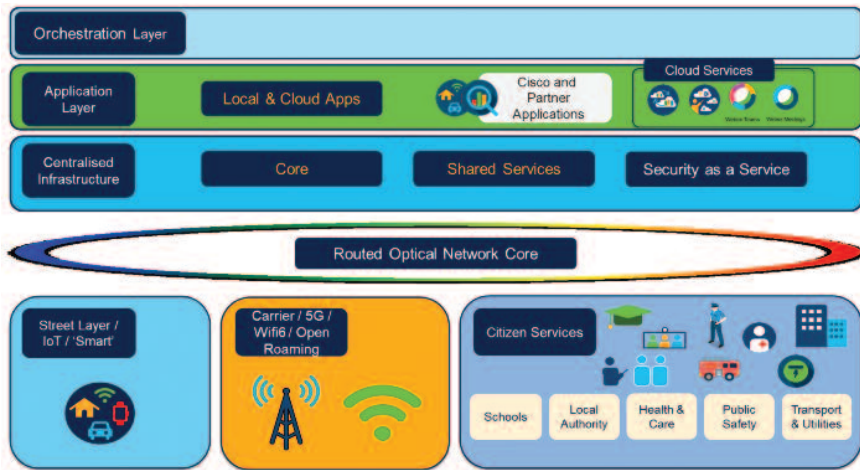


Figure 3: Logical Architecture of the GM One Network

possible to manage and consume services without having to worry about the technology and tools enabling the platform in the day-to-day operation of GM One Network.

Figure 5 shows this ‘Platform’ approach.

As can be seen, the complex elements within the platform are ‘invisible’ to the users of the infrastructure and services and managed through the ServiceNow orchestration layer.

A brave new world

This type of regional, secure, high-speed infrastructure, combined with a comprehensive data strategy and end-to-end vision will create an environment capable of delivering almost ‘unlimited’ connectivity and data sharing opportunities.

This means that it will be possible to re-imagine the delivery of services to everyone, everywhere, whether in a town centre or the most rural of locations.

Technology has genuinely changed in the past few years and is much faster, more secure, and intelligent than ever before. We are only just scratching the surface of what’s possible with AI and Automation for example. These solutions will create the platform to support the majority of future public services.

In 2019 at an Institute of Telecommunications Professionals event in London, Fawley Waterside, a development to create an ‘Intelligent Merchant City’ in the New Forest in Hampshire was discussed. Despite the pandemic, this project has been steadily progressing and is now really taking shape. Fawley’s vision is to: “Showcase how we should live in the 21st Century” by “building a town that makes sustainability – in all senses of the word: environmental, social, and economic – easy and attractive”.

A lot has changed since 2019:

Physically the site has undergone a dramatic transformation: from a decommissioned 1960s power station to a blank canvas ready for the development of beautiful place to live and work. There has been a lot of carefully

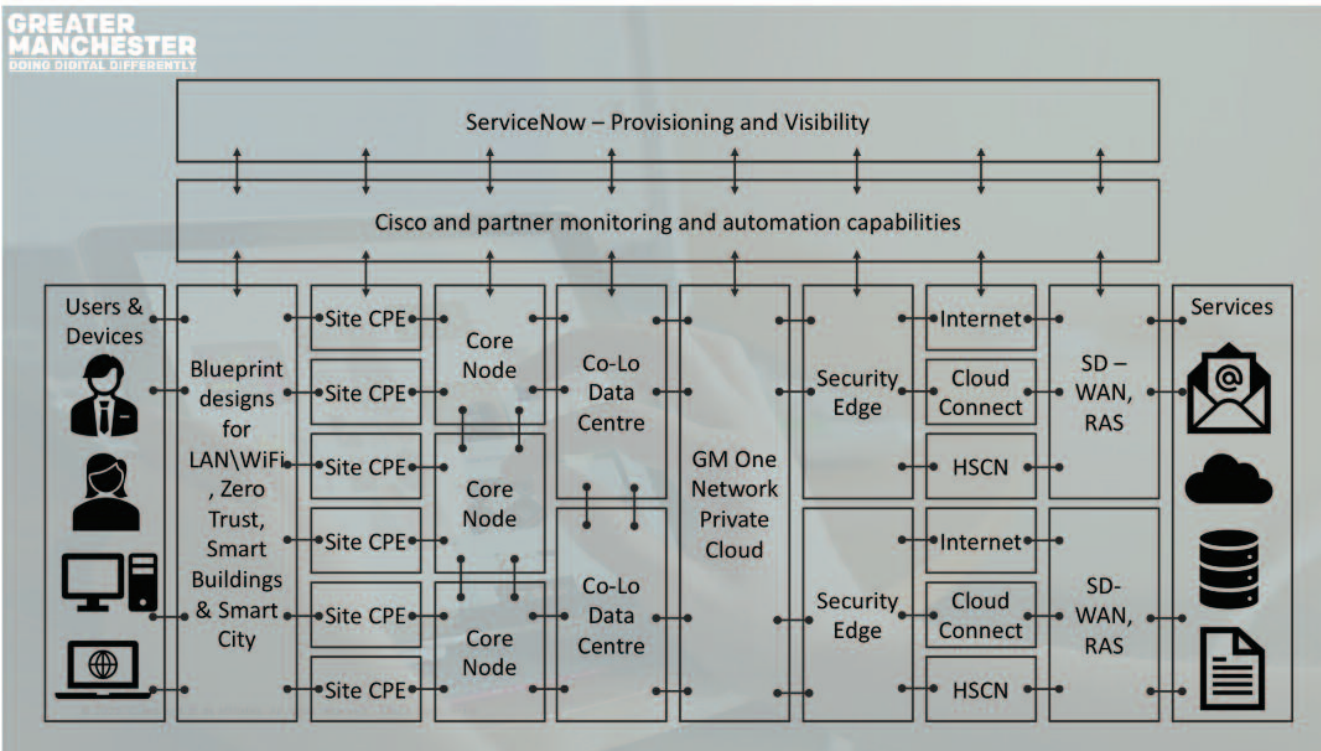


Figure 4: Design elements of the GM One Network (courtesy GMCA)

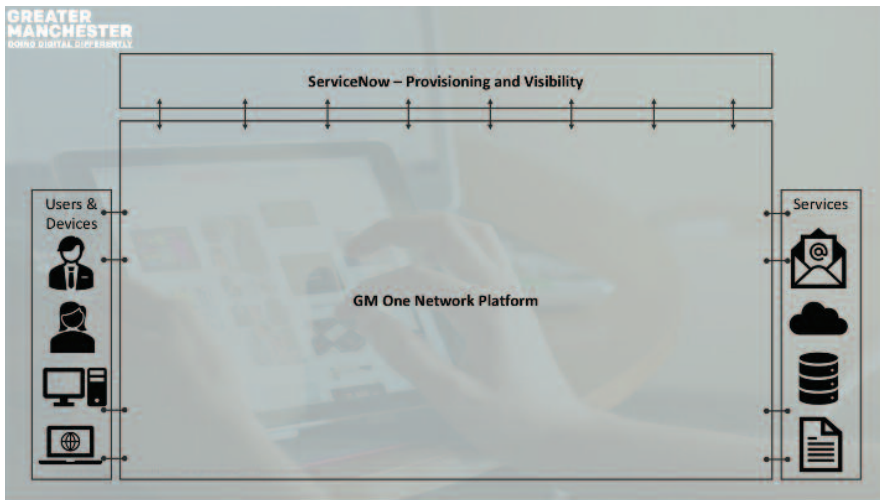


Figure 5: How the GM One Network will be presented to GMCA

managed demolition and the site has been cleared ready for construction to begin.

Digitally, the connectivity and data strategy has matured and will ultimately deliver the ‘intelligent merchant city’ dreamed of at the start of the project. Plans are in place to deliver a digital twin of the entire town and as the construction phase gets underway, the physical and digital versions of Fawley will develop together.

Fawley was also part of the successful “Solent Freeport” proposal to “accelerate the creation of high-quality employment space, with investment specifically targeted at state-of-the-art growth sectors and ground-breaking approaches to decarbonisation and green innovation”.

Figure 6 shows the site before demolition

began and an artist’s impression of the proposed development.

Everybody’s talking about sustainability

One of the most noticeable shifts since the pandemic is the rise in the recognition of the importance of sustainability. Sustainability, net zero and environmental Impact are now being discussed everywhere.

20% of energy-related greenhouse gas emissions currently come from buildings and over 70% come from cities. In 2022 the World Economic Forum said that the digital sector (which MDPI earlier estimated represented 1.4% [4] of the global total of greenhouse gas emissions) “can reduce global emissions by up to 20%”. [5] This is a strongest indication so far of how digital technology can help address this incredibly important global challenge.

Globally, an increasing number of public sector organisations are challenging their commercial partners to help them achieve their sustainability targets and to prove their own sustainability credentials too.

One outstanding example of what is possible is at Fawley where they have achieved a Deconstruction / Demolition Recovery Index of 98.37% with their contractors Brown and Mason. This is an indication of the percentage of building elements, products or materials that are reused or recycled from a demolition / construction project. Levels generally accepted on a well-run site are around 75% - 80%.

**Beyond sustainability
Social value measurement**

In September 2020 the UK Government issued its Public Policy Note entitled “Taking account of social value in the award of central government contracts” [6].

This procurement policy note launched a “new model to deliver social value through government’s commercial activities” and while it was chiefly aimed at Central Government departments and agencies, much of the UK public sector has adopted a very similar approach.

In Local Government it is not uncommon to see Social Value (SV) requirements accounting for 20% or more of the scoring in a technology procurement. Some Local Authorities are already considering



Figure 6: Fawley Waterside – from a 1960s power station to an intelligent merchant city (courtesy Fawley Waterside)

New York City

One example of the delivery of a more sustainable and cost-effective solution managing the environmental impact of new technology is the trade-off the New York City Department of Information Technology & Telecommunications (DoITT) made when selecting their new infrastructure.

DoITT, who provide IT and telecommunications services to all public agencies in NYC needed to upgrade their infrastructure to provide additional capacity for current and future needs while reducing operational expenses.

They operate mission-critical services for 120 City agencies and other public customers and were seeing continued growth in bandwidth demand for the City's core network. "CityNet" needed to modernise to maximise efficiency and operate with agility and deliver unprecedented levels of security. By migrating to software-defined networking (SDN), they recognised that they would be better equipped to configure, manage, secure, and optimise network services and deliver a more sustainable solution than before.

Utilising performant and cost-effective Cisco technologies helped them reduce the number of major connected sites. Significant OPEX cost reduction through convergence of separate legacy optical and routing networks into single platform (utilising RON) provides 100G of capacity to meet the needs of all agencies and is future-proofed for at least the next ten years.

increasing this to as much as 30%!

There are a number of categories used for measurement of SV and these can be loosely combined to give three broad groupings: People, Environment & Sustainability and Innovation. What is really interesting (and challenging) is the need to relate anything done to a specific procurement, project, region or organisation. It is not possible to just use a company's Corporate Social Responsibility statements and actions and apply them to every procurement. The commitments made have to be related to the project being procured. For example: "number of local direct employees hired or retained (for the tendered contract)", "Innovative measures to promote local skills and employment" & "Number of hours dedicated to support young people into work (16-24)".

The IT industry has to show how they are contributing to each community where its collective technologies are used. This forces suppliers to focus on the outcomes enabled by their solutions, not on the technology itself.

Making suppliers accountable for 'giving

back' and ensuring detailed reporting of progress is a major change in how things are done.

What about the Economics?

In a time of increasing inflation and the rising costs of living, the UK's national ambition to level up society and create equitable opportunities is something where digital technologies will play a vital supporting role.

Further digitisation and transformation of society – where every citizen is connected, has digital skills and public services and industries are digitised – has the potential to add £168bn to the UK economy by 2030 [7].

Connecting remote, rural communities via technologies such as 5G and open Wi-Fi has the power to achieve equitable geographic access, open digital economic opportunities, and boost productivity. Without secure, affordable access to connected services, people are limited in their ability to gain access to education and engage in essential services that support welfare and quality of life as well as participating in the digital economy.

Commercial models need to change

In order to support these ambitions, new ways of 'buying' or consuming technology are required. Flexible commercial frameworks and marketplaces are not just necessary but imperative. Public and private sector organisations have to be able to take advantage of new and innovative ways to access digital solutions and to pay for them.

It needs to be easier to procure solutions in flexible ways that can address different requirements. Not all of these put price as the highest priority. For example, a purchase may contribute to a broader economic strategy or be part of an 'evergreen' approach to procurement which puts sustainability at the heart of an invitation to tender.

Public service provision has to benefit the public sector, the people they serve and the environment where they all live in a connected community.

AUTHOR'S CONCLUSIONS

The benefits are clear for the provision of 'access for all'. If everybody has access to the services and people they need whenever they need them, it should be possible to get help from the most appropriate doctors and social carers and in many cases, recover in less time and at home. People would be able to know that the air they breathe is clean. And a joined-up public sector will be able to work more closely together to solve some of society's most complex problems.

A Smart City with unlimited, secure, high-speed infrastructure will enable the delivery of services to those that need them most. All participants (people and technology) can rely on the infrastructure to move data to where it can do the most good. The more connected people are digitally, the more connected they will be socially.

Technology today is helping to redefine the meaning of the smart city and while not everyone will agree on the definition of what 'smart' is, no-one will want to live somewhere dumb!

ABOUT THE AUTHOR



Stu Higgins is Cisco's UK Smart City and IoT Lead and a Cisco Sustainability Ambassador. He has worked in IT for over 30 years and is a passionate advocate for harnessing digital technologies to improve the lives of everyone, every day. He helps public sector organisations deliver strategic outcomes while reducing the climatic impact of their technology deployments. Prior to Cisco he worked at a number vendors and a boutique management consultancy. He represents Cisco on several strategy boards. *Twitter handle: @stuhiggins*

ABBREVIATIONS

GM	Greater Manchester
GMCA	Greater Manchester Combined Authority
OpEx	Operational Expenditure
CapEx	Capital Expenditure
RON	Routed Optical Networking
SDN	Software Defined Networking

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