Quantum Edge Enabled Smart Cities
by
Joe Reddix
Master Systems Integration (MSI) – The Reddix Group

The Quantum Era

The global smart cities market size was valued at USD 1,090.64 billion in 2021 and is expected to expand at a compound annual growth rate (CAGR) of 24.2% from 2022 to 2030. The increasing urbanization, need for efficient management of resource utilization, public safety concerns, and increasing demand for an environment with efficient energy utilization are the major growth drivers. Due to the COVID-19 pandemic, countries followed strict lockdowns and mobility constraints to avoid the spread of the virus. During the pandemic, the dependence of global economies on urban areas and the importance of public healthcare in smart city initiatives have been brought to light. However, organizations are trying to implement emerging technologies such as the Internet of Things (IoT) and Artificial Intelligence (AI) to overcome the challenges faced during the pandemic. - Grand View Research

Quantum/Edge Enabled Smart Cities are coming -
For their residents, these centers of urban living are their livelihoods. Cities are the sprawling metropolises where citizens live, shop, and work. For others, cities represent oases of culture where visitors can uncover the latest cultural phenomena, buy the most up-to-date goods, or even just spend a day exploring. And soon, more people might live within city limits rather than beyond their borders. In fact, the world is urbanizing at an unprecedented speed and scale, with more than half the global population living in cities today… a statistic that is rising to nearly 7 out of 10 people in cities by 2050. In response to these rapid increases in population, cities are getting smarter. As a result, they are becoming more interactive and more livable – and today's world is merely at the cusp of what technology could eventually do in the urban environment.

Smart Cities and the Internet of Things

Indeed, across the world we are seeing increased interconnectivity thanks to the Internet of Things (IoT) and cities and people who are technology dependent. In response, a new wave of smart applications is changing how we approach everyday activities. Perhaps in your own home you have personal assistants like Amazon's Alexa, an intelligent refrigerator or smart home security applications. These types of technology all create opportunities for more efficient living. "Smart Cities" have been proposed as the future of urbanism, which raises the question – how do we connect this new technology for the ultimate efficient society?

An answer lies within the millions of sensors that are already available today for thousands of processes to be monitored, measured, and controlled. Communication protocols have been standardized and operations have achieved impressive autonomies, optimizing costs, deadlines, and spaces.

Smart Cities Edge Computing

The distributed nature of this paradigm introduces a shift in security schemes used in cloud computing. In edge computing, data may travel between different distributed nodes connected through the Internet and thus requires special encryption mechanisms independent of the cloud. Edge nodes may also be resource-constrained devices, limiting the choice in terms of security methods. Moreover, a shift from centralized top-down infrastructure to a decentralized trust model is required. On the other hand, by keeping and processing data at the edge, it is possible to increase privacy by minimizing the transmission of sensitive information to the cloud. Furthermore, the ownership of collected data shifts from service providers to end-users

The world's data is expected to grow 61% to 175 zettabytes by 2025. According to research firm Gartner, around 10% of enterprise-generated data is created and processed outside a traditional centralized data center or cloud. By 2025, the firm predicts that this figure will reach 75%. The increase of IoT devices at the edge of the network is producing a massive amount of data - storing and using all that data in cloud data centers pushes network bandwidth requirements to the limit. Despite the improvements of network technology, data centers cannot guarantee acceptable transfer rates and response times, which, however, often is a critical requirement for many applications. Furthermore, devices at the edge constantly consume data coming from the cloud, forcing companies to decentralize data storage and service provisioning, leveraging physical proximity to the end user.

In a similar way, the aim of edge computing is to move the computation away from data centers towards the edge of the network, exploiting smart objects, mobile phones, or network gateways to perform tasks and provide services on behalf of the cloud by moving services to the edge, it is possible to provide content caching, service delivery, persistent data storage, and IoT management resulting in better response times and transfer rates. At the same time, distributing the logic to different network nodes introduces new issues and challenges.

Summary - MIT Media Lab Kent Larson *Director, City Science Group*

With more than half of the world's population living in urban areas, the future needs smarter, safer, and more sustainable cities that are ultimately more responsive to the needs of their citizens. While smart city solutions typically focus on digital optimizations to existing urban infrastructure, this program goes beyond optimizations to explore the ways in which disruptive technology can dramatically improve the planning, design, and management of contemporary cities for their more resilient futures. With the Reddix Group (TRG) you will discover how technologies like data analytics, artificial intelligence (AI), new urban systems, real-time simulations, and predictive urban design can be leveraged to realize more entrepreneurial, high-performance, and livable urban communities providing the following as examples of what can be accomplished.

Citizen Benefits

- Mobility
- Distributed water and waste strategies
- Advent of autonomous transport systems
- Relationship between density, diversity, and proximity in urban communities

Contributing factors

- Architectural design of a city
- Social, cultural, political, and economic forces affecting the built environment and ways to responding to them.
- How technology can be harnessed as a meaningful solution to both local and global challenges, and ultimately serve as a means of delivering better quality of life for urban citizens.

Relevancies

- Engineers
- Designers
- Architects
- Urban Planers
- Environment
- Energy
- IT Infrastructure
- Technology and Data

If you are an entrepreneur, business leader, or an investor looking for new business opportunities in sustainability, mobility, urban design, or innovation, then this program will be relevant to you. City department heads, government innovation officers, and other government leaders interested in the potential of new technologies to improve the quality of life in cities would also benefit.

Design and technology for people-centric cities
Learn to leverage technology to make the city of the future work like a small village of the past.

The mobility revolution and urban robotics
Use data to understand the most efficient and sustainable ways for people to move around a city.




The live-work transformation: robotics, prefabrication and IOT technology
Explore technological innovation such as architectural robotics, AI, and new materials for urban living that will transform the way people live and work.

A network of neighborhoods: AI, real-time simulation, and emerging systems
Discover how density, proximity, and diversity, together with a focus on connected communities, can create high-performance cities.

Sustainable communities: Local production and lower consumption
Explore interventions and distributed systems that encourage communities to consume fewer resources and produce locally.

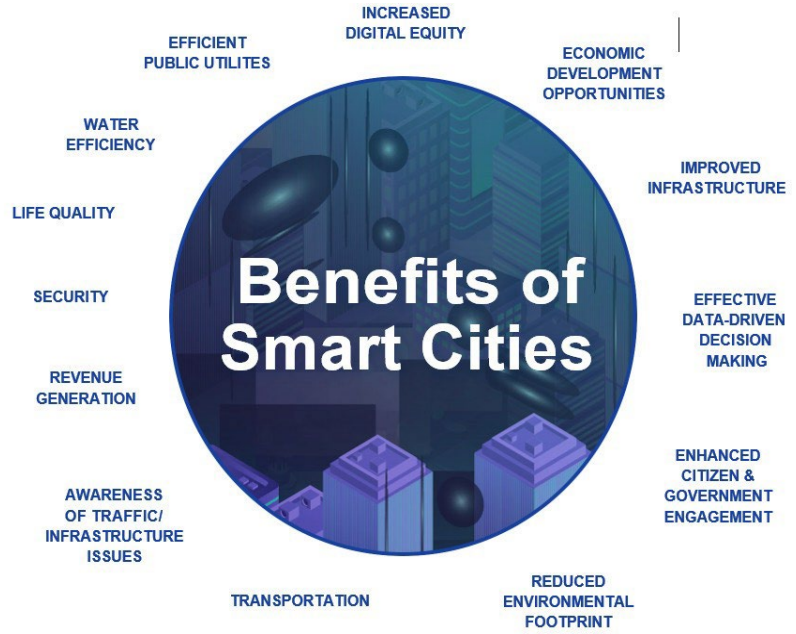
Governance: Token economies and algorithmic zoning for prosocial behaviors
Explore future speculations on how new governance models, behaviors, and emerging technologies will facilitate healthier urban communities

"Highly successful cities in the future will likely consist of a network of compact urban districts where resources and amenities of daily life are in proximity, allowing people to live, work, play, and exchange ideas in walkable, vibrant communities.

Quantum Cybersecurity Integrated into the Cloud

Our country is at risk, not only from a catastrophic cyberattack but from millions of daily intrusions disrupting everything from financial transactions to the inner workings of our electoral system. Capturing the complexity of this challenge is hard.

The reality is that we are dangerously insecure in cyber. Your entire life—your paycheck, your healthcare, your electricity—increasingly relies on networks of digital devices that store, process, and analyze data. These networks are vulnerable, if not already compromised. Our country has lost hundreds of billions of dollars to nation-state sponsored intellectual property theft using cyber espionage. A major cyberattack on the nation's critical infrastructure and economic system would create chaos and lasting damage exceeding that wreaked by fires in California, floods in the Midwest, and hurricanes in the Southeast.



How do Quantum Enabled Smart Cities benefit residents?

The main objective of a smart city is to serve the people who live there, as well as those who visit. Smart cities have the potential to improve quality of life in the following ways:

1. **Cost-saving:**

The effective use of automation, artificial intelligence, cognitive computing, data sharing, analysis, and sensors by public service organizations overwhelmingly reduces several operating costs where mobilization expenses are abruptly optimized.

2. **Efficiency gains:**

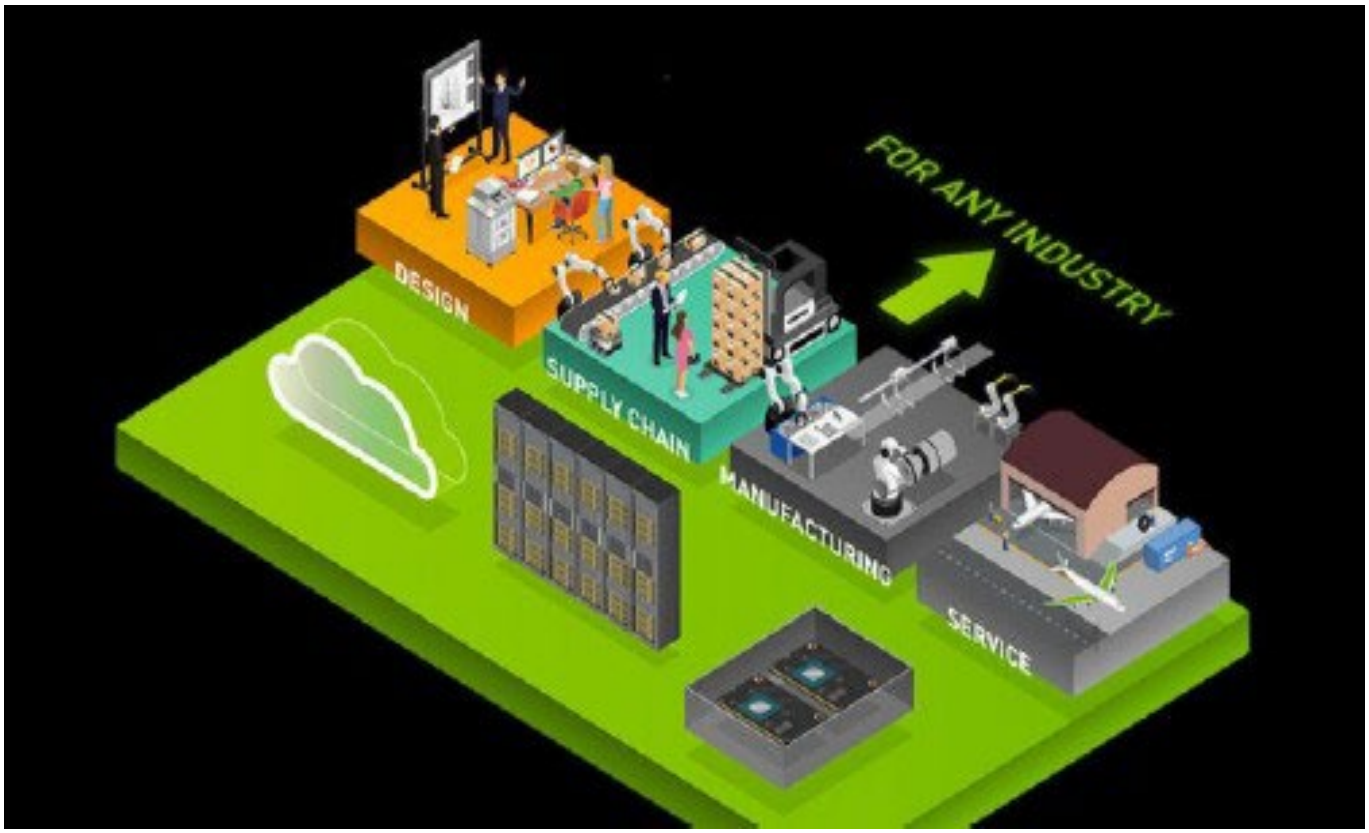
Smart City components improve the performance of different parts of operations, promoting an efficiency gain of up to 80 percent for certain procedures and with an average of a 25 percent gain within the full physical networking. Faster and more informed decision-making processes allow for a quick and confident management procedure.

3. **Revenue generation:**

Smart technologies create new resources to generate revenue through creative initiatives. IoT solutions effectively allow cooperation with public works and other utilities organizations, generating a new source of revenue. Smart cities also can reduce fraud and promote better usage of the proprieties and urban infrastructure.

4. **Overall life quality:**

Existing implementations are reporting that smart city initiatives are saving each local citizen an average of 125 hours of travel time a year. A lot of this comes from reductions in traffic and congestion: the average peak-time vehicle speed in cities is currently 4 mph, causing drivers to lose up to 70 hours per year. This free time can translate to life quality, as residents can spend more time with entertainment, tourism, the home, and family enjoyment.

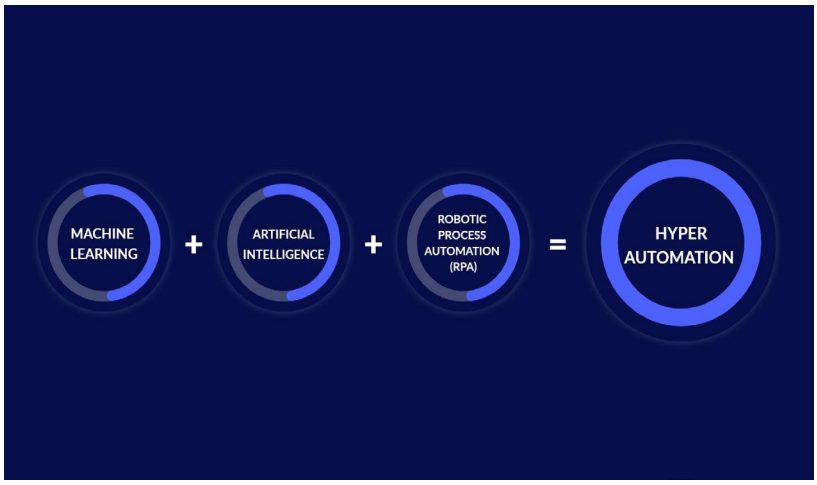


Quantum Enabled Smart Cities Disruptive Innovations

1. Computer-Vision

Computer vision obtains and analyzes huge amounts of data to extract critical information, store it, and communicate it to decision makers. Through video wall management and customized interfaces by user type, CV can prioritize events, leading to better crowd control and better public safety. CV can recognize license plates, faces, gunshots, shattering glass, and even panic by using cameras and other IoT-connected devices. It is a comprehensive solution that leads to a city that is better managed and safer for residents and visitors.

2. Hyperautomation



Hyperautomation helps in anything from automating conversations with internal and external clients, to maintenance, support, and continuous evolution. For businesses within cities to survive, individuals need to focus their time on performing activities that truly make a difference rather than being preoccupied with mundane tasks. As a result, business leaders need to do everything they can to automate repetitive activities, removing responsibility for these from their human workforce and enabling them to deliver real value.

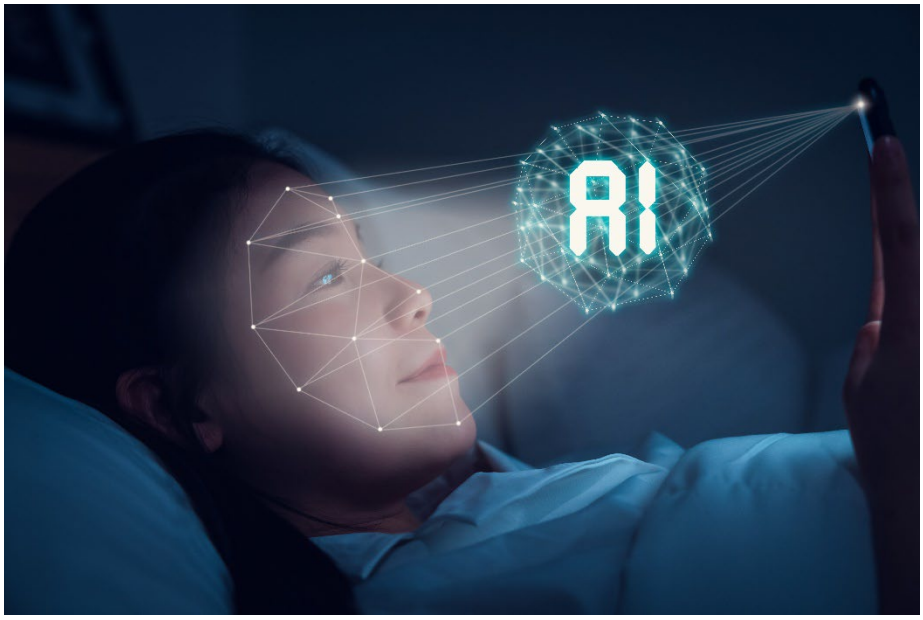
3. Internet of Things (IoT)

Every device that is part of a smart city needs to be connected so that they can talk amongst themselves and make decisions that allow for the managing of resources for a megacity population. This is where IoT functions as a body of communicating devices, providing smart solutions to everyday problems. Connected cameras, sensors, and platforms collect and analyze data across the environment, traffic, water, crowd control, transit, lighting, waste management, security, and parking. All smart solutions in smart cities are based on IoT where they are connected and smart enough to decide the course of action they need to take.

4. Cyber Security

Understanding the risks of having vulnerable applications, web pages or servers is especially important for cities' risk management strategy. So, learning how to spot and fix them before they turn into a real threat to city applications is a must. Reinforced data protection regulations and increasingly harmful cyberattacks challenge your city's resilience. Demonstrating a good IT security posture may provide a differentiator from others.

5. Sensors



Sensors are a hidden but ubiquitous component of the urban landscape, usually found as a crucial component of any intelligent control system. A process is improved based on its environment. For a control system to be aware of its environment, it is typically fitted with an array of sensors, from which it collects the required data. It then uses the appropriate variables to characterize its environment and adjusts its operations accordingly. The availability of a multitude of different sensors and continuously evolving technology enables applications that were infeasible in the past due to high costs and limited availability. Sensors are like converters that convert parameters of a physical nature to an electronic signal, which can be interpreted by humans or can be fed into an autonomous system. These signals for conventional sensors, amongst others, include light, pressure, temperature, humidity, moisture, and a variety of other parameters.
Analytics & Big Data

These services are designed to empower your city. When leveraging analytics and big data, make sure you are being provided a holistic view of your city's data and actionable insights. Look for a partner that leverages industry-leading best practices for data governance, and works to deliver data strategy, organization, visualization, and predictive modeling solutions.

6. Geospatial Technology

Anything built for a smart city needs to be sustainable. This need requires accurate, concise, and detailed data, which is provided by geospatial technologies. These technologies give us the underlying foundation and ultimately the fabric upon which such solutions can be built. They provide location, which allows for pinpointing exactly what the need is so that a better solution can be applied to it. Geospatial technology also provides a necessary framework for collecting data and transforming observations to facilitate software-based solutions around smart infrastructure.

7. Artificial Intelligence

Smart cities are generating huge amounts of data. The data that is created is of no use until and unless it is processed, which generates information in return. Artificial intelligence can then make the most sense out of this data. AI allows machine-to-machine interaction by processing the data and making sense out of it. For example, in a system where energy spikes tend to happen, AI can learn where they usually occur and under which circumstances. This information can then be used for better management of the power grid. Likewise, Artificial Intelligence also plays a role in intelligent traffic management and healthcare facilities

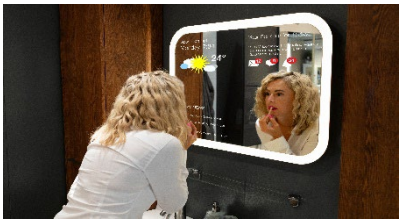
8.Cloud

Cloud capabilities have changed the way technology works for organizations and individuals across all industries. Whether your enterprise is looking to migrate to a cloud platform or pilot new software, we can assist you and your business in cloud adoption and implementation. Across Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), we will work with your unique business needs to balance data accessibility with security concerns and address the growing need for agility to adapt to a connected world.

9. Blockchain

The application of blockchain is new to the smart city concept. Simply put, blockchain technology secures data flow. Its integration into smart cities could better connect all city services while boosting transparency and security. In some ways, blockchain is expected to influence cities through smart contracts, which help with billing, processing transactions, and handling facilities management. Smart contracts are self-executing contracts with the terms of the agreement between the buyer and seller directly written into lines of code.
They permit trusted transactions and agreements to be carried out among disparate parties without the need for a mediating third party, making the process safer, cheaper, and faster. Blockchain can also be used in smart grids to facilitate energy sharing, a current trend





System integration is defined in engineering as the process of bringing together the component sub-systems into one system (an aggregation of subsystems cooperating so that the system can deliver the overarching functionality) and ensuring that the subsystems function together as a system, and in information technology as the process of linking together different computing systems and software applications physically or functionally, to act as a coordinated whole.

The system integrator integrates discrete systems utilizing a variety of techniques such as computer networking, enterprise application integration, business process management or manual programming.

System integration involves integrating existing, often disparate systems in such a way "that focuses on increasing value to the customer" (e.g., improved product quality and performance) while at the same time providing value to the company (e.g., reducing operational costs and improving response time).

In the modern world connected by Internet, the role of system integration engineers is important: more and more systems are designed to connect, both within the system under construction and to systems that are already deployed. Since the start of the millennium, cities have held increasing appeal to well-educated young adults between the ages of 25 and 34 who hold at least a bachelor's degree. Young adults the powerhouse of the U.S. economy, but they have increasingly become fans of city life.

In the 52 largest U.S. urban centers, the population of well-educated young adults has increased by 32% since 2010, in close-in neighborhoods — that is, those that are three miles from a central business district. Further, according to an analysis of U.S. Census Bureau data, the rate of growth in four out of five of those cities accelerated faster than during the previous decade. And as coronavirus continues to unfold, while some wealthier neighborhoods in New York City temporarily emptied out amidst the pandemic, the pattern is unlikely to hold. We have seen this trend occur in history before; specifically, the resurgence of urban living that followed previous calamities like the 9/11 attacks and the Spanish flu of 1918. Therefore, this challenge is not different from the ones we have faced before. It is the sort of thing that cities evolve and adapt to.

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