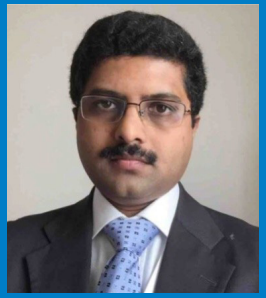

Creating Globally
Scalable Smart City
Solutions
intel
+
L&T Technology Services



Ramakrishna JVS
Global BU Head-Sustainable Smart World, L&T Technology Services

"L&T Technology Services (LTTS) is engineering a smarter, more connected world through its strategic collaboration that integrates Intel's advanced edge computing capabilities with LTTS' deep engineering expertise.

This collaboration is setting new benchmarks in the development and deployment of next-gen smart city solutions, which have positively impacted 150 million+ lives and counting.

Through its partnership with Intel, LTTS is not only elevating its offerings but also contributing significantly to the evolution of global smart infrastructure and smarter technologies that are helping revitalize our common future and enabling a sustainable tomorrow."

Renu Navale
Vice President &
General Manager, Video &
AI Cities, Intel Corporation

"The Intel and LTTS collaboration has furthered India's digital transformation creating new opportunities to improve safety, security, productivity, and profitability.

With advanced video analytics, AI, and supporting computing technology advancements this collaboration represents proof-of-concept for scalability and deployment of similar initiatives in cities across the globe."

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I. Introducing the Stakeholders

About Intel

Intel is a world leader in the design and manufacturing of essential technologies and platforms. From edge computing to the 5G network, cloud computing, AI, and sustainability, Intel delivers the necessary building blocks for an increasingly smart and connected world.

About LTTS

L&T Technology Services Limited (LTTS) is a global leader in Engineering and R&D (ER&D) services. LTTS' expertise lies in engineering design, product development, smart manufacturing, and digitalization.

II. The Global Landscape of Smart Cities

The global landscape of smart cities is evolving rapidly, driven by advancements in technology, urbanization, sustainability goals, and the need for efficient resource management. Here's a list of key aspects of the smart city landscape:

- Technology Integration
- Infrastructure Development
- Sustainability Initiatives
- Urban Mobility
- Citizen Engagement
- Data-driven Governance
- Cybersecurity and Privacy
- Collaboration and Partnership

These initiatives and approaches vary greatly across regions and countries. While some cities focus on specific areas such as transportation or energy, others take a holistic approach to urban development, addressing multiple aspects of city life in the domains of public safety, infrastructure, and utility management.

L&T Technology Services' Global Smart City Portfolio

Smart Cities and Public Safety

- Smart Cities
- Local Governments
- Defense

Smart Public Infrastructure

- Airports
- Metros

Smart Utilities and Resources

- Oil and Gas
- Energy Distributors
- Process Industry

System Integration

Cloud and edge data centers

Data and Analytics Services

Cybersecurity and SOC services

IoT and Integration Services

Next-gen communication, 5G, pLTE, Wi-Fi 6

Application and Infra Managed Services

Managed NOC and SOC

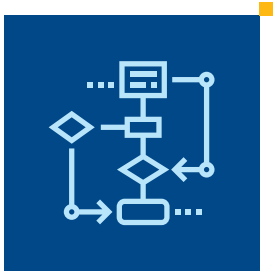
A Master System Integrator (MSI) plays a crucial role in the development and implementation of complex smart city projects and other large-scale integrated systems. Owing to its expertise as an MSI, L&T Technology Services (LTTS) works closely with Intel and a global network of partners to create and implement cutting-edge solutions that address technological integration in the development of smart cities.

To leverage a variety of technologies, including the Internet of Things (IoT), artificial intelligence (AI), big data analytics, cloud computing, and sensors that collect and analyze data for improving urban services and infrastructure, LTTS pivots its smart city solutions around three pillars.

Safe and Secure

Solutions secure physical and digital assets

Smart



Solutions seek to improve process efficiency of public infrastructure operators

Sustainable

Solutions help to accelerate net zero transition and reach sustainable development goals (SDGs)

This approach enables LTTS to drive smart city initiatives by deploying a scalable technological framework across sectors and workloads, which is in turn, strongly supported by Intel's platforms and tools.

This ebook distils insights from LTTS and the success of its smart city deployments.

III. LTTS & Intel's Collaboration for Smart City Initiatives

The collaboration between Intel and LTTS is a synergy of resources, expertise, knowledge, and cutting-edge technology aimed at achieving shared objectives and tackling distinct urban challenges. In a few use cases, this collaboration has transcended conventional partnership frameworks by creating an ecosystem of partners, customers, and suppliers. Within this ecosystem, ideas and technologies flow freely, fostering an environment that is primed for accelerated innovation and breakthroughs in smart city development.

This collaboration is also synchronous with India's Smart Cities Mission. This mission is aimed at propelling urban centers into the future through innovative modernization strategies. By focusing on core infrastructure, digitalization, and citizen-centric services, the mission lays the groundwork for more livable, sustainable, efficient, and inclusive cities[1]. As this mission progresses, numerous development opportunities arise which can be addressed through Intel and LTTS' collaboration.

Here is an overview of these opportunities:

Opportunities for Infrastructure Readiness

- Digitally integrated roadways
- AI-enabled public services
- Smart utilities

Opportunities for Digital Integration

- Digitized operating protocols
- Efficient data management
- Enhanced scalability of solutions
- Interoperability of solutions

Opportunities for Data Security and Privacy

- Secure data privacy protocols
- Enhanced security posture

Opportunities for Sustainability and Energy Efficiency

- Optimized energy consumption
- Digital energy delivery mechanisms
- Smart metering solutions
- Smart waste disposal mechanisms

Opportunities for Citizen Inclusivity

- Simplified citizen portals
- Robust devices and networks

Figure 2: An overview of smart city opportunities that Intel and LTTS' collaboration can leverage

A prime example of one such deployment is LTTS' Integrated Command and Control Center (ICCC) solution. These centers function as the core of city operations, improving city-wide monitoring, public safety, and transport management services in some of the most densely populated cities in the world. ICCC solutions by LTTS are deployed on scalable computing platforms from the Intel® Xeon® and Intel® Core™ families. The ICCC solution is just one of the many ways in which LTTS leverages its expertise in ER&D as well as systems integration to enable its customers to maximize the benefits of their smart city investments. Intel too has a proven track record of driving optimization and efficiency in smart city investments with exceptionally engineered platforms that deliver a high level of quality, stability, and trust, for enterprise partners and governments across the globe. This synergy translates into positive outcomes for citizens and smart city stakeholders.

IV. Smart City Use Cases

As we delve into the practical applications of Intel and LTTS' collaboration, the following section showcases a series of compelling use cases which illuminate how the integration of LTTS' innovative solutions and Intel's advanced technology platforms is driving smart city success.

The Impact of LTTS Smart City Initiatives at a Glance[2]

1,35,000+ Connected IoT/Edge Devices	**150 Milllion+** Urban Lives Touched
55 Million+ Lives Secured Using the Early Warning Dissemination System	**13 States** Digitally Connected
6,300+ Schools and Universities Enabled Digitally	**35,000+** Smart Cameras Deployed to Secure Indian Cities

In-house Platforms for Smart Citites, Smart Utility Management and Perimeter Security

1. Deploying India's Largest City Monitoring Project

Cities worldwide are adopting smart monitoring solutions for enhanced public safety and traffic management. New York's Domain Awareness System, serving 8 million citizens[3], is a prime example. Hyderabad, with over 11 million citizens[4], boasts a similarly crucial infrastructure: the Integrated Command and Control Center (ICCC). This solution, managed by the state government, is pivotal in overseeing day-to-day operations and incident response. Till date, 25+ instances of this solution have been deployed across India by LTTS. LTTS' partnership with Intel has added significant value to this critical system, underscoring its importance in Hyderabad's digitally integrated public safety initiatives.

Hyderabad ICCC's System Architecture

12,000 Cameras and 100,000 Community Cameras Integrated	3 Administrative Divisions (Hyderabad, Cyberabad, Rachakonda)	Intelligent Traffic Management + Adaptive Signalling	~450 Emergency Call Boxes and Public Address System
Multi-agency Disaster Management	2 Data Centers (Active | Active) MPLS Connectivity	1,100 RLVD / ANPR System	~250 Variable Messaging Displays

Solutions

Smart Surveillance

Video Analytics

Command and Control Center

Computer Aided Dispatch

Traffic Enforcement

Speed Violation Detection

Wrong Way Detection

No Helmet Detection

Incident Management

Data Analytics

The Results Delivered by Hyderabad's ICCC[2]

60% faster inference times

12% dip in criminal cases registered through improved surveillance

65% decrease in instances of chain snatching due to AI-enabled monitoring

61% increase in the recovery rate of stolen goods due to more efficient monitoring

2. Managing Kumbh Mela, the Largest Spiritual Gathering in the World

Smart city projects globally are instrumental in managing large public gatherings. Rio De Janeiro's Operations Center, for instance, efficiently manages public safety and traffic routes during the annual Rio Carnival, accommodating up to 2 million[5] visitors per day. In comparison, the Kumbh Mela in Prayagraj, India, attracts over 240 million[6] pilgrims and has been certified as the 'Planet's Largest Gathering' by the Guinness Book of World Records.

This monumental event, amid challenges like COVID-19 outbreaks and traffic management, called for seamless coordination between authorities and technology. LTTS' expertise as a systems integrator, coupled with Intel's collaboration, significantly bolstered its value proposition in managing such massive gatherings.

Prayagraj's City-wide Smart Monitoring System Architecture[2]

~450 Cameras	2 Integrated Command and Control Centers	25 Variable Messaging Displays
Dial - 100	2 Data Centers and Data Recovery Centers	Traffic Enforcement (50+ ATCS, RLVD and ANPR Systems)

Solutions


Unified Smart City Platform


Citywide Surveillance

License Plate Recognition


AI-based Video Analytics


Data Center (MPLS Connectivity)


Crowd Management


Grievance Management


Unified IP Communication


Multi-agency Operations


GPS-based SWM Collection

The Results Delivered by Prayagraj's Smart City Solution[2]

80,000+ citizens' grievances addressed

30 Million+ pilgrims managed on the busiest day of the Kumbh Mela

3. Completing India's First Integrated Smart City with e-Governance

According to the UN, e-Governance has the potential to support the implementation of the 2030 Agenda and its 17 sustainable development goals (SDGs), facilitating integrated policies and services across all 193 UN Member States. With technology such as AI, Cloud, IoT and 5G gaining momentum, this global perspective underscores the significance of e-Governance initiatives that aim to leverage these technologies for sustainable urban development. Among these initiatives is the development of India's first smart city in Visakhapatnam, a groundbreaking collaboration between Intel and LTTS, standing as a testament to the country's commitment to harnessing innovation to address modern urban challenges.

An Overview of Intel and LTTS' Integrated Smart City Solution[2]

- Integrated Command and Control Center
- 50+ Smart Poles
- 50 Variable Messaging Displays
- 2 Data Centers (Active | Passive) MPLS Connectivity
- Womens Safety / Bus SOS
- 50 Solid Waste Management Centers
- Traffic Enforcement
- 500+ Smart Cameras
- 100+ Wi-Fi Access Points

Solutions

Citizen App

City Governance

Smart Pole

City-wide Monitoring System

Solid Waste Management

Citizen Services

Dial 108

Call 100

4. Completing One of India's Largest Smart Meter Rollouts

Power distribution losses are a global concern amid the impending energy crisis. While the global average stands at 8%[7] of total electricity generated, India faces higher losses at around 17%[8] due to the scale of its grids and metered connections.

To combat this, a leading distribution company (DisCom) partnered with LTTS for a large-scale smart meter rollout. Collaborating with Intel, LTTS deployed an IoT-enabled Advanced Metering Infrastructure (AMI).

This solution integrates digital meters with existing systems, establishes robust communication networks, and addresses energy losses more effectively.

An Overview of Intel and LTTS' AMI Solution[2]

3 States	8 Distribution Companies (DisComs)
11 Million+ Smart Meters Installed	

Technology Stack

- Head-end System
- Pre-paid Engine
- MDMS
- Smart Meter Rollout and Operation
- Integration
- Analytics

Under the broader umbrella of the AMI lie individual smart meters. These IoT-enabled edge devices are capable of two-way communication through LoRaWAN with data movement in real time. Each meter incorporates a digital signal processor and an Intel® Xeon® CPU.

The meter measures numerous parameters such as current, voltage, power, and energy consumption, and generates a bill based on the energy consumption and price per unit of electricity. The smart meters also need to ensure security through a detection system that prevents manipulation, misuse, and theft of electricity.

The Results of Intel and LTTS' AMI Solution

22% reduction in aggregate technical and commercial losses[2]

21% improvement in billing efficiency[2]

5. Creating a More Efficient and Effective Solid Waste Disposal System

Globally, municipal solid waste generation is projected to increase from 2.3 billion tonnes in 2023 to 3.8 billion tonnes by 2050. Without technology-enabled waste management solutions, the annual global cost of treatment and disposal could nearly double to approximately US$ 640.3 billion by 2050[9].

Addressing this challenge is crucial for meeting sustainability goals and ensuring cost optimization of solid waste disposal operations for civic authorities and waste management enterprises.

In India, a significant portion of generated waste remains untreated, posing environmental and public health risks. To tackle this issue, LTTS and Intel have collaborated on an innovative Solid Waste Management solution that aims to transform waste management practices, ensuring efficiency and sustainability.

System Architecture of the Solid Waste Management Solution

Smart Sensor Bins with RFID Tags	IoT-enabled Real-time Tracking and Route Monitoring	Digitally Integrated Staff Attendance and Field Supervision	IoT Gateways	ICCC Application
			▪ Weighbridge Integration	▪ Citizen App ▪ Command and Control Center

6. Creating an Intelligent Transport System for a Large Metropolitan City

Covering an area of 743.9 square kilometers, Singapore boasts a vehicle density of 700+ vehicles per square kilometer[10]. Leveraging its Intelligent Transit System (ITS), powered by AI, edge, and IoT technology, Singapore maintains its status as one of the world's least congested cities.

Conversely, Chennai, India, spanning 462 square kilometers and with a vehicle density of 2,000+[2] vehicles per square kilometer, faces significant congestion challenges.

Recognizing the critical need for intelligent transportation systems, Chennai's authorities turned to LTTS for integrated smart city solutions. Collaborating with Intel, LTTS delivered robust solutions for Chennai's traffic management, road safety, and CO_2 emissions reduction.

An Overview of Chennai's Traffic Statistics[2]

4th Largest City in India	GDP of US$ 78.6-86 Billion
6.4 Million+ Population	2,000+ Vehicle Density
2,700+ Kilometer Road Network	

7. Helping One of the World's Most Densely Populated Countries Effectively Manage Public Health

Amid the global COVID-19 pandemic, healthcare systems worldwide faced unprecedented challenges. With the number of confirmed cases exceeding 100 million[11] globally, nations urgently sought innovative solutions to manage the crisis. In India, grappling with a densely populated landscape and complex healthcare infrastructure, Intel and LTTS collaborated to deploy transformative solutions for public health management. Leveraging cutting-edge technology, including AI and IoT, these solutions facilitated efficient pandemic management, from contact tracing to resource allocation. This partnership exemplifies the power of technology in combating global health crises, underscoring Intel and LTTS' commitment to innovation and public well-being.

An Overview of Intel and LTTS' COVID-19 Management Solutions

AI-based Vehicle Movement Restriction Technology: • Machine Learning • IoT	**Public Management in Crowded Urban Areas** Technology: • Deep Learning • GeoSpatial Technology • Computer Vision	**Remote Billing through Advanced Metering Infrastructure** Technology: • Big-data Analytics • IoT • GSM	**COVID-19 Mobile App and e-Pass Solution** Technology: • Big-data Analytics • GeoSpatial Technology
Drone-based Monitoring of Lockdowns Technology: • Machine Learning • IoT	**ICCCs for COVID-19 Management and Containment** Technology: • Big-data Analytics • GeoSpatial Technology • IoT	**Body Temperature Scanning in Public Places** Technology: • Big-data Analytics • IoT • GSM	**Public Information Dissemination** Technology: • IoT • GeoSpatial Technology • Computer Vision

V. The Future of Intel and LTTS' Collaboration: Exploring Strategic Synergies

Serving as a strategic technology enabler, Intel's expertise and cutting-edge resources encompass hardware infrastructure sizing, workload optimization, bill of materials (BOM) optimization, total cost of ownership (TCO) analysis, and sustainability benchmarks tailored to specific requirements. This gamut of offerings enables LTTS to spearhead smart city initiatives across India and beyond.

By rigorously evaluating 4th Gen Intel® Xeon® Scalable processors, and the software capabilities within the Intel® Tiber™ Edge Platform portfolio, such as Intel® Distribution of OpenVINO™ toolkit, Intel® SceneScape, and Intel® Geti™, L&T Technology Services is laying the groundwork for future smart city and smart world applications. This iterative testing process allows L&T Technology Services to fine-tune smart city solutions, ensuring they align seamlessly with the evolving demands of urban environments such as real-time analytics, predictive decision-making and more.

4th Gen Intel® Xeon® Scalable Processors: Ushering in the Era of AI-driven Smart Cities

4th Gen Intel® Xeon® Scalable processors feature Intel® Accelerator Engines designed to accelerate performance across the fastest-growing workloads. These processors have the most built-in accelerators of any CPU on the market to help improve performance efficiency for emerging workloads, especially those powered by AI[12]. With accelerated vector instructions and matrix multiply operations, these processors provide exceptional AI inference and training performance. Intel® Advanced Matrix Extensions (Intel® AMX) can provide a substantial performance increase for Deep Learning workloads, such as recommendation systems, NLP, image recognition, media processing and delivery, and media analytics. In addition to being AI-optimized, 4th Gen Intel® Xeon® Scalable processors also have advanced security technologies to help protect data in an ever-changing landscape of smart cities while unlocking new opportunities for business insights.

Learn more about **4th Gen Intel® Xeon® Scalable processors**

intel® tiber™
Edge Platform

Intel® Tiber™ Edge Platform: Designed to Accelerate Edge AI Development

The Intel® Tiber™ Edge Platform enables enterprises to build, deploy, run, manage, and scale edge and AI solutions on standard hardware with cloud-like simplicity.

The platform enables enterprises to onboard compute infrastructure, with zero-touch provisioning, in a zero-trust environment.

With AI model development capabilities such as Intel® Geti™, application development and packaging with Edge Developer Toolbox, and vertical industry solutions such as Intel® SceneScape, all these eventually enabling to run AI models and applications with OpenVINO™ runtime, the Intel® Tiber™ Edge Platform is enabling L&T Technology Services to develop innovative edge AI solutions for smart city use cases.

Learn more about
Intel® Tiber™ Edge Platform

OpenVINO™

Intel® Distribution of OpenVINO™ Toolkit: Powering AI-driven Video Analytics

Intel® Distribution of OpenVINO™ toolkit is an open source toolkit that accelerates AI inference with lower latency and higher throughput while maintaining accuracy, reducing model footprint, andoptimizing hardware use. It streamlines AI development and integration of deep learning in domains like computer vision, large language models,and generative AI.

Intel® Distribution of OpenVINO™ toolkit is being evaluated by LTTS as it seeks to deploy advanced neural networks across a spectrum of smart world solutions. Tailored for both data centers and edge devices, Intel® Distribution of OpenVINO™ toolkit enables users such as LTTS to harness the full potential of AI-driven video analytics.

This capability proves invaluable for smart city applications, ranging from intelligent traffic management and surveillance to public safety initiatives. Intel® Distribution of OpenVINO™ toolkit will provide LTTS' solutions to deliver actionable insights in real-time by providing tools for video inference and deep learning that can process billions of data points.

Learn more about **Intel® Distribution of OpenVINO™ Toolkit**

Intel®
SceneScape

Intel® SceneScape: Crafting a 4D Digital Twin for Enhanced Spatial Awareness

Intel® SceneScape is a software platform that reaches beyond vision-based AI to realize spatial awareness from sensor data. It transforms data from many sensors to create and provide live updates to a 4D digital twin of any physical space.

Digital twins can be applied to use cases to look at past analytics, track what is happening in the present, and make predictive decisions for the future. LTTS is evaluating SceneScape's ability to assimilate data from diverse sensors and derive comprehensive insights, monitor ongoing activities, and make predictive decisions.

This spatial awareness will facilitate a myriad of smart city innovations across urban planning, resource allocation, and infrastructure management.

Learn more about
Intel® SceneScape

intel GeTi™

Intel® Geti™: Streamlining AI Model Development for Scalable Solutions

Intel® Geti™ is a commercial software platform that enables enterprise teams to develop vision AI models faster. With the platform, companies can build computer vision AI models with minimal data, and with Intel® Distribution of OpenVINO™ toolkit integration, facilitate deploying solutions at scale. By simplifying data labelling, model training, and optimization tasks, Intel® Geti™ will empower LTTS to create custom AI models at scale, thereby accelerating the deployment of intelligent solutions. Whether it's optimizing energy consumption, enhancing public transportation, or fostering sustainable urban growth, Intel® Geti™ will equip LTTS with the agility and scalability needed to address complex smart city challenges effectively.

Learn more about
Intel® Geti™

Intel's strategic collaboration with L&T Technology Services transcends conventional boundaries, fostering a symbiotic relationship that drives innovation, scalability, and sustainability in the realm of smart world solutions. Through the integration and testing of transformative technologies like Intel® Distribution of OpenVINO™ toolkit, Intel® SceneScape, and Intel® Geti™ , L&T Technology Services is poised to deliver unparalleled value across the smart city value chain.

VI. Conclusion

By leveraging their expertise in IoT devices, edge computing, machine learning, AI and cloud computing, Intel and LTTS' collaboration makes it easier for governments to transform cities running on legacy infrastructure to sustainable, technology-supported smart cities. As the collaboration continues to evolve, their success stories validate the transformative power of technology.

With globally scalable solutions, this collaboration has demonstrated the effectiveness of cutting-edge solutions based on AI and IoT technology in leveraging a multitude of smart city opportunities, setting a precedent for governments and enterprises globally.

VII. Getting Started on Your Smart City Journey

Leading a city through strategic innovation and transformation is a continual journey and is critical to the future of economic growth, citizen engagement, and effective delivery of city services.

Using experience working with many governments and cities worldwide, Intel and LTTS bring together the right network of service providers and technology partners to create the necessary building blocks that civic authorities and enterprises can use to initiate smart city investments. Stakeholder participation and defining clear priorities are essential starting points for building your plan. But to succeed in improving public safety, improving transportation, ensuring city-wide sustainable practices and protecting the privacy of citizens, you will also need a well-supported set of policies and good governance. Effective methods for implementing smart programs, assessing performance, and ensuring continuous improvement can also contribute to success.

The journey to a smarter, safer city can begin with small steps. For example, reaching out to like-minded leaders in your city, and/or public safety agencies and identifying common goals is one way to get started. Another way to begin is with a citywide assessment to identify infrastructure projects that will move your city forward by leveraging smarter city solutions.

This is only a starting point for your journey to a smarter, safer city. At Intel, we believe public safety and city leaders can successfully transform their cities by establishing clear priorities, encouraging active stakeholder participation, and ensuring methodical technology infrastructure planning while enabling the right policy and governance. With our advanced solutions and strong partner ecosystem, Intel can help bring your Smart City vision to life.

VIII. Take the Next Step

Intel and LTTS are dedicated to helping you achieve your smart city goals. To that end, our companies have partnered to work directly with customers. Our experts are available to meet with your team to discuss smart city solutions for public safety, sustainability, and e-governance in a workshop setting. Connect with LTTS team to begin your Smart City journey.

LTTS: info@ltts.com

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