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Smart City and Infrastructure

Solution Brief

Overview

IoT is driving a new era for cities and municipalities who wish to create a smart, data-driven infrastructure that effectively connects its people, businesses and government. Smart cities leverage an array of IoT and edge sensors to enhance city-wide operations, promote energy efficiency, expand citizen services and experiences, and improve traffic flow, public safety, and the environment.

Smart city infrastructure intelligently and seamlessly connects everything from building and energy systems to transportation, waste management, environmental controls and public services – all with an eye on improving the life for citizens and businesses and helping them better utilize resources.

Upgrade to a Smart, Modern Urban Infrastructure

The database is the foundation of any comprehensive IoT strategy. Aerospike helps city governments upgrade their legacy systems and build a coordinated IoT-powered data architecture designed to optimize machine-learning data processing at the edge and speed in-depth data analysis at the core for long-term strategic insights. The scalable framework accommodates expanding IoT networks without losing performance and ensures total connectivity between data sources and stakeholders.

Smart City IoT Use Cases

Smart Energy
Empower faster processing of energy grids, meters and power plants

Environmental Controls
Build green cities that monitor and reduce emissions, pollution and waste

Smart Buildings
Connect building-wide sensors across facilities for better efficiency and insights

Mobility & Transit
Transport people, vehicles and goods faster and more safely

Public Safety
Deploy lighting, video and information systems to reduce crime and enhance security

Citizen Services
Improve life of citizens with open data, government transparency and better policymaking

And Aerospike empowers modern 5G connectivity to support more devices and help scale smart city projects. 5G offers faster connections, more reliability and greater capacity at lower cost, enabling high-bandwidth and low latency necessary for smart city applications such as real-time connected vehicle/traffic data and infrastructure safety. Additional connectivity technologies include Open Radio Access Network (O-RAN), virtual and software-based options and low-power WANs (LPWANs) for service-layer applications.

AI and machine learning technologies help simplify the routing, processing and analysis of key city-wide data, enabling automatic delivery of insights from large volumes of rapidly changing data points and empowering more incisive decision making. Scale your IoT operations to process high volumes of requests simultaneously, performing analysis, shaping actions and response strategies, and reaching resolution in milliseconds.

Smart City Use Cases

Smart city infrastructure encompasses a vast array of IoT-enabled technology networks. Aerospike powers fast, intelligent data flow for optimal city services for these solution areas:

- **Smart Energy**
- **Environmental Controls & Sustainability**
- **Smart Buildings**
- **Mobility and Connected Transit**
- **Public Safety and Security**
- **Citizen Services**

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Key Technical Specifications & Benefits

Low Latency

Sub-millisecond responsiveness at 95th percentile

Performance at Any Scale

Reliably handles millions of transactions per second while efficiently scaling to meet petabyte-range data volume needs

High Availability

Demonstrated uptime of five 9s, enabled by dynamic cluster management, Smart Client, and local and remote replication

Data Consistency

Multi-site clustering supports strong immediate data consistency, multiple locations and automated failovers without loss of data

Global Data Hub

Route data captured at the edge to where it is needed to meet compliance requirements

Low TCO

Patented flash-optimized storage architecture with dynamic cluster management fuel a 40-60% lower TCO over in-memory NoSQL databases.

Integrations & Connectivity

Apache Spark™, Kafka, Pulsar, Presto and JMS™ to deploy modern data architectures for real-time, mission-critical apps

5G Architecture

Onboard database with SSD storage, sync edge datacenters via XDR, with models and decisioning onboard or at the edge

Enterprise Security

Data Encryption (in-motion, at rest), authentication, authorization, auditing, access control, whitelisting, Hashicorp integration.

Smart Energy

Intelligent electrical power distribution will be a key component of smart city infrastructure, and faster and more accurate monitoring of energy data will lie at the heart of its success. A range of IoT sensors will drive adoption in smart cities, including smart power distribution, dynamic-reading electrical meters, self-healing energy grids, networked buildings and industrial plants, automated water use and leak detection, and just-in-time waste collection. Intelligent monitoring and analysis of data will help cities achieve the promise of better energy automation, safety and transparency, predictive maintenance, sustainability, and cost savings for governments and citizens.

Aerospike will drive faster and more accurate analysis of IoT sensor data, including:

- Automated energy grids that monitor energy distribution in real time, detect system faults, alternate distribution paths, schedule resources, and repair and reconfigure systems without troubling customers
- Smart energy meters that track electrical consumption over time intervals so a utility can offer dynamic pricing based on demand and encourage energy conservation
- Improved grid storage and stability across control systems, components, converters and batteries, and renewable energy
- Faster processing of switchboards, switchgears, circuit breakers, surge arresters & others to monitor voltage and ensure safety
- Communication-enabled and networked smart buildings and industrial plants that make efficient use of energy needs
- Connected home monitoring devices that track and regulate A/C, water heaters, thermostats, and appliances to reduce energy consumption in peak periods

Environmental Controls & Sustainability

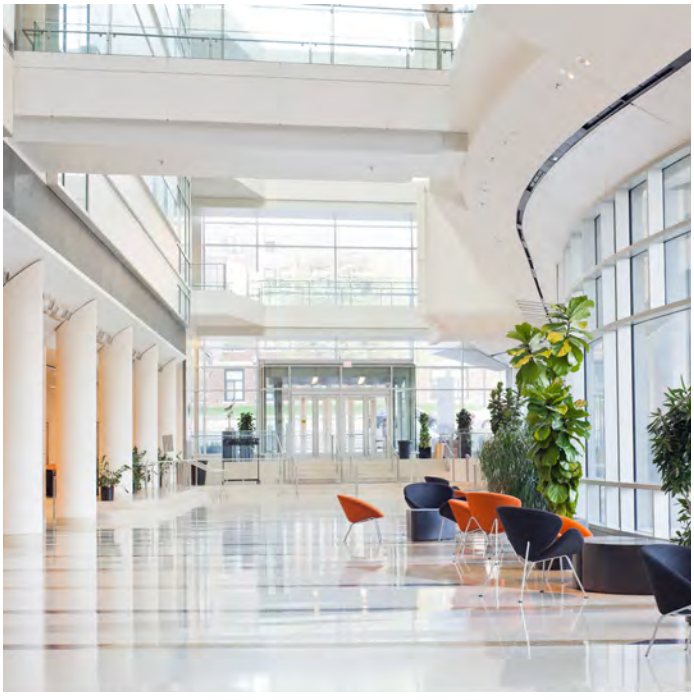
Tomorrow's smart cities will be green cities, maximizing the value of energy-efficiency, pollution monitoring, traffic control and sustainable resources. IoT networks can provide immediate data on how to reduce emissions and eliminate waste, but when coupled with deep and accurate data analysis, they allow city governments to find innovative ways to ensure long-term sustainability solutions.

Aerospike provides the data analysis engine to:

- Evaluate smart energy grid outputs to create economical and responsible use of electrical power distribution
- Monitor air quality, thermal overheating of equipment and electrical components, and soil and vegetation quality to improve the environment
- Improve pollution monitoring by reducing the lag between the beginning signs of pollution and detection so that cities can take more proactive action
- Drive automated water sensors that analyze how much water is needed for agriculture based on current conditions, and water flow and leakage detection that can reduce water loss
- Empower digital twins to conduct sims. of potential environmental issues like noise pollution, traffic & carbon emissions
- Improve the reliability of energy efficiency data from buildings and industrial applications
- Just-in-time waste collection that measure intake in real time and optimize collection

Smart Buildings

IoT-enabled building and facility management solutions connect building-wide sensors to improve energy efficiency, improve space utilization, lower costs and improve the life for the people who spend their days there. Aerospike's centralized model for connecting building-wide sensor data helps capture and consolidate information and insights to transform the way cities run building operations and improve the occupant experience. Building administrators are able to integrate and transform IoT data into useful insights to guide current actions and future initiatives, and ensure cross-functional teams are all working from the same playbook.



Aerospike ensures fast and insightful processing of data to:

- Capture and consolidate IoT data from a diverse array of building endpoints, including energy monitoring, smart grid management, HVAC controllers, and lighting solutions
- Automate control of building automation systems (BASes), including mechanical devices, electrical equipment, and connected lighting, utilities, elevators and plumbing
- Optimize space utilization from sensor-enabled IoT devices to identify underutilized rooms and desks
- Provide IoT-driven security, including cameras, motion detection device, building access control, post-forensic analysis and video analytics
- Roll out customized, pre-assembled connected structures with modular smart power supplies for locations that are hard to access, or where temporary building access is needed, such as construction sites

Mobility and Connected Transit

Integrated mobility infrastructure has the power to enable people, vehicles and goods to be transported faster, safer and more efficiently throughout a connected city. Smart mobility systems include autonomous and connected vehicles, coordinated mass transportation systems, traffic control, parking and many other transit related services. Aerospike can power the immediate vehicle analysis and decision-making as well as centralized processing and coordination to ensure streamlined transit operations, safer and predictive road conditions and a cleaner environment.

Aerospike can help drive:

- Traffic management and analytics with camera-based video surveillance to provide traffic congestion analysis, car flow, accident monitoring, law enforcement and safety
- Vehicle to everything connectivity (V2X), where cars communicate with cars, infrastructure and pedestrians
- Connected vehicle communication to monitor distances between vehicles, traffic, and speed, eliminating human error and more efficient, safer driving.
- Telemetry sensors to track routes, speed, deacceleration, traffic patterns and other key metrics
- External road and environmental conditions and driver biometrics in real-time to avoid dangerous on-road driving situations which require sub-millisecond reads and writes
- Analytics to develop consumption-based dynamic pricing and taxes on roads, transit, usage-based car insurance
- Connected streetlight cameras to monitor foot traffic and reroute cars to avoid pedestrian accidents
- Smart parking, bike traffic monitoring and e-mobility charging systems

Public Safety and Security

Data can play a vital role in improving public safety and preventing crime. IoT sensors spread across smart cities, including street lighting, video monitoring, drones and other devices provide a coordinated real-time look at security issues as they play out. And smart analytical systems can tap all of these information streams, as well as individual crowdsourced reports, to keep streets safe for citizens and provide the fuel to go deep on trends and proactive risk assessments.

Aerospike can help provide the data management capabilities to:

- Promote smart street lighting and motion detection to drive citizen safety and energy efficiency
- Process real-time crowdsourcing of data on crime, including identifying security gaps, active crime tracking and empowering faster response times by authorities
- Give video cameras and drones the intelligence to identify and track safety concerns
- Provide license plate recognition for traffic safety and crime correlation, and implement augmented reality security screening at airports and transits
- Improve city-wide cybersecurity measures, governance and access controls
- Enable advanced detection and monitoring such as gunshot detection
- Connect officer wearable devices to improve awareness and decision-making

Citizen Services

Among the many goals of smart cities is to improve services and quality of life for citizens. Green spaces, faster transit and better safety are among the first priorities, but cities can take IoT-driven benefits to a more personal level by promoting government transparency and providing expansive services to citizens that may not exist in the old model.

Aerospike's data management and processing capabilities can make new services a reality, including:

- Analytics to develop insight-driven government policies, engage constituents, and improve government operating efficiency
- Open data initiatives to enhance transparency of government infrastructure for citizens
- Healthcare: Infrastructure and analytics to help monitor individual health remotely and improve citizen well-being
- Smart homes: optimize appliance use, match energy use with occupancy for cost savings and enable smart entry
- Economic competitiveness: smart cities can also be business-friendly cities, encouraging job expansion and a healthy economy

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About Aerospike

Aerospike is the global leader in next-generation, real-time NoSQL data solutions for any scale. Aerospike enterprises overcome seemingly impossible data bottlenecks to compete and win with a fraction of the infrastructure complexity and cost of legacy NoSQL databases. Aerospike's patented Hybrid Memory Architecture™ delivers an unbreakable competitive advantage by unlocking the full potential of modern hardware, delivering previously unimaginable value from vast amounts of data at the edge, to the core and in the cloud. Aerospike empowers customers to instantly fight fraud; dramatically increase shopping cart size; deploy global digital payment networks; and deliver instant, one-to-one personalization for millions of customers. Aerospike customers include Airtel, Banca d'Italia, Nielsen, PayPal, Snap, Verizon Media and Wayfair. The company is headquartered in Mountain View, Calif., with additional locations in London; Bengaluru, India; and Tel Aviv, Israel.

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