![Red Hat logo]

Edge computing for smart cities and emergency management

Process data at the edge for faster decisions and lower costs

Prompt problem resolution requires early awareness

City residents' expectations are rising but budgets are not. To improve services while increasing efficiency, local governments are taking inspiration from the "smart cities" model. The idea is to incorporate emerging technologies such as the Internet of Things (IoT) and artificial intelligence and machine learning (AI/ML) to swiftly identify and remediate problems affecting public safety, citizen satisfaction, and environmental sustainability. Examples include traffic flow monitoring, transportation management, timely pothole repair and garbage pickup, optimized street lighting, identification of suspicious bags, and automated response to emergencies like chemical spills or gas plumes.

Smart cities come of age

Early smart city projects were constrained by the technology of the time. Wi-Fi and LTE 4G networks limited the number of devices that could be deployed. Data from the edge had to be sent to the cloud for processing because edge servers lacked the power for analytics. Round-trip latency ruled out time-sensitive responses, such as opening parking garage ventilation systems in response to dangerous carbon monoxide levels.

Recent advances make smart city solutions practical at scale:

‣ **Powerful processing at the edge.** Off-the-shelf graphics processing units (GPUs) can be embedded in compact edge devices suitable for roadways, parking structures, etc. Processing some data at the edge is faster, and it conserves bandwidth.

‣ **Better edge connectivity.** Compared to Wi-Fi and 4G networks, 5G networks are faster and connect far more devices—up to one million in one square kilometer (.38 square miles).

‣ **Distributed cloud architectures.** Applications built as containerized microservices can be distributed across multiple clouds, municipal datacenters, and the edge. When practical, processing happens closer to data sources.

‣ **Fast application development.** With DevSecOps methodology, code is continuously deployed and integrated. Automated security is built in. New features are available in days—sometimes less than an hour.

Red Hat approach

With Red Hat® open source technologies and our partner ecosystem, you can build a hybrid cloud to power the smart city. The hybrid cloud can span one or more public clouds, your datacenter, and edge devices near roadways, city buildings, and transportation hubs.

‣ Build smart cities applications using Red Hat OpenShift®. Distribute the application across multiple clouds and dozens or hundreds of edge sites to create a consistent application development and operations experience. Red Hat Enterprise Linux® puts a consistent layer on all environments and allows the image to be customized for edge deployments.

Why Red Hat for smart cities

Security:
Our solutions meet government security and privacy requirements.

Lower costs:
Our subscriptions can cost less than proprietary software licenses and support contracts.

Partner ecosystem:
You can work with our extensive network.

Openness:
Municipalities need to be prepared to answer questions about decisions, such as picking up trash from one neighborhood and not another. Unlike proprietary AI/ML solutions, solutions built on Red Hat open source solutions have visible inputs and operations, clearly showing how a system came to a conclusion.

▸ Manage the distributed platform—edge locations and one or more clouds—with Red Hat OpenShift and Red Hat Advanced Cluster Management for Kubernetes. Manage workloads on up to 10,000 edge nodes from one interface with IBM Edge Application Manager.

▸ Deploy nearly any vendor's IoT sensors—such as IP video cameras, environmental sensors, chemical sensors, vehicle counters, or parking space sensors. With Red Hat's open application programming interfaces (APIs) you can mix and match sensors, avoiding vendor lock in.

▸ Deploy smart edge computing devices with a GPU optimized for AI/ML, like the NVIDIA EGX™ AI platform. The GPU Operator allows workloads running on Red Hat OpenShift or via the driver on Red Hat Enterprise Linux for edge computing to use the GPU itself.

▸ Set up the IoT sensors to transmit to nearby edge devices. There, a rules engine determines which information to process locally and which to send to the cloud. For example, if the fill sensor on a trash bin triggers a message to the nearest collection truck, data never leaves the edge. In contrast, telemetry information from city buses across a region might be sent to the cloud to feed an ML model used for predictive maintenance.

In action: Smart cities solution from Red Hat and NVIDIA

Red Hat and NVIDIA collaborated on a hybrid cloud solution to improve traffic congestion, pedestrian flow, and infrastructure maintenance. The solution brings together edge processing and cloud processing. At the edge, an application running on NVIDIA EGX™ extracts metadata from live video streams sent by cameras at traffic intersections. The edge device forwards the right data to the cloud for analytics and visualization. The analytics application runs on a multinode Red Hat OpenShift cluster that can scale up or down based on real-time demand. Built from microservices-based containers, the cloud application can be moved freely to any other cloud.

Learn more about the Red Hat and NVIDIA collaboration.

Read more about edge computing and Red Hat's edge computing solutions.

About Red Hat

Red Hat is the world's leading provider of enterprise open source software solutions, using a community-powered approach to deliver reliable and high-performing Linux, hybrid cloud, container, and Kubernetes technologies. Red Hat helps customers integrate new and existing IT applications, develop cloud-native applications, standardize on our industry-leading operating system, and automate, secure, and manage complex environments. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500. As a strategic partner to cloud providers, system integrators, application vendors, customers, and open source communities, Red Hat can help organizations prepare for the digital future.

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