Edge computing in the public sector

Support the mission by running workloads near the data and users

Government missions aided by edge computing.

- Tactical field response
- Fleet management
- Distributed field offices
- Smart cities
- Law enforcement: field investigations, fly team kits, remote sensors
- Healthcare: AI-based diagnosis at patient home, remote clinic, or battlefield
- Port security: Airport scanners, facial recognition, identity checks
- Energy: Monitoring and control, critical infrastructure, autonomous vehicle
- Logistics/smart cities: UAVs/drones, path finding
- Fleet management
- Space: Low-Earth orbit (LEO) satellites, International Space Station, atmospheric science
- State Department: Outside the Continental U.S. (OCONUS) deployments, embassies

Move your cloud to the data, not the data to your cloud

Much government data is generated and accessed outside the datacenter or cloud—at the edge. Where the edge is, exactly, varies by agency. The edge can be vehicles (planes, ships, trains, fleets), roadways and intersections, weather observation stations, hospitals, warehouses, reservoirs, utility substations, garrisons, and even spacecraft.

Moving data from the edge to the datacenter or to a cloud for processing can produce latency that impedes the mission. At a transportation hub, for example, an extra sub-second of delay in facial recognition can lengthen queues. In a military base used for tactical operations, delayed processing of sensor data can postpone troops' awareness of an approaching adversary, leaving them vulnerable.

Edge computing brings computing closer to data sources and users, helping to improve mission effectiveness and efficiency. Edge platforms need to address challenges that are not present in datacenters and public clouds:

- **Limited space, power, and cooling.** Space-constrained edge locations like vehicles, satellites, and sensor pods need small-form-factor (SFF) devices, which require a lightweight operating system (OS).
- **Diverse edge devices.** An agency's edge devices might include tablets, single-board computers, and rack-mounted servers. An edge software platform that can run on all devices lowers costs and simplifies IT operations.
- **Disadvantaged networks.** Edge devices operating in denied, disconnected, intermittent, low-bandwidth (DDIL) network conditions need the ability to autonomously collect and analyze data.
- **Lack of on-site IT support.** Edge devices may be difficult to access or deployed in locations with little or no local technical expertise. Automating tasks such as patching, configuration, and security remediation reduces management overhead.
- **Compliance with cybersecurity requirements.** Depending on its purpose, edge software may need to comply with Federal Information Processing Standards (FIPS) 140-2/3, Common Criteria, Section 508, specialized requirements like the DO-178C airworthiness standard, and other standards.

Red Hat edge solutions

Red Hat provides a range of edge solutions that extend applications outside the datacenter or cloud, closer to data sources and users. The following Red Hat® edge solutions can be deployed anywhere. The optimal edge solution for an agency depends on its physical environment (space, power, and cooling constraints), network connection, and availability requirements. For example, consider an AI-powered application that analyzes the safety risks of construction workers on a job site. Red Hat Device Edge, running on a compact, rugged edge node, can connect to a local camera with software

Red Hat credentials

Red Hat is the #1 overall contributor to Cloud Native Computing Foundation (CNCF) projects. We represent our customers in key communities, driving new capabilities and fixing issues. Using our software to build applications gives government organizations early access to the latest innovations in security and performance. Our technology complies with standards such as FIPS 140-2, Common Criteria, and others, including an early FIPS 140-3 validation submission that is pending review at the time of writing. Check out Red Hat's latest compliance activities and government standards.

that recognizes when people fall or are not wearing hard hats. By deploying the application at the edge, the agency eliminates the need for a constant internet connection, avoids network latency that could delay awareness of safety issues, and protects privacy by not transmitting video offsite.

Red Hat Enterprise Linux for workloads at the edge

Red Hat Enterprise Linux® can be the lowest-cost option to deploy container workloads at the edge. Use the included image builder to create a customized OS image that is optimized for the edge. Zero-touch provisioning, system health visibility, and timely security remediation makes it unnecessary for technicians to travel to the edge location, lowering costs. To avoid disruption during OS updates, the updates are staged in the background and applied automatically at a specified time of day.

Red Hat Device Edge for orchestration on small-form-factor devices

Red Hat Device Edge is a flexible platform that supports diverse workloads across SFF devices at the farthest edge. It includes an edge-optimized OS built from Red Hat Enterprise Linux, the Red Hat build of MicroShift (a lightweight Kubernetes distribution), and Red Hat Ansible® Automation Platform for automating tasks such as software updates and security patching. Use Red Hat Device Edge to deploy and manage virtual or containerized workloads on resource-constrained edge devices, orchestrated with or without Kubernetes. Workloads at the farthest edge run on the same OS used in the core and cloud, increasing operational efficiency.

Single node OpenShift when space and resources are limited

Single node OpenShift® combines control and worker node capabilities in a single server, creating independent Kubernetes clusters at edge sites that have little or no dependence on a centralized Kubernetes cluster. The edge nodes can run autonomously when needed, and the user experience is consistent across all sites where Red Hat OpenShift is deployed. To minimize edge footprint and resource consumption, composable OpenShift components can be disabled so that optional features do not consume resources.

Three-node OpenShift compact cluster when the mission requires high availability

For applications that require higher availability, deploy a 3-node OpenShift compact cluster in as few as 2 rack units (RUs). When used with Red Hat OpenShift Data Foundation, a 3-node compact cluster provides hyperconverged compute, network, and storage.

Red Hat OpenShift remote worker nodes at the edge when there is reliable connectivity to the datacenter

At edge locations with reliable network connections, a Red Hat OpenShift remote worker node can communicate with a control plane in a central location. Red Hat OpenShift offers a flexible platform that agencies can use to extend enterprise capabilities to remote locations while managing nodes centrally. If the connection to the control plane is lost, the worker nodes continue collecting and processing data until the connection is restored.

Mission value of Red Hat edge solutions

Based on open source, Red Hat's edge solutions provide mission capabilities not generally available from proprietary systems, including:

- **Centralized fleet management.** Expanding mission requirements are exponentially increasing the number of devices at the edge. Red Hat edge solutions help public sector teams consistently operate and manage these deployments across various topologies and infrastructure. Teams can

Hardware-based zero trust model from Mainsail and Red Hat

Built on Red Hat Enterprise Linux, Mainsail Metalvisor is a security platform that protects edge workloads outside of the enterprise datacenter or cloud environment. The platform protects edge workloads from sophisticated cyberattacks by using separation, enforced by security functions built into the hardware. These features protect data in all forms: at rest, in transit, and in use. Read more.

Smart cities solution

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.

support massive numbers of distributed nodes using a hub-and-spoke architecture, which allows for a single instance to control thousands of edge nodes as if they were located in a datacenter. The architecture reduces operational complexity, and a unified interface for configuration, monitoring, and troubleshooting increases efficiency.

- **Operations in environments with unreliable connectivity.** Allow applications to continue running even if network connectivity drops or a node goes out of range. Data is synchronized when network connectivity is reestablished.
- **Resilience.** Minimize downtime and enable uninterrupted operations even when human intervention is not practical. With self-healing capabilities, Red Hat edge solutions can detect and respond to failures automatically.
- **Efficient over-the-air updates.** Maintain the health and security posture of edge devices without manual intervention. Automated updates help to make sure that edge devices are running the latest software, reducing vulnerabilities and improving overall system reliability.
- **Platform consistency.** Deploy consistent configurations and policies across diverse hardware and software platforms. Standardizing on Red Hat Ansible Automation Platform minimizes configuration drift and reduces the risk of compatibility issues.
- **Certified software and vendor ecosystem.** Increase mission capabilities at the edge by bringing in Red Hat-certified hardware, software, and cloud solutions from Red Hat's partner community.
- **Enterprise support.** Access Red Hat's knowledge, guidance, and support from the Red Hat Customer Portal. Select a support tier that aligns with the mission, such as 24x7 access to support engineers for critical missions.

Red Hat edge solutions in action

U.S. Army

Red Hat edge solutions underpin a 2023 expansion of the U.S. Army's Garrison Defensive Cyberspace Operations Platform (GDP), which is based on a network intelligence solution from Axellio. Rapidly deployable at the edge or in the datacenter, the framework detects and analyzes anomalous behavior and intrusions in the Army's garrison networks. Read more.

National Oceanic and Atmospheric Administration (NOAA)

NOAA developed the Advanced Weather Interactive Processing System (AWIPS) to ingest, analyze, forecast, and disseminate weather data, including time-sensitive warnings to protect life and property. AWIPS is deployed on Red Hat OpenShift clusters in 170 edge locations around the U.S. Each edge cluster operates independently and does not rely on services from a central location. NOAA deployed more than 600 servers in 6 months. Watch the video.

International Space Station (ISS)

Aboard the ISS, mission specialists are studying microbes on surfaces and in water to assess whether it is safe to drink. Transmitting results of each DNA sequencing run to Earth for analysis would take weeks. To accelerate research, NASA deployed a containerized machine learning application directly aboard the ISS, on a compact edge device running Red Hat OpenShift Local. Developers built the code on the ground and pushed it to the ISS. Results of edge analysis were available immediately to ISS personnel and also relayed to scientists on the ground. Read more.

Learn more

Talk to a Red Hatter.

Read more about Red Hat edge solutions.

Learn more about how Red Hat can help your agency or institution achieve its mission.

About Red Hat

Red Hat helps customers standardize across environments, develop cloud-native applications, and integrate, automate, secure, and manage complex environments with award-winning support, training, and consulting services.

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