

INTELLIGENT GATEWAYS FOR THE IOT

TECHNOLOGY OVERVIEW

TRANSFORMING DATA INTO KNOWLEDGE

The Internet of Things (IoT) is ushering a new era of computing where intelligent applications holistically monitor and control connected devices, and transform information into knowledge. By intelligently gathering and analyzing massive amounts of data, smart systems can optimize business flows and automate industrial control processes, improving productivity, decision making, and financial results. IoT business opportunities abound in virtually every industry including transportation, energy, hospitality, healthcare, manufacturing, retail, and financial services.

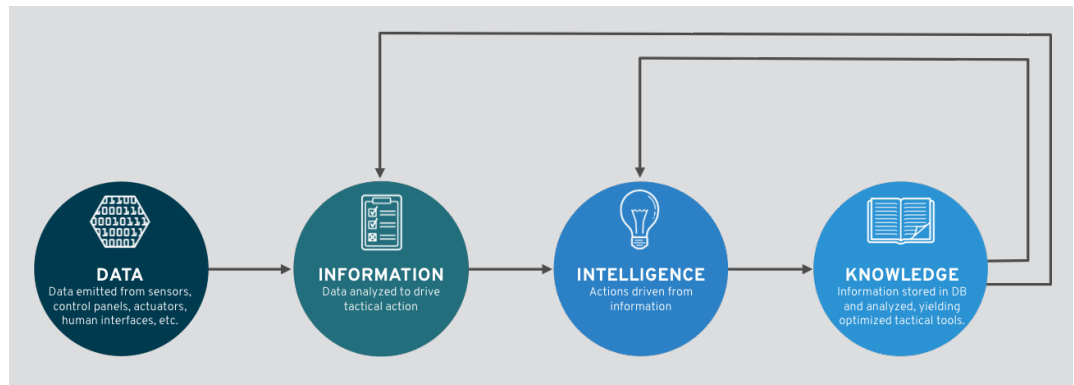


Figure 1. The IoT data lifecycle

EASING THE IOT DATA JOURNEY

Across the IoT data lifecycle, intelligent systems turn raw data into meaningful and actionable information. Along the way, the sheer magnitude and scope of the IoT creates enormous design challenges for system planners, including:

- **Scalability:** Intelligent systems must collect and analyze massive volumes of data from vast numbers of endpoints, introducing unprecedented data processing, storage, and bandwidth demands.
- **Reliability:** With many smart applications, system outages or data loss can result in lost productivity or revenue. With some applications—intelligent medical systems, smart grid applications, surveillance solutions—system downtime can result in safety hazards, health risks, or loss of life. Continuous system availability is critically important.
- **Security:** Some intelligent systems may rely on Internet connectivity or use cloud compute or storage resources. Strong safeguards against data loss, service theft, and denial of service attacks are paramount.

ENSURING HIGH SCALABILITY, AVAILABILITY, AND SECURITY

Red Hat's intelligent systems architecture addresses stringent IoT performance, reliability, and security requirements. The distributed architecture pushes data processing and routing functions to the edge of the network enabling massive scalability. A layered design, with distinct device, gateway, and datacenter/cloud tiers enables resiliency and extensibility.

The device tier includes smart endpoints such as sensors and actuators. The data center/cloud tier includes intelligent applications that automate business flows and industrial control processes. The gateway tier acts as an intermediary between the device and datacenter/cloud tiers—aggregating, processing, transforming, and routing data at the network edge.

SMART MANUFACTURING AND INDUSTRIAL CONTROLS

Eurotech, a leading provider of machine-to-machine platforms, and Red Hat have developed an end-to-end IoT framework to bridge the gap between operational technology and information technology.

Using intelligent gateways, the unified solution collects and processes real-time industrial control data and executes business logic at the network edge based on real-time conditions, for high performance and scalability.

Gateways aggregate, transform, and route data to central IT systems providing business insights.

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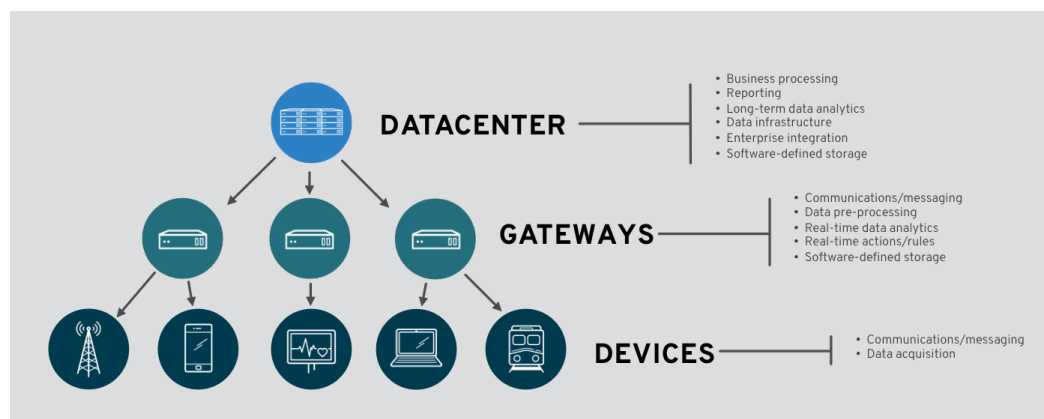


Figure 2. Red Hat intelligent systems architecture

Designers can install redundant components in each tier to ensure continuous service availability, employ distinct security measures across tiers to protect against diverse threats and vulnerabilities, and use gateways to create massively scalable systems.

IOT GATEWAYS TRANSFORM DATA AT THE NETWORK EDGE

IoT gateways are essential for enabling high performance, speed, and resiliency. They can execute business rules and oversee local endpoints at the edge of the network—without communicating with central applications. The autonomous approach eliminates wide area network (WAN) latency, enabling rapid device control. (For example, a gateway can instantaneously close a valve based on a sensor alarm). The approach also enables continued local operation in the event of WAN outages or central application failures.

The cornerstone of the Red Hat intelligent system architecture, IoT gateways:

- **Optimize system performance and scalability** by offloading data collection and processing from the datacenter/cloud tiers.
- **Simplify application development** by providing an abstraction layer between devices and business applications.
- **Support diverse applications and service types** by classifying, prioritizing, queueing and routing northbound messages based on administratively defined policies.
- **Reduce WAN costs** by minimizing machine-to-machine (M2M) communications and enabling least cost routing and load balancing based on message classes.
- **Mitigate risks** by isolating failure points, securing upstream communications and providing continued local operation in the event of WAN outages or application tier failures.
- **Protect and extend previous investments** by enabling interoperability with legacy devices and protocols.

- **Accelerate endpoint qualifications and rollouts** by decoupling devices from higher-level applications.
- **Simplify application development and gateway administration** by allowing external applications to dynamically reconfigure gateway business rules to address real-time conditions.

RED HAT INTELLIGENT IOT GATEWAY FRAMEWORK

Whether you are designing a complete IoT system or developing individual components of an intelligent solution, Red Hat can help you simplify development and integration tasks and save money. Our standards-based middleware solutions and open and flexible operating platforms help you get to market quickly and cost-effectively, while addressing demanding IoT scalability, reliability, and security requirements.

Red Hat intelligent systems solutions include a complete set of IoT gateway foundational components. The Internet of Things is still in its infancy. IoT technologies will continue to evolve for the foreseeable future. Red Hat's layered IoT gateway framework supports standards-based interfaces and protocols to help you avoid vendor lock-in and meet your unique project objectives and budget goals, both in the near term and in the future. You can mix and match and swap out components over time to keep pace with advances in technology, while protecting previous investments.

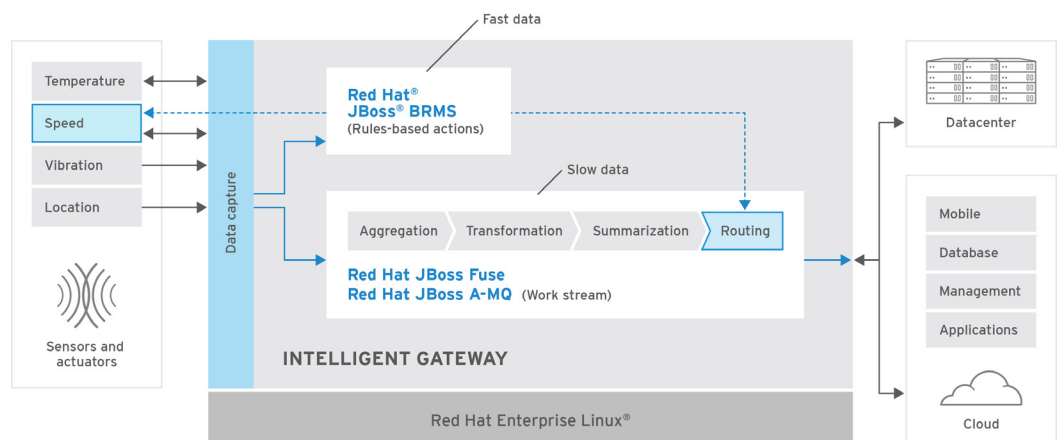


Figure 3. IoT gateway using open Red Hat technologies

MEET STRINGENT IOT RELIABILITY REQUIREMENTS

Stable, open operating environment—Red Hat® Enterprise Linux®, the world's leading enterprise Linux platform, provides a field proven, highly reliable foundation for x86- or Atom-based IoT gateways. The solution delivers military-grade security and 99.999% availability.

BUILD MASSIVELY SCALABLE IOT SYSTEMS

Rapid application integration and data transformation—Red Hat JBoss® Fuse is a lightweight, flexible enterprise service bus for executing routine gateway services such as data routing, aggregation, and protocol mediation. The solution lets you interconnect diverse IoT components quickly and efficiently.

Efficient system-wide communications—Red Hat JBoss A-MQ is a lightweight messaging bus for asynchronously moving data between endpoints and control points. It connects system components, applications, and information across the IoT in a highly scalable and efficient manner.



ABOUT RED HAT

Red Hat is the world's leading provider of open source software solutions, using a community-powered approach to reliable and high-performing cloud, Linux, middleware, storage, and virtualization technologies. Red Hat also offers award-winning support, training, and consulting services. As a connective hub in a global network of enterprises, partners, and open source communities, Red Hat helps create relevant, innovative technologies that liberate resources for growth and prepare customers for the future of IT.

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ACCELERATE BIG DATA ANALYTICS PERFORMANCE

Advanced business logic execution—Red Hat JBoss BRMS supports comprehensive IoT business rules management and complex event processing (CEP). By executing business logic in the gateway, you can accelerate local control functions and enable continued operation in the event of WAN or application failures. By pushing intelligence to the edge of the network you can cost-effectively scale IoT deployments, while enabling leaner, faster IoT applications. External applications can modify business rules dynamically to address real-time events and evolving system conditions.

IOT GATEWAYS IN ACTION: SMART FARE COLLECTION SYSTEM

A leading transportation industry solution provider uses IoT gateways to ensure high performance and scalability for its intelligent fare management system. The cloud-based service helps mass transit systems improve passenger satisfaction and reduce operating expenses. Riders can purchase electronic tickets and passes over the web and pay fares using mobile apps and smart cards. Comprehensive analytics and reporting tools help transit agencies track ridership, optimize scheduling, and improve capacity planning.

Using Red Hat Enterprise Linux and Red Hat JBoss Fuse, IoT gateways securely collect, aggregate, and transmit ridership and fare information to cloud-based business applications. The intelligent gateways efficiently interconnect diverse system components and subsystems while ensuring the end-to-end accuracy and integrity of financial data.

CONCLUSION

Next-generation intelligent systems must analyze and act upon massive datasets in a highly efficient and reliable manner. IoT gateways can help you maximize smart system performance and scalability by pushing data processing and control functions to the edge of the network.

Red Hat's intelligent systems architecture and standards-based IoT gateway building blocks help you address stringent smart system scalability, reliability, and security requirements—quickly and cost-effectively.

To learn more about Red Hat's three-tier architecture for the Internet of Things, download our [whitepaper](#). For additional information on the IoT, visit our Internet of Things insights [page](#).



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