Johnson Controls Digital Vault

Making Buildings Smart
with a Secure, Scalable and Powerful Platform

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Smart Buildings and Smart Cities are Possible – Today

Think about all the systems at work within your building: heating, ventilation and air conditioning (HVAC), security, fire, lighting, information technology (IT), refrigeration, asset and work order systems, meters, field devices—the list goes on and on. Each of these systems generates a massive amount of data that, in combination with other data sources like weather, daily utility pricing and social media, can be used to help you make buildings safer, more comfortable and more efficient. But because each of these systems operates separately and speaks its own language, it's traditionally been difficult to make sense of this vast collection of data in a timely and meaningful way.

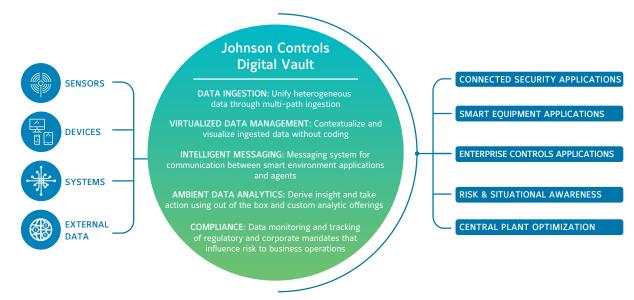## Our Building Expertise Spans Decades

With more than 130 years of experience in the industry, no other company offers a more comprehensive building technology portfolio than Johnson Controls. We work with customers every day who use Digital Vault to enable smart building experiences and business outcomes.

What is Digital Vault?

The Johnson Controls Digital Vault is a flexible, scalable, cloud-based platform that reaches across silos to gather data from disparate sources, stores it securely and standardizes the data. It then converts the data into something you can leverage to predict business and building outcomes and gain new insights related to buildings and occupants. It can also ensure your processes comply with regulatory or internal business rules.

We offer the capability to fully integrate disparate internal and external data sources to help you make sense of energy usage, security breaches, equipment performance and space utilization. The pace of technological change requires building professionals like you to be more analytical, flexible and agile than ever before. Plus, as budgets shrink, enterprise executives are being asked to 'do more with less.'

Digital Vault helps you meet those challenges head-on. We give you the power to make faster, smarter, data-driven decisions which better positions you to achieve other business goals such as reducing energy use, increasing productivity and creating safer more comfortable environments.

Johnson Controls Digital Vault

SENSORS

DEVICES

SYSTEMS

EXTERNAL DATA

DATA INGESTION: Unify heterogeneous data through multi-path ingestion

VIRTUALIZED DATA MANAGEMENT: Contextualize and visualize ingested data without coding

INTELLIGENT MESSAGING: Messaging system for communication between smart environment applications and agents

AMBIENT DATA ANALYTICS: Derive insight and take action using out of the box and custom analytic offerings

COMPLIANCE: Data monitoring and tracking of regulatory and corporate mandates that influence risk to business operations

CONNECTED SECURITY APPLICATIONS

SMART EQUIPMENT APPLICATIONS

ENTERPRISE CONTROLS APPLICATIONS

RISK & SITUATIONAL AWARENESS

CENTRAL PLANT OPTIMIZATION

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Leverage Your Data, Your Way

You can deliver the outcomes that matter most with this platform.

The Johnson Controls Digital Vault can be leveraged in simple environments where you may be collecting data from just one device or in large initiatives involving data from multiple devices, buildings and spaces. Most important, we can customize it to better help you achieve your business objectives.

- **Want to enhance building or rental value?** Johnson Controls Digital Vault makes it possible to create impressive and more productive experiences for the people who live and work in your building by enabling features such as frictionless entry and occupancy-based temperature control.

- **Feeling overwhelmed by the number of security system alerts and alarms you're receiving?** Johnson Controls Digital Vault uses machine learning to prioritize alarms so you can focus on the most important ones. It analyzes building data in a more robust and targeted manner and does much of the thinking for you and your staff.

- **Putting more emphasis on proactively managing risk?** Johnson Controls Digital Vault helps you identify potential threats by synthesizing data from weather, real-time critical-event feeds, social media and other sources.

- **Is extending the life of your HVAC equipment a priority?** The predictive diagnostics in Johnson Controls Digital Vault helps you prevent equipment issues and maintain a continuously comfortable environment—efficiently.

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What If Your Office Experience was Powered by Johnson Controls Digital Vault?

On your way to the office, you receive a text message telling you where to find an open spot in the parking structure.

As you get out of your car, your arrival is announced to the door access control agent, which means you can enter without badging or signing in.

Once inside, you are automatically directed to the elevator with the shortest wait time.

As you reach your first meeting of the day, your digital assistant automatically powers up the conference bridge and AV system, lowers the window shades and displays the presentation you've prepared.

The Johnson Controls Digital Vault enables you to have a streamlined, more productive day-to-day experience. As a result, applications that use the platform also help building professionals extend the life of their HVAC equipment, proactively manage security risks and efficiently maintain a comfortable environment for building occupants.
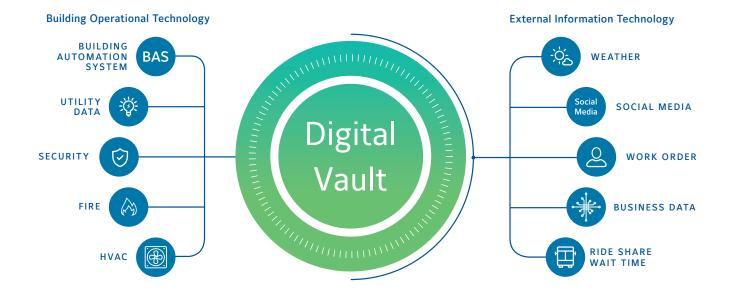
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Johnson Controls Digital Vault Services

Data Ingestion for Powerful and Simple Insights

Data Ingestion

Johnson Controls Digital Vault provides a means of communication among various building sub-systems and devices so that their data can be mined easily. Traditionally, the gathering of this data has been done manually and required months or more of effort. Our data ingestion service automates much of this process, delivering data up to 80 percent faster.

Digital Vault supports two distinct data-ingestion paths:

- **Operational Technology device data**
  Johnson Controls has an established track record of harnessing the power of OT device data. Today, our universal protocol transformation service is available as a standard product with Digital Vault.

- **Information Technology systems and external data**
  The platform brings together weather, utility billing, spatial information, facility mapping and even social media communications through its portfolio of tools and custom-developed applications.

Building Operational Technology

- BUILDING AUTOMATION SYSTEM — BAS
- UTILITY DATA
- SECURITY
- FIRE
- HVAC

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External Information Technology

- WEATHER
- SOCIAL MEDIA
- WORK ORDER
- BUSINESS DATA
- RIDE SHARE WAIT TIME

Edge-to-Cloud

Edge Computing

The Digital Vault lives in the Cloud, but important work happens on the edge. The Digital Vault connects the two seamlessly. The gateway component can process and filter data before sending it to the Cloud. If connectivity is down, the gateway buffers data until the connection returns. Your network security team can breathe easy: Digital Vault respects your organization's firewalls and makes only outgoing connections to known hosts, does not require any new ports to be opened and does not allow for incoming connections.

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Knowledge Graph

Virtualized Data Management for Better Business Decisions

Johnson Controls Digital Vault puts the data that's been gathered into context, so you can manage it efficiently and make more informed building and business decisions. Digital Vault accomplishes this by supporting unified meta-data management that allows for consistent descriptions of building components and the relationships between them. Digital Vault will provide the missing functionality and capabilities of existing metadata models, e.g., BACnet, Project Haystack and BIM, to be more complete, expressive and usable.

The Johnson Controls Digital Vault data management service includes several sub-platforms:

- Multi-modal data storage abstraction service
- Unified meta-data management
- Smart entity management
- Knowledge graph service for the smart environment
- Streaming data management service

Intelligent Messaging

Intelligent Messaging for Connected Devices

Johnson Controls Digital Vault makes it easier to implement building optimization tools and strategies. Through its intelligent messaging functionality, it creates an environment for connected devices and data that allows each asset within the building to become 'self-aware,' communicate with each other and take action or make adjustments based on what it learns from other devices.

Ambient data analytics for smart environments

Johnson Controls Digital Vault delivers ready-to-use analytics for rapid application development. Not only does it shorten development time from months to weeks, it streamlines the process of adding new systems or components and connecting them to the data ecosystem.

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Cybersecurity

Digital Vault takes the security and privacy of your data seriously. All data is encrypted at rest and in transit, using industry-leading protocols. Johnson Controls devices are individually and securely provisioned and take advantage of tamper-proof TPM hardware modules when available. In the Digital Vault, data is protected by a rich access control system, ensuring only those permitted have access to the data. Data stored in the Digital Vault can be masked, so people who need access to the data can be prevented from also obtaining any personally identifiable information (PII).

Cyber Security

Device assurance
Whether it is cybersecurity or environment security, Johnson Controls specializes in the science of protection. Device Assurance Service gives you peace of mind knowing that all of your devices are secure, healthy and up-to-date with the latest software and any required regular maintenance. Device Assurance service makes it a breeze to generate the audit documentation for any compliance requirements.

Device Assurance

Cyber thieves are getting more sophisticated. Are all your cyber doors locked?
Most security software runs in a siloed fashion, leaving gaps that can likely be infiltrated. The Digital Vault can unify data monitoring and better protect and notify you of a potential data breach.
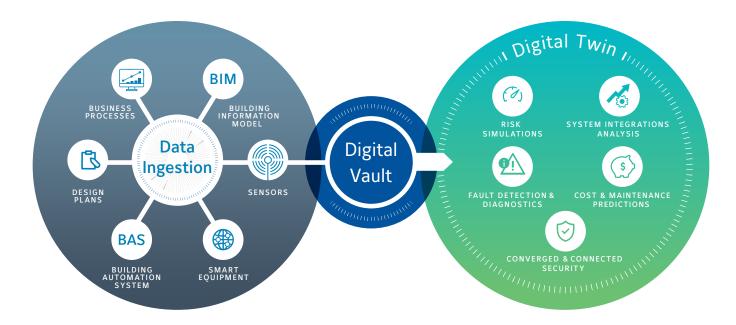
Cyber Thief

Are your business rules strong enough to protect personally identifiable information?
Technology can help guard the massive amounts of information that your systems amass, but it is not foolproof. As regulations change, it is vital that you can prove you pro-actively took the steps necessary to protect vital information and minimize risk. The Digital Vault allows you to implement such business rules across multiple systems and minimizes your risk of fines.

Personally Identifiable Information

Are all of your cyber doors locked?
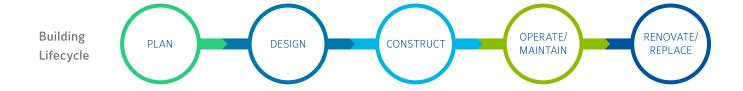
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Digital Twin Throughout the Building Lifecycle

Digital Vault enables the creation of cyber-physical representation or the digital twin of the building throughout its lifecycle. Data can flow into the Digital Vault from many sources and all be integrated together to create a complete representation of the building and made available as an Application Programming Interface to applications or exported to external systems.

Digital twins can help both before and after construction. Before construction, digital twins can give engineers an idea of how building systems interact. After construction, a digital twin can help predict when parts need to be replaced, identify inefficiencies in the system, analyze how new processes can be integrated and proactively manage security for a frictionless security environment, among other uses.

Building Lifecycle

PLAN → DESIGN → CONSTRUCT → OPERATE/MAINTAIN → RENOVATE/REPLACE

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Faster Development with Pre-Developed Analytics and Data Models

Whatever your objectives, Johnson Controls Digital Vault eliminates the need to build custom applications from scratch. It takes advantage of industry-leading experience and expertise to deliver out-of-the-box analytics and professionally developed data models that give you and your teams a head start, so you can build targeted applications in half the time.

The chart below compares the number of hours required to build a single-page web application with and without Johnson Controls Digital Vault, which:

- Minimizes database modeling and administration
- Simplifies and unifies device connectivity and security
- Unifies identity and access control of information

- Reuses pre-built data models
- Reuses pre-built analytics and time series management
- Lowers the test surface via leveraging quality assurance passed platform services

Not only does this platform cut development time in half, it also analyzes building data in a more robust and targeted manner. It does much of the thinking for you and your staff. With the Johnson Controls Digital Vault, your personnel will find that their schedules now allow them to focus more attention on your core mission rather than design and develop smart building solutions.

Develop an Application in Half the Time

Estimated Work Efforts **WITHOUT** Johnson Controls Digital Vault Hours

Estimated Work Efforts **WITH** Johnson Controls Digital Vault Hours

| Comparison of Total Work Hours to Develop Single-Page Web Application

Step-by-Step Process

- Learning Johnson Controls Digital Vault
- Quality Assurance
- Develop data integration with application meta-data
- Develop business process/logic
- Design user and data access control and authorization
- Design security for end-to-end from device-to-Cloud and Cloud-to-device
- Develop bi-directional communication for command processing with guaranteed message delivery

- Implement visualization for telemetry data analytics (anomaly detection and weekly, monthly and quarterly rollups)
- Design data schema and develop data management and back up
- Develop OLAP for time series data roll up
- Develop telemetry data pre-processing and handling for missing, out of order and storage
- Evaluate technology and service for back end storage and indexing
- Develop highly available data connectivity between device/source system to cloud service

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Contact us to learn more about Johnson Controls Digital Vault.
www.johnsoncontrols.com/digitalvault

Brick

One of the biggest challenges facing the global building industry today is the lack of a common data model for the applications and systems that exist within buildings. This prevents interoperability and limits scalability—issues that cost the industry an estimated $15 billion.[1]

Brick is an open-source development effort designed to address that challenge by creating a uniform schema for representing metadata in buildings. Brick is flexible and expressive, enabling the next generation of building environments. Johnson Controls is a founding corporate sponsor of the Brick consortium, a group that will drive the development and adoption of Brick.

www.brickschema.org

[1] Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry, National Institute of Standards and Technology, retrieved 4-19-2018 from https://nvlpubs.nist.gov/nistpubs/gcr/2004/NIST.GCR.04-867.pdf

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