CASE STUDY

Prescriptive Data: Smart Building AI

Scalable Savings for Smart Buildings

Scalable Intel® IoT technology cuts building operating costs by $0.55 per square foot[1] and leads to the creation of a smart building AI startup.

By collaborating with Intel, real estate company Rudin transformed a smart grid pilot project into a global solution for building management:

- The owner of 15 million square feet in Manhattan, Rudin created software to improve operations at its flagship property
- Intel helped the company redesign its solution for scalability, enabling rapid rollout across 17 properties
- The result: Up to 31% less energy use, and annual savings of $5.4 million USD[1]
- Rudin now offers its NANTUM* technology through subsidiary Prescriptive Data, with customers typically saving $0.55 USD per square foot annually[1]

As the owner of the largest commercial real estate portfolio in Manhattan, Rudin Management Company, Inc. has a significant interest in the comfort, sustainability, and operating cost of its buildings. So when utility Con Edison asked Rudin to pilot a smart grid project, the company welcomed the opportunity.

The project began as an effort to improve tenant comfort and safety. For example, if Con Edison signaled an impending blackout, Rudin would be able to stop all elevators on the nearest floor, avoiding entrapments.

The First Building OS

As a first step, Rudin needed to integrate data from diverse building systems. However, existing solutions were siloed, limited to reporting, and lacked building-wide functionality. For example, an elevator dashboard might report system status, but provide no means of control or integration with utility data.

So Rudin decided to strike out on its own, and worked with Columbia University to create the world's first operating system (OS) for buildings. This OS was built around a database that could take in data from any building system, provide a unified view, and allow remote control and coordination of building functions.

The results were remarkable. Not only did the OS automate comfort and safety, but by adjusting the heating, ventilation, and air conditioning (HVAC) in real time it could optimize energy use to match.

Seeing the potential to cut costs across its portfolio, Rudin wanted to roll out the OS to other buildings. But there was a problem: scalability.

Islands of Information

As in most commercial buildings, Rudin properties contained a mix of equipment from many vendors, installed over many years. Each of these systems had its own interfaces and protocols. This fragmented environment forced Rudin to spend long hours updating its database before it could bring a new system online.

Further complicating matters, Rudin's OS ran on a PC inside the building. For every new building Rudin wanted to automate, it had to deploy a completely separate database instance. That left Rudin without a portfolio-wide view of its properties—meaning that learnings from one building could not be easily shared with another.

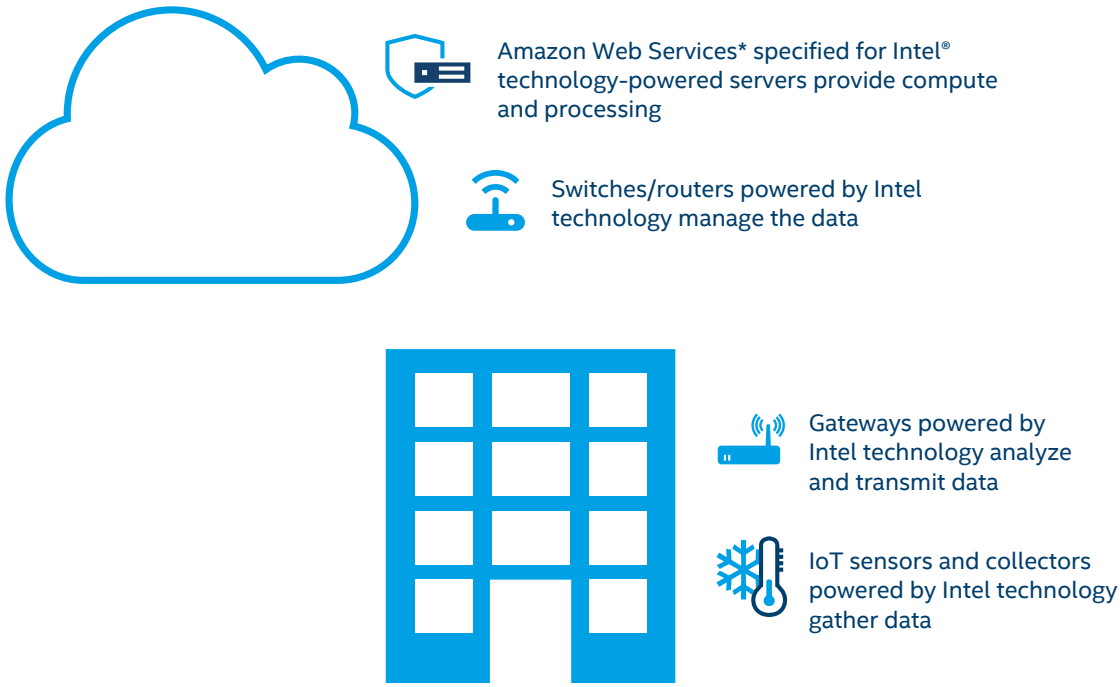


Figure 1. Intel® scalable IoT architecture stretches from the sensor to the cloud

Scaling Up the Solution

When Intel heard about these challenges, it knew it could help. As a global leader in Internet of Things (IoT) technology, Intel has unparalleled expertise in connecting islands of information and deploying IoT designs at enterprise scale.

Working closely with Rudin, Intel overhauled the building OS to create a far more scalable architecture. First, Intel replaced the existing relational database with MongoDB*. Now the database could easily adapt to new data streams—no more coding every time a building system was connected.

Next, Intel helped Rudin port the architecture to the cloud. Providing Rudin with a single, high-performance system that could manage all of its buildings from a centralized hub. Moving to a cloud-based system also meant that improvements to the OS could be deployed instantly across the entire portfolio.

> "NANTUM* is an operator that is working full-time."
>
> **– Chief Engineer, Rudin**

Enterprise-Grade Architecture

A critical component to making this all work was the replacement of in-building PCs with IoT gateways from Dell*. Unlike PCs, these gateways are purpose-built for automation, with I/O designed to connect with a wide range of building systems.

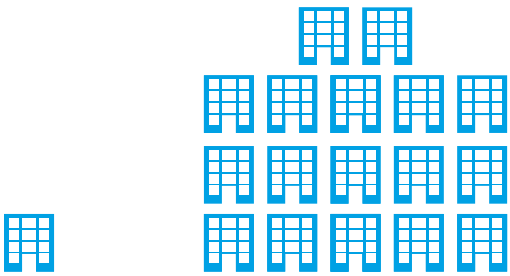
In addition to communicating with the building systems, the IoT gateways gave Rudin a standardized, interoperable platform with enterprise-grade security and manageability. And by using Intel-based gateways, Rudin achieved a scalable, consistent architecture that stretches from the building to the cloud (Figure 1).

In this new architecture, the IoT gateways perform data analytics within the building, optimizing performance in real time while maintaining a lightweight connection to the cloud. In the cloud—an instance of Amazon Web Services* specifically optimized for servers powered by Intel technology—advanced artificial intelligence (AI) combines building data with external data such as weather forecasts to proactively predict optimal settings for the HVAC and other systems.

On top of this foundational work with Intel, Rudin collaborated closely with building system vendors to create an automation API library. At the end of this process, Rudin says it has the largest such driver library,[1] enabling nearly plug-and-play deployment.

Rapid Deployment Across the Portfolio

All of these enhancements made it far easier to scale the solution. With its original OS, Rudin needed 2.5 months of intense effort to bring a single building online. With the new solution—now known as the NANTUM* OS—Rudin had 17 buildings up and running in a single year (Figure 2).



Original OS
One building
online in 2.5 months

NANTUM OS
17 buildings
online in 1 year

Figure 2. Intel helped Rudin achieve scalability

And with the addition of AI, Rudin was able to substantially trim operating costs. Rudin saw energy costs drop by as much as 31%, for an annual savings of $5.4 million USD across the 17 buildings.[1] This return on investment (ROI) was so impressive that the cost savings paid for the development and deployment of NANTUM in the first year.

The performance observed at 345 Park Avenue illustrates the benefits of the new architecture. This skyscraper boasts 1.8 million square feet across 44 floors, and a multimillion-dollar annual energy budget. After the implementation of NANTUM, the building's energy use dropped 9% for a savings of nearly $1 million USD in the first year—or roughly $0.48 USD per square foot (Figure 3).[1]

More Efficient Operations

The rollout of NANTUM was also a boon for Rudin's building engineers, who previously had to roam the buildings with pencil and clipboard to check the status of key systems. If something went wrong, it might take an entire workday for the engineers to field a tenant complaint, diagnose the problem, and address the issue.

Now, engineers can monitor the entire building from a tablet. Automated alerts ensured that problems got immediate attention and a quick resolution. "NANTUM is an operator that is working full-time," said one Chief Engineer.

The reporting tools built into NANTUM also helped engineers avoid problems in the first place—as reflected by the 70% drop in hot and cold complaints from tenants.[1] "NANTUM makes us want to perform better for operating our building," said the Chief Engineer.

345 Park Avenue, New York City
44 Floors, 1.8M Sq. Ft.

Energy use **down 9%**

Cost **down nearly $1M in the first year**

Hot/cold calls **down 70%**

Figure 3. The return on investment was substantial

Third-party applications with open APIs can be installed over NANTUM OS

Prescriptive Data maintains a **large library** of interoperable protocol adapters and communications drivers

Figure 4. The open architecture enables innovation

An Open Platform for Smart Buildings

Seeing the impressive success of NANTUM*, Rudin decided to make this technology available to other real estate interests. So in 2015 Rudin created Prescriptive Data, an independent subsidiary dedicated to improving the cost, comfort, and sustainability of commercial buildings.

In 2017, Prescriptive Data joined the Intel® Internet of Things Solutions Alliance to scale up its platform to commercial buildings worldwide. A global ecosystems of more than 500 IoT technology leaders, the Alliance—which also includes Prescriptive Data's partners Dell* and Amazon Web Services*—provides the end-to-end solutions building owners need to realize the full value of the IoT.

With the backing of the Alliance, the NANTUM solution has been qualified as an Intel® IoT Market Ready Solution. Now venues around the globe are adopting NANTUM, with expected annual savings of $0.55 USD per square foot[1] for a typical installation. Thanks to the foundation of scalable Intel IoT technology, installation takes as little as one month, so the savings are realized almost instantly.

And these benefits are only the beginning. Because NANTUM is open, any third-party applications (Figure 4) can be installed over the OS, provided they also have open APIs. That creates opportunities not only for additional cost savings but also for innovative new applications like air quality monitoring.

Learn More

For more information on Prescriptive Data NANTUM, see the Intel® Solutions Directory.

[1] Rudin internal data.