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Your Journey on the Real-time Operational Intelligence Continuum

A Modius Whitepaper

Complex Challenges of Managing Infrastructure

Managing the physical infrastructure that supports IT systems is different from managing the IT systems. "How do I attain the visibility needed to do my job effectively?" It's a common refrain in organizations, from the C-Suite, to business unit managers, to the people that rely on monitoring to keep systems up and running. Servers, clouds, remote boxes, and mobile devices can be complicated to manage. The physical infrastructure that supports these IT systems and networks pose complex challenges as well.

Unfortunately, legacy equipment with varying protocols and platforms complicate your ability to monitor your physical infrastructure, let alone manage it. Cyber security is another important concern and consideration when planning how best to manage disparate infrastructure.

With edge architecture becoming an important part of IT and network infrastructure, these disparate Operating Technology (OT) systems—with their myriad hardware and software systems—become an increasingly common headache.

"How do I attain the visibility needed to do my job effectively?"

Normal business operations like acquisitions, expansion to new locations or technology refreshes exacerbate the issue. And compelling events like storms resulting in electrical failures or downtime expose the lack of visibility even further. Meanwhile, Operations Managers are expected to remotely handle more infrastructure — and with potentially less staff. This is particularly true in today's "new normal".

All these complicating factors make it increasingly difficult for the Operations team to efficiently manage physical infrastructure. The desired solution includes a unified dashboard that consolidates all disparate components and all locations and presents "a single pane of glass" view of the health of the entire operation.

To accomplish this, Operations teams need Real-time Operational Intelligence (RtOI).

Real-time Operational Intelligence

RtOI leverages software tools to glean the value from those disparate devices, platforms and systems. Once Operations teams have visibility to operating conditions, they can determine the step-by-step improvements required to achieve their operational goals.

Real-time Operational Intelligence begins with data. All of the challenges with lack of visibility across your systems and locations can be traced back to unstructured data.

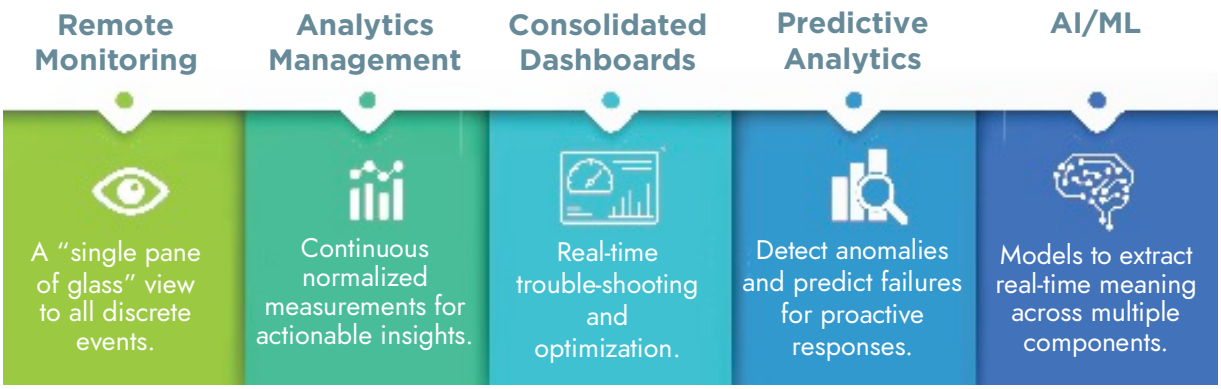
Until recently, unstructured data wasn't the problem of OT managers, notes VC Kumaran of Infrastructure Development Finance Company: "But today management has realized that huge valuable data is available in the unstructured data." [1]

Timothy King, Senior Editor of Data Management Solutions, notes that these new types of unstructured data are coming fast and furious: "Usually in the form of social media data, or real-time streaming data from IoT smart devices. There is also geographic data, search engine queries, and many other kinds, with new varieties coming online daily. These data types create a unique challenge for organizations struggling to analyze data beyond their traditional structured stores."[2]

Lack of visibility across your systems can be traced back to unstructured data.

Unstructured data in disparate and legacy systems can be a major stumbling block for OT organizations. In larger IT facilities, it's pretty common to monitor measurements such as temperature, humidity, and power usage from critical equipment. These measurements support preventative (or predictive)maintenance and are vital if downtime is to be avoided. The challenge is to source these measurements across all locations.

Unfortunately, the tools that transform structured data into Real-time Operational Intelligence don't work with unstructured data or disparate systems. So, the secret to RtOI is accurate, normalized, and time-aligned data which can then be transformed into actionable information. The RtOI Continuum provides an incremental and easy to follow structure to achieve these goals.



The five stages of the RtOI Continuum employ data, reporting, analytics, and AI to gain valuable insights and improve business decision-making.

The RtOI Continuum

Today, everywhere you read, AI is grabbing headlines as the data solution for every business, with analysts like Gartner and Forrester warning companies to jump on the bandwagon or be left in the dust. The reality is more nuanced. You don't flip a switch to turn AI on in your organization.

Leveraging the value of your data is not a binary decision. It is a journey.

The RtOI Continuum is a set of five stages that lead you through this journey. It employs data, reporting, analytics, and AI to gain valuable insights and improve business decision-making.

The process begins with wrangling your disparate data sources into a unified, actionable view and moves through Remote Monitoring, Analytics Management, Consolidated Dashboards, Advanced Analytics, all the way up to Artificial Intelligence/Machine Learning.

Most organizations today fall into the first or maybe the second Stage, with a large number actually just to the left of the chart, struggling to access their data in any kind of cohesive

fashion. It's worth noting that there is significant ROI attached to each stage, so it pays for organizations to embark on the journey correctly because it only works if you get Stage One right.

Stage One: Remote Monitoring

The first step to getting value out of your data is a normalization of all data types, so you have a consistent real-time enterprise-wide view, which sets the foundation for RtOI. Remote Monitoring is Stage One of the RtOI Continuum.

It all starts with Remove Monitoring

Many organizations in this stage may employ localized compute power to enable processing of massive amounts of data at the edge. Their goal is to monitor machines and operating conditions such as power, cooling, and energy consumption, all in real-time.

An IT professional may have a handle on the enterprise center but not necessarily the edge sites which are supporting apps and machines (networked and non-networked) from less accessible (or hospitable) remote locations. This is where smart alerts become critical to ongoing operations.

Smart alerts warn of an incident, such as equipment failure, or pending SLA violation before it occurs and provide a standardized way of managing the event with a predetermined escalation path.

"Organizations are faced with an avalanche of data, all in siloed views across their infrastructure, from the data center to the edge," explains Craig Compiano, Modius President. "So, they don't have normalized and structured data for a cohesive view across all locations and devices. The value in Stage One of the RtOI Continuum is standardized event and alarm data, regardless of make and model or location of your devices."

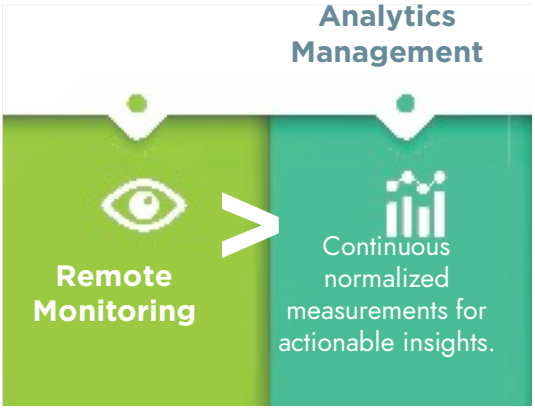
"During this first stage of the Continuum, all the disparate, unstructured, siloed data—from every remote location—is gathered into a single source of truth," he continues. "Now you have a holistic view to all discrete events, like equipment failure and all relevant supporting measurements of device health. This is the baseline—watching everything live, continuously, in real-time."

Even at this initial level of the Continuum, organizations will begin to see concrete ROI. Some benefits will come in the form of more efficient operational staffing with a standardized way of responding to event management. Some benefits will come in the form of simple, but profound insights. For instance, you now have the ability to view all metrics and measurements within the data center, including operational status, temperature, vibration, energy consumption, etc. from disparate and geographically distributed machines. And end-to-end monitoring covers the network all the way out to every edge device, which are also monitored in real-time—no matter what the make, model, or location.

Now users can access all data in a simple single interface, saving 30-40% of their time.[3] Monitoring may sound simple, but without this level set of data, any business intelligence project is doomed to stagnate.

Stage Two: Analytics Management

Stage One monitors "a moment in time"; Stage Two incorporates the ability to develop an array of sophisticated analysis of trends, time-aligned and normalized for easy comparison. With the ability to rapidly collect and analyze data, you begin to identify historical issues across the business that are holding you back or negative trends which might trigger an SLA violation and instead allows you to take preventative action. In Stage Two, analytic reports can be generated ad-hoc or can be scheduled to enable recipients to analyze historical data and identify trends.



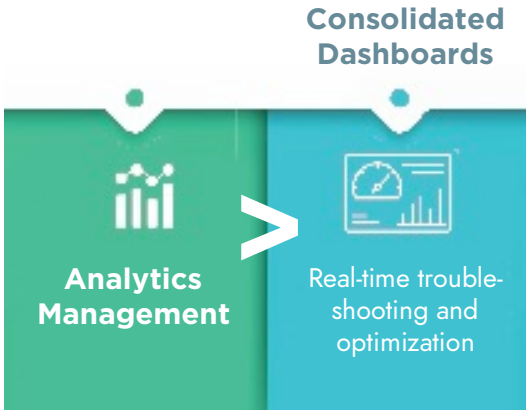
Remote Monitoring allows for Analytics Management

Organized reporting—via integrated charts, graphs, and other reports— turns your data into a narrative. Now you can study regions, departments, and equipment history to discover and deliver valuable insights and recommendations. The low hanging (ROI) fruit is improved communication, increased productivity, more accurate analysis, and more agile business responses.

Now you can see real-time trending device health and events," explains Compiano, "And you can begin analysis of time-series data to view history and trend metrics, all enterprise wide."

Stage Three: Consolidated Dashboards

To make this valuable data truly actionable requires a robust, on-demand personalized user interface that allows access to your analytics, including the ability to quickly drill deep into data, including individual edge devices.



Analytics Management for Consolidated Dashboards

While Stage One and Stage Two operate in a reactive fashion, in Stage Three, live, interactive dashboards allow the response to be more proactive.

"Live dashboards are all about availability," explains Mark Carberry, Modius VP of sales. "Now you have instant access to continuous and historical measurements." The data is no longer buried in reports; streaming analytics are immediately accessible on the monitoring screens. Now RtOI is really kicking in.

> **"Live dashboards are all about availability."**
> — MARK CARBERRY, MODIUS VP OF SALES

"Whatever stage you are on, you always want a standardized way to link the structure of a dataset (its physical layout) with its semantics (its meaning)," says Compiano, "A standard method of displaying a multivariate set of data is in the form of a data matrix in which rows correspond to sample individuals and columns to variables, so that the entry in the ith row and jth column gives the value of the jth variate as measured or observed on the ith individual."

Imagine a large telecommunications company with thousands of networking sites to manage. If one site goes down, communications can be affected. Having a consolidated view of the performance of all these tiny remote sites can prevent an outage. Consolidated dashboards to monitor facilities, report alerts, and spot dangerous trends are critical to continuous operation. The same can be said of edge data centers and global manufacturing plants.

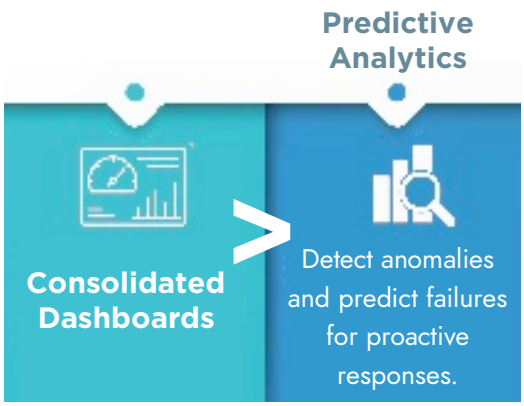
"Dashboards are basically mashups of different reports and charts that may be used to tell a story about something of interest," noted Compiano. "For example, all temperature and fuel level readings for a region could help someone spot outliers and dangerous trends."

It is critical that these outputs are available 24/7 to facilitate real-time troubleshooting and optimization. And export options can facilitate manual capture or sharing of information offline. Now you have a comprehensive snapshot of performance, with the immediate ability to identify trends for future decision-making.

Stage Four: Predictive Analytics

Once data is normalized and instantly available, you are able to transition to Stage Four: Advanced Analytics to provide complex mathematical transformations of all your data—no matter what the source.

Now you can correlate multiple sources, measuring and extrapolating data between and among devices, allowing for deeper, richer, insights.



Consolidated Dashboards allow for Predictive Analytics

CIO magazine says the global market for these mathematical transformations—predictive analytics—is projected to reach $10.95 billion by 2022. They note the value is in the ability to "generate future insights with a significant degree of precision. With the help of sophisticated predictive analytics tools and models, any organization can now use past and current data to reliably forecast trends and behaviors milliseconds, days, or years into the future."[4]

"Everyone is looking to future-proof their strategies," says Craig Compiano. "Predictive analytics allows you to detect important correlations between points. Now that you can predict how things will behave, you can detect anomalies and predict failures for proactive responses."

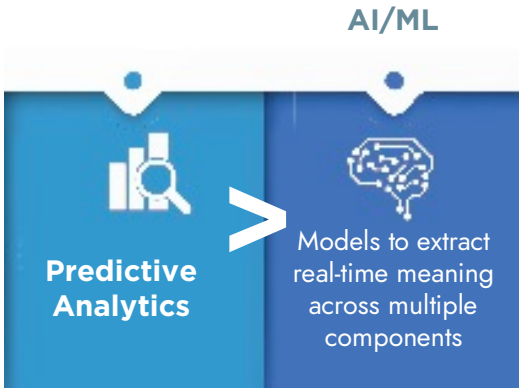
Advanced analytics are key to gaining insight into the availability and performance of critical systems. For instance, whether the facility is a data center or a distribution center, most sites.

have a basic thermostat to control HVACs, but these thermostats will never be able to report enough information to manage performance of the infrastructure. By combining measurements from multiple pieces of equipment or adding context to the measurements, advanced metrics can be employed to spot "hidden" trends and automatically identify a risky situation based upon two or more related metrics.

For example, if you combine metrics associated with the cycling of an HVAC system with temperature measurements, an Operations Manager can be notified of the possibility of an outage resulting from overheating. Advanced analytics adds yet another layer of sophistication in the ability to proactively manage the performance of critical infrastructure. These analytics employ statistical modeling and other mathematical processes—all of which are based on normalized data.

Now you can transform data into KPI's, detect trends, and forecast events and conditions, leading to ROI in performance and operational improvements, preventive maintenance, and market response agility.

Stage Five: AI/Machine Learning:
Machine Learning takes the lessons learned from Stage Four, and develops algorithms that train and improve themselves purely through data, without relying on explicit programming. While advanced analytics rely on Subject Matter Experts to identify and enter initial data, in AI, software defines the inputs and relationships.



Predictive Analytics allow for AI and Machine Learning

Digitalist magazine points out that "Efficient pattern recognition and self-learning are the backbones of ML models, which automatically evolve based on changing patterns in order to enable appropriate actions."[5]

With Machine Learning — the final stage of the RtOI Continuum—you can leverage this ability to introduce self-improving AI algorithms based on learning sets.

These AI algorithms are of massive benefit. Manufacturing plants, for instance, have an unusually high diversity of systems and manufacturing equipment, along with a significant amount of non-networked legacy equipment. This diversity of systems makes it very difficult for factory operators to monitor the conditions in their factories, let alone achieve their desired levels of operational efficiency.

Now manufacturing plants can take AI algorithms (based off of advanced analytics) and develop "self-driving" operational intelligence to enable factory managers to recognize opportunities to mitigate risk, improve efficiency and optimize capacity.

AI intelligence also understands efficiencies and revenue opportunities at deeper levels. And plenty of organizations are recognizing just that: *Forbes* notes that "The global machine learning market was valued at $1.58B in 2017 and is expected to reach $20.83B in 2024, growing at a CAGR of 44.06% between 2017 and 2024."[6]

"There is huge promise with AI and Machine Learning," says Compiano, "but it begins with normalized data. That starts at Stage One and must carry throughout all the Stages in order to gain the true value of the RtOI Continuum."

Machine Learning develops algorithms that improve purely through data.

The Problem of Legacy Systems

As they make their way across the RtOI Continuum, the biggest challenge companies face is multiple legacy systems.

"It's a common problem," says Mark Carberry, "Many companies have a serious lack of simple monitoring. They have an aging system, and as they have invested in new subsystems, the holistic monitoring can fall apart. Their technology is all over the map—and seemingly out of date."

In CIO magazine, Prashant Kelker notes that "reliance on legacy systems is one of the biggest hurdles in the digital transformation journey. The technology industry smells blood and is full of advice: move everything to the cloud, invest in platforms, replace legacy systems with SaaS software, start a legacy modernization program, and create the next generation architecture."[7]

Unfortunately, legacy systems are typically spread across the enterprise, so for most companies, it's cost prohibitive to scrap and replace them with something new.

"This is the Modius advantage," emphasizes Craig Compiano, "Our software works in a configuration model. We can ingest data from any piece of equipment, every make and model, any version of firmware — all permutations at that physical layer. Either it all stays disparate to your database (meaning more unstructured data) or you do what we do: normalize and structure the data, and then send it up to the server."

Modius provides the solutions for managing the availability, capacity and efficiency of critical facilities. It provides all the tools and expertise you need to manage the performance of your mission critical infrastructure, from integration of disparate d evices, to implementation of incremental software tools you'll desire to advance along the RtOI Continuum. From monitoring, to analytics, to integrated dashboards, to AI all in that single pane of glass.

Machine Learning develops algorithms that improve purely through data.

In addition, with Modius, moving analysis to the edge means you only send relevant and sanitized data to the central server, reducing bandwidth issues. So, companies with multiple geographically distributed locations see vast improvements in network speed. Modius' best-in-breed integration approach is paired with data management technologies to provide both real-time and historical analysis at multiple levels of an organization.

The Modius model of collecting at the edge means mediation goes to the central server, ensuring a cyber secure format. With an open data architecture, the distributed security between OT and IT layers means compliance standards are maintained for access to OT data. And the solution connectivity includes secure access to remote devices for more efficient site management. Companies can still employ their legacy systems, but now they are secure.

Finally, the best part may be that Modius routinely does this end-to-end integration for 33-50% less than other providers.

That's because the Modius OpenData® platform doesn't require programming to deploy or individual device drivers for every sensor or edge device. Instead, devices can be

instantiated using simple configuration or prefabricated templates. The savings can be huge because you don't need a controls engineer for every deployment.

Another differentiator is the fact that Modius is not a services company. Selling solutions rather than services makes Modius more nimble in adjusting to customer needs. If you are a services company, your business is to provide services. Modius, on the other hand, builds the blueprint for companies and lets them do as much as they like. Modius can deploy for one or as many locations as needed, but will always empower customers with options so they may decide how best to leverage their existing resources.

A Financial Services company avoided $2M per year in personnel costs; reduced energy costs by $600k per year and reduced operational reporting costs by $100K per year.

Use Cases: "Lots of Little Boxes"

The advantage of the ready-to-deploy, end-to-end platform is that it is cyber secure and ready to deploy at any number of locations. Modius offers a turnkey IoT solution that includes hardware, software, services, and expertise. Whether deployed in the cloud or on-premise, companies can quickly access accurate, structured IoT data.

Modius began by creating solutions for data centers, which are complex infrastructures with high risk assets and centralized servers.

This model translates to telco, utilities, transportation, and buildings. Each of these companies need access to structured and .accurate data from multiple edge sites. This data is centralized to a data center, where it may be accessed using integrated tools, or internal systems.

"As the size of the 'box' goes down and the number of 'boxes' goes up, you have an exponentially larger problem," explains Craig Compiano. "Little boxes in remote locations are typically unmanned with unpredictable equipment. This infrastructure needs to be transformed and integrated, so you can analyze all of the devices across your network."

A major financial services company uses Modius' OpenData to manage 15 data center sites across North America. With the capabilities of OpenData, the customer was able to avoid $2M per year in personnel costs which were needed to staff remote locations 24x7, reduced

energy costs by $600K per year, and reduced costs for operational reporting by an additional $100K per year.

And a major enterprise software and services company employs 4,000 people in 60 countries around the world. Based on the data and analytics supplied by using OpenData, the customer saved 15% of the chiller energy. These projects and others accounted for an annual cost savings of $262,000 and a measurable savings of 2.3 Million kW per year in energy, and deferred $13.5M in capital improvements.

This kind of Real-time Operational Intelligence for industrial operations provides production managers the insight to mitigate risk, improve efficiency, and optimize capacity. Basing decisions on theoretical models or stale data is a risky proposition. RtOI—where data is refreshed in seconds—means the ability to take proactive action and make smarter decisions for resolving issues.

It's important to have an agile analytics platform for your infrastructure," concludes Compiano. "Whether you're using it to manage real-time event data across remote locations, or creating comprehensive trend analysis and operational improvement, or even developing complex AI transformation of data—having a scalable, end-to-end solution is the most important first step."

About Modius

Modius Inc. is a world leading end-to-end solution provider for managing the availability, capacity and efficiency in the critical facilities of data centers, smart buildings, telecommunications and other IoT environments. Founded in 2004 with headquarters in San Francisco, California, Modius has customer deployments around the globe. Modius' flagship offering, OpenData, provides all the tools needed to manage the performance of mission critical infrastructure, from integration of disparate devices, to analytics, to integrated dashboards, all in a "single pane of glass.

Sources

[1] https://www.dqweek.com/structure-the-unstructured-data/

[2] https://solutionsreview.com/data-management/80-percent-of-your-data-will-be-unstructured-in-five-years/

[3] The Universal Mind: The Evolution of Machine Intelligence and Human Psychology, Xiphias Press

[4] https://www.cio.com/article/3273114/what-is-predictive-analytics-transforming-data-into-future-insights.html

[5] https://www.digitalistmag.com/digital-economy/2018/03/15/differences-between-machine-learning-predictive-analytics-05977121

[6] https://www.forbes.com/sites/louiscolumbus/2020/01/19/roundup-of-machine-learning-forecasts-and-market-estimates-2020/#7c338cd25c02

[7] https://www.cio.com/article/3267464/how-to-deal-with-legacy-systems-the-achilles-heel-of-digital-transformation.html

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