FROST & SULLIVAN



Reinventing the Supply Chain with IoT Asset Management

IoT Platforms to Manage Inventory, Suppliers and Customers

IN COLLABORATION WITH

AT&T Business

A Frost & Sullivan White Paper

Information and Communications Technology

50 Years of Growth, Innovation and Leadership

THE STRATEGIC IMPERATIVE

An enterprise deploying an IoT solution has to solve for many challenges from both the operational and IT perspectives. These challenges are amplified by the risks associated with an IoT solution; decisions of "build vs. buy" and the high level of fragmentation in the industry (i.e., the ability to support a solution over a long period of time) are core considerations that cannot be ignored. Moreover, Frost & Sullivan believes that, upward and downward integration capabilities, the flexibility of the IoT platform, and the strength of the partner's ecosystem should be critical criteria to evaluate in the vendor selection process. Making these decisions early can help an enterprise generate a positive return on investment (ROI) at a faster pace.

AT&T's IoT platform has proven to help organizations increase the success of their IoT deployments. Their large ecosystem of partners, long-term solution support, ability to integrate with connected devices at the edge, and enterprise management solutions in the cloud differentiate AT&T from competitors, as enterprises look to digitize their supply chain with IoT asset management solutions.

To support the ability to continuously add or upgrade future capabilities, AT&T has an application development platform (DataFlow) that integrates a wide range of connected devices at the edge, while allowing seamless integration with enterprise cloud solutions. AT&T takes this a step further with its Asset Management Operations Center (AMOC) solution that creates the bridge between operations technology (OT) and information technology (IT) to help enterprises focus on their core business needs, rather than develop a platform in-house to support their growing asset management needs.

The *Frost Radar for IoT Platforms* has identified AT&T as one of the Growth and Innovation leaders in the industry due to its superior performance and customer value proposition. AT&T is positioned as one of the leaders that uniquely enable upward and downward integration. Frost & Sullivan believes the platform is poised to help enterprises create that critical bridge between OT and IT to deploy a successful IoT strategy.



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INTRODUCTION

The deployment of an enterprise Internet of Things (IoT) solution faces many challenges. A typical IoT solution is developed with an amalgamation of technologies and integrated with additional layers of security, micro-services, data analytics, artificial intelligence, enterprise applications, and emerging technologies. The risks associated with such a massive integration require enterprises to work with a partner that has a track record of success and can bring together the larger ecosystem of partners and component sub-systems into one functioning solution. In addition, working with such a partner can help an enterprise answer the age-old question of "build vs. buy". Typically, when developing an IoT solution in-house, enterprises develop point solutions to alleviate a challenge instead of developing a solution that can stand the test of time, allowing the enterprise to continue to add or upgrade capabilities as requirements evolve.

While it is tempting to build an in-house IoT solution, often components of the solution are easier to buy from a reputable solution partner. The strength of this ecosystem depends on how well the IoT platforms are able to integrate and create meaningful offerings for their customers. Devising a strategy to create a robust ecosystem that can cater to diverse customer requirements is one of the most significant conundrums for an IoT platform vendor.

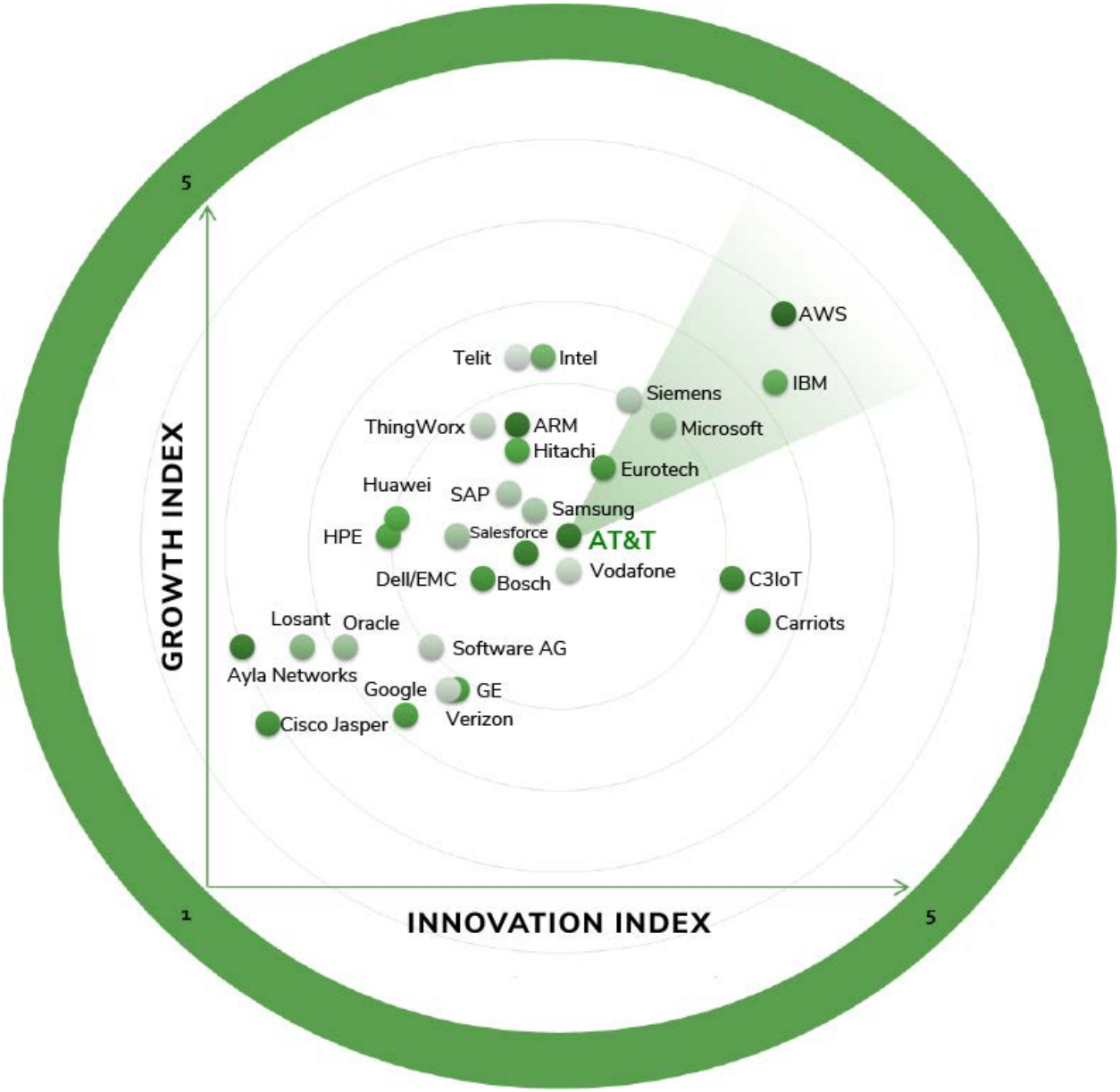
The market for IoT platforms is highly fragmented with hundreds of companies providing platform services. However, no one company can claim that they can provide the entire end-to-end spectrum of services and products. This has frustrated end users that are looking to deploy an IoT solution, often creating confusion with respect to vendor selection and service fulfillment. The value of an IoT platform is, essentially, dependent on three important considerations:

1. The robustness of features and functionality of the platform
2. The strength (and scale) of the platform vendors' ecosystem of partners
3. The ability of the platform to enable both **"upward"** integration with existing cloud services and enterprise applications and **"downward"** integration with edge devices and applications.

In 2018, Frost & Sullivan developed the Frost Radar for IoT Platforms to recognize the platforms that all end users of IoT solutions must consider when developing their IoT strategy and solutions. The process started with over 1,000 companies that call themselves an IoT platform. This was narrowed down to close to 400 companies that have platform capabilities. From that number, the Frost Radar was developed with the 30 companies that have true platform capabilities with a robust set of features, partner ecosystems and the ability to integrate with applications and existing cloud-based infrastructure. The following graphic is the visual representation of the Frost Radar for IoT Platforms.

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EXHIBIT 1: **Frost Radar: Global IoT Platforms Market, 2018**



Source: Frost & Sullivan

While the market for IoT platforms is highly fragmented, there are different types of platforms to consider. Companies such as AWS, Microsoft, IBM and SAP offer IoT capabilities with their partner ecosystems but are better known as the enterprise management companies than as IoT specialists.

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While companies such as GE, Siemens and Bosch provide more vertically-oriented platforms, a key consideration for any enterprise is working with a platform that is horizontally-oriented but can support vertical market use cases. Companies such as AT&T, Telit, Intel, Samsung etc. play the role of leveraging their software platform to bridge the gap between IT and OT.

This is particularly true for applications such as supply chain and logistics. Support for such applications across various vertical markets allows end users to focus on their specific needs rather than developing much of the IoT solution themselves. Working with a vendor that has a large ecosystem of partners and APIs will allow the enterprise to focus on their core business, while IoT partners can design solutions that seamlessly integrate with their existing systems, processes and people.

A FLEXIBLE IOT SOLUTION DESIGN *MUST* BRIDGE THE GREAT DIVIDE BETWEEN IT AND OT

One of the common themes according to end users across vertical markets and use cases is that the requirements for an IoT solution are vastly distinct between operations and IT departments. The focus for IT is generally around integration with existing systems, advanced technology capabilities and security. In contrast, operations personnel use IoT solutions to solve specific and complex business problems, such as a bottleneck in the production process or, for instance, to improve visibility into the arrival of a specific shipment of parts at the factory for assembly.

Another area of contention is the importance of cloud-based solutions. With most enterprise systems being hosted in the cloud over the past decade, IT professionals look towards working with IoT solutions developed using existing public cloud providers such as AWS or Microsoft or IBM, whereas the operations teams are less concerned with the cloud and more focused on storing data from production processes locally to prevent security breaches. Thus, to mitigate these points of contention, it is essential for an IoT platform to perform the critical function of both upward and downward integration.

Downward integration, not only with existing applications but also with potential new applications, is one of the most important considerations when developing an IoT solution. As the needs of a business evolve, so do the applications that will be developed. For example, a manufacturer might begin their IoT deployment with connected sensors to collect data from machines on the manufacturing line. Over time, they might move more of their operations towards just-in-time manufacturing. At that point, they would need to integrate their supply chain to ensure that parts arrive at the right time to reduce physical storage costs. Once they have lowered the operations costs of their parts, the manufacturer may need an outbound IoT supply chain solution to manage how the finished product is delivered to their reseller partners and capture valuable data on the condition of product during transport.

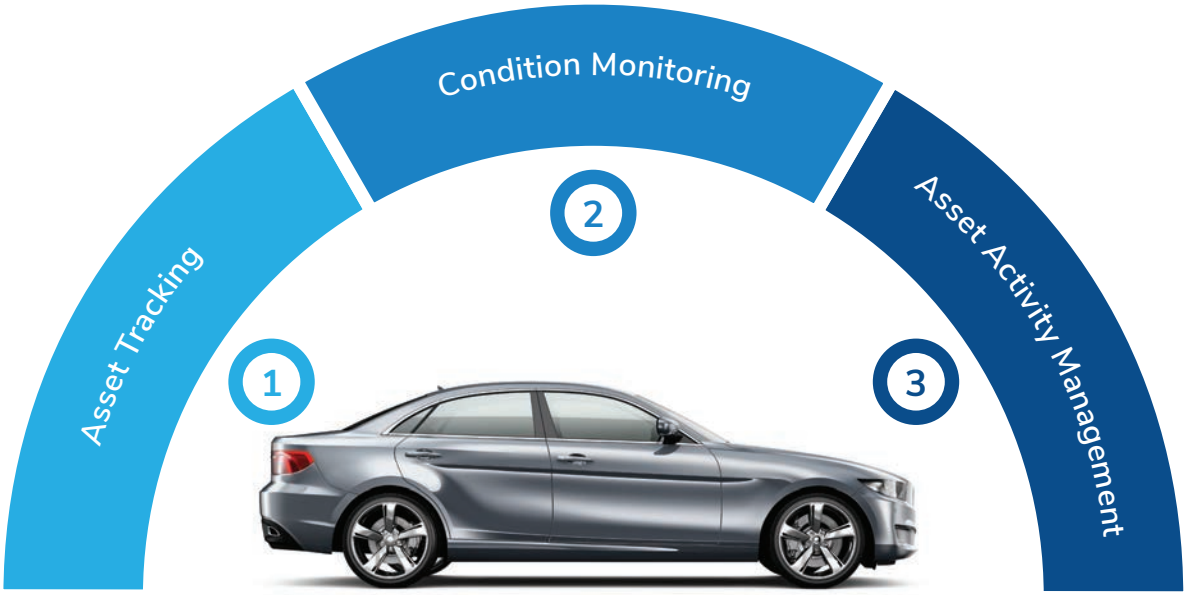
As illustrated in the example above, business needs evolve and an IoT solution ecosystem must have the ability to evolve with those changes and continuously deliver value to its customers.

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REINVENTING THE SUPPLY CHAIN WITH IOT WITH ASSET MANAGEMENT

The Applications

Asset management is one of the broadest applications in IoT. Every industry solution has an aspect of asset management. Within the supply chain, asset management can be broken down in 3 use cases: 1) asset tracking, 2) asset condition monitoring, and 3) asset activity management.



Source: Frost & Sullivan

Asset Tracking: Asset tracking is knowing where your assets are in near-real time and improving customer service with accurate delivery information. Benefits include:

- Easily locate assets in the field
- Asset arrival and departure information
- Helps avoid theft and speedy recovery of assets.

Condition Monitoring: Condition monitoring helps preserve the integrity of your assets by closely monitoring and maintaining an optimal environment. Benefits include:

- Detect excessive movement and shock to ensure sensitive goods are delivered intact
- Maintain integrity of goods with controlled humidity
- Help avoid theft with light exposure alerts
- Help prevent damage from light exposure to high value assets such as fiber optic cabling, artwork, etc.

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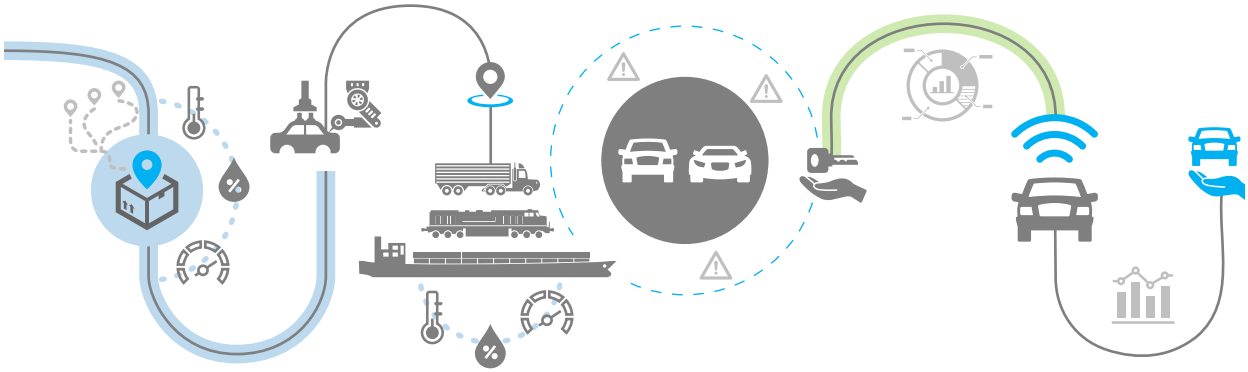
- Capture data from analytics during transportation to detect impacts to condition of raw materials in advance of their introduction into the manufacturing process
- Maintain quality and help improve regulatory compliance of refrigerated goods.

Asset Activity Management: Asset activity management helps ensure day-to-day operations are running smoothly and maintain peak proficiency and productivity of remote assets.

- Get alerted when assets in the field are active or inactive
- Real-time telemetry to maintain optimal conditions such as temperature, fuel levels, etc.
- Receive notifications when assets are entering or leaving a designated area.

The Real-life Scenario

Here is an example of a vehicle OEM managing their end-to-end supply chain.



Source: Frost & Sullivan

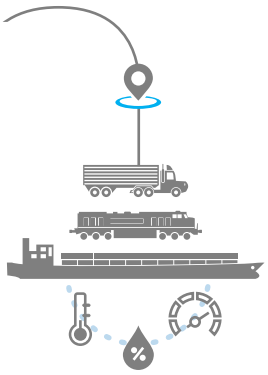
Raw Materials to Factory



- Parts are manufactured by a 3rd party supplier. The supplier uses asset tracking to ship the parts to an automotive OEM.
- The automotive OEM can track the shipments from all its suppliers and develop a schedule for assembling the finished product.
- The shipments are embedded with humidity, temperature, light and pressure/ shock sensors to monitor the condition of the parts throughout their journey to the OEM.
  - » If the data from these sensors exceeds normal thresholds, the OEM can inform their parts supplier so additional parts can be shipped via a faster method to reduce any delays.
- Once the parts are received, the OEM can install all parts and assemble the vehicle.
- The assembled vehicle is inspected and loaded and shipped to its destination.

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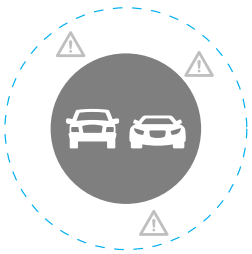
Factory to Dealership



A device that is specific to the dealership is temporarily attached to each finished vehicle to measure the humidity, temperature, light and pressure/shock sensors. The condition of the vehicles can be monitored throughout their journey to dealers nationally and internationally.

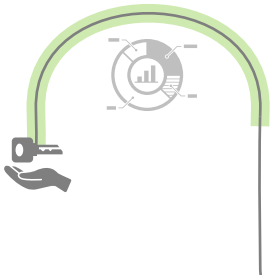
- Correlations between location and conditions can be:
  - » Analyzed to determine alternative routes/transportation partners for future trips.
  - » Used to anticipate remedial action for the vehicles that may have been impacted.
  - » Potential benefit for shipment insurance claims
- Geofences are set up in a GUI for key established locations during the trip (Seaports, Railyards, Truck hubs)
  - » Used for inventory scheduling purposes by dealerships
  - » Helps mitigate theft

At Dealership



- Once the vehicle has been delivered to the dealer, it is put in a geofenced area to notify the dealer if the vehicle has left the lot.
  - » Authorized movement will not result in action being taken
  - » Unauthorized movement will trigger an alert immediately, so vehicle can be tracked and reacquired quickly.

Sale of Vehicle to Consumer



SCENARIO A

Consumers may be concerned about privacy issues

- When the vehicle is sold to the customer, the device is removed.

SCENARIO B

- Consumers that consent per applicable regulation to keep tracker on
- When the vehicle returns to the dealership for servicing, it is automatically provisioned to track the vehicle while it is within dealer premises.

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- Every time that vehicle is in the dealership, data from the vehicle is automatically uploaded to the OEM so they can perform predictive maintenance on the vehicle and ensure all equipment is performing within established parameters.
    - » Any deviance can be reported back to the service technicians so the customer can be informed immediately.

The Solution

AT&T Asset Management Operations Center (AMOC) simplifies IoT implementations, provides visibility of mobile assets on a single dashboard and can help improve operational efficiencies. AMOC enables multiple solutions in a single platform across all major communications protocols, providing a near-ubiquitous solution for an enterprise's asset management needs. So now, organizations can add new connected assets from different vendors running different protocols and easily view and manage them on a single pane of glass.

As carriers ramp up their network to enable 5G connectivity, AMOC provides users with a common UI for all their mobile assets using different connectivity protocols. Powered by the AT&T network and hosted on the Microsoft® Azure® cloud, AMOC features include:

- Data-powered insights in near-real time
- Compatible with multiple LTE and LTE-M devices
- Supports cellular and satellite connectivity
- Enables multiple types of assets on a single platform
- Offers easy integration into a variety of applications
- Provides strong security for sensor data and asset management
- Maximized scalability and global capability

AT&T VALUE PROPOSITION FOR IOT PLATFORMS

An IoT platform is a broad characterization of software solutions that provide various technological capabilities including application enablement and connectivity management. AT&T is a leader for wireless connectivity in the United States with roaming partners globally to support IoT deployments. AT&T has a wide-ranging portfolio of IoT devices that are specific to the variety of use cases within Supply Chain. Whether companies have 53' trailers with a life span of 8-10 years, or pallets used in their warehouses or a vehicle OEM managing parts and finished vehicles in the supply chain, AT&T has relationships with device suppliers and platforms like DataFlow and AMOC to provide end-to-end asset management solutions. While AT&T provides both application enablement and connectivity management, the value proposition of AT&T's application enablement capabilities is particularly noteworthy. AT&T Dataflow and Asset Management Operations Center (AMOC) provide a compelling platform to streamline processes and optimize business operations.

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AT&T DataFlow is a managed, cloud-hosted IoT platform that enables enterprises to create new business value through the transmission, management, integration, and consumption of connected device data. Today's enterprises are complex webs of assets and objects connected remotely that generate vital data. To optimize success, enterprises need to integrate operations under a single, end-to-end, IoT-driven approach that is powerful, flexible, and highly secure. With DataFlow, enterprises can design, connect, accept, control, monitor and analyze connected devices, resulting in actionable insights from IoT data.

AT&T DataFlow enables upward and downward integration with a wide range of device, network and cloud providers working within the technology portfolio of any organization to meet customer needs. Some of the key features of the solution include:

- Onboard devices
  Use pre-built device templates or translate custom protocols to support bi-directional communications with the broadest range of IoT devices.
- Visualize and track
  Data organization, dashboards, rules and applications enablement.
- Integrate with enterprise system
  Pre-built connectors for popular and custom back-end SaaS, OSS/BSS, and cloud systems.
- Deploy to production
  Directly deploy to production from GUI to choice of available geographically redundant hosted clouds (AWS, Azure).
- Develop custom solutions
  Create custom business logic to react to sensor data, transform and augment near-real-time data sets, and generate value from insights.

Benefits of deploying AT&T DataFlow include:

- Develop and scale fast
  Rapid application development and prototyping for new IoT applications. Open-sourced based architecture with hardware, software, and community client libraries to move fast.
- Drag and drop service catalog
  Connect devices and enterprise IT solutions through drag-and-drop interface and catalog of pre-built connectors (without writing code).
- Easy integration
  Deploy enterprise-grade applications into multi-site production, directly from the UI.
- Business operation dashboards and widgets
  Monitor and maintain the health of your connected business.
- Network and cloud agnostic
  Connect any Internet-connected IoT devices and backup and restoration of IoT data on multiple clouds.

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- **Project specification approach**
  Provisioning of ready-made templates plus automatic deployment of servers and infrastructure to deploy custom IoT solutions.
- **Connected objects and registry**
  The ability to track, in near real-time, any number of unique objects, their associated data and relationships with one another.
- **Broker**
  Ability to handle vast quantities of messages directly from connected devices and/or external services, each with unique data management requirements.
- **Device adapter**
  Ability to utilize data from any IoT Internet-connected devices with a variety of protocols and sources, each arriving in unique and traditionally non-compatible formats to ingest and process the data.

THE LAST WORD

In deploying IoT solutions, success for an enterprise is measured in reducing costs, streamlining operations and/or development of new products and services. Enterprises have often been tempted to develop these solutions in-house. However, long term success can only be achieved by partnering with an organization or IoT solution that evolves constantly, enables upward and downward integration of technologies and has a large ecosystem of partners developing new applications.

With AMOC, AT&T has developed an asset management solution

TO HELP ORGANIZATIONS REINVENT THEIR SUPPLY CHAIN TO STREAMLINE THEIR OPERATIONS AND REDUCE COSTS.

To learn more about AMOC, please visit:
https://www.business.att.com/products/operations-center.html

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