

WHITE PAPER

Asset Avatars

Get a 360-Degree View of Your Assets

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Executive Summary

Smart industrial assets are enabling organizations throughout the manufacturing, transportation, energy and urban development sectors to move forward on their journey to digital transformation. These assets are capable of delivering a wealth of data on their own or with the help of external sensors; this data can help organizations drive new levels of competitive growth and differentiation. While the growth of data has the potential to make organizations smarter, as smart-asset data volume increases, so does the challenge of managing and utilizing this data.

To make sense of this data, organizations are turning to internet of things (IoT) platforms to collect and decipher the captured intelligence. Companies in the industrial sector know they need IoT solutions that deliver fast time-to-value and help solve costly problems, such as unplanned downtime. The key to success lies in choosing the right solution to help the organization connect and manage assets.

Hitachi's Lumada IoT Platform provides a complete software platform based on Hitachi's expertise in building both IT systems and the equipment that powers your industry. A core component of the Lumada IoT Platform is the asset avatar. Each asset avatar is a digital representation of a physical asset.

With asset avatars, you can drive automation, predict and prevent costly outages, and move towards a fully automated business. The platform gives you a complete view of a single asset or a view of all your assets at once. This paper shows you how asset avatars can provide the analytics insight and system automation you need to begin your journey to digital transformation.

Introduction: Get a 360-Degree View of Your Assets

Industry 4.0 holds the promise of helping organizations in manufacturing, transportation, energy and urban development to digitally transform with IoT-enabled technologies, advanced analytics, artificial intelligence (AI) and machine learning (ML). Underlying these digital technologies are assets providing vast amounts of data through an array of sensors and IoT-connected assets. The number of IoT-connected assets is expanding at an unprecedented rate, with industry analysts anticipating 20-30 billion IoT-connected assets by 2020. As assets and sensors multiply, the data coming from each asset is exploding in volume and velocity, making the management of that data difficult.

In addition, teams within organizations often have siloed access to data, making management inefficient, and creating incomplete pictures of the health of assets and the entire company. Poor information management contributes to costly unscheduled machine breakdowns, and impacts your bottom line.

To reduce the risk of downtime and make asset management more efficient, organizations need a way to break down data silos, get more insight into their assets, and put information in the hands of the people who need it, when they need it. Asset avatars were designed to provide a 360-degree view of assets, and deliver this information to decision-makers across the organization.

What Is an Asset Avatar?

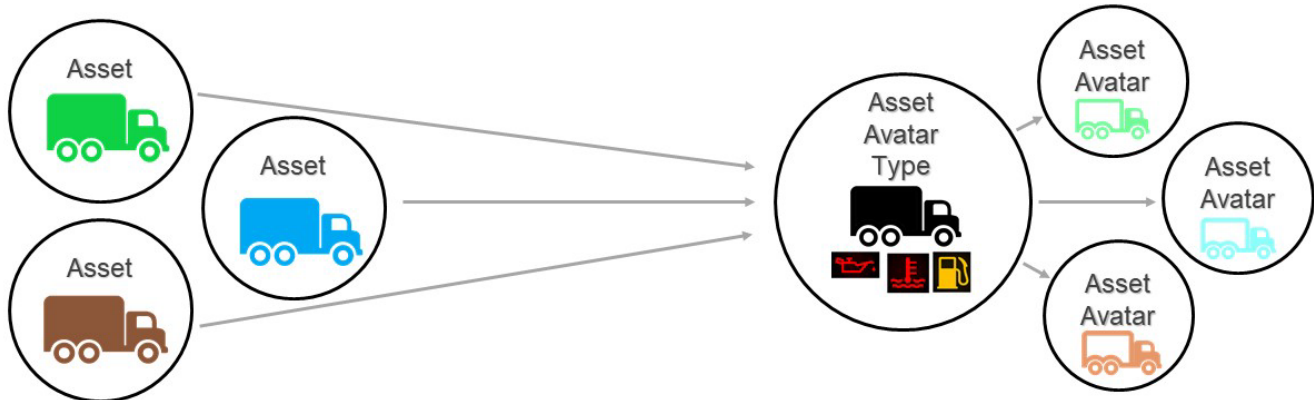
An asset avatar is a digital representation of a physical asset. It enables you to view and monitor key performance indicators (KPIs), such as an asset's sensors, current and historical state, properties and events, no matter where these assets are geographically located. Asset avatars and the assets they represent have a 1:1 relationship: a single asset avatar is associated with only one asset. Asset avatars integrate data from many different locations to enable better information management, collaboration and lower operational costs.

Asset avatars are also defined by an asset avatar type, which is a digital blueprint for a class of physical assets of the same type. The asset avatar type enriches your asset avatar with information about your asset's identity. Asset avatar types can also be associated with assets and applied to asset avatars that share the same characteristics. When it comes to mapping, asset avatar types help translate your assets' raw, unintelligible data into easily understood information.

Asset Avatars in the Transportation Industry

To understand how asset avatars can help manage and monitor asset status, let's look at the transportation industry. If a shipping company manages a fleet of trucks, the definition of a truck can be created as an asset avatar type. The truck asset avatar type defines which sensor data all trucks in the fleet will provide, such as current speed, location, direction, fuel level, fuel efficiency and oil pressure.

For a specific truck in the fleet, an asset avatar is created from the asset avatar type. This avatar monitors the sensors specific to that truck based on data supplied by the sensors on the truck. Fleet managers can get a complete picture of the status of each individual truck in near-real time, so they can respond to problems quickly.



With integration into other business systems, a truck reporting poor fuel efficiency outside the bounds of the KPIs set in the system automatically generates a maintenance ticket to a service system, so the truck can be scheduled for service.

The ability to get a 360-degree view of the status of any particular truck makes fleet management more efficient. It optimizes preventive maintenance and reduces the risk that a truck will need unexpected repairs, resulting in costly delays.

Asset Avatar Type Example

An asset avatar type defines the properties of an asset using JavaScript Object Notification (JSON). This example shows a portion of what an asset avatar type for a single truck in a fleet might look like. The truck type may include properties, such as name, speed, location and engine oil pressure. It does not necessarily need to contain all of the asset's properties. You can define type properties around a specific use case or to describe many of your asset avatars.

```
{
  "properties":{
    "speed":{
      "type":["integer","null"]
    },
    "engine":{
      "properties":{
        "rpm":{
          "type":["integer","null"]
        },
        "fuel_level":{
          "type":["number","null"]
        }
      }
    },
    "type":["object","null"]
  },
}
```

Lumada IoT Platform: Asset Avatars Drive New Levels of Intelligence

IoT solution providers are everywhere, with each promising to help make sense of your data. But few IoT providers have the operational technology (OT) and information technology (IT) expertise necessary to deliver the real value from the data generated. Hitachi's Lumada IoT Platform builds on Hitachi's expertise in harnessing the power of OT and IT. In addition, Hitachi knows how to build asset avatars, designing them to meet the needs of both OT and IT. Asset avatars help you get the full value from your assets on your path to increased automation.

Asset avatars help you take advantage of all the data you already get from your assets, and bring it together to get a complete view of the asset. They break down data silos and put actionable information to work for everyone who needs it. Combining Hitachi's extensive industry experience building the machines industries depend on with the analytics software that understands the data, Lumada IoT Platform becomes an ideal choice.

Lumada IoT Platform builds on Hitachi's experience in the industrial sector, helping you to achieve faster time-to-value through the visualization of the state of your assets. With automation and analytics tied to asset avatars, you can get out of a reactive model, reduce asset downtime and use AI to help predict and prevent failure. It's your bridge to a fully automated system, one that improves efficiencies and lowers costs.

Asset Avatar Capabilities

Asset avatars help you transform the raw data from your assets into a rich description of the asset, based on the sensors and sensor data. Within Lumada IoT Platform, asset avatars can move from the core to the edge. This capability allows asset data to stay close to the assets and help guide the operators of the systems to make faster and more accurate decisions.

Asset avatars:

- Provide insight into the current state of asset.
- Manage KPIs for the asset.
- Integrate assets into business systems, such as an enterprise resource planning (ERP) system.
- Deliver code to execute actions if KPIs fall outside of defined thresholds (for example, sending a maintenance ticket if an asset's temperature is too high).
- Provide code to transform complex machine output into human-readable output using formats, such as YAML.

With these capabilities, asset avatars give you a 360-degree view of your asset, and can route information and run code. The asset avatar becomes an automated extension of the asset (see Table 1).

With asset avatar types, you can send information from a single machine to all similar machines. For example, because asset avatars are based on asset avatar types, a problem found in one asset can be corrected, and the correction sent instantly to all other assets based on that asset avatar type.

This sharing of data helps you automate changes across an entire range of assets in ways that have not been possible before. This enables a more proactive approach to asset management.

Table 1. Asset Avatar Features and Capabilities

Asset Avatar Type	Asset Avatar
A name and unique ID that can be programmatically referenced throughout Lumada	A name and unique asset ID that can be programmatically referenced throughout Lumada
The unique ID of the parent asset avatar type, if it is the child of a complex parent asset avatar type	<ul style="list-style-type: none"> The unique ID of the asset avatar type from which it is derived The unique IDs of one or more groups the asset belongs to The unique ID of the parent asset avatar, if it is the child of a complex parent asset avatar
Baseline metadata about this type of asset	Baseline metadata about this particular asset
New or updated metadata contributed by one asset avatar to be shared with all asset avatars of the same type	New or updated metadata to be shared with the asset avatar type from which it is derived
Names and data types of every sensor exposed by the asset	<ul style="list-style-type: none"> Names of every asset sensor along with current and historical values Ongoing maintenance records
Names and data types of every actuator exposed by the asset to receive commands	Names of every asset actuator to receive commands from authorized services and relay them to the actual asset
User-defined KPIs and/or thresholds for each sensor	A secure access token with a predefined, limited lifetime
<ul style="list-style-type: none"> Code to be executed against incoming telemetry Analytic engines or runtimes used to execute code Multiple blocks of code specified for different purposes and locations including edge data filtering and IFTTT alerting 	A flag to denote whether or not the asset is enabled, for use in blacklisting compromised assets
Asset configuration information including network interface, protocols, data formats, parsing and data transformation information required to initiate telemetry ingestion	
Post-processing data destination	

Asset Avatar Benefits

By providing a 360-degree view of your assets, along with the code and seamless integration to your business systems, asset avatars deliver benefits across the organization. For example, bringing information together in new and meaningful ways with ML and AI can help you to predict and prevent failure of assets, reducing costly unplanned downtime.

With this information, you can also extend the useful life of the machines that run your business by predicting when maintenance is needed and automatically scheduling it when the data dictates, further reducing downtime.

Finally, with advanced analytics and built-in automation, asset avatars can further automate your supply chain management based on near-real-time data from your assets. This helps with planning, when all of the key decision-makers in the organization have access to the right data at the right time.

Begin Your Digital Transformation Journey With Lumada IoT Platform

While talk about digital transformation and the IoT is everywhere, sorting through the hype in the marketplace is challenging. Companies in the industrial sector need solutions that offer fast time-to-value and reduce machine outages. With Lumada IoT Platform asset avatars, you can take advantage of the data your assets already generate and bring that data together to give unprecedented insight into the state of your business.

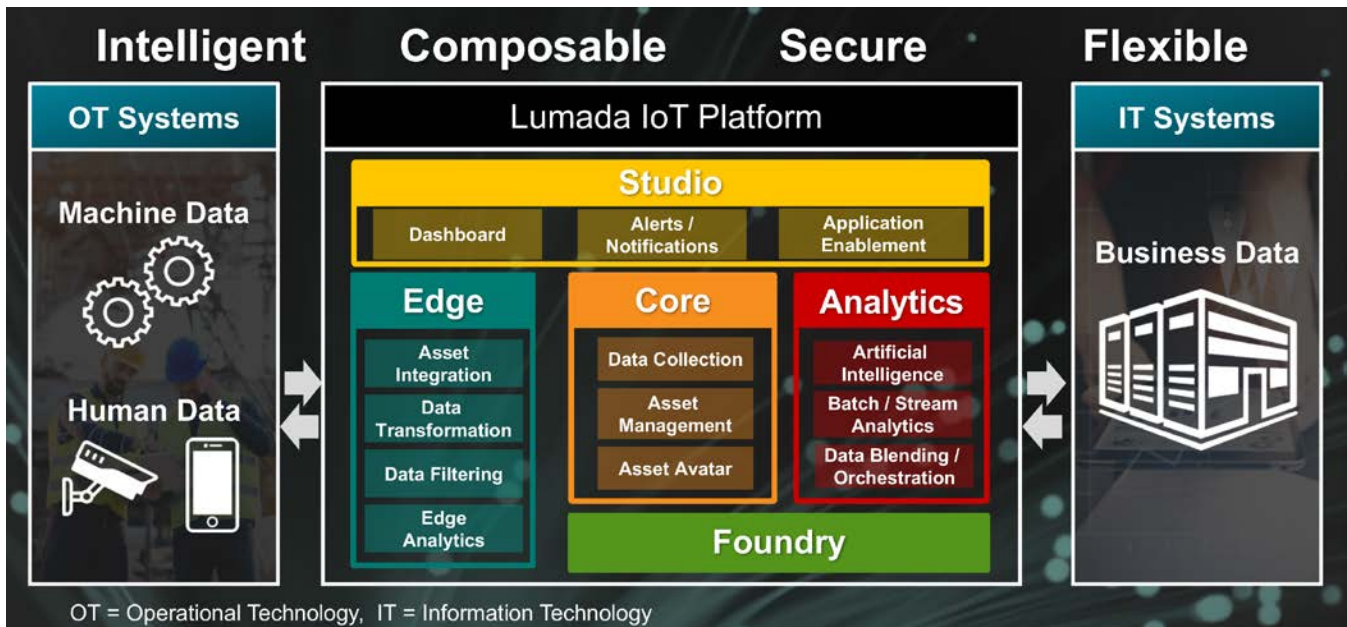
Asset avatars allow you to link operational data and human data to your IT systems. With asset avatars, you use machine learning and AI to take a more proactive, data-driven approach to the assets that run your business. When you utilize the asset avatars within Lumada IoT Platform, you produce better outcomes, extend the life of your assets and realize tangible value from the start.

About Hitachi's Lumada IoT Platform

Your business generates data in many ways. Data comes from machines, including sensors and actuators, distributed systems and enterprise systems. It also comes from your employees, who use a variety of applications and forms, and the IT systems that run your business. Lumada IoT Platform illuminates the data you gather from all sources to help you more effectively achieve the outcomes you want.

To provide an intelligent, composable, secure and flexible platform for IoT, Hitachi built Lumada on four pillars: core, edge, analytics and studio. Foundry provides deployment, repair, upgrade and scaling services for industrial grade software, either on premises or in the cloud. See Figure 1 for a visual of how these pillars fit together. To learn more about how Hitachi's Lumada IoT Platform can enable your digital transformation, visit the [Lumada website](#).

Figure 1. Hitachi's Lumada IoT Platform



When it comes to qualifications, Hitachi has over 107 years of experience in OT and more than 55 years in IT. With extensive resources in people, capital, patents and partners, Hitachi is already providing Lumada IoT Platform solutions for cities, industries and businesses, and helping to pioneer the future.



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