

# Improving the efficiency and productivity of mission-critical systems with Intel® Decision Solutions: Trend Analytics Module

Transform remote monitoring and decision support for aircraft and other industrial systems



The management of mission-critical assets such as aircraft demands a reliable assessment of the current and future operational conditions for that asset.

## CHALLENGES

- Airlines and maintenance and repair overhaul organizations (MROs) require data and advanced analytics for detection, prediction, and alerting about abnormal conditions.
- A trending analysis tool is important to estimate failure progression and a means to strengthen maintenance decision support.
- Unanticipated severe conditions in aircraft engines and systems can lead to costly air turnbacks as well as delays and cancellations (D&Cs).
- Industry personnel must often struggle with a range of asset types with disparate user interfaces from different manufacturers.

## SOLUTIONS

- Increased asset availability improves operational efficiency for asset operators and MROs.
- Enhanced asset visibility and awareness leads to reduced unplanned maintenance and allows a shift to planned condition-based maintenance (CBM).
- Greater real-time insight into asset operation and health conditions results in more timely maintenance actions.
- Expertise in physics-based models drives more accurate analytics.
- An open-system platform provides users with the ability to monitor different types of assets via a single console, reducing operator training, context switching, and expense.
- Rich user management and configuration features reduced lead time to deploy applications to a user's live operating environment.

The management of mission-critical assets such as aircraft demands a reliable assessment of the current and future operational conditions for that asset. Success requires the ability to effectively capture key operational and performance data while the plane is in flight, and then analyze it in a timely manner.

The level of predictive precision starts with the accuracy of the system models on which those predictions are based. Sound models make it possible to identify and resolve potential problems before they deteriorate. They also contribute to the safety and welfare of crew and passengers, as well as the financial health of those who build, fly, and maintain the aircraft.

## **ANOMALY ALERTS: ACTIVE AND PASSIVE**

An anomaly is an unknown, abnormal condition as opposed to a fault, which is a known, repeatable, abnormal condition. When TAM detects an anomaly, one of two types of alert is generated:

### **Active alert:**

Users receive active alerts via email as the alerts are generated, helping ensure important issues can be addressed in a timely fashion.

### **Passive alert:**

Users manage passive alerts by reviewing detailed supporting information via the TAM interface.

## **INTEL® DECISION SOLUTIONS: PREDICTIVE ANALYTICS MODULE**

The Intel Decision Solutions: Predictive Analytics Module (PAM) is a software platform for the validation of analytics and maturation of mission-critical asset management concepts. Built on a similar open-system architecture as TAM, it is an analysis and research environment for manipulating the same operational data.

## **SUPPORT SERVICES**

Support is available from Intel, including providing models to users. With TAM Pro, the support may be included in the contract, which covers creating and improving the system models for engines, monitoring the engines, and sending out alerts as needed.

To learn more about the Trend Analytics Module, contact [\*\*Karthik Murugan\*\*](mailto:Karthik Murugan) ([\*\*karthik.murugan@intel.com\*\*](mailto:karthik.murugan@intel.com)).

# Common user interface streamlines remote monitoring and maintenance decision support for all types of systems and equipment.

## **Intel® Decision Solutions: Trend Analytics Module**

Intel Decision Solutions: Trend Analytics Module (TAM) addresses the predictive maintenance challenges of airplane operators and maintenance personnel with a software solution that enables remote monitoring, trending and diagnostics, and maintenance decision support. Built on an open-system architecture, TAM is a proven commercial-off-the-shelf (COTS) remote monitoring tool for engines, airplane systems and components, and all types of industrial equipment.

TAM provides a Web-based platform for detecting, predicting, and alerting users about abnormal conditions. It incorporates six-sigma analysis and control charting methodology to identify potential problems from the asset's operational and performance data.

Mission-critical assets such as aircraft commonly rely on monitoring technologies from a range of different parts makers, increasing management time and usage complexity. TAM resolves this challenge by delivering a common user front end with a streamlined analytic methodology that accommodates all types of assets, regardless of the manufacturer.

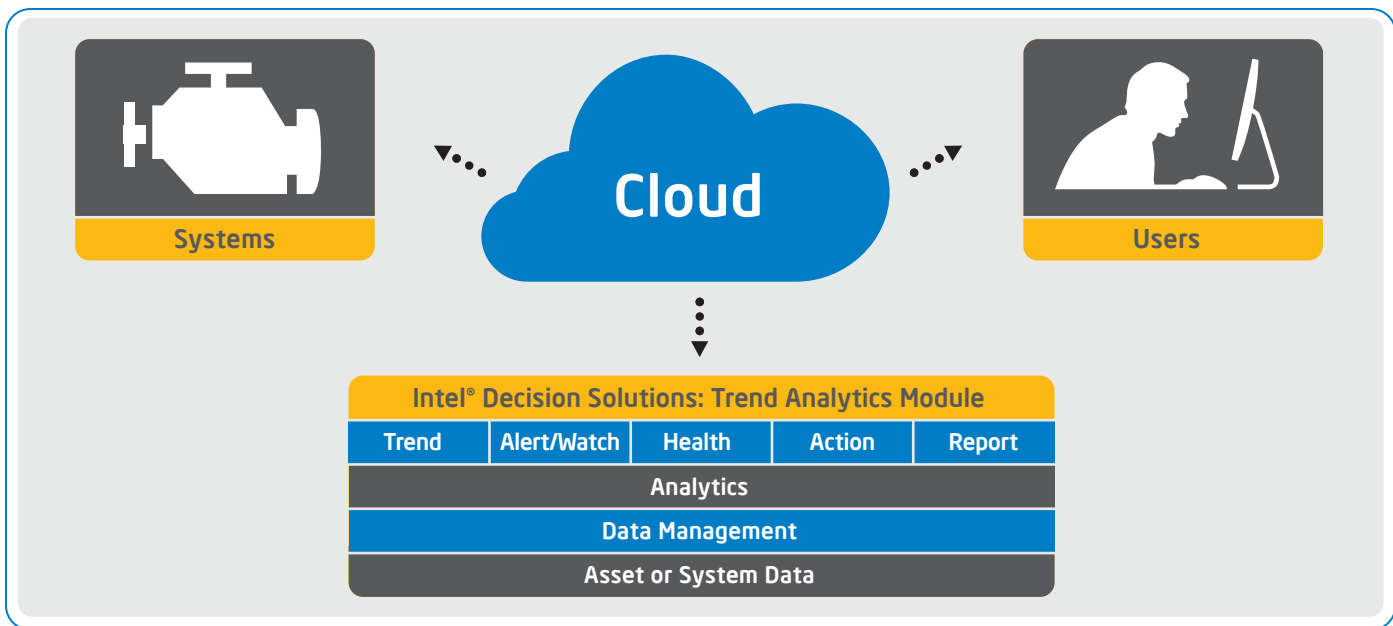
## **Intel Decision Solutions: Trend Analytics Module—Two Options**

### **TAM Pro**

TAM Pro addresses the needs of the enterprise, providing a full range of features for remote monitoring and decision support for hundreds to thousands of assets. User data is hosted on Intel® cloud server(s), and all computation and system resources required to use the application have been optimized. Remote monitoring is provided as a cloud service with the TAM Pro application, negating the need for IT infrastructure and software updates. Results of TAM Pro can be integrated with existing data portals and maintenance planning applications.

### **TAM Basic**

Intel offers a simplified version of the Trend Analytics Module that delivers a subset of features for remote monitoring and decision support. Supporting a limited number of users, monitored assets, or systems, TAM Basic is licensed to customers who then host their own data, manage their own system configuration, and use the software to enable their own remote monitoring offerings. Results of TAM Basic can be integrated into existing data portals and maintenance planning applications.



## TAM: How It Works

TAM is a cloud-based application that is accessed via a Web portal. Management of the data, detection of anomalies, computing analytics, and alerts of potential problems are all handled internally by the software. Alerts can also be pushed to mobile devices in a TAM application called mAlert\*.

Users can choose an Intel-hosted solution with TAM Pro or they can elect to host their own solution with TAM Basic. In the case of the Intel-hosted solution, users send data to Intel, which then provides the TAM Pro application with a high-availability IT infrastructure to the user.

Running on either a Windows\*- or Linux\*-based operating system, TAM is written in Java\* using a component-based architecture. The user interface is accessed via a Web browser on the user's computer or tablet device. Because TAM is a web application, users are relieved of the burden of software updates and version management.

With TAM Pro, operational data from monitored assets is stored in a secure database at Intel. TAM manages the data and performs analyses automatically to identify problems. Rich features are provided for user management and system configuration, reducing the lead time required to deploy the application to the user's live operating environment.

## TAM Features

### Watch list

Create a watch list of certain alerts for a given asset. If the alert reoccurs, the watch list provides a valuable history, offering additional intelligence about the asset and maintenance needs.

### Configuration

TAM software comes with default asset types and an asset hierarchy that users can populate, modify, and add to. Configuration is optimized and does not require IT involvement.

### Data upload

With TAM Pro, in-flight aircraft sensor data is collected and transmitted to Intel. With TAM Basic, users load the data through a predefined format onto the TAM server.

### Database storage

Data is stored in a relational database format on the TAM server. It is easy for users to convert the raw sensor data and deliver it to Intel for storage (in the case of TAM Pro).

### Automatic asset reparenting

If an airline replaces an engine, TAM detects the new engine serial number in the asset hierarchy, and is capable of automatically reparenting that engine.

### Web-based application

A Web-based application, TAM can be accessed by multiple users via one user-friendly interface to monitor all types of aircraft engines and assets from different manufacturers.

## TAM Benefits

*Common user interface*—The user-friendly Web-based interface streamlines asset management, enabling operators to conveniently handle a mix of asset types with different user interfaces from different manufacturers.

*Increased productivity*—Consistent analysis and alerting methodologies allow users to deliver more timely maintenance for improved asset efficiency and performance.

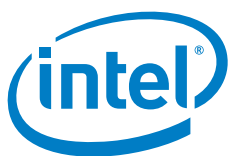
*Reduced lead time*—Rich user management and configuration features enable users to deploy applications to their live operating environment.

*Increased profitability*—Accurate asset visibility and prediction lead to reduced unplanned maintenance; fewer air turnbacks, delays and cancellations (D&Cs); and reduced operator training and expense.

*Enhanced asset availability*—Sound analytics models and alerting algorithms have proven very effective at diagnosing and predicting failure conditions and minimizing asset downtime.

*Greater situational awareness*—The platform approach enables users to monitor many different solutions via a single console.

Intel® Decision Solutions: Trend Analytics Module (TAM) addresses the predictive maintenance challenges of airplane operators and maintenance personnel with a software solution that enables remote monitoring, trending and diagnostics, and maintenance decision support.



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