JTA
PRODUCTIVITY MONITOR

Product Specification

JTA PRODUCTIVITY MONITOR

The JTA Productivity Monitor is a flexibly configurable service for monitoring and analyzing production equipment status as well as productivity data. Other data measured from production machines or the production process, such as temperature and power consumption data, can also be uploaded into the productivity monitor.

The productivity monitor makes it easy to dive into trends in status data for production machinery. This information is based on the status data monitored from the device itself and is therefore reliable information in support of the decision-making process.

Figure 1. Illustration of JTA Productivity Monitor

The productivity monitor is a web-based application and the information provided by the monitor can be displayed flexibly on any internet-connected terminal device, such as a computer, tablet, smart phone or info TV. The trend displayed by the monitor can be scaled flexibly, for example, to the previous hour, shift, or day. The maximum length is 90 days.

PRODUCTIVITY MONITOR DATA CONTENT

The productivity monitor operates on a cloud-based and can be configured to store production status data according to the customer's needs. The JTA Productivity Monitor has pre-configured

default views for monitoring utilization, productivity, quality and OEE, as well as device status information.

Note: above mentioned measurement data requires that the necessary status data can be received from the production equipment. For more information, see Device Integration.

Device Status

The production device status data is stored into a so-called time series database as data points. Most straight forward way to calculate Productivity is to collect status data e.g. from device status beacon (or equivalent):

1. Beacon_green = true; machine producing
2. Beacon_green = false; machine not producing and not in error
3. Beacon_red = true; machine error

Usability

Availability is calculated from the number of data points over the desired time interval as follows:

Usability = {Beacon_green-count(true)} / {Beacon_green-count}

i.e. a machine producing in relation to the total machine available time.

Availability is shown as a percentage of 0-100%.

Productivity

To calculate the device productivity, also “machine is not available for production” status information is needed.

Productivity is calculated from the number of data points over the desired time interval as follows:

Productivity = ({Beacon_green-count} – {Beacon_red-count(true)}) / {Beacon_green-count(true)}

i.e. work in progressin relation to the machine available.

Availability is shown as a percentage of 0-100%.

Quality

Quality refers to the ratio of approved completed pieces to all worked pieces.

Quality information can be collected automatically only if automatic quality control is connected to the production process. The necessary quality data can be added either manually or automatically from customer data system. Quality information requires a customer-specific definition and implementation.

Quality is shown as a percentage of 0-100%

OEE

If each above mentioned measurement data Usability, Productivity and Quality are available, the OEE (Overall Equipment Efficiency) value can also be calculated:

OEE = Usability x Productivity x Quality (e.g. OEE = 0.95 x 0.8 x 0.95 = 0.72)

The OEE value is therefore relative and its value is greatly influenced by, how productivity is to be defined in each enterprise.

Generally can noted that before one starts measuring productivity, especially OEE, it is a good idea to plan in advance, into what the measurement is aiming for. On the other hand, the JTA Productivity Monitor is flexible for reconfigurations, supporting step-by-step towards the goal - approach.

Other measured values

Productivity monitor can also store other information relevant to the process, such as process temperature, power consumption, etc. It is enough to have a suitable measuring instrument installed and its measurement data transferred to the Productivity Monitor database.

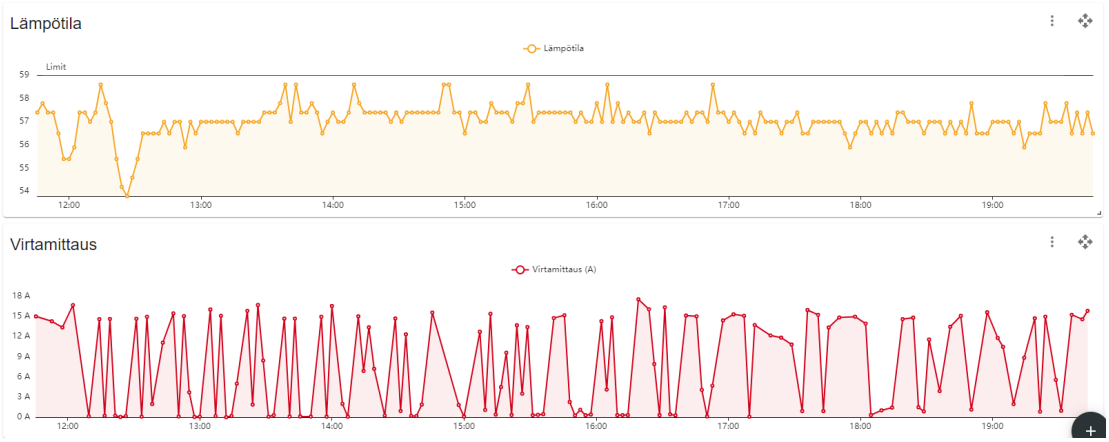

Figure 2. Graphs on temperature and power measurement

The productivity monitor can further refine the data collected. Operations, such sum, average, standard deviation, mode or median, may be calculated. New variables may be generated from the calculation operation. The productivity monitor therefore also enables the presentation of statistical process control cards.

Alarms and Tasks

The Productivity Monitor can be configured for raising alarms based on changes in monitored variables. For example, if a hydraulic filter is blocked (pressure too high), an alarm can be generated on the monitor. Alert information can be sent to the specified e-mail.

Alarms can be used to create tasks, tasks have own page in the Productivity Monitor. Tasks can be directed to users for decision-making. For example, when an alarm comes out of filter blockage, a ticket can automatically be created for the maintenance person. After the filter has been changed, the person can set the task as completed.

Figure 3. Example of alert information

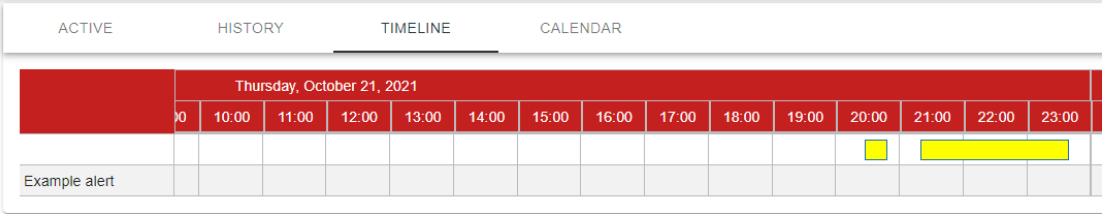

Figure 4. Alert duration on timeline

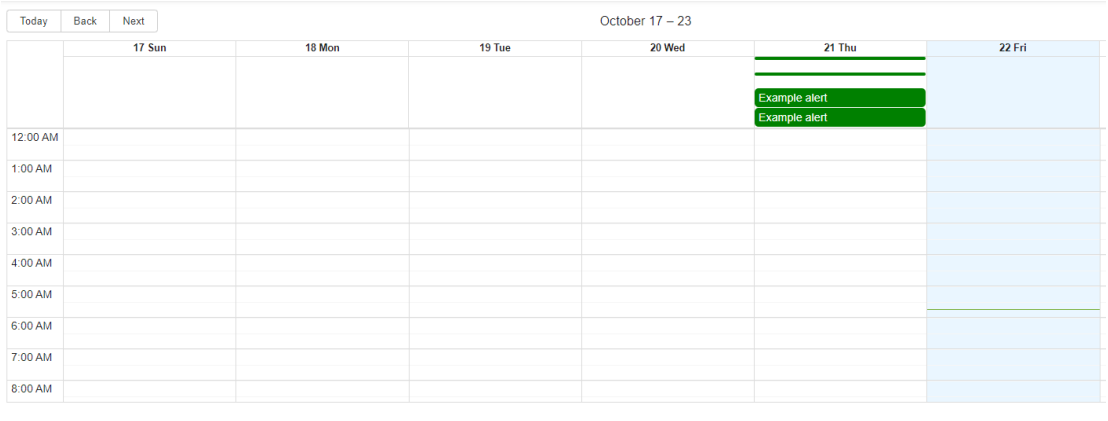

Figure 5. Alerts in calendar

Reporting

In the Productivity Monitor can be created time series -reports based on desired variables. Reports can be created within a specific time interval. Report data points can be saved into a .csv file.

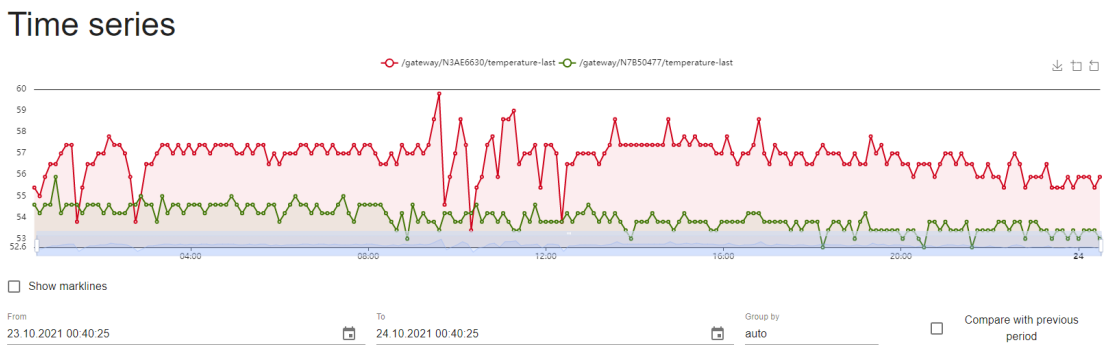

Figure 6. Sample report

Users

Different user roles can be created to view or edit the productivity monitor. Roles can be modified based visibility, as well as editing or viewing permissions.

CONNECTING DEVICES

The productivity monitor uses the Amazon AWS cloud service to store measurement data. The data is stored in the InfluxDB time series database and the PostgreSQL relational database is used to present the data.

Measurement data is sent to the cloud using the MQTTS protocol.

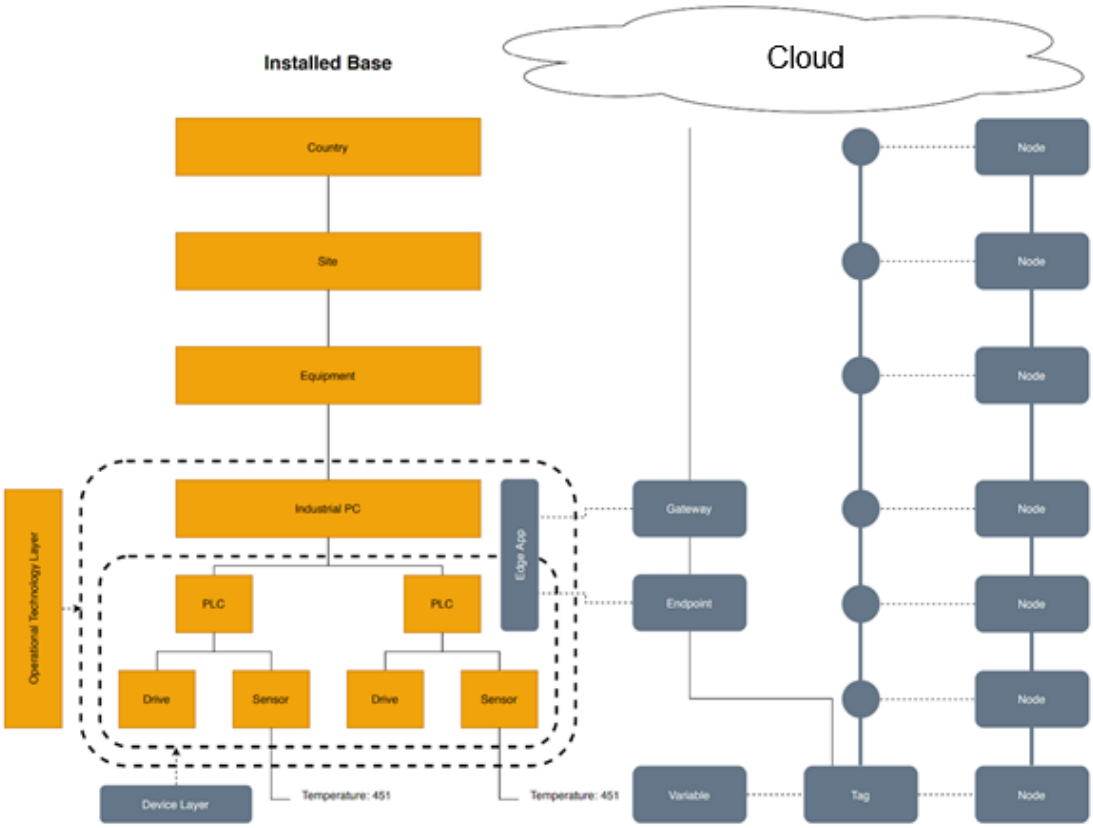

Figure 7. Integration image

Edge application communicates with the production device. The app is installed on a computer, plc, or a separate IoT device. Note, that PC/IoT device is not part of delivery content.

Endpoint is the device on which the edge app is installed and from which it reads data. There may be more than one device behind one gateway.

“Variable” in the picture is a variable that is collected from a production device, e.g. status information.

Tag is the name of the variable. The productivity monitor treats variables as tags.

Node is the path associated with the tag.

Security

The servers used by the cloud are protected by a firewall. All data sent to the cloud is encrypted (256-bit TLS encryption).

It is also possible to send data to the cloud over a VPN tunnel using a Tosibox connection device.

Connecting Production Devices

The measured data is either analog voltage/current change or I/O (on/off) signal. The measurement data is collected and transmitted into the cloud via an edge-device (e.g. PC having installed the edge-app). Edge device needs an internet connection. The edge-device can be a separate IoT data collection device or any other device that supports Docker software (for example, PC or plc).

Several known interfaces can be used to collect data from production equipment, such as:

- Siemens S7
- OPC-UA
- TwinCat ADS
- Ethernet/IP
- Modbus
- MSSQL ja PostgreSQL

Software Integration

The Productivity Monitor can also store information produced by the JTA IMC user interface, such as information about completed parts. The information can be automatically generated by the application or manually entered by the user.

Another data sources can also be used for data collection. Data can be read with MQTT, FTP or from a file.

Software integrations are defined and configured on a case-by-case basis.

EXAMPLE OF JTA PRODUCTIVITY MONITOR DEPLOYMENT

JTA Delivery Content

JTA delivery content consists of an installation and commissioning project and a service usage fee.

Installation and Commissioning

Together with the customer JTA team defines what information shall be collected and shown from the customer's production equipment and/or process. If the necessary signals are not available, the devices shall be equipped with required additional sensors.

When the data is available, the edge app and, if necessary, the IoT data collection device can be installed in the customer's environment. The Productivity Monitor will be configured (connecting signals to tags) and desired monitor pages will be made (alarm, task and report templates, as well as users and user groups).

After training, the monitor is ready for use.

Service Usage Fee

The JTA Productivity Monitor is based on monthly or year-on-year pricing. The price includes the necessary third-party license fees, productivity monitor maintenance and 100 GB of traffic towards the cloud from each terminal. If necessary, traffic volumes can be increased.

Customer Checklist

1. Consider in advance about what information you would like to collect from production machines or process. Remember that it is also possible to collect data from other systems.

2. How do I access the data? Is the required sensors and internet connection available? If you want to collect data from multiple devices of the same type, do you need to harmonise the data so that it is comparable between devices?

3. Consider in what form the collected data is to be presented and what presentation method best supports decision-making. Also, remember that it is possible to make alerts about critical process variables.

4. Where and to whom the data shall be present.

5. Finally, JTA automation and software professionals can help you with any of the questions above.