cab and the Smart Factory

Networked labeling
cab and the Smart Factory

Requirements
In the industrial sectors, more and more productional and logistic environments are based on digital process control systems. Machines exchange information with human beings or with other machines, process manufacture-relevant data autonomously, feed data or forward it. Individualization, scalability, lean and traceable processes as well as reliable devices and components are key requirements.

Most of the applications or services on which the control systems are based are hosted on the Internet. Data from sensors, devices or software are transferred to the Cloud and can easily be exchanged between printers or labeling systems, robots and IT systems - provided that they all speak the same language and understand one other.

The protocol
Open Platform Communications Unified Architecture, abbr. OPC UA, creates the basis for interacting machines and components from different manufacturers in an industrial surrounding. In the OPC UA, various specifications have been united to a consistent data model, thus creating a new interface standard. OPC UA triggers networking in industrial manufacturing, as we know it from network and USB interfaces in offices.

Connected with cab devices
You put a production plant into operation? Or you plan to network your material warehouses according to Industry 4.0? If an IP-ready network is available, OPC UA can already be used as a consistent framework for machine-to-machine information access. In the matter of marking components, products or packaging within a plant, cab label printers of the current generation as well as IXOR labeling devices are already OPC UA-ready. They are able to cooperate with superior control units.

Event-driven labeling
Asking a label printer at the press of a button how he is doing is outfashioned. Today, smart devices automatically indicate that they want to be maintained or that the material to be printed resp. the ribbon are running short and must be replaced. Labels can be loaded remotely, as well as label characteristics can be read and variable data can be exchanged for printing. Operating parameters such as the print head’s running performance so far, its temperature or the number of labels still to be printed in the current job are displayed just in time. Information is transferred by the printer to the plant control system, which identifies and interpretes the information and directly initiates the appropriate measure.

OPC UA as a superior control system offers the advantage of bringing together production data, alarms, events and data history controlled by software under one roof. It integrates and unifies various address spaces and the interfaces to be accessed.

Highlights at a glance
- On demand production
- Automated processes
- Device configuration
- Remote device control
- Device monitoring
- Interoperability
- Prognostics and analysis
- Traceability
- Inventory resp. stock optimization
- Shortening of distances
- Transparency
OPC UA with cab printers

OPC UA features that are at present supported by cab devices* are as followed:

• **Communication Stack**
  OPC UA binary protocol

• **Encryption**
  none
  Basic128Rsa15
  Basic256Sha256

• **Authentication**
  anonymous
  user name/password

While fully authenticated users may have full access to the provided data model, anonymous users may only access printer nodes read-only and are not granted to call any method, even if the method does not change the printer’s configuration or state.

• **OPC UA Services**
  SecureChannel Service Set
  Session Service Set
  Attribute Service Set: reading/writing of attributes, events, no historical data access
  Method Service Set
  MonitoredItem Service Set
  Subscription Service Set
  View Service Set

* cab label printers SQUIX, MACH 4S, EOS2, EOS5, print and apply systems HERMES Q, labeling heads IXOR

Information model

cab printers implement the OPC UA Device Integration (DI) model. Two namespaces are provided:

http://cab.de/Printer for print job monitoring and control
http://cab.de/Printer/Setup for device configuration

The functions displayed on the following pages correspond to the current status and are continuously further developed.
### Namespace http://cab.de/Printer

This namespace provides access to the current state of the printer, including the state of the I/Os, printer model information or any information about the current job status.

#### Node name | Node class | Description
--- | --- | ---
**Printer** | Object | The primary entry point for accessing the printer's information model
FPAGRevision, Manufacturer, Model, SerialNumber, SoftwareRevision, HardwareRevision | Variable | Supply hardware and software versioning information
**Bitmap** | Method | Returns the last printed label in .png format
**Screen** | Method | Returns a screenshot of the printer's display in .png format
**I/O** | Object | Provides software access to the printer's I/O; generates IOSStatusChangeEvent
ENDPOS | Variable | Applicator is in labeling position
ERROR | Variable | The printer is in error state
FEEDON | Variable | A feed is currently in progress, i.e. paper is moving
HOMEPOS | Variable | Applicator is in home position
JOBRDY | Variable | Print data is available
MEDERR | Variable | End of paper or ribbon
PEELPOS | Variable | Label is in peel position
READY | Variable | Printer is ready
**Status** | Variable | Combined I/O status (bit combination) with the following bits set:
RIBWARN 1 FEEDON 4 PEELPOS 16 ERROR 64 
ENDPOS 2 HOMEPOS 8 JOBRDY 32 READY 128
**TriggerInput** | Method | Allows to trigger an I/O input, one of FSTLBL, REPRINT, START, LBLREM, JOBDEL, RSTERR, STOP
**Interpreter** | Object | Job status information; generates ErrorEvent, JobInfoEvent and JobFinishEvent
Current Label | Object | Available whenever a job is executed by the interpreter
Id | Variable | Unique job id of current job
Name | Variable | Job name; name of the current job in Interpreter as provided by JScript j command
Content Fields | Object | Root node of named label content fields. They may be replaced by setting the value of the content nodes.
**abc Status** | Variable | Current status of integrated abc basic interpreter, one of Idle, Compiling, Running, RuntimeException, SyntaxError
Active | Variable | Indicates printer is active, i.e. interpreting or printing
Available Space | Variable | Available print queue memory in %
ESCs | Variable | String containing the result of JScript's ESCs command
ESCz | Variable | String containing the result of JScript's ESCz command
Error | Variable | Provides detailed error information as in the ESCs command; the numeric value may be interpreted as an ASCII char, e.g. 45 == '-' indicates No error
Labels To Print | Variable | Labels to be printed within the current job
Last Job | Variable | Name of last job; see the corresponding direct JScript command j
Online | Variable | Printer is ONLINE, i.e. the graphical user interface shows the home screen
Paused | Variable | Printer is in PAUSE
CancelJob | Method | Allows the cancellation of the current print job
LoadLabel | Method | Allows to load a label from any printer storage
PrintData | Method | Allows to send JScript print data directly to the printer
TotalCancel | Method | Cancels all print jobs scheduled or currently printed by the printer
**Ribbon** | Object | Detected ribbon diameter in millimeters
RibbonDiameter | Variable | Indicates whether the ribbon is considered to be low in reference to the corresponding printer setting
RibbonLow | Variable | The attached cutter device may be used for perforation.
Has Stacking Box | Variable | The attached cutter device has a stacking box.
Statistics | Object | Uptime of printer in minutes
Labels | Variable | Number of labels printed
Operating Time | Variable | Printed thermal direct material in millimeters
Thermal Direct | Variable | Printed thermal transfer material in millimeters
Thermal Transfer | Variable | Printed thermal transfer material in millimeters
SubDevices | Object | Object
Applicator* | Object | Object
Barcode Verifier* | Object
Cutter* | Object
Can Perforate | Variable | Applicator is in home position
Demand Sensor* | Object | Photo sensor status
Rewinder* | Object | Object

* Optional nodes, only available with suitable peripheral device attached
### Namespace http://cab.de/Printer

<table>
<thead>
<tr>
<th>Node name</th>
<th>Node class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SubDevices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ribbon Saver*</td>
<td>Object</td>
<td>Ribbon Saver is initialized and fully operational.</td>
</tr>
<tr>
<td>Sync</td>
<td>Variable</td>
<td>Current state of the print head, one of Printing or Saving</td>
</tr>
<tr>
<td>Head State</td>
<td>Variable</td>
<td></td>
</tr>
<tr>
<td>Synchronize</td>
<td>Method</td>
<td>Issues a ribbon saver synchronization command; only relevant for service tasks</td>
</tr>
<tr>
<td>ToggleHead</td>
<td>Method</td>
<td>Toggles the head state up or down; only relevant for service tasks</td>
</tr>
<tr>
<td>TPH 1</td>
<td>Object</td>
<td>Print head information</td>
</tr>
<tr>
<td>Model</td>
<td>Variable</td>
<td>Human readable description string of the installed print head</td>
</tr>
<tr>
<td>SoftwareRevision</td>
<td>Variable</td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td>Variable</td>
<td>Open state</td>
</tr>
<tr>
<td>SerialNumber</td>
<td>Variable</td>
<td>Serial string of print head</td>
</tr>
<tr>
<td>Temperature</td>
<td>Variable</td>
<td>Current print head temperature in °C</td>
</tr>
<tr>
<td>Statistics</td>
<td>Object</td>
<td>Statistics correlated with the print head</td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IFFS</td>
<td>Object</td>
<td>(I)nternal (F)lash (F)ile (S)ystem</td>
</tr>
<tr>
<td>IFFS Available Space</td>
<td>Variable</td>
<td>Space available on the file system in kB</td>
</tr>
<tr>
<td>IFFS Capacity</td>
<td>Variable</td>
<td>Capacity of the file system in kB</td>
</tr>
<tr>
<td>SD Card</td>
<td>Object</td>
<td></td>
</tr>
<tr>
<td>SD Card Attached</td>
<td>Variable</td>
<td>Indicates whether the file system is attached or not</td>
</tr>
<tr>
<td>USB Memory</td>
<td>Object</td>
<td></td>
</tr>
</tbody>
</table>

* Optional node, only available with service key attached

### Namespace http://cab.de/Printer/Setup

This namespace provides full access to the printer’s configuration tree, which is modeled in the same way as the setting levels of the graphical user interface. The actual position of configuration parameters within the tree is subject to change, so it is not safe to look up a node via it’s browse path. Instead, configuration nodes may be directly accessed by their unique string identifier.

<table>
<thead>
<tr>
<th>Node name</th>
<th>Node class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setup</td>
<td>Object</td>
<td>This sub-node of the Printer node is the primary entry point for accessing the printer’s setup; generates SetupValueChangeEvent and SetupVisibilityChangeEvent</td>
</tr>
<tr>
<td>ExportSettings</td>
<td>Method</td>
<td>Exports printer configuration in .xml format</td>
</tr>
<tr>
<td>ImportSettings</td>
<td>Method</td>
<td>Imports printer configuration in .xml format</td>
</tr>
<tr>
<td>ImportCertificateTLS</td>
<td>Method</td>
<td>Imports a custom TLS certificate</td>
</tr>
<tr>
<td>ResetSettings</td>
<td>Method</td>
<td>Reset to factory defaults</td>
</tr>
<tr>
<td>ResetPasswords</td>
<td>Method</td>
<td>Reset passwords to factory defaults</td>
</tr>
<tr>
<td>&lt;SetupFolder&gt;</td>
<td>Object</td>
<td>Contains setup values</td>
</tr>
<tr>
<td>&lt;SetupValue&gt;</td>
<td>Object</td>
<td>A setup value which can be edited</td>
</tr>
<tr>
<td>isActive</td>
<td>Variable</td>
<td>This setup parameter is currently accessible in the printer’s graphical user interface.</td>
</tr>
</tbody>
</table>

The following setup value types are available:

- **Boolean** values
- **Enumerations**
- **String** values contain the fields
  - **MinLen**
  - **MaxLen**
  - **Regex**, an optional regular expression which will be applied to a write operation on the attribute’s value
- **Numeric** values contain the fields
  - **Range**
  - **Step**
  - **ToggleInt** (optional, for display purpose)
  - **Unit** (optional, for display purpose)
- **Passwords** contain minimum and maximum length attributes just like string values

In order to activate OPC UA functions on your cab device, please contact support.de@cab.de
Events

Beyond OPC UA standard events, cab printers provide the following supplementary events.

<table>
<thead>
<tr>
<th>Event name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ErrorEvent</td>
<td>LocalizedText</td>
<td>Emitted whenever a printer error occurs; generated by node Interpreter</td>
</tr>
<tr>
<td>Message</td>
<td>LocalizedText</td>
<td>Error message</td>
</tr>
<tr>
<td>Detail1</td>
<td>LocalizedText</td>
<td>More details about the supplied error</td>
</tr>
<tr>
<td>Detail2</td>
<td>LocalizedText</td>
<td>Even more details about the supplied error</td>
</tr>
<tr>
<td>JobInfoEvent</td>
<td>Int32</td>
<td>Emitted whenever a label is printed; generated by node Interpreter</td>
</tr>
<tr>
<td>LabelNo</td>
<td>Int32</td>
<td>Number of label within current job</td>
</tr>
<tr>
<td>JobSize</td>
<td>Int32</td>
<td>Size of job</td>
</tr>
<tr>
<td>IsTestPrint</td>
<td>Boolean</td>
<td>Indices that currently printed label is a test print</td>
</tr>
<tr>
<td>JobFinishEvent</td>
<td></td>
<td>Emitted whenever a job is finished and the printer returns to Idle; generated by node Interpreter</td>
</tr>
</tbody>
</table>

Limitations: The OPC UA stack implementation currently does not support:

- Different kinds of Monitored items - either Change notify or Event notify - within a single subscription though multiple Monitored items of the same kind in a subscription is allowed
- Where clauses in Monitored items requests
- Alarms and conditions

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**cab product overview**

**Label printers MACH1, MACH2**
in the lower price segment

**Label printers MACH 4S**
where little space is available

**Label printers EOS2**
Desktop device for label rolls up to diameter 152 mm

**Label printers EOS5**
Desktop device for label rolls up to diameter 203 mm

**Label printers SQUIX 2**
Industrial device for print widths up to 57 mm

**Label printers SQUIX 4**
Industrial device for print widths up to 108 mm

**Label printers SQUIX 6.3**
Industrial device for print widths up to 168 mm

**Label printers A8+**
Industrial device for print widths up to 216 mm

**Label printers XD4T**
for double-sided printing

**Label printers XC**
for two-color printing

**Print and apply systems HERMES Q**
for automation

**Print and apply systems Hermes C**
for two-color printing and applying

**Print modules PX**
to be integrated in labeling machines

**Labels**
made from more than 400 materials

**Ribbons**
in wax, resin and resin/wax qualities

**Label software cablabel S3**
Design, print, control

**Label dispensers HS, VS**
for horizontal or vertical dispense

**Labeling heads IXOR**
to be integrated in labeling machines

**Marking lasers XENO 4**
in 19” housings

**Laser marking systems**
in desktop housings
cab // 820 distribution partners in more than 80 countries