

ByVision Cutting

OPC UA Interface

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1 Introduction

What is OPC-UA?

OPC-UA is a communication protocol to ensure simple, scalable and safe information exchange with the shop floor. It does not only allow data exchange, but provides information modelling capabilities in a platform-independent way. It is essential for the communication and connection of intelligent systems, providing the integration of production data, alarms, events, programs and historical data through the underlying object model. It provides a secure, robust and reliable transport of raw data and pre-processed information from sensor and field level up to control systems and into production planning systems.

- Global open communication standard (IEC 62541), by a vendor-independent non-profit organization (www.opcfoundation.org)
- Simple to adapt on basis of service-oriented architecture (SOA), in which a service provider receives requests, processes them and sends results back with the response.
- Runs on all operating systems and can be implemented through several programming languages
- Secure connection oriented client/server communication model, using X.509 certificates. Signed and encrypted transfer of information.
- Semantic meta-model, that describes the data and its purpose to guarantee the best usage of data (Object oriented address space, including metadata and object description)
- Scalable with a possible integration through all layers, allowing for horizontal and vertical networking of systems, machines and processes.
- Seamless MES integration of systems with OPC-UA simplifies shop floor programming.

Unified OPC UA objects

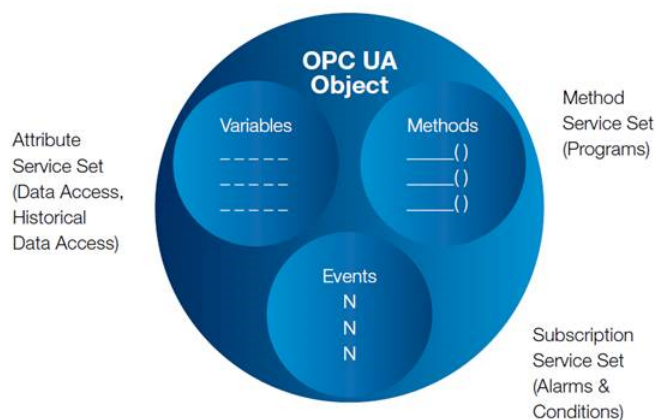


Fig.: 1-1: Source: OPC Unified Architecture, Pioneer of the 4th industrial (r)evolution V2; OPC Foundation

Who is this documentation for?

- Developers familiar with the OPC-UA structure
- System integrators
- IT specialists

How to access the data?

- Bystronic offers the interface and information, integration into the systems lies within the responsibility of the customer.
- Often ERP or MES systems support the OPC-UA standard offering modules to access and interact with the data.
- The OPC foundation offers support and additional documentation regarding the interface on their website.
- Example clients for OPC-UA: “UaExpert” (Unified Automation), products from “Softing” and other OPC-UA program providers or SDK’s with various levels of capabilities.

System Requirements for Bystronic Machines regarding OPC-UA:

- ByVision Cutting (since fall 2016)
- ByVision Bending (since fall 2015)

(Older machines with ByVision can be accessed via the older OPC-Classic protocol)

2 Information model hierarchy

Machine

- ActualJobList
- ActualMachineState
- ActualStateMessages
- ActualSystemInformation
- CNC
 - AxisX
 - AxisY
 - AxisZ
- MachineDataAcquisition
 - MDA
 - MDATime
 - Message
- ProductionDataAcquisition
 - PDA
- Remote
- SoftwareVersions

2.1 Namespaces

Type Namespace: <http://bystronic.com/Machine/>

3 Machine object

Represents the cutting machine.

3.1 Variables

Variable	Datatype	History	Description
ActualJobList	Object	No	See ActualJobList object
ActualMachineState	Double	No	See ActualMachineState object
ActualStateMessage	Double	No	See ActualStateMessage object
ActualSystemInformation	Int32	No	See ActualSystemInformation object
CNC	Object	-	See CNC object
Comment	String	No	Current plan comment
CurrentCuttingPlan	String	No	Current plan name
CurrentUser	String	No	Currently logged in user
EquipmentNumber	String	No	Unique identifier
MachineDataAcquisition	Object	-	See MachineDataAcquisition object
MachineKind	Enum (Int32)	No	Machine kind 1: Laser Cutting 1: Water Cutting
MachineName	String	No	Machine name
MachineState	Enum (Int32)	No	Global machine state 0: Idle 1: Running 2: Warning 3: Error
MachineType	String	No	Machine type
ProductionDataAcquisition	Object	No	See ProductionDataAcquisition object
Remote	Object	No	See Remote object

Variable	Datatype	History	Description
SheetHeight	Int32	No	Current sheet height
SheetThickness	Int32	No	Current sheet thickness
SheetWidth	Int32	No	Current sheet width
SoftwareVersions	Object	No	See SoftwareVersions object

3.2 Methods

3.2.1 GetScreenImage method

Gets a screenshot image from the primary screen.

Input arguments	Datatype	Description
PixelWidth	Int32	Image width in pixels
PixelHeight	Int32	Image height in pixels. If 0 the image height is computed with the correct aspect ratio.

Output arguments	Datatype	Description
Image	ImagePNG	Image in PNG format

4 ActualJobList object

Represents the Job list.

4.1 Variables

Variable	Datatype	History	Description
CutTime	Double[]	No	Cutting Time
CuttetRuns	String[]	No	Finished sheets
Guid	String[]	No	Job Guid
Material	String[]	No	Text
Name	String[]	No	Job name
Param	String[]	No	Job parameter
Path	String[]	No	Job path
Runs	String[]	No	Total Counts
SheetHeight	String[]	No	Sheet height
SheetWidth	String[]	No	Sheet width
State	String[]	No	Job State Inactive Cutting Failed
.Thickness	String[]	No	Sheet thickness

5 ActualMachineState object

Represents the current machine state.

5.1 Variables

Variable	Datatype	History	Description
EffecticeCutProgress	String	No	Cutting Time [%]
MachineState	String	No	Machine state Cutting Confirm Failed
Material	String	No	Text
Param	String	No	Job parameter
Plan	String	No	Plan path
PlanGuid	String	No	Plan Guid
Progress	String	No	Total process [%]
ProgressRoute	String	No	Total cutting way [%]
Run	String	No	Run number
RunGuid	String	No	Run Guid
Thickness	String	No	Sheet thickness
TotalRuns	String	No	Total run count

6 ActualStateMessages object

Represents the current messages.

6.1 Variables

Variable	Datatype	History	Description
AdditionalArguments	String[]	No	Message arguments
ErrorCode	String[]	No	Message code
MessageKey	String[]	No	Message key
MessageSource	String[]	No	Message PLC CNC TRANS STORE PCS
MessageType	String[]	No	Message type Error Warning Info Condition
ReadableMessageText	String[]	No	Message text
TimeStamp	Timestamp[]	No	Message timestamp

7 ActualSystemInformation object

Represents the System information.

7.1 Variables

Variable	Datatype	History	Description
BvcVersion	String	No	Versions information
CncVersion	String	No	Versions information
OsVersion	String	No	Versions information
SourceIntensity	String	No	Source intensity 4400 6000 8000 10000
SourceType		No	Source type Laser Water

8 Cnc object

Represents the CNC.

8.1 Variables

Variable	Datatype	History	Description
AxisX.Position	Double	No	X Axis position
AxisY.Position	Double	No	Y Axis position
AxisZ.Position	Double	No	Z Axis position

9 MachineDataAcquisition object

Represents the machine data acquisition.

9.1 Variables

Variable	Datatype	History	Description
MDA	Object	No	See MDA object
MDA Time	Object	No	See MDA Time object
Message	Object	No	See Message object

10 MDA object

Represents the machine data.

10.1 Variables

Variable	Datatype	History	Description
Automatic	Int	Yes	changed, [0,1]
CncActive	Int	Yes	changed, [0,1]
CurrentUser	String	Yes	current user logged in
DncMode	Int	Yes	changed, [0,1]
ErrorState	Int	Yes	changed, [0,1]
Inverse	Int	Yes	changed, [0,1]
Logon	Int	Yes	changed, [0,1]
MMC	Int	Yes	changed, [0,1]
ManualMode	Int	Yes	changed, [0,1]
ProcessActive	Int	Yes	changed, [0,1]
StartWork	Int	Yes	changed, [0,1]
TimeStamp	TimeStamp	Yes	Message timestamp
WaitContAbort	Int	Yes	changed, [0,1]
WaitMaterial	Int	Yes	changed, [0,1]
WaitOther	Int	Yes	changed, [0,1]

11 ProductionDataAcquisition object

Represents the production data acquisition.

11.1 Variables

Variable	Datatype	History	Description
PDA	Object	No	See PDA object

12 PDA object

Represents the production, plate and parts, data.

12.1 Variables

Variable	Datatype	History	Description
ArticleInfo	String	Yes	Article Info, cut plan
ChargeInfo	String	Yes	Charge Info, cut plan
CurrentUser	String	Yes	Logged in User
CuttingTimePart	Int	Yes	Cutting time [s]
CuttingTimeSheet	Int	Yes	Cutting time [s]
FigureNumber	String	Yes	Figure, cut plan
JobName	String	Yes	Job name, cut plan
NcProgramPath	String	Yes	Cut plan path
OrderNumber	Int	Yes	Order from cut plan
PartCount	Int	Yes	Part count, 1,2,3,....
PlanName	String	Yes	Plan name
PlanOffsetX	Double	Yes	Cut shift X
PlanOffsetY	Double	Yes	Cut shift Y
PlanRotation	Double	Yes	Cut shift rotation
ProgramNumber	Int	Yes	Program number from cut plan
RunGuid	String	Yes	Guid
SheetCount	Int	Yes	Total sheets
State	Int	Yes	Part / Plan 0: start 1: cut 2: cut with restart 3: aborted
TimeStamp	TimeStamp	Yes	Event timestamp

13 Remote object

Represents the remote system.

13.1 Variables

Variable	Datatype	History	Description
Activity	Enum (Int32)	Yes	Activity 0: Unknown 1: Confirm
Category	LocalizedText	Yes	Category name
Comment	String	Yes	Comment
Component	LocalizedText	Yes	Component
MaturityDate	DateTime	Yes	Maturity date (UTC)
MaturityType	Enum (Int32)	Yes	Maturity type 0: FixedDate 1: Counter 2: Hourly 3: Daily 4: Weekly 5: Monthly 6: QuarterAnnually 7: SemiAnnually 8: Annually
Operation	LocalizedText	Yes	Maintenance operation

14 SoftwareVersions object

Represents the software version table.

14.1 Variables

Variable	Datatype	History	Description
Caption	LocalizedText	No	Table title
ModuleName	String[]	No	Module names
ModuleVersion	String[]	No	Module versions