



ATS Bus connects every manufacturing system within your company, from the machines on the shop floor to the systems that oversee production. By collecting, combining and analyzing all of your manufacturing data, no matter the source or the format, ATS Bus presents a fast return on investment and will help you achieve your continuous improvement goals.

How it Works

The basic setup of ATS Bus can be described as follows:

1. Equipment, services and applications are connected to the bus using Bus Stops.
2. Data arriving at a Bus Stop is translated into a standard B2MML format (an ISA-95 standard for XML) before being put on the Bus.
3. The information within the message is available to everyone on the Bus.
4. When another Bus Stop sees information in the message that it wants it translates it and sends it on to the relevant destination.

Available Connections

ATS Bus uses channels to communicate with 3rd party applications or shopfloor equipment. The available connections are described below.

OT Connection Channels

OT channels are used in OT bus stops. They allow shop floor equipment to connect to the bus. Data can either be uploaded or downloaded using any of the channel types.

Channel	Description
OPC	Handles OPC connections using either OPC Unified Architecture (UA) specifications or OPC Data Access (DA) specifications. <ul style="list-style-type: none"> • UA security: Secured using certificates. See Kepware and OPC Foundation websites for more information. • DA security: Permissions can be applied using DCOM settings.
OPC Server	Acts as an OPC UA server. It can be accessed by a Classic OPC Client using a COM Wrapper.
XML	Connects via a local or remote XML file.
CSV	Connects via a local or remote CSV file.
WebService	Supports SOAP and REST communication and provides SOAP/REST host services. It runs as a server sending and receiving XML messages.
MQTT	Supports the ISO standard (ISO/IEC PRF 20922) protocol. ATS Bus supports encryption between the MQTT channel and the MQTT broker using X509 certificates.

RFID	Uses the Octane SDK to communicate with Impinj Speedway readers. The channel connects to the reader using a raw TCP/IP socket. These TCP/IP connections are not secured using certificates.
MTConnect	Supports communication with MTConnect agents that exchange information with CNC machines.
Socket	A bidirectional (client or server) TCP/IP communication channel. It can be used to process CSV, text or binary data. As a server the channel binds to a port. As a client the channel connects to a hostname and port. It does not provide data encryption.
Smart Tools	Connects to torque controllers from vendors that support the Open Protocol specification. These include Atlas Copco, Stanley, ASG and Desoutter.
Weihenstephaner	A protocol frequently used in the packaging and bottling industry. It is TCP/IP based and uses pre-defined tags. See this website for more information.
Extension	Required when other OT channels don't have the functionality required to communicate with a customer's software. It reads and writes to a plug-in (.NET assembly) using a standard interface. It may or may not have secure communications depending on how it's used.
Serial Port	A bidirectional (client or server) RS-232 communication channel. It supports CSV, text and binary data payloads. COM ports can be virtual or physical.
Database	Communicates with Microsoft SQL Server and Oracle databases.

IT Connection Channels

IT channels are used in IT bus stops. They allow the enterprise layer (e.g. MES/MOM/ERP/PLM) to connect to the bus. Data can either be uploaded or downloaded using any of the channel types.

Channel	Description
XML	Connects via a local or remote XML file.
ActiveMQ	Connects via Apache ActiveMQ messaging service. Apache ActiveMQ is an open source messaging and integrations patterns server. Encryption is not currently supported on this channel.
WebService Server	Supports WCF and REST communication and provides WCF/REST host services. It runs as a server sending and receiving XML messages.
WebService Client	Exchanges information with REST, SOAP and HTTP based web services.
Extension	Required when other IT channels don't have the functionality required to communicate with a customer's software. It reads and writes to a plug-in (.NET assembly) using a standard interface. It may or may not have secure communications depending on how it's used.



Data Security

Communication Between Bus Stops

Bus stops communicate with each other using the ATS Bus which is built on top of the service bus framework of NServiceBus. NServiceBus uses the security features supplied by the transports it contains. ATS Bus supports MSMQ and RabbitMQ transports. These transports pass JSON and XML formatted messages, that can be configured by the user, between bus stops.

By default, the message bodies are not encrypted but ATS Bus can encrypt them using AES encryption.

MSMQ

MSMQ security is based on windows user permissions. A queue can be secured by only allowing specific users access to the queues.

RabbitMQ

RabbitMQ and the bus stops support TLS. Visit the [RabbitMQ](#) website for more information. Visit the [NServiceBus](#) website for more information about TLS support when connecting to RabbitMQ.

When connecting to RabbitMQ, a username and password are required to determine what that user can do. RabbitMQ comes with an internal user database where the system administrators can setup RabbitMQ users. Visit the [RabbitMQ](#) website for more information.

RabbitMQ also comes with an LDAP plugin allowing user authentication against AD. Visit the [RabbitMQ](#) website for more information.

Communication Between ATS Bus Applications and Services

ATS Bus applications and services exchange information with each other using a secured connection (TLS).

ATS Bus applications and services access the database via a data service.

To use ATS products, a license is required. This license is installed on a license server. The server is accessed via the network using a secure connection (TLS). This connection requires a certificate. This certificate is installed when installing the data service.

Communication Between ATS Bus and 3rd Party Applications

ATS Bus uses channels to communicate with 3rd party applications and shopfloor equipment. For information on the security features available in each channel see [Available Connections](#) above.

Localised Decision Making

Each bus stop can perform a number of different actions when a message is exchanged with either the outside world or the Bus.

OT Bus Stop

Message Received From Shopfloor

These actions are executed when a message is received from the shopfloor to the Bus Stop.

- **Download Next Order:** Gets the first available order with a matching operation number from storage and sends it to the equipment via a channel message.
- **Download Specified Order:** Gets the order with a matching Lot ID, Serial Number or Equipment ID and matching operation number from storage and sends it to the equipment via a channel message.
- **Update Batch:** Updates the batch record (production run) with the information the received message contains.
- **Calculate Quantity:** Accumulates all produced materials to complete the quantity information in the produced material section of the OperationsPerformance message. The shopfloor message Counters is updated with information from ProducedMaterialContexts counts.
- **Forward:** Forwards the received message to equipment via a channel message. This action can be used for data conversion. For example a message can be received on an XML channel and sent on to a CSV channel.
- **Request Operations Schedule:** Sends request to IT bus stop for the operation schedule for a specified operation.
- **Publish As Operations Capability:** Publishes information from this channel message, such as equipment Ids, equipment states and equipment modes, onto the Bus as a ProcessOperationsCapability message.
- **Download Order By Expression:** Selects and processes specific orders based on user defined expressions.
- **Publish As Work Response:** Publishes information from this channel message, such as equipment Ids, equipment states and equipment modes, onto the Bus as a ProcessWorkResponse message.

Message Sent To Shopfloor

These actions are executed when a message is sent to the shopfloor from the Bus Stop.

- **Start Order On Confirm:** Starts an order on confirmation.
- **Download Next Order:** Downloads the next available order for a selected operation to the production line via a selected channel.

Message Received From Bus

These actions are executed when a message is received by the Bus Stop from the Bus.

- **Enqueue Order Operation:** Enqueues a new order for the specified operation to the list of orders that the bus stop has to run.
- **Download Order Operation:** Enqueues and downloads the order directly to the production line.



- **Update Batch:** Updates the batch record (production run) with the information the received message contains.
- **Download Content To Channel Message:** Downloads the content of the bus message to the production line.

IT Bus Stop

Message Received From Enterprise Layer

These actions are executed when a message is received at the Bus Stop from the enterprise layer.

- **Update Master Data:** Updates master data in the configuration database.
- **Publish on The Bus:** Publishes received information onto ATS Bus.
- **Forward:** Forwards the received message to the enterprise layer through another selected channel.

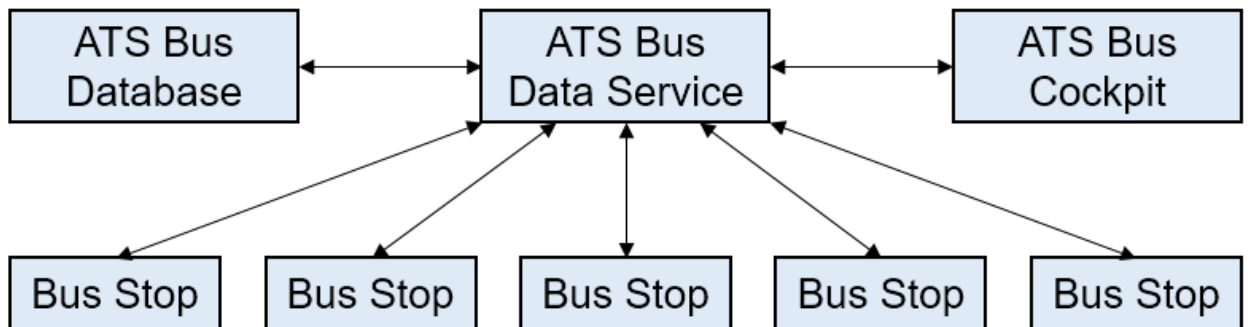
Message Received From Bus

These actions are executed when a message is received by the Bus Stop from the enterprise layer.

- **Export:** Exports the ATS Bus message to the enterprise layer.

Central Configuration

Configuration across the entire network is carried out using the same application within ATS Bus, ATS Cockpit. All configuration information is shared via a data service.



ATS is The *Independent* Solution Provider for Smart Digital Transformation. ATS is a global company offering decades of experience in strategy, deployment and support of IT & OT (Operations Technology) solutions. our experience, your success.

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