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Infineon

Software Design Description (SDD)

SECS/GEM Interface

Infineon Biometrics

Version: 1.9
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Document History

Version	Date	Author	Comment
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1.2	01.08.2023	André Patenge	Format adapted
1.3	04.08.2023	André Patenge	Implementation content added
1.4	06.12.2023	André Patenge	Implementation and Message content added
1.5	14.12.2023	André Patenge	Corrections of typos and formatting
1.6	22.12.2023	André Patenge, Michael Humpl	Added additional commands and events
1.7	12.01.2024	Michael Humpl	Corrected wrong naming and missing placeholder
1.8	31.01.2024	André Patenge	Added separate Tool events (not combined with Material events anymore), added Material Level Event, added Substrate Message, correction of typos and formatting
1.9	22.03.2024	Michael Humpl	Update / Extend CreateLot Command

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Content

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1 Introduction

This document describes the architecture and development design for the MES System especially for the SECS / GEM interface for the Infineon Biometric machine line.

1.1   Document Purpose

This document is the base for any development and will be used by all developers working on this project to share ideas.

1.2   Subject Scope

The document describes especially the SECS / GEM machine line interface and its internal implementation.

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1.3   Definitions, Acronyms and Abbreviations

Item	Description
UML	Unified Modeling Language - general-purpose visual modeling language that is intended to provide a standard way to visualize the design of a system
SECS/GEM	SECS - SEMI Equipment Communication Standard GEM - Generic Model for Communications and Control of Manufacturing Equipment
XML	Extensible Markup Language - markup language and file format for storing, transmitting, and reconstructing arbitrary data
DLL	Dynamic Link Library - Is Microsoft's implementation of the shared library concept in the Microsoft Windows and OS/2 operating systems.
Machine Line	A machine line is the whole line of several main modules. It has a line control software which handles all main modules communication in one central place.
Main Module	A main module is a separate machine or contains several modules and combines these into a logic unit. It can be also a physical machine frame holding several modules.
Module	A module is a hardware and software unit for a specific process.
Item	An item is a piece to be produced or processed on a machine inside of the modules. An Item can also have sub items to be produced (Sheet/Tape → Chips).

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Product	Product is a recipe or process file which contains settings for a specific product currently produced on the machine. In this document it is always call product.
Job	A job is a logical unit of data for items to be produced. It can reference single data sets of units, product to be used and other settings specific for the current production.

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1.4 References

The following documents and contact persons are referenced regarding the requirements.

1.4.1 Documents

Document	Responsible	Description
EQ-Spec Biometric Module Assembly Line signed by IFX.pdf	Stefan Kittl (Infineon)	Equipment Procurement Specification - technical specification for a machine to produce products to the defined function to meet the process specification
TOS_BE_v.2.4.4.docx	Florian Scharf (Infineon) Christian Kaess (Infineon)	Tool Operation Specification (TOS) for Backend – describes all requirements in detail
db-matik_Biometric_Assembly_SRF-for-TOS_BE_v2.4.4 - 2022-05-13.xlsx	Florian Scharf (Infineon) Christian Kaess (Infineon)	Supplier Response Form (SRF) – Lists all requirements briefly – confirmed by db-matik
db-matik_Biometric_Assembly_SRF-for-TOS_BE_v2.4.4 - 2023-07-25.xlsx	Florian Scharf (Infineon) Christian Kaess (Infineon) André Patenge (db-matik)	Supplier Response Form (SRF) – new version of SRF, same requirements, just some corrections
db-matik_Biometric_Assembly_SRF-for-TOS_BE_v2.4.4 - 2022-05-13_Signoff_FINAL.pdf	Florian Scharf (Infineon) Christian Kaess (Infineon)	Supplier Response Form (SRF) – sign off page
APC Parameter List Biometric EQ_2022-04-11_draft.xlsx	Uwe Wagner (Infineon)	List of required parameters (SECS/GEM variables)

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APC Parameter Biometric EQ.pptx	Uwe Wagner (Infineon)	APC Parameter Handling
BiometricModuleAssemblyV3.svg	Uwe Wagner (Infineon)	Additional workflow specification of job and report handling via SECS/GEM
Infineon_Biometric_SECSGEMInterface_Software Requirements Specification (SRS)_v1.3.docx	André Patenge	Requirement specification
Infineon_Biometric_SECSGEMInterface_Software Requirements Specification (SRS)_Requirements List_v1.0.xlsx	André Patenge	Requirements list (related to Requirement specification) – all requirements summary
Infineon_Biometric_SECSGEMInterface_ CollectionEventMapping_v1.0.xlsx	André Patenge	Mapping of messages between XML protocol and SECSGem protocol
SECS-Ethernet-Biometric Interface-05.pdf	Harald Frick	Interface specification between Middleware and Machine Line software

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1.4.2   Contact Persons

Infineon Technologies AG:

- Stefan Kittl – Stefan.Kittl@infineon.com – Project Manager/Development Department

- Uwe Wagner – Uwe.Wagner2@infineon.com – Tool Responsible/Process Engineering

- Florian Scharf – Florian.Scharf@infineon.com – Responsible SECS/GEM interface – SRF and TOS

- Christian Kaess – Christian.Kaess@infineon.com – Responsible SECS/GEM interface – SRF and TOS

AVL Software and Functions GmbH:

- Ege Ozdemir - AVL/TR - ege.ozdemir@avl.com – Developer Event Message Interface

- Begum Sunal - AVL/TR - begum.sunal@avl.com – Developer Event Message Interface

- Isa Karabocek - AVL/TR - isa.Karabocek@avl.com – Developer Event Message Interface

- Ceyhun Ibolar - AVL/TR - ceyhun.ibolar@avl.com – Developer Event Message Interface

- Ulrich Deml - AVL - ulrich.deml@avl.com – Team Lead AVL

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Harald Frick (Freelancer):

- Harald Frick - harald.frick@chello.at – Freelance Developer of Middleware application.

db-matik AG:

- Jochen Lehner – jochen.Lehner@db-matik.de – Project Manager

- André Patenge – andre.patenge@db-matik.de – Senior Software Developer – Responsible for the SECS/GEM Interface

- Bernd Wiltschka – bernd.wiltschka@db-matik.de – Senior Software Developer – Responsible for the SECS/GEM Interface

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1.5   Document Overview

This document gives and overview of the general system, then it describes the specific components and how these will be implemented in detail. It defines interfaces and container objects and the user interface.

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2 Design

In the following the implementation design will be described.

2.1   Stakeholder Concerns

Customer:
- Operator User – The main user of the system. Needs a user friendly and intuitive user interface
- Maintenance/Service User – Has the same requirements as the Operator User but needs additional access to service and maintenance features of the system.
- Supervisor User – Has the same requirements as the Operator User and Maintenance/Service User but needs additional access to correct and fully available data.
- Management User – Needs the information communicated via SECS/GEM interface, the correct and fully available data is required in time.

Development:
- Developer – Needs to know how to implement the business logic and the data handling of the system.
- User Interface Designer – Needs to know which user interfaces are needed and how these have to be designed.

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2.2   Selected Viewpoints

The customer Infineon needs an Interface between the machine line and their MES System CamStar via SECS/GEM interface.

Db-matik needs a reusable and generally applicable interface for any MES systems such as the one from Infineon and other customers. The interfaces should be simply replaceable to be able to connect via SECS/GEM, OPC UA and other future technologies.

2.3   Context

The system will be developed as part of the machine line project for the Infineon Biometric machine. The machine will apply finger print chips to a chip tape. Therefore several processing steps are required. Each processing step needs process information in form of a Product and produced result data. This data and control information will be communicated via SECS/GEM interface.

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2.4   Composition

The following main components are involved.

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2.4.1   Components:

- Infineon Host (Camstar) – The customer main host application requires to receive events and send commands to the machine line. I communicates via SECS/GEM interface. The host is running in the Infineon server environment.

  The Infineon host is handled by Florian Scharf (see contact persons above)

  Note: Beside the Infineon Host there are two further interface to the machine which have no relation to the SECS/GEM interface. It is only shown and listed here for the sake of completeness:
    o   IT Tools (ONDESO) – Monitor IT equipment and take backups of it
    o   Chip Tester Server (IFX) – Handle chip test application

- Middleware (Cimetrix) – The middleware is translating SECS/GEM communication into internal XML Message communication via TPC/IP.

  It is a C# server application based on the Cimetrix SECS/GEM library (Cimetrix CIMConnect, 1.16.7.906). I will run on a dedicated Middleware PC (Industrial PC: Windows 11 Professional 64 Bit, Intel Core i7 13600, 16GB DDR5-4800, 1TB Samsung SSD).

  The middle ware is developed completely by Harald Frick (see contact persons above).

- The MES Interface with specific SECS/GEM is the internal handler of commands, events, so overall information between the different machine line modules and the external interface, in this case the middle ware (above).

  It will run as component of the machine line software and integrates via interfaces into each of the sub modules.

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It communicates to the middle ware with XML
Message communication via TPC/IP and internally via standard
message protocol, method calls and container objects.

The implementation will be done by André Patenge (see contact list above).

2.4.2   Interfaces

- SECS/GEM Interface – This interface will be covered by the Middleware (Cimetrix) and only indirectly part of the implementation. Only the information, commands and events have to be covered the physical interface and communication protocol is taken over by the Cimetrix Library within the Middleware.

  This interface is fully defined and specified in:
  - SEMI E30 - GEM – The Brain/Equipment Functionality
  - SEMI E5 - SECS II – Message Specification
  - SEMI E4 - SECS I (RS232) – Replaced by E37
  - SEMI E37 - SECS I (HSMS) – Ethernet/TCP/IP

- XML via TCP/IP – This interface is required to communicate between the Middleware and the MES Interface in the machine line software.

  This interface was specified by Harald Frick in the document: "SECS-Ethernet-Biometric Interface-05.pdf"

  The first version of that XML message interface was done by AVL,

- Internal Interface – Machine software message interface – Internal existing Interface and method calls.

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2.5   Logical

The System will be split into 4 main parts.
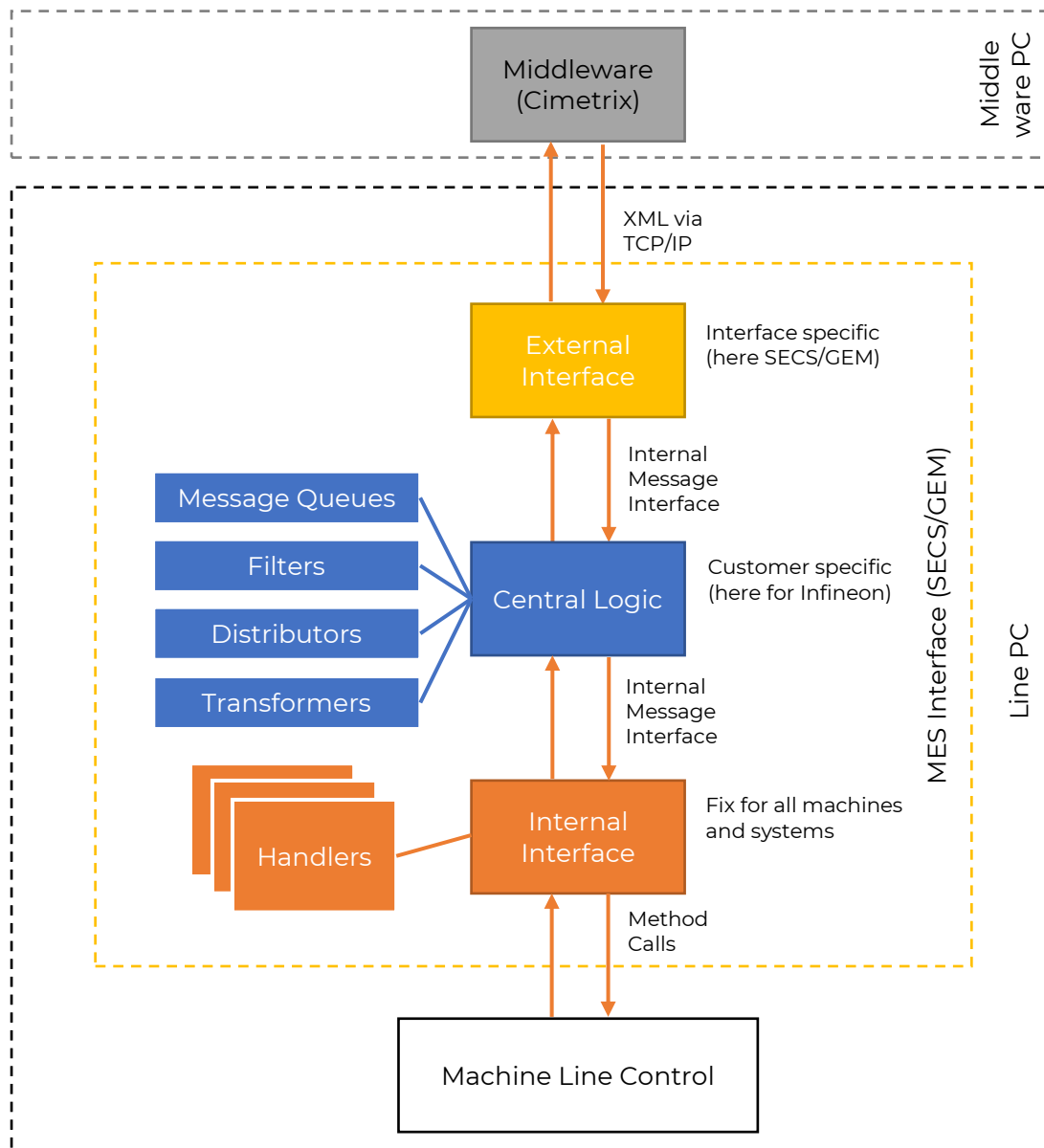
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2.5.1   Internal Interface

This interface builds the integration layer to the machine software itself. It receives events from the machine work cycle and other central components.

It will contain handlers for each specific element of information to be shared or command to control the system.

This interface should be the same for any machine. For sure it will be extended by any required element in the future, if needed.

The internal interface will be provided as DLL. It will be loaded on demand by selection of the DLL via configuration by the machine control.

2.5.2   Central Logic

The central logic is the component which handles the communication between the internal (above and the external interface (below).

It will contain:
- Message Queues:
    - Incoming Messages (Commands) from Customer MES
    - Outgoing Messages (Events) to Customer MES
- Filters: Defines what Message will be processed
- Distributors: Define where a Message goes to
- Transformers: Transform Data from external to internal formats and vice versa

The base implementation will be the same for any machine project.

The Filters and Distributors will have a customer specific implementation. It will be derived from the base implementation and overrides its functionality if needed.

The central logic will be provided as DLL. It will be loaded on demand by selection of the DLL via configuration by the internal interface.
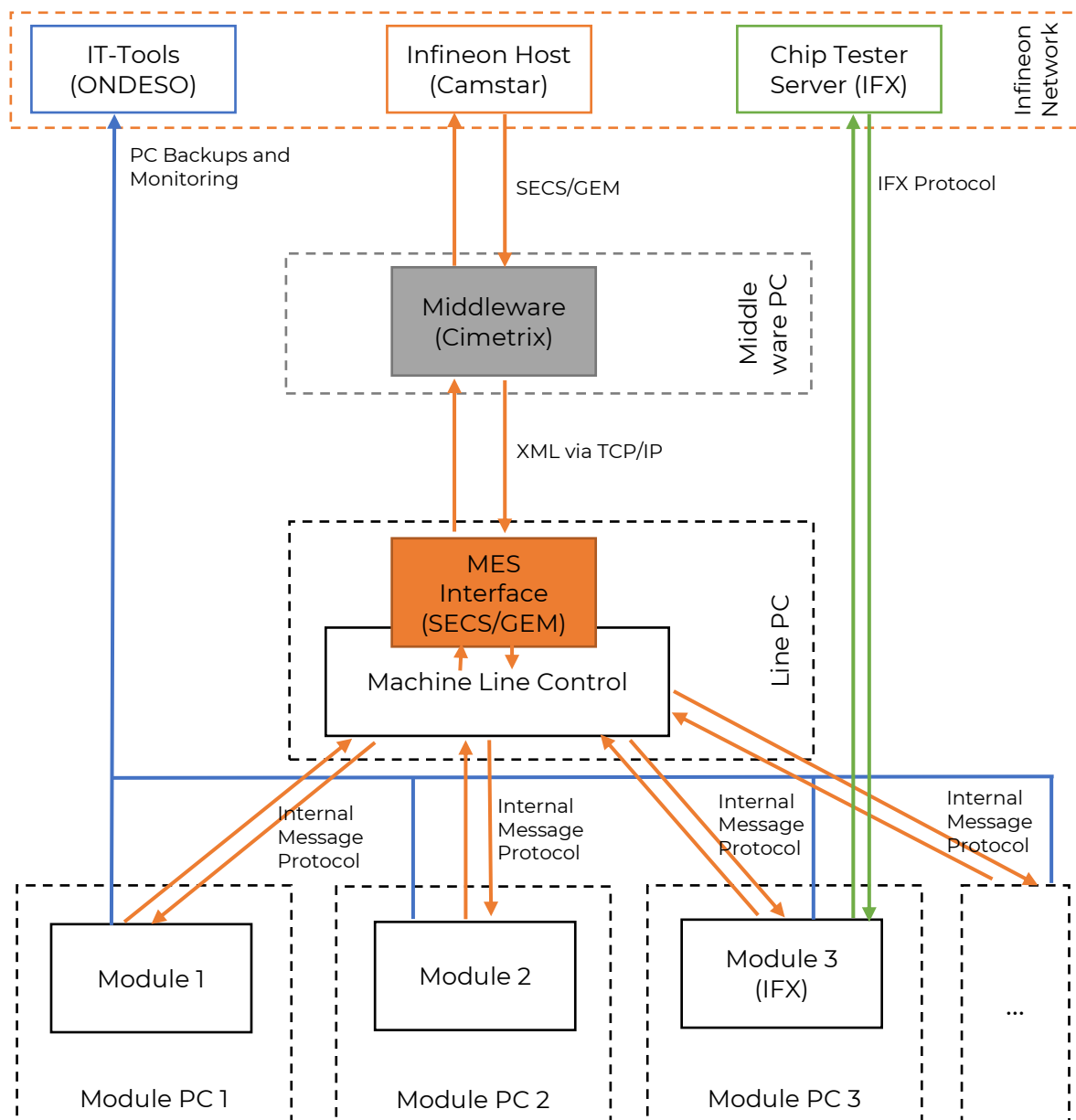
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2.5.3   External Interface

The external interface is the component which does the communication with the external system, such as the customer MES.

The external interface will implement the interface to the Cimetrix SECS/GEM Middleware (as described above).

It will be implemented for any further interface, e.g. OPC UA and others.

The external interface will be provided as DLL. It will be loaded on demand by selection of the DLL via configuration by the central logic.

2.5.4   Framework

The communication between the 3 components above (internal interface, external interface and the central logic) will be done via Message interface and method calls.

The communication classes for that will be defined in the Framework library.

The framework will be provided as static library which will be loaded by each projects which requires to have knowledge about the communication classes.

In the following each of these 4 components will be described in Detail.

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2.6 Internal Interface

2.6.1.1 Fix Events (MES Interface, already existing)

The following fix events are already defined and will be used to communicate information to the MES system.

- Set Machine Process State
  The machine process state changed

- Set User
  The User changed by login to another user

- Set Product
  The recipe was changed

- Set Text Message
  A Message was sent to the GUI to be shown

- Set Popup Opened Message
  An Alarm occurred and waits for user interaction

- Set Popup Closed Message
  An Alarm was cleared by the user

Note: These events are fix implemented already in the machine MES interface and must not be changed for now.

ToDo: Define in detail

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2.6.1.2 Handlers

A Handler is a class or class system which takes care of a specific element of information or command.

- Data Collection Handler (Database, Shift Register and so on)
  - Equipment Constants
  - Status Variables
  - Data Variable
- Product Handler
- Report/Trace Handler (Shift Register)
  - Report after n modules produced
- Remote Command Handler (incoming commands)
- Machine State Handler (machine state)
- User Management Handler (users)
- Alarm/Message Handler (notifications, popups)
- Terminal Message Handler (popups, messages)
- Event Handler (popups)
- Control State Handler (new)
- Material Handler (new)
- Limit Handler (optional, later)

ToDo: Define in detail

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2.7   Central Logic

2.7.1   Filters (What to communicate?)

It can happen that for a specific customer not all data has to be transferred between the machine and the MES. Here filters will be used to filter specific messages and information.

2.7.2   Distributors (Where to communicate?)

The instance which decides which message and information goes where the distributors are used.

2.7.3   Transformers (Turn this into that.)

A mapping or transformation of information and data will be done by transformers. It can for example turn an internal state into a state expected by customer.

2.7.4   Message Queues

Message queues put messages into a queue and handle these one by one.

- Incoming

  The incoming message queue handles messages coming from the MES to machine control (external to internal). These are called "commands".

- Outgoing

  The outgoing message queue handles the messages going from machine software to the MES (internal to external. These are called "events".

  ToDo: Define in detail

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2.8   External Interface

The external interface provides the communication with the MES System.

Here a middleware is used to transform XML messages via TCP/IP into the SECS/GEM protocol. This middleware is called "Cimetrix SECS/GEM middleware" and is developed by Harald Frick. The interface is also specified in the document "SECS-Ethernet-Biometric Interface-05.pdf" but will be explained here as part of the internal specification.

2.8.1   Communication Channels

The communication between the external interface and the middleware will be done via TCP/IP protocol. There will be two communication channels

2.8.1.1 Command Channel (A)

Server: MES System (external interface)
Client: Cimetrix SECS/GEM middleware
Purpose: Send command Messages from middleware to machine.
            Receive response for command messages from machine.

2.8.1.2 Event Channel (B)

Server: Cimetrix SECS/GEM middleware
Client: MES System (external interface)
Purpose: Send event Messages from machine to middleware. Receive
            response for event messages from middleware.

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2.8.1.3 Command

A command message is an active request for information or to trigger for a specific action called from the MES system.

It can be called at any time and has to be processed (if possible or allowed) as soon as possible by the machine or software of the machine.

A command will be always answered by a response message to notify if it was received and could be processed properly. If no answer is provided the middleware has to handle this as an error.

Some command messages will have a response via event message (below). Therefore the event contains a reference to the corresponding command message.

ToDo: Define error handling or retry procedure for missing responses!!!

2.8.1.4 Event

An event message is an active provision of one or more information elements from the machine.

It can be provided at any time when the machine changes a status or variable values.

An event will be always answered by a response message to notify if it was received and could be processed properly. If no answer is provided the external interface has to handle this as an error.

ToDo: Define error handling or retry procedure for missing responses!!!

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2.8.1.5 XML Message Format

Any message, either command or event are defined as XML formatted strings.

Example:
```
<TagName AttributeName="[AttributeValue]">
        [VALUE]
        <SubTagName >…</SubTagName>
        <…>…</…>
</TagName>
```

- The names for Tags and Attributes are CamelCase.
- The definitions for values will be described below in [...].
- If a list of tags in a message occurs it will be marked as <…>…</…>.

Definitions for all command, event and watchdog messages:

[EQUIPMENTID]
        is the equipment name/ID of the machine line.
        It is currently define as "636-360" by Infineon.
        The equipment name/ID has to be configurable.

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Command Message

(Middleware → External Interface, via Channel A)

```
<Cmd ID="[COMMANDID]"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
     <…>…</…>
     <…>…</…>
     <…>…</…>
</Cmd>
```

Command Message Acknowledge

(External Interface → Middleware, via Channel A)

```
<CmdAck ID="[COMMANDID]"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
         <Result>[RESULT]</Result>
         <Error>[ERRORCODE]</Error>
         <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for command messages:

[COMMANDID]

> is the command name/id of the specific command. The command name/id will be the same in it's acknowledge message.
>
> The command ID always belongs of the predicate (verb) and the object.
>
> The event ID of a response event related to a command always adds "Response" to the command ID. The format is camel case.
>
> Example:

Predicate	Object	CommandID	EventID
Get	Variable	GetVariable	GetVariableResponse

[SEQID]

> is the sequence ID for command requests and event responses. It increases from 0 to maximum long (2^{64}) for each command message as long as the system runs. After restart of the system it restarts with 0. This sequence ID will be provided by the middleware.
>
> It will be sent in the command and will be respond in the corresponding response event. In the acknowledge messages it must not be sent.

[CMDSEQID]

> is the sequence ID for commands and it's acknowledge.
>
> It increases from 0 to maximum long (2^{64}) for each command message as long as the system runs. After restart of the system it restarts with 0.
>
> The command sequence ID is sent in the command and it's acknowledge message.
>
> This sequence ID will be provided by the middleware.

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[RESULT]

is the general flag if the message could be processed successfully.

Result Values	
Value	Description
true	success
false	failure

[ERRORCODE]

Error Codes definition:

General Error Code Definition	
Value	Description
0	success
Different from 0	failure

General Error Codes:

Error Codes	
Value	Description
0	OK
-1	Unknown Message
-2	Unknown Parameter
ToDo	Define all error codes

Note: Detailed error codes are defined per message below.

[TIMESTAMP]

is the time stamp of the creation time of the acknowledge message.

The format of the timestamp has to be:
YearMonthDayHourMintueSecondMillisecond

Example:
"20231231235959999"

Note: All required command messages are defined in 0 Messages.

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Event Message

(External Interface → Middleware, Channel B)

```
<Evt ID="[EVENTID]"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
     <…>…</…>
     <…>…</…>
     <…>…</…>
</Evt>
```

Event Message Acknowledge

(Middleware → External Interface, Channel B)

```
<EvtAck ID="[EVENTID]"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for event messages:

[EVENTID]
is the command name/id of the specific command. The command name/id will be the same in it's acknowledge message.

The event ID always belongs of the object and predicate (verb). The format is camel case.

Example:

Object	Predicate	EventID
User	LoggedIn	UserLoggedIn
Alarm	Set	AlarmSet

Note: The events as response for a command are described above under [COMMANDID].

[SEQID]
is the sequence ID for command requests and event responses. It increases from 0 to maximum long (2^{64}) for each command message as long as the system runs. After restart of the system it restarts with 0. This sequence ID will be provided by the middleware.

It will be sent in the command and will be respond in the corresponding response event. In the acknowledge messages it must not be sent.

[EVTSEQID]
is the sequence ID for events and it's acknowledge. It increases from 0 to maximum long (2^{64}) for each command message as long as the system runs. After restart of the system it restarts with 0.

The event sequence ID is sent in the event and it's acknowledge message.

This sequence ID will be provided by the machine software.

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[RESULT]

is the general flag if the message could be processed successfully.

Result Values	
Value	Description
true	success
false	failure

[ERRORCODE]

is the error code for any processing error.

Error Codes definition:

General Error Code Definition	
Value	Description
0	success
Different from 0	failure

General Error Codes:

Error Codes	
Value	Description
0	OK
-1	Unknown Message
-2	Unknown Parameter
ToDo	Define all error codes

Note: Detailed error codes are defined per message below.

[TIMESTAMP]

is the time stamp of the creation time of the acknowledge message.

The format of the timestamp has to be:
YearMonthDayHourMintueSecondMillisecond

Example:
"20231231235959999"

Note: All required event messages are defined in 0 Messages.

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2.8.1.6 Unknown Messages

Any unknown message will be responded by a message response with the error acknowledge message.

Command Acknowledge Message

```
<CmdAck ID="[CMDID]"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>false</Result>
          <Error>-1</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

Event Acknowledge Message

```
<EvtAck ID="[EVENTID]"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>false</Result>
          <Error>-1</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

Definitions for Unknown Acknowledge Messages:

In case of an unknown message the response data will be

Result Data	
Tag	Value
Result	false
Error	-1
TimeStamp	Timestamp of creation of the unknown message response.

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2.8.1.7 Communication

Any command and event message will be handled sequentially per specific channel.

This means if a message is sent, no other message will be sent on the same channel until the response for the message came back.

Definitions for communication timeouts:

In case no message comes back a timeout has to be defined. If the timeout is reached the message will be interpreted as not sent and the next message can be sent.

The timeout has to be configurable.

The default timeout will be defines with:
Timeout: 5 Seconds (5.0 s).

Error Handling:
In case a timeout occurs, the machine will be stopped and an error message will be shown to the user informing about a communication issue. It is not allowed to continue production until the communication issue is solved, otherwise a loss of information can happen.

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2.8.1.8 Watchdog

The watchdog makes sure that the connection between the external
interface and the middleware is still active.

On each communication channel A and B this message will be sent and
responded with and acknowledge message on a regular base.

Watchdog Message
```
<WatchDog EquipID="[EQUIPMENTID]"
      TimeStamp="[TIMESTAMP]"/>
```

Watchdog Acknowledge
```
<WatchDogAck EquipID="[EQUIPMENTID]"
      TimeStamp="[TIMESTAMP]"/>
```

Definitions for Watchdog message:

The Watchdog message will be send every 5 Second (5.0 s). If the watchdog or
response is not sent for more than 5 seconds an error handling has to be
done.

The watchdog frequency has to be configurable.

The default Watchdog message frequency is defined as:
       Every 5 Seconds (5.0 s)

Error handling:
       In case the watchdog message does not arrive in the defined watchdog
       frequency, the machine will be stopped and an error message will be
       shown to the user informing about a communication issue. It is not
       allowed to continue production until the communication issue is solved,
       otherwise a loss of information can happen.

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[TIMESTAMP]
   is the time stamp of the creation time of the acknowledge message.

   The format of the timestamp has to be:
      YearMonthDayHourMintueSecondMillisecond

   Example:
      "20231231235959999"

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2.9 Framework

The Framework defines all base classes, the DLL loading mechanisms and the internal event, command and container classes.

The Framework will be implemented as static library and will be used by the internal interface, the central logic and the external interface to be able to communicate to each other.

2.9.1 Base classes
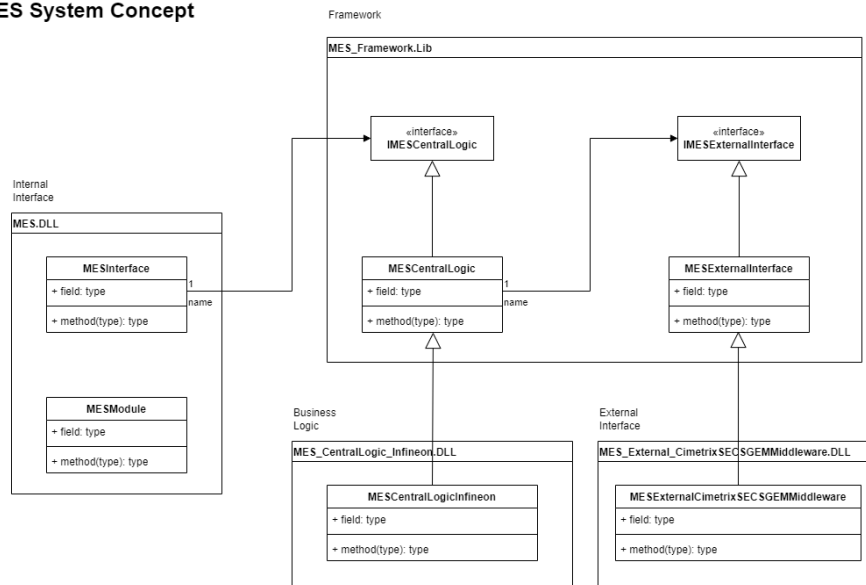
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2.9.1.1 Central Logic

IMESCentralLogic (IMESCentralLogic.h)
Declares the central logic interface

CMESCentralLogic (MESCentralLogic.cpp, MESCentralLogic.h)
Implements the central logic base class functionality, including handling of configurations and settings and the loading of the external interface DLL.

2.9.1.2 External Interface

IMESExternalInterface (IMES*ExternalInterface*.h)
Declares the external interface interface

CMESExternalInterface (MES*ExternalInterface*.cpp, MES*ExternalInterface*.h)
Implements the external interface base class functionality including handling of configurations and settings.

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## 2.9.2	Defines

MESDefines.h – Provide general definitions

Enumerations:

enum class – **eMESMachineState**	
Defines the internal machine process states	
State	Value
Init	0
Loaded	1
Ready	2
Standby	3
NoOperation	4
Setup	5
Down	6
Running	7
Unknown	99

ToDo: define all internal enumerations here.

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2.9.3   DLL Loading

The central logic and the external interface are implemented in form of a DLL. Therefore the DLL exports the derived class of each base class (above) as shared pointer via "create" method (example for central logic).

```
static std::shared_ptr<IMESCentralLogic> create(const
std::shared_ptr<_module::IModule>& macCtrl)
{
    return std::make_shared<CMESCentralLogicDefault>(macCtrl);
}
```

It will be exported via "BOOST_DLL_ALIAS" as "create_plugin":

```
BOOST_DLL_ALIAS(dbmatik::mes::CMESCentralLogicDefault::create,
create_plugin)
```

The object of the derived base class will be stored including the export function itself in a pair (Note: It is important also to hold the function, otherwise the pointer to object of the derived base class is not valid after leaving the current context):

```
    std::pair<std::shared_ptr<IMESCentralLogic>,
    std::function<CreatorCentralLogic>> result;
```

Loading of a DLL will be done via "boost::dll::import_alias"

```
result.second =
boost::dll::import_alias<CreatorCentralLogic>(dllPath,
dllExportFunc, boost::dll::load_mode::append_decorations);
```

"dllPath" is the path to the specifc DLL file on the file system. "dllExportFunc" is the name of the exported method "create_plugin".

Instantiation of the object from the DLL:

```
result.first = result.second(macCtrl);
```

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2.9.4   Containers

There will be containers classes for each data item used in during the handling inside the MES system. There are holding one or more combined data elements which have to be transferred between the external interface and the internal interface, means between the MES and the Machine.

2.9.4.1 Common Container

The common container class is the base class for all following. It contains the timestamp of creation which is an important information for all containers.

- Date Time – DateTime of the creation time stamp

2.9.4.2 Product Container

The product container holds the product information.

- Product Name – String of the product name
- Content – XML string of the product settings

    ToDo: Define how to store the content. XML with all product settings or file, or list of product settings, depending on message below.

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2.9.4.3 User Container

The user container holds the user information.

- Username – String of the user name
- Access Level – Integer of the level of access. The level defines what rights the user in the system has.

  Access Levels:
      0 – Guest/No User
              1 – Operator User
              2 – Process Engineer User
              3 – Maintenance Engineer User
              4 – Service Engineer User
              5 – Developer User

- Default User – Boolean if user is the default user after startup of the machine
- Deleteable– Boolean if the user is deleteable (internal users cannot be deleted)

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2.9.4.4 Process State Container

The process state container holds the information about the current and previous machine processing state.

- Process State – Integer of the current process state
- Previous Process State – Integer of the previous process state

    Processing states:
        Init – Startup of the machine
        Loaded – Machine is started up
        Ready – Machine is ready to produce
        Standby – Machine is waiting for material
        NoOperation – Machine is stopped
        Setup – Machine is initializing
        Down – Machine is in error
        Running – Machine is producing
        Service – Machine is in service

2.9.4.5 Variable Container

The variable container holds the information about a specific variable data (Equipment Variable, Status Variable or Data Variable)

- Variable Name – String of variable name
- Variable Value – String of variable value
- Variable Unit – Integer of unit type

    ToDo: define if unit will be a class or enumeration with type and or name.

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2.9.4.6 Messages Container

All external XML messages will be processed and turned into internal
message objects.

There will be messages classes for command and event messages.

The watchdog messages are only handled by the external interface and will
not have an internal message class.

Base Class:
- Message Name/ID
- Equipment Name/ID (for later use)
- Sequence ID

Command
- Command specific members

Events
- Event specific members

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2.10 Variables

Variable Type Definitions:

EC – Equipment constants
Equipment constants are settings of the machine line and its modules which are general and not product specific. Product specific values are stored in the product settings file.

Equipment constants are readable and writeable. It can be changed at any time from outside, similar to the product (see product messages below)

Equipment constants have a minimum and maximum value. The value can only be in that range. To set a value outside of that range will result in an error.

SV – Status Variables
Status variables are values of measurement modules or sensors. This can be for example the current value of the height measurement sensor of the oven temperature sensor.

Status variables are always read only. (A sensor value cannot be set from outside)

DV – Data Variables
Data variables are

Data variables are always read only. (A result data of a finished process cannot be changed afterwards from outside)

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Variable Naming and Identification:

Any of the variable types above are internally stored in the data pool of the machine software and can be addressed via data pool variable address conventions.

Each variable of the data pool has a unique address. For the external MES system variables need to have also a unique ID. Therefore each variable will be mapped to its variable name.

The mapping is defined as the following:
- Variable ID: 4 digits, Zero leading
- Variable Type: EC, SV and DV according to table above
- Variable Name: String, CamelCase
- Address: Configuration.Module.VariableName

List of Types:

Variable Types	
Variable Type	Description
EC	Equipment Constants. Readable and Writable.
SV	Status Variables. Read only.
DV	Data Variables. Read only.

List of Variables:

Variable Mapping			
Variable ID	Variable Type	Variable Name	Variable Address
0001	EC	OvenTemperatureZone1	Mac.Oven.Temperature
0002	SC	OvenTemperature	Mac.Oven.Temperature
0003	DV	OvenTemperature	Mac.Oven.Temperature
ToDo		Define more	Define more

Note: Variables usually have a unit. All possible units are defined below under 2.2.9 Units.

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2.11   Datatypes

Each variable can have a data type. Datatypes will be identified by its unique Datatype ID.

List of data types:

Datatype Mapping		
Datatype ID	Datatype	Description
1	unsigned int	32 bit unsigned
2	int	32 bit signed
3	unsigned long / size_t	at least 32 bits unsinged
4	long	at least 32 bits
5	unsigned long long	at least 64 bits unsigned
6	long long	at least 64 bits
7	unsigned short	16 bits unsigned
8	short	16 bits
9	unsigned char	8 bits unsigned
10	char	8 bits
11	double	64 bit (52 bits for fraction)
12	long double	80 bits+
13	float	32 bit (23 for fraction)
14	bool	1 byte (true or false)
15	string	string object with ASCII UTF-8 Encoding
16	wstring	string object with UTF-16 or UTF-32 Encoding
17	duration<double,unit> nanoseconds microseconds milliseconds seconds minutes hours days	provides the duration in type double with unit type for conversion

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18	Datetime	yyyymmddhhMMssfffffff
19	TBD	More complex structures possible (like xml and json)
ToDo	Define more	Define more

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2.12 Units

Each variable can have a unit. Units will be identified by its unique Unit ID.

List of units:

Unit Mapping		
Unit ID	Unit	Description
1000	Length	
1001	nm	Nanometer
1002	µm	Micrometer
1003	mm	Millimeter
1004	cm	Centimeter
1005	dm	Decimeter
1006	m	Meter
1007	km	Kilometer
2000	Time	
2001	ns	Nanosecond
2002	µs	Microseconds
2003	ms	Milliseconds
2004	s	Seconds
2005	m	Minutes
2006	h	Hours
2007	ts	Timestamp
3000	Weight	
3001	µg	Microgram
3002	mg	Milligram
3003	g	Gram
3004	kg	Kilogram
4000	Speed	
4001	µm/s	Micrometer/Second
4002	m/s	Meter/Second
5000	Area	
5001	mm²	Square Millimeter

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5002	cm²	Square Centimeter
5003	dm²	Square Decimeter
6000	Volume	
6001	mm³	Cubic Millimeter
6002	cm³	Cubic Centimeter
6003	dm³	Cubic Decimeter
6004	m³	Cubic Meter
6005	ml	Milliliter
6006	l	Liter
7000	Pressure	
7001	Pa	Pascal
7002	kPa	Kilopascal
7003	MPa	Megapascal
7004	bar	Bar
8000	Power	
8001	W	Watt
8002	kW	Kilowatt
8003	MW	Megawatt
9000	Temperature	
9001	°C	Celsius
9002	°F	Fahrenheit
9003	K	Kelvin
ToDo	Define more	Define more

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Definitions for metric conversions:

Metric Prefix	Metrix Prefix Name	Conversion	
T	Tera	10^{12}	1 000 000 000 000
G	Giga	10^{9}	1 000 000 000
M	Mega	10^{6}	1 000 000
k	Kilo	10^{3}	1 000
h	Hekto	10^{2}	100
da	Deka	10^{1}	10
	<no prefix>	10^{0}	1
d	Dezi	10^{-1}	0,1
c	Zenti	10^{-2}	0,01
m	Milli	10^{-3}	0,001
µ	Micro	10^{-6}	0,000 001
n	Nano	10^{-9}	0,000 000 001 000
p	Piko	10^{-12}	0,000 000 000 001

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2.13 Control States

The SECS/GEM standard defines different control states for the communication and interaction between the MES and the machine system.

The following control states and sub-states are defined:

Offline (lowest level)
    The operator working in the operator console manually operates the entire equipment. The equipment will reply with an SxF0 to any direct message from the host other than S1F13 or S1F17; the equipment will reply with an SxF0.

Online
    Local (medium level)
        The Host is only permitted to carry out "read-only" operations in this state, such as data collecting. The host cannot change equipment constants that impact processes, remote commands that result in motion, or processing-initiating commands.

    Remote (highest level)
        The highest level of operation is ONLINE/REMOTE, in which case the host is free to use the equipment to the fullest extent possible using the communications interface.

The control states can be setup locally on the machine and can be requested by the MES system to take over control over the processes in the machine.

2.14 Remote Commands

In the control state Online Remote the MES is able to control the machine from external via remote commands. Each command is defined as a 2 digits identifier with leading zeros (starting with 01).

Controls list:

Remote Command Mapping		
Remote Command ID	Remote Command Name	Description
01	Start	Start the machine line or module, if machine or module allows to start, otherwise error
02	Stop	Stop the machine line or module
03	Pause	Pause the machine line or module
04	Resume	Start the machine line or module if it is paused
05	Abort	Abort the current running processes on the machine line or in module if running
ToDo	Define more	Define more

Note: The machine line or module will only allow to execute that remote command action if this can be done under safe condition. If it is not possible it will return with a specific error.

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2.15 Modules

Each module in the machine line has a unique name and 5 digits identifier
(starting with 10000) to request information and states from it.

List of modules:

Module Mappings			
Module ID	Main Module	Module Name	Description
10000	0	MachineLine	Whole machine line
10101	1	Unwinder	Unwinder to feed in tape from reel (optional)
10102	1	BadHoleInspection1	Bad hole inspection to identify already bad items
10103	1	Downset	Downset to punch the contacts down.
10201	2	Jetter1	Glue Dispenser 1 for the fingerprint chip (1-12)
10202	2	Jetter2	Glue Dispenser 2 for the fingerprint chip (13-24)
10203	2	AOI1	Optical inspection of dispensed glue
10301	3	SiPlace	Bonding the fingerprint chip to the tape
10401	4	Curing	Curing the bonded chip
10402	4	Tester	Test the fingerprint chips functionality
10403	4	Plasma	Plasma treatment of the surface before filler
10501	5	Jetter3	Filler Dispenser 1 for the edge of the fingerprint chip (1-12)
10502	5	Jetter4	Filler Dispenser 2 for the edge of the fingerprint chip (13-24)
10503	5	AOI2	Optical inspection of dispensed filler

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10601	6	Oven	Curing oven for the filler
10701	7	AOI3	Optical inspection final items from bottom
10702	7	AOI4	Optical inspection final items from top
10801	8	HeightMeasurement	Height Measurement of the final applied fingerprint chip
10802	8	BadHolePunch	Bad Hole Punch of bad items after all inspections and measures
10803	8	BadHoleInspection2	Bad Hole Inspection if the bad hole punched before
10804	8	Rewinder	Rewind the tape back to reel (optional)

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2.16 Products

A Product is a recipe or process file which contains settings for a specific product currently produced on the machine. In this document it is always call product.

A product on the machine is not a single information of file. It is a collection of several files in the XML format. These files are located in the settings folder under "process":

        \<machine folder>\settings\process

The files are named according to the product name in the software. For each module in the machine, there is a subfolder with its product files included. Means you will find a general product file in the top folder and a specific one per module in its sub folders.

There is always a product called "default" which is selected as long as no other specific product is selected.

The currently selected product is setup in "productName.xml".

The product settings have to be communicated to the MES system. Also the MES system needs to be able to change product settings on the machine.

Therefore the product settings will be combined from many XML product files into one XML structure and this XML structure is communicated via message to the MES and vice versa.

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Find here an example for such a product XML structure:

Note: This is just an example how it can look like and will change during the further developments.

```xml
<?xml version="1.0"?>
<Database Parameter-Type="proc">
        <AccessLevel Value="255" />
        <AoiControlDevice1>
                <maxAllowedBadMeasurements Value="10" />
                <useFinishEquipment Value="1" />
        </AoiControlDevice1>
…
        <AoiIfc1>
                <equipment>
                        <jobName>
                                <test Value="" />
                        </jobName>
                        <jobNumber Value="1.000000" />
                </equipment>
                <distance Value="0.000000" />
        </AoiIfc1>
…
        <IFXCommunicationInterface1>
                <equipment>
                        <jobNumber Value="1.000000" />
                </equipment>
        </IFXCommunicationInterface1>
…
        <buffer1>
                <ai>
                        <fillLevel>
                                <empty Value="0.000000" />
                                <full Value="10.000000" />
                        </fillLevel>
                </ai>
                <ao>
                        <value>
                                <motorSpeed Value="0.000000" />
                        </value>
                </ao>
        </buffer1>
…
        <camera1>
                <ActualModelFile Value="" />
                <ClearBeforeDisplay Value="0" />
                <DelayAfterGrab Value="0" />
                <DelayBeforeGrab Value="0" />
                <IgnoreAngleCorrection Value="0" />
                <ImagePath Value="./simulations/vision/" />
                <Kamera Value="1" />
                <MAtrixCorrectionUsed Value="1" />
                <ModePattern Value="0" />
                <ModeScale Value="0" />
                <ModeShape Value="0" />
                <ModeVariation Value="0" />
                <SaveModelFileName Value="" />
                <SearchQuality Value="20" />
                <UseFrameGrabber Value="1" />
                <VariationLimit Value="0" />
                <VariationResult Value="0" />
                <WindowHeight Value="480" />
                <WindowPosX Value="0" />
```

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```
                <WindowPosY Value="50" />
                <WindowWidth Value="640" />
        </camera1>
        …
        <control1>
                <numConnectedShifts Value="1.000000" />
        </control1>
        <control2>
                <numConnectedShifts Value="12.000000" />
        </control2>
        <control3>
                <numConnectedShifts Value="1.000000" />
        </control3>
        <curingStation>
                <enable Value="1" />
                <useFinishEquipment Value="1" />
        </curingStation>
        <downsetMotor>
                <AccPercentage Value="100.000000" />
                <DecPercentage Value="100.000000" />
                <HomingSpeedPercentage Value="" />
                <SpeedPercentage Value="100.000000" />
        </downsetMotor>
        <dryer>
                <enable Value="0" />
        </dryer>
        <dryerMotor>
                <AccPercentage Value="100.000000" />
                <DecPercentage Value="100.000000" />
                <HomingSpeedPercentage Value="" />
                <SpeedPercentage Value="100.000000" />
        </dryerMotor>
        <false Value="" />
        <heatingUnit>
                <AlarmschwelleZone1 Value="20" />
                …
                <WarnLimitZone6 Value="10" />
        </heatingUnit>
        <heatingUnit1>
                <SollwertZone1 Value="" />
                …
                <StatusZone6 Value="0" />
        </heatingUnit1>
        <heightMeasurement>
                <useFinishEquipment Value="1" />
        </heightMeasurement>
        <jetter1>
                <enable Value="1" />
                <useFinishEquipment Value="1" />
        </jetter1>
        <jetter2>
                <enable Value="1" />
                <useFinishEquipment Value="1" />
        </jetter2>
        <jetter3>
                <enable Value="1" />
                <useFinishEquipment Value="1" />
        </jetter3>
        <jetter4>
                <enable Value="1" />
                <useFinishEquipment Value="1" />
        </jetter4>
        …
        <plasmaStationControlDeviceModule>
                <enable Value="0" />
        </plasmaStationControlDeviceModule>
        …
        <transport1>
                <bufferLvlZero Value="0.000000" />
```

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```
        <camCheckMode Value="0" />
        <cameraPos Value="0.100000" />
        <correctionTolerance Value="0.100000" />
        <distance Value="28.000000" />
        <loop>
                <created Value="0" />
                <length Value="0.000000" />
        </loop>
        <numberOfCycles Value="1.000000" />
        <speedPercentage Value="100.000000" />
        <ModelId Value="Transport1" />
</transport1>
…
<transportMotor1>
        <AccPercentage Value="100.000000" />
        <DecPercentage Value="100.000000" />
        <HomingSpeedPercentage Value="" />
        <SpeedPercentage Value="100.000000" />
</transportMotor1>
…
<heatingUnitIfcModule>
        <AlarmschwelleZone1 Value="20" />
        …
        <WarnLimitZone9 Value="10" />
</heatingUnitIfcModule>
<SiplaceIndexer>
        <AccPercentage Value="100.000000" />
        <DecPercentage Value="100.000000" />
        <HomingSpeedPercentage Value="" />
        <SpeedPercentage Value="100.000000" />
</SiplaceIndexer>
<plasmaPressurePlateMotor>
        <AccPercentage Value="100.000000" />
        <DecPercentage Value="100.000000" />
        <HomingSpeedPercentage Value="" />
        <SpeedPercentage Value="100.000000" />
</plasmaPressurePlateMotor>
<badHoleVisionInspection1>
        <modelID Value="BadHoleInspection1" />
</badHoleVisionInspection1>
<badHoleVisionInspection2>
        <modelID Value="BadHoleInspection2" />
</badHoleVisionInspection2>
<AoiIfc4>
        <distance Value="" />
        <equipment>
                <jobName>
                        <test Value="" />
                </jobName>
        </equipment>
</AoiIfc4>
<AOI1Motor>
        <AccPercentage Value="100.000000" />
        <DecPercentage Value="100.000000" />
        <HomingSpeedPercentage Value="" />
        <SpeedPercentage Value="100.000000" />
</AOI1Motor>
<AOI2Motor>
        <AccPercentage Value="100.000000" />
        <DecPercentage Value="100.000000" />
        <HomingSpeedPercentage Value="" />
        <SpeedPercentage Value="100.000000" />
</AOI2Motor>
<AOI3MotorBottom>
        <AccPercentage Value="100.000000" />
        <DecPercentage Value="100.000000" />
        <HomingSpeedPercentage Value="" />
        <SpeedPercentage Value="100.000000" />
</AOI3MotorBottom>
```

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```xml
<AOI3MotorTop>
        <AccPercentage Value="100.000000" />
        <DecPercentage Value="100.000000" />
        <HomingSpeedPercentage Value="" />
        <SpeedPercentage Value="100.000000" />
</AOI3MotorTop>
<AOI3Motor>
        <AccPercentage Value="100.000000" />
        <DecPercentage Value="100.000000" />
        <HomingSpeedPercentage Value="" />
        <SpeedPercentage Value="100.000000" />
</AOI3Motor>
<AOI4Motor>
        <AccPercentage Value="100.000000" />
        <DecPercentage Value="100.000000" />
        <HomingSpeedPercentage Value="" />
        <SpeedPercentage Value="100.000000" />
</AOI4Motor>
<AoiControlDevice4>
        <maxAllowedBadMeasurements Value="10" />
        <useFinishEquipment Value="1" />
</AoiControlDevice4>
</Database>
```

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2.17 Messages

In the following all specific command and event messages its acknowledge messages and responses are described in detail.

Note: Find general definitions for values in the message descriptions above.

2.17.1 Command Overview

The following messages have to be implemented:

Messages	
Message Name	Message Parameters
Commands	
GetVariables	
SetVariables	
GetControlState	
SetControlState	
GetModuleProcessStates	
RemoteCommand	
GetProductNames	
SelectProduct	
DownloadProduct	
UploadProduct	
RenameProduct	
SetTerminalMessage	
GetUsers	
GetCurrentLoggedInUsers	
CreateLot	
GetLot	
GetLots	
UpdateLot	
DeleteLot	
SetSubstrateMap	
Events	
GetVariablesResponse	
SetVariablesResponse	

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GetControlStateResponse	
SetControlStateResponse	
GetModuleProcessStatesResponse	
RemoteCommandResponse	
GetProductNamesResponse	
SelectProductResponse	
DownloadProductResponse	
UploadProductResponse	
RenameProductResponse	
TerminalMessageResponse	
GetUsersResponse	
GetCurrentLoggedInUserResponse	
CreateLotResponse	
GetLotResponse	
GetLotsResponse	
UpdateLotResponse	
DeleteLotResponse	
SetSubstrateMapResponse	

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2.17.2 Commands

In this section all commands coming from middleware / MES and its responses via events are defined.

2.17.2.1 Variable Commands

The following commands are related to the variables information.

2.17.2.2 GetVariables (EC/SV/DV)

Get variables requests the EC, SV and DV variables from machine software. Find a detailed definition of these variables above.

Command:

```
<Cmd ID="GetVariables"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
          <Variable ID="[VARIABLEID]" Name="[VARIABLENAME]"/>
          <...>...</...>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="GetVariables"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "GetVariables" command:

[VARIABLEID]
> The variable ID is the unique ID of the specific variable to be requested. This will be used by the software to identify the variable in the mapping table (see above under Variables section).

[VARIABLENAME]
> The variable name is the name of the variable from the mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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GetVariablesResponse

The response for the "GetVariables" command is the "GetVariablesResponse" event.

The [SEQID] sequence ID will be the same as for the "GetVariables" command to link both messages in the middleware.

Event:

```
<Evt ID="GetVariablesResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Variable ID="[VARIABLEID]" Name="[VARIABLENAME]"
          Type="[VARIABLETYPE]"
          UnitID="[UNITID]" Unit="[UNIT]"
          DataTypeID="[DATATYPEID]" DataType="[DATATYPE]">
               [VALUE]
          </Variable>
          <…>…</…>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="GetVariablesResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "GetVariablesResponse" event:

[VARIABLEID]
 The variable ID is the unique identifier of the specific variable to be requested. This will be used by the software to identify the variable in the mapping table (see above under Variables section).

[VARIABLENAME]
 The variable name is the name of the variable from the mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

[VARIABLETYPE]
 The variable type is the type according to the type definition above. The variable type can be EC, SV and DV.

[UNITID]
 The unit ID is the unique identifier of the unit of the specific variable to be requested. This will be used by the software to identify the variable unit in the units mapping table (see above under Units section).

[UNIT]
 The unit is the name of the unit of that specific variable. I is defined in the units mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

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[DATATYPEID]

The datatype ID is the unique identifier of the datatype of the specific variable to be requested. This will be used by the software to identify the variable datatype in the datatypes mapping table (see above under Datatypes section).

Note: The datatype defines the source data type in the software. The middleware can use it to transform the string of the value in that message into that datatype, but it is not a must.

[DATATYPE]

The unit is the name of the datatype of that specific variable. I is defined in the datatypes mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

[VALUE]

The value is the specific value of the requested variable. According to its unit and datatype it will be a numeric or alphanumeric string. It can be also a more complex structure such as a XML or JSON formatted string.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.3SetVariables (only EC)

Set variables will set the EC variables from middleware to the machine software. Find a detailed definition of these variables above.

Command:

```
<Cmd ID="SetVariables"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
          <Variable ID="[VARIABLEID]" Name="[VARIABLENAME]"
          Type="[VARIABLETYPE]"
          UnitID="[UNITID]" Unit="[UNIT]"
          DataTypeID="[DATATYPEID]" DataType="[DATATYPE]">
               [VALUE]
          </Variable>
          <…>…</…>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="SetVariables"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "SetVariables" command:

[VARIABLEID]

The variable ID is the unique identifier of the specific variable to be requested. This will be used by the software to identify the variable in the mapping table (see above under Variables section).

[VARIABLENAME]

The variable name is the name of the variable from the mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

[VARIABLETYPE]

The variable type is the type according to the type definition above. The variable type can be EC, SV and DV.

[UNITID]

The unit ID is the unique identifier of the unit of the specific variable to be requested. This will be used by the software to identify the variable unit in the units mapping table (see above under Units section).

[UNIT]

The unit is the name of the unit of that specific variable. I is defined in the units mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

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[DATATYPEID]
>   The datatype ID is the unique identifier of the datatype of the specific
>   variable to be requested. This will be used by the software to identify the
>   variable datatype in the datatypes mapping table (see above under
>   Datatypes section).
>
>   **Note:** The datatype defines the source data type in the software. The
>   middleware can use it to transform the string of the value in that
>   message into that datatype, but it is not a must.

[DATATYPE]
>   The unit is the name of the datatype of that specific variable. I is defined
>   in the datatypes mapping table. It would be optional for the
>   communication and will not be used to identify the variable. But it has
>   to be added for logging and debugging purpose.

[VALUE]
>   The value is the specific value of the requested variable. According to its
>   unit and datatype it will be a numeric or alphanumeric string. It can be
>   also a more complex structure such as a XML or JSON formatted string.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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SetVariablesResponse

The response for the "SetVariables" command is the "SetVariablesResponse" event.

The [SEQID] sequence ID will be the same as for the "SetVariables" command to link both messages in the middleware.

Event:

```
<Evt ID="SetVariablesResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Variable ID="[VARIABLEID]" Name="[VARIABLENAME]">
            <Value>[VALUE]</Value>
            <Result>[RESULT]</Result>
            <Error>[ERRORCODE]</Error>
            <TimeStamp>[TIMESTAMP]</TimeStamp>
        </Variable>
        <…>…</…>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="SetVariablesResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "SetVariablesResponse" event:

[VARIABLEID]
> The variable ID is the unique identifier of the specific variable to be requested. This will be used by the software to identify the variable in the mapping table (see above under Variables section).

[VARIABLENAME]
> The variable name is the name of the variable from the mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

[VALUE]
> The value is the specific value of the requested variable. According to its unit and datatype it will be a numeric or alphanumeric string. It can be also a more complex structure such as a XML or JSON formatted string.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.4 Control State Commands

The following commands are related to the control state of the system.

2.17.2.5 GetControlState (Online (Local/Remote), Offline)

Requests the current control state between the MES and the machine.

Command:

```
<Cmd ID="GetControlState"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
```

Command Acknowledge:

```
<CmdAck ID="GetControlState"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
            <Result>[RESULT]</Result>
            <Error>[ERRORCODE]</Error>
            <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

Definitions for "GetControlState" command:

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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GetControlStateResponse

The response for the "GetControlState" command is the "GetControlStateResponse" event.

The [SEQID] sequence ID will be the same as for the "GetControlState" command to link both messages in the middleware.

Event:

```
<Evt ID="GetControlStateResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <CurrentState>
               <State>[STATE]</State>
               <SubState>[SUBSTATE]</SubState>
          </CurrentState>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="GetControlStateResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "GetControlStateResponse" event:

The event provides only the current control state.

[STATE]

The control state of the machine defines the operating mode between the MES and the machine, this is described above under section Control States.

Possible values for state:
Online (Sub-states: Local, Remote)
Offline (No sub-state)

[SUBSTATE]

The sub-state is only required for the Online state. It specifies the accessibility of the machine in online control state.

Possible values for sub-state:
Local
Remote

Note: For the state Offline the sub-state will stay empty, but the message will contain the tag.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.6   **SetControlState** (Online (Local/Remote), Offline)

Set control state tries to set the current control state from MES to the machine software. If it is currently not possible or declined by the operator an error will be reported back.

Command:

```
<Cmd ID="SetControlState"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
            <State>[STATE]</State>
            <SubState>[SUBSTATE]</SubState>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="SetControlState"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
            <Result>[RESULT]</Result>
            <Error>[ERRORCODE]</Error>
            <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "SetControlState" command:

[STATE]
The control state of the machine defines the operating mode between the MES and the machine, this is described above under section Control States.

Possible values for state:
Online (sub-state: Local, Remote)
Offline (No sub-state)

[SUBSTATE]
The sub-state is only required for the Online state. It specifies the accessibility of the machine in online control state.

Possible values for sub-state:
Local
Remote

Note: For the state Offline the sub-state will stay empty, but the message will contain the tag.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Cannot change to control state
2	Control state already set
ToDo	Define all error codes

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SetControlStateResponse

The response for the "SetControlState" command is the "SetControlStateResponse" event.

The [SEQID] sequence ID will be the same as for the "SetControlState" command to link both messages in the middleware.

The event provides the previous and the current control state.

Event:

```
<Evt ID="SetControlStateResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <PreviousState>
               <State>[STATE]</State>
               <SubState>[SUBSTATE]</SubState>
          </PreviousState>
          <CurrentState>
               <State>[STATE]</State>
               <SubState>[SUBSTATE]</SubState>
          </CurrentState>
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="SetControlStateResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "SetControlStateResponse" Event:

[STATE]
The control state of the machine defines the operating mode between the MES and the machine, this is described above under section Control States.

Possible values for state:
Online (sub-state: Local, Remote)
Offline (No sub-state)

[SUBSTATE]
The sub-state is only required for the Online state. It specifies the accessibility of the machine in online control state.

Possible values for sub-state:
Local
Remote

Note: For the state Offline the sub-state will stay empty, but the message will contain the tag.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Cannot change to control state
2	Control state already set
ToDo	Define all error codes

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2.17.2.7 Module Processing State Commands

The following commands are used to request the processing state of modules and the machine line.

2.17.2.8   GetModuleProcessStates

Requests the current module state of one or more modules and/or the whole machine line.

Command:

```
<Cmd ID="GetModuleProcessStates"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
          <ModuleState ID="[MODULEID]" Name="[MODULENAME]"/>
          <…/>
          <…/>
          <…/>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="GetModuleProcessStates"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "GetModuleProcessStates" command:

[MODULEID]

The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section).

[MODULENAME]

The module name is the name of the module inside the machine line. I is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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GetModuleProcessStatesResponse

The response for the "GetModuleProcessStates" command is the
"GetModuleProcessStatesResponse" event.

The [SEQID] sequence ID will be the same as for the
"GetModuleProcessStates" command to link both messages in the
middleware.

Event:

```
<Evt ID="GetModuleProcessStatesResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <ModuleState ID="[MODULEID]" Name="[MODULENAME]"/>
               [MODULESTATE]
          </ModuleState>
          <…/>
          <…/>
          <…/>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="GetModuleProcessStatesResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "GetModuleProcessStatesResponse" event:

[MODULEID]
The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section).

[MODULENAME]
The module name is the name of the module inside the machine line. I is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[MODULESTATE]
The module state returns the state of the current module.

The following states are possible:

Module states	
Value	Description
0	Init
1	Loaded
2	Ready
3	Standby
4	NoOperation
5	Setup
6	Down
7	Running
99	Unknown
ToDo	Define all states

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[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.9   Remote Commands

The following commands are used to control the machine remotely. This will be only possible in Online Remote control state.

2.17.2.10   ExecuteRemoteCommand

The remote command executes a specific control action for a specific module and/or the whole machine.

Command:

```
<Cmd ID="ExecuteRemoteCommand"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
          <RemoteCmd ID="[REMOTECMDID]" Name="[REMOTECMDNAME]"
          ModuleID="[MODULEID]" ModuleName="[MODULENAME]"/>
          <…/>
          <…/>
          <…/>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="ExecuteRemoteCommand"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "ExecuteRemoteCommand" command:

[REMOTECMDID]
The remote command ID is the unique identifier of the remote command executed on the machine line. This will be used by the software to identify the remote command in the remote command mapping table (see above under Remote Command section).

[REMOTECMDNAME]
The remote command name is the name of the remote command to be executed inside the machine line. I is defined in the remote command mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[MODULEID]
The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section).

[MODULENAME]
The module name is the name of the module inside the machine line. I is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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ExecuteRemoteCommandResponse

The response for the "ExecuteRemoteCommand" command is the "ExecuteRemoteCommandResponse" event.

The [SEQID] sequence ID will be the same as for the "ExecuteRemoteCommand" command to link both messages in the middleware.

Event:

```
<Evt ID="ExecuteRemoteCommandResponse"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
         <Result>[RESULT]</Result>
         <Error>[ERRORCODE]</Error>
         <TimeStamp>[TIMESTAMP]</TimeStamp>
         <RemoteCmd ID="[REMOTECMDID]" Name="[REMOTECMDNAME]"
             ModuleID="[MODULEID]" ModuleName="[MODULENAME]">
                     [SUBRESULT]
         </RemoteCmd>
         <…/>
         <…/>
         <…/>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ExecuteRemoteCommandResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
         <Result>[RESULT]</Result>
         <Error>[ERRORCODE]</Error>
         <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ExecuteRemoteCommandResponse" event:

[REMOTECMDID]
> The remote command ID is the unique identifier of the remote command executed on the machine line. This will be used by the software to identify the remote command in the remote command mapping table (see above under Remote Command section).

[REMOTECMDNAME]
> The remote command name is the name of the remote command to be executed inside the machine line. I is defined in the remote command mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[MODULEID]
> The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section).

[MODULENAME]
> The module name is the name of the module inside the machine line. I is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[RESULT]
> is the general flag if the all commands for the modules could be processed successfully

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[SUBRESULT]
 is the flag if the command for the specific module could be processed
 successfully if any of the sub results is false, the general result will be
 marked as false as well.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.11 Product Commands

The following commands are used to manage products on the machine remotely.

2.17.2.12 GetProducts

Requests the list of currently available products by name.

Command:

```
<Cmd ID="GetProducts"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
```

Command Acknowledge:

```
<CmdAck ID="GetProducts"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "GetProducts" command:

There is no specific parameter for that request command.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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GetProductNamesResponse

The response for the "GetProducts" command is the "GetProductsResponse" event.

The [SEQID] sequence ID will be the same as for the "GetProducts" command to link both messages in the middleware.

Event:

```
<Evt ID="GetProductsResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Products>
               <Product>[PRODUCTNAME]</Product>
               <…/>
               <…/>
               <…/>
          <Products>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="GetProductsResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "GetProductsResponse" command:

[PRODUCTNAME]
This product name is the name of the specific product already available on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.13   SelectProduct

This command selects the current product for the production on the machine line. It will be only possible if the machine is not in production. Otherwise it will be respond with an error.

Command:

```
<Cmd ID="SelectProduct"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
          <Product>[PRODUCTNAME]</Product>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="SelectProduct"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "SelectProduct" command:

[PRODUCTNAME]
This product name is the name of the specific product already available on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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SelectProductResponse

The response for the "SelectProduct" command is the "SelectProductResponse" event.

The [SEQID] sequence ID will be the same as for the "SelectProduct" command to link both messages in the middleware.

Event:

```
<Evt ID="SelectProductResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Product>[PRODUCTNAME]</Product>
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>

</Evt>
```

Event Acknowledge:

```
<EvtAck ID="SelectProductResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "SelectProductResponse" event:

[PRODUCTNAME]
This product name is the name of the specific product already available on the machine line.

[STATUS]
The Status if / how the file was written.

Status codes	
Value	Description
0	New Product created successfully
1	Existing Product file updated
2	Error during writing
ToDo	Split to more accurate status codes

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.2.14   DownloadProduct

Requests a specific product XML structure by its name.

Command:

```
<Cmd ID="DownloadProduct"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
          <Product Name="[PRODUCTNAME]"/>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="DownloadProduct"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "DownloadProduct" command:

[PRODUCTNAME]
This product name is the name of the specific product already available
on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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DownloadProductResponse

The response for the "DownloadProduct" command is the "DownloadProductResponse" event.

The [SEQID] sequence ID will be the same as for the "DownloadProductProduct" command to link both messages in the middleware.

Event:

```
<Evt ID="DownloadProductResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Product Name="[PRODUCTNAME]">
                 [PRODUCTXML]
          </Product>
     </Evt>
```

Event Acknowledge:

```
<EvtAck ID="DownloadProductResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "DownloadProductResponse" command:

[PRODUCTNAME]
This product name is the name of the specific product already available on the machine line.

[PRODUCTXML]
This product XML is the XML structure of the whole product in merged XML format of all product XML files of the same name.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.15 UploadProduct

Uploads a specific product XML structure by its name from middleware onto the machine line.

If the product already exists, it will be updated by the new values.

Command:

```
<Cmd ID="UploadProduct"
    EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
        <Product Name="[PRODUCTNAME]">
            [PRODUCTXML]
        </Product>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="UploadProduct"
    EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "UploadProduct" command:

[PRODUCTNAME]
    This product name is the name of the specific product already available
    on the machine line.

[PRODUCTXML]
    This product XML is the XML structure of the whole product in merged
    XML format of all product XML files of the same name.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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UploadProductResponse

The response for the "UploadProduct" command is the
"UploadProductResponse" event.

The [SEQID] sequence ID will be the same as for the "UploadProduct"
command to link both messages in the middleware.

Event:

```
<Evt ID="UploadProductResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Product Name="[PRODUCTNAME]"/>
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="UploadProductResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "UploadProductResponse" command:

[PRODUCTNAME]
This product name is the name of the specific product already available on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.16   RenameProduct

Renames a specific product on the machine line.

Command:

```
<Cmd ID="RenameProduct"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
          <Product Name="[PRODUCTNAME]">
               [NEWPRODUCTNAME]
          </Product>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="RenameProduct"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "RenameProduct" command:

[PRODUCTNAME]
    This product name is the name of the specific product already available
    on the machine line.

[NEWPRODUCTNAME]
    This is the new name for the specific product.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product currently in use, cannot be renamed
ToDo	Define all error codes

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RenameProductResponse

The response for the "RenameProduct" command is the "RenameProductResponse" event.

The [SEQID] sequence ID will be the same as for the "RenameProduct" command to link both messages in the middleware.

Event:

```
<Evt ID="RenameProductResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Product Name="[PRODUCTNAME]"/>
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="RenameProductResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "RenameProductResponse" command:

[PRODUCTNAME]
This product name is the name of the specific product already available on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.17   Terminal Commands

In the following the terminal command messages are defined.

2.17.2.18   SetTerminalMessage

The terminal message is a message from MES which is shown on the machine GUI. Therefore a command will be sent to the machine with the terminal message information. The user result will be respond by an event.

Command:

```
<Cmd ID="SetTerminalMessage"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]">
            <TerminalMessage>
                  <MessageTitle>[MESSAGETITLE]</MessageTitle>
                  <MessageText>[MESSAGETEXT]</MessageText>
                  <MessageType>[MESSAGETYPE]</MessageType>
                  <MessageCode>[MESSAGECODE]</MessageCode>
                  <MessageOptions>[MESSAGEOPTIONS]</MessageOptions>
                  <Stop>[STOP]</Stop>
            </TerminalMessage>
</Cmd>
```

Command Acknowledge:

```
<CmdAck ID="SetTerminalMessage"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
            <Result>[RESULT]</Result>
            <Error>[ERRORCODE]</Error>
            <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "SetTerminalMessage" command:

[MESSAGETITLE]
   The message title is shown in the title of the message display. This is
   optional for now but should be provided for later use (e.g. for the HTML
   GUI).

[MESSAGETEXT]
   This is the fully formatted text of that message. There are no
   placeholders to be replaced by the machine software before showing
   the message in that text.

[MESSAGETYPE]
   The Message type defines the specific type of the terminal message.

Message Types	
Type	Description
Information	Information message
Warning	Warning message
Error	Error message
ToDo	Define all message types

[MESSAGECODE]
   The Message code defines a unique code for the terminal message.

Message Codes	
Type	Description
1	Message 1
2	Message 2
3	Message 3
ToDo	Define all message codes

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[MESSAGEOPTIONS]

Message box options allow to define which buttons a user will be able to click to respond to a terminal message.

List of message options:

Message Options	
Option	Description
OK	Only OK
OKCancel	OK and Cancel
AbortRetryIgnore	Abort, Retry and Ignore
YesNoCancel	Yes, No and Cancel
YesNo	Yes and No
RetryCancel	Retry and Cancel
ToDo	Define all message options

[STOP]

Defines if the machine should stop as soon as the message will be shown.

Stop Options	
Option	Description
True	Stop machine for this message
False	Continue production, only show message

Note: The machine software can stop internally also for error messages, without setting this flag.

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[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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SetTerminalMessageResponse

The response for the "SetTerminalMessage" command is the
"SetTerminalMessageResponse" event.

The [SEQID] sequence ID will be the same as for the "SetTerminalMessage"
command to link both messages in the middleware.

This response is the clear message event.

Event:

```
<Evt ID="SetTerminalMessageResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <TerminalMessage>
            <Response>[MESSAGERESPONSE]</Response>
        </TerminalMessage>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="SetTerminalMessageResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "SetTerminalMessageResponse" event:

[MESSAGERESPONSE]
The message response is the confirmation of the user in the message display.

List of message response options:

Message Options	
Option	Description
OK	OK selected by user
Cancel	Cancel selected by user
Abort	Abort selected by user
Retry	Retry selected by user
Ignore	Ignore selected by user
Yes	Yes selected by user
No	No selected by user
ToDo	Define all message options

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.19 User Commands

In the following the user related commands are be defined.

2.17.2.20 GetUsers

The "GetUsers" message requests all users available on the machine.

Command:

```
<Cmd ID="GetUsers"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
```

Command Acknowledge:

```
<CmdAck ID="GetUsers"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
            <Result>[RESULT]</Result>
            <Error>[ERRORCODE]</Error>
            <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "GetUsers" command:

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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GetUsersResponse

The response for the "GetUsers" command is the "GetUsersResponse" event.

The [SEQID] sequence ID will be the same as for the "GetUsers" command to link both messages in the middleware.

Event:

```
<Evt ID="GetUsersResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Users>
            <User AccessLevel="[ACCESSLEVEL]" Default="[DEFAULT]"
                Deleteable="[DELETEABLE]" LoggedIn="[LOGGEDIN]">
                    [USERNAME]
            </User>
            <…/>
            <…/>
            <…/>
        </Users>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="GetUsersResponse"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "GetUsersResponse" command:

[USERNAME]
　　　The user name is the unique name of the available user.

[ACCESSLEVEL]
　　　The access level is the specific user group and defines which user rights
　　　that user has on the machine.

[DEFAULT]
　　　The default defines if the user is the default user which is logged in
　　　automatically after machine start.

[DELETEABLE]
　　　The delectable option defines if this user is allowed to be deleted in the
　　　software.

[LOGGEDIN]
　　　The flag notifying about the login in status of this user.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.21 GetLoggedInUsers

The "GetLoggedInUsers" message requests all users currently logged in on the machine (not all users).

Note: Usually only one user is logged in at the time. In special cases / in the future also more than one user can be logged in, in this case more than one user will sent back.

Command:

```
<Cmd ID="GetLoggedInUsers"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
```

Command Acknowledge:

```
<CmdAck ID="GetLoggedInUsers"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
            <Result>[RESULT]</Result>
            <Error>[ERRORCODE]</Error>
            <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "GetLoggedInUsers" command:

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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GetLoggedInUsersResponse

The response for the "GetLoggedInUsers" command is the
"GetLoggedInUsersResponse" event.

The [SEQID] sequence ID will be the same as for the "GetLoggedInUsers"
command to link both messages in the middleware.

Event:

```
<Evt ID="GetCurrentLoggedInUserResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Users>
               <User AccessLevel="[ACCESSLEVEL]" Default="[DEFAULT]"
                    Deleteable="[DELETEABLE]" LoggedIn="[LOGGEDIN]">
                         [USERNAME]
               </User>
               <…/>
               <…/>
               <…/>
          </Users>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="GetCurrentLoggedInUserResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "GetLoggedInUsersResponse" event:

[USERNAME]
        The user name is the unique name of the available user.

[ACCESSLEVEL]
        The access level is the specific user group and defines which user rights
        that user has on the machine.

[DEFAULT]
        The default defines if the user is the default user which is logged in
        automatically after machine start.

[DELETEABLE]
        The delectable option defines if this user is allowed to be deleted in the
        software.

[LOGGEDIN]
        The flag notifying about the login in status of this user.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.22   Lot Commands

The following commands are to manipulate Job / Lot data on the machine

2.17.2.23   CreateLotCommand

The "CreateLotCommand" message creates a new lot on the machine.

Command:

```
<Cmd ID="CreateLot"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
      <Lot>
                <Name>[LOTNAME]</Name>
                <Count>[ITEMCOUNT]</Count>
                <Product>
                     <Name>[PRODUCTNAME]</Name>
                </Product>
                <CustomDataList>
        <CustomData Name="[CUSTOMDATANAME]"> [CUSTOMDATACONTENT] <
/CustomData>
        <CustomData Name="[CUSTOMDATANAME]"> [CUSTOMDATACONTENT] <
/CustomData>
        <CustomData Name="[CUSTOMDATANAME]"> [CUSTOMDATACONTENT] <
/CustomData>
        Etc…
                </CustomDataList>
        </Lot>
      </Cmd>
```

Command Acknowledge:

```
<CmdAck ID="CreateLot"
      EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "CreateLot" command:

[LOTNAME]
>   The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
>   The item count defines how many main items have to be produced. Any items can have sub items.

[PRODUCTNAME]
>   This product name is the name of the specific product used on the machine line.

[CUSTOMDATANAME]
>   The specific name for the CustomData, so the machine could handle different structures and would still be able to work correctly if the order is changed

[CUSTOMDATACONTENT]
>   The Custom Content which is sent from the MES to the machine and needs to be progressed.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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CreateLotResponse

The response for the "CreateLot" command is the "CreateLotResponse" event.

The [SEQID] sequence ID will be the same as for the "CreateLot" command to link both messages in the middleware.

Event:

```
<Evt ID=" CreateLotResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
     <Lot>
     <Result>[RESULT]</Result>
                <Name>[LOTNAME]</Name>
                <Count>[ITEMCOUNT]</Count>
                <Product>
                     <Name>[PRODUCTNAME]</Name>
                </Product>
     </Lot>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID=" CreateLotResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "CreateLotResponse" event:

[RESULT]
The Result if the lot war created successfully.

[LOTNAME]
The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
The item count defines how many main items have to be produced. Any items can have sub items.

[PRODUCTNAME]
This product name is the name of the specific product used on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.24 GetLotCommand

The "GetLotCommand" message gets a specific lot from the machine and its details.

Command:

```
<Cmd ID="GetLot"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
     <Lot>
           <Name>[LOTNAME]</Name>
     </Lot>
     </Cmd>
```

Command Acknowledge:

```
<CmdAck ID="GetLot"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
           <Result>[RESULT]</Result>
           <Error>[ERRORCODE]</Error>
           <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "GetLots" command:

[LOTNAME]
    The lot name defines the specific name of that lot on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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GetLotResponse

The response for the "GetLot" command is the "GetLotResponse" event.

The [SEQID] sequence ID will be the same as for the "GetLot" command to link both messages in the middleware.

Event:

```
<Evt ID=" GetLotResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
     <Result>[RESULT]</Result>
     <Lot>
          <Name>[LOTNAME]</Name>
          <Count>[ITEMCOUNT]</Count>
          <Product>
               <Name>[PRODUCTNAME]</Name>
          </Product>
     </Lot>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="GetLotResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "GetLotResponse" event:

[RESULT]
The Result if the lot war created successfully.

[LOTNAME]
 The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
 The item count defines how many main items have to be produced. Any
 items can have sub items.

[PRODUCTNAME]
 This product name is the name of the specific product used on the
 machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.25   GetLotsCommand

The "GetLotsCommand" message gets all current available loaded lots from the machine.

Command:

```
<Cmd ID="GetLots"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
```

Command Acknowledge:

```
<CmdAck ID="GetLots"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "GetLots" command:

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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GetLotsResponse

The response for the "GetLots" command is the "GetLotsResponse" event.

The [SEQID] sequence ID will be the same as for the "GetLots" command to link both messages in the middleware.

Event:

```
<Evt ID=" GetLotsResponse"
      EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
      <Result>[RESULT]</Result>
      <Lots>
            <Lot>
                  <Name>[LOTNAME]</Name>
                  <Count>[ITEMCOUNT]</Count>
                  <Product>
                        <Name>[PRODUCTNAME]</Name>
                  </Product>
            </Lot>
            <Lot>[...]</Lot>
            [...]
            </Lots>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="GetLotsResponse"
      EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
            <Result>[RESULT]</Result>
            <Error>[ERRORCODE]</Error>
            <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "GetLotsResponse" event:

[RESULT]
The Result if the lot war created successfully.

[LOTNAME]
	The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
	The item count defines how many main items have to be produced. Any items can have sub items.

[PRODUCTNAME]
	This product name is the name of the specific product used on the machine line.

 [ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.26   UpdateLotCommand
The "UpdateLotCommand" message updates an existing lot on the machine.

Command:

```
<Cmd ID="UpdateLot"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
          <Lot>
               <Name>[LOTNAME]</Name>
               <Count>[ITEMCOUNT]</Count>
               <Product>
                    <Name>[PRODUCTNAME]</Name>
               </Product>
          </Lot>
     </Cmd>
```

Command Acknowledge:

```
<CmdAck ID=" UpdateLot"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
     </CmdAck>
```

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Definitions for "UpdateLot" command:

[LOTNAME]
The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
The item count defines how many main items have to be produced. Any items can have sub items.

[PRODUCTNAME]
This product name is the name of the specific product used on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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UpdateLotResponse

The response for the "UpdateLot" command is the "UpdateLotResponse" event.

The [SEQID] sequence ID will be the same as for the "UpdateLot" command to link both messages in the middleware.

Event:

```
<Evt ID=" UpdateLotResponse"
      EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
      <OldLot>
             <Result>[RESULT]</Result>
             <Name>[LOTNAME]</Name>
             <Count>[ITEMCOUNT]</Count>
             <Product>
                     <Name>[PRODUCTNAME]</Name>
             </Product>
      </OldLot>
      <NewLot>
             <Result>[RESULT]</Result>
             <Name>[LOTNAME]</Name>
             <Count>[ITEMCOUNT]</Count>
             <Product>
                     <Name>[PRODUCTNAME]</Name>
             </Product>
      </NewLot>

</Evt>
```

Event Acknowledge:

```
<EvtAck ID=" UpdateLotResponse"
      EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
             <Result>[RESULT]</Result>
             <Error>[ERRORCODE]</Error>
             <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "UpdateLotResponse" event:

[RESULT]
The Result if the lot war created successfully.

[LOTNAME]
    The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
    The item count defines how many main items have to be produced. Any
    items can have sub items.

[PRODUCTNAME]
    This product name is the name of the specific product used on the
    machine line.

 [ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.27   DeleteLotCommand

The "DeleteLotCommand" message deletes an existing lot on the machine.

Command:

```
<Cmd ID="DeleteLot"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
          <Lot>
               <Name>[LOTNAME]</Name>
          </Lot>
     </Cmd>
```

Command Acknowledge:

```
<CmdAck ID=" DeleteLot"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</CmdAck>
```

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Definitions for "DeleteLot" command:

[LOTNAME]

The lot name defines the specific name of that lot on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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DeleteLotResponse

The response for the "DeleteLot" command is the "DeleteLotResponse" event.

The [SEQID] sequence ID will be the same as for the "DeleteLot" command to link both messages in the middleware.

Event:

```
<Evt ID=" DeleteLotResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Result>[RESULT]</Result>
          <Name>[LOTNAME]</Name>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="DeleteLotResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "DeleteLotResponse" event:

[RESULT]
The Result if the lot war created successfully.

[LOTNAME]
    The lot name defines the specific name of that lot on the machine line.

 [ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.2.28 SetSubstrateMap

The "SetSubstrateMap" message provides the processing map for the substrate such as material from a roll, from a wafer, tray or similar.

Command:

```
<Cmd ID="SetSubstrateMap"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]" SeqID="[SEQID]"/>
          <SubstrateMap>
               <MaterialId>[MATERIALID]</MaterialId>
               <MaterialName>[MATERIALNAME]</MaterialName>
               <ModuleId>=[MODULEID]</ModuleId>
               <ModuleName>[MODULENAME]</ModuleName>
               <Content>[CONTENT]</Content>
          </SubstrateMap>
     </Cmd>
```

Command Acknowledge:

```
<CmdAck ID="SetSubstrateMap"
     EquipID="[EQUIPMENTID]" CmdSeqID="[CMDSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
     </CmdAck>
```

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Definitions for "DeleteLot" command:

[MATERIALID]
The unique identifier of the material, usually the QR / Barcode which is associated with the material.

[MATERIALNAME]
The Name / Type of the Material which is removed from the machine module. It would be optional for the communication and will not be used to identify the material. But it has to be added for logging and debugging purpose

[MODULEID]
The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section), which used the specified material.

[MODULENAME]
The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[CONTENT]
The content is the content of the substrate map. This is individual depending on the material and mapping structure. It can be formatted in XML, JSON or similar.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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SetSubstrateMapResponse

The response for the "SetSubstrateMap" command is the "SetSubstrateMapResponse" event.

The [SEQID] sequence ID will be the same as for the "SetSubstrateMap" command to link both messages in the middleware.

Event:

```
<Evt ID="SetSubstrateMapResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Result>[RESULT]</Result>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="SetSubstrateMapResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "SetSubstrateMapResponse" event:

[RESULT]
The Result if the lot war created successfully.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.3 Event Overview

The following messages have to be implemented:

Messages	
Message Name	Message Parameters
Events	
VariableChanged	
AlarmSet	
AlarmCleared	
UserLoggedIn	
UserLoggedOut	
UserCreated	
UserDeleted	
UserEdited	
ModuleProcessStateChanged	
ItemProcessStarted	
ItemsProcessStarted	
ItemProcessCompleted	
ItemsProcessCompleted	
ControlStateChanged	
MaterialReceived	
MaterialProcessed	
MaterialLevel	
MaterialRemoved	
ToolReceiced	
ToolWearingLevel	
ToolRemoved	
ProductCreated	
ProductSelected	
ProductUpdated	
ProductDeleted	
ProductStored	
ProductDownloaded	
OperatorCommandExectued	

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LotCreated	
LotUpdated	
LotDeleted	
LotStarted	
LotCompleted	
LotAborted	
LotPaused	
LotResumed	

EnableAlarm
> **AlarmID**
> **False/True**

All equipment shall implement the following Status Variables: -
AlarmsEnabled - EventsEnabled

EnableEvent
> **What is an event?**
> **False/true**

All equipment shall implement the following Status Variables: -
AlarmsEnabled - EventsEnabled

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2.17.4 Events

In the following all pure Events coming from machine software will be defined.

2.17.4.1 Variables Events

Variables events are called when variables are changing

2.17.4.2   VariableChanged (EC/SV/DV)

Variable events will be called when a variable is changed by the user.

Event:

```
<Evt ID="VariableChanged"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Variable ID="[VARIABLEID]" Name="[VARIABLENAME]"
        Type="[VARIABLETYPE]"
        UnitID="[UNITID]" Unit="[UNIT]"
        DataTypeID="[DATATYPEID]" DataType="[DATATYPE]"
        User="[USERNAME]">
            [VALUE]
        </Variable>
        <...>...</...>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="VariableChanged"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "VariableChanged" event:

[VARIABLEID]

The variable ID is the unique identifier of the specific variable to be requested. This will be used by the software to identify the variable in the mapping table (see above under Variables section).

[VARIABLENAME]

The variable name is the name of the variable from the mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

[VARIABLETYPE]

The variable type is the type according to the type definition above. The variable type can be EC, SV and DV.

[UNITID]

The unit ID is the unique identifier of the unit of the specific variable to be requested. This will be used by the software to identify the variable unit in the units mapping table (see above under Units section).

[UNIT]

The unit is the name of the unit of that specific variable. I is defined in the units mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

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[DATATYPEID]
The datatype ID is the unique identifier of the datatype of the specific variable to be requested. This will be used by the software to identify the variable datatype in the datatypes mapping table (see above under Datatypes section).

Note: The datatype defines the source data type in the software. The middleware can use it to transform the string of the value in that message into that datatype, but it is not a must.

[DATATYPE]
The unit is the name of the datatype of that specific variable. I is defined in the datatypes mapping table. It would be optional for the communication and will not be used to identify the variable. But it has to be added for logging and debugging purpose.

[USERNAME]
The user name of the user changing the variable.

[VALUE]
The value is the specific value of the requested variable. According to its unit and datatype it will be a numeric or alphanumeric string. It can be also a more complex structure such as a XML or JSON formatted string.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.3   Alarm Events

The alarm events will be sent to notify the MES about an alarm and when it was cleared.

2.17.4.4   AlarmSet

This message is sent when an alarm occurs.

Event:

```
<Evt ID="AlarmSet"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Alarm>
                <ID>[ALARMID]</ID>
                <Text>[ALARMTEXT]</Text>
                <ModuleID>[MODULEID]</ModuleId>
                <ModuleName>[MODULENAME]</ModuleName>
                <TimeStamp>[TIMESTAMP]</TimeStamp>
          </Alarm>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="AlarmSet"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "AlarmSet" command:

[ALARMID]
Each alarm has a unique ID. This ID will be sent as alarm ID.

[ALARMTEXT]
The fully formatted alarm text. It will be not necessary to replace any placeholders in the text.

[MODULEID]
The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section).

[MODULENAME]
The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[TIMESTAMP]
The timestamp when the alarm happened.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.5   AlarmCleared

This message is sent when an alarm is cleared by the operator.

Event:

```
<Evt ID="AlarmCleared"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Alarm>
               <ID>[ALARMID]</ID>
               <Text>[ALARMTEXT]</Text>
               <ModuleID>[MODULEID]</ModuleId>
               <ModuleName>[MODULENAME]</ModuleName>
               <Response>[ALARMRESPONSE]</Response>
               <TimeStamp>[TIMESTAMP]</TimeStamp>
          </Alarm>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="AlarmCleared"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "AlarmCleared" command:

[ALARMID]
Each alarm has a unique ID. This ID will be sent as alarm ID.

[ALARMTEXT]
The fully formatted alarm text. It will be not necessary to replace any placeholders in the text.

[MODULEID]
The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section).

[MODULENAME]
The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[TIMESTAMP]
The timestamp when the alarm happened.

[ALARMRESPONSE]
The alarm response is the confirmation of the user in the message display.

List of alarm response options:

Message Options	
Option	Description
OK	OK selected by user
Cancel	Cancel selected by user
Abort	Abort selected by user
Retry	Retry selected by user
Ignore	Ignore selected by user
Yes	Yes selected by user
No	No selected by user
ToDo	Define all message options

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.6 User Events

User events are called when a logged in user is changed, a new user is created or an existing user is deleted.

2.17.4.7 UserLoggedIn

This event is triggered when a user signs in.
Event:

```
<Evt ID="UserLoggedIn"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <User AccessLevel="[ACCESSLEVEL]" Default="[DEFAULT]"
          Deleteable="[DELETEABLE]">[USERNAME]</User>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="UserLoggedIn"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "UpdateCurrentLoggedInUser" event:

[USERNAME]
The user name is the unique name of the available user.

[ACCESSLEVEL]
The access level is the specific user group and defines which user rights that user has on the machine.

[DEFAULT]
The default defines if the user is the default user which is logged in automatically after machine start.

[DELETEABLE]
The delectable option defines if this user is allowed to be deleted in the software.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.8 UserLoggedOut

This event is triggered when a user signs out.
Event:

```
<Evt ID="UserLoggedOut"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <User AccessLevel="[ACCESSLEVEL]" Default="[DEFAULT]"
        Deleteable="[DELETEABLE]">[USERNAME]</User>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="UserLoggedOut"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "UpdateCurrentLoggedOutUser" event:

[USERNAME]
    The user name is the unique name of the available user.

[ACCESSLEVEL]
    The access level is the specific user group and defines which user rights
    that user has on the machine.

[DEFAULT]
    The default defines if the user is the default user which is logged in
    automatically after machine start.

[DELETEABLE]
    The delectable option defines if this user is allowed to be deleted in the
    software.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.9 UserCreated

Event:

```
<Evt ID="UserCreated"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <User AccessLevel="[ACCESSLEVEL]" Default="[DEFAULT]"
        Deleteable="[DELETEABLE]">[USERNAME]</User>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="UserCreated"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "UserCreated" event:

[USERNAME]
      The user name is the unique name of the available user.

[ACCESSLEVEL]
      The access level is the specific user group and defines which user rights
      that user has on the machine.

[DEFAULT]
      The default defines if the user is the default user which is logged in
      automatically after machine start.

[DELETEABLE]
      The delectable option defines if this user is allowed to be deleted in the
      software.

[USERSTATE]

User State	
Value	Description
0	OK
ToDo	Define all error codes

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.10   UserDeleted

Event:

```
<Evt ID="UserDeleted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <User AccessLevel="[ACCESSLEVEL]" Default="[DEFAULT]"
          Deleteable="[DELETEABLE]">[USERNAME]</User>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="UserDeleted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "UserDeleted" event:

[USERNAME]
　　　The user name is the unique name of the available user.

[ACCESSLEVEL]
　　　The access level is the specific user group and defines which user rights
　　　that user has on the machine.

[DEFAULT]
　　　The default defines if the user is the default user which is logged in
　　　automatically after machine start.

[DELETEABLE]
　　　The delectable option defines if this user is allowed to be deleted in the
　　　software.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.11 UserEdited

Event:

```
<Evt ID="UserEdited"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <OriginalUser AccessLevel="[ACCESSLEVEL]"
          Default="[DEFAULT]"
          Deleteable="[DELETEABLE]">[USERNAME]</OriginalUser>
          <NewUser AccessLevel="[ACCESSLEVEL]" Default="[DEFAULT]"
          Deleteable="[DELETEABLE]">[USERNAME]</NewUser>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>

</Evt>
```

Event Acknowledge:

```
<EvtAck ID="UserEdited"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "UserEdited" command:

[USERNAME]
The user name is the unique name of the available user.

[ACCESSLEVEL]
The access level is the specific user group and defines which user rights that user has on the machine.

[DEFAULT]
The default defines if the user is the default user which is logged in automatically after machine start.

[DELETEABLE]
The delectable option defines if this user is allowed to be deleted in the software.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.12   Module Processing State Events

The following events are used to notify about the processing state of modules and the machine line.

2.17.4.13   ModuleProcessStatesChanged

Notifies about the current module state of one or more modules and/or the whole machine line.

Event:

```
<Evt ID="ModuleProcessStateChanged"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <ModuleState ID="[MODULEID]" Name="[MODULENAME]"/>
               [MODULESTATE]
          </ModuleState>
     <…/>
     <…/>
     <…/>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ModuleProcessStateChanged"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ModuleProcessStateChanged" event:

[MODULEID]
    The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section).

[MODULENAME]
    The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[MODULESTATE]
    The module state returns the state of the current module.

    The following states are possible:

Module states	
Value	Description
0	Init
1	Loaded
2	Ready
3	Standby
4	NoOperation
5	Setup
6	Down
7	Running
99	Unknown
ToDo	Define all states

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[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.14   Item Events

The following events are used to notify about the processing state any item produced on the machine line.

2.17.4.15   ItemProcessStarted

This event notifies about item starts in the machine line or for any module, it contains all information to track the item through the machine including sub items if the item has any defined.

Event:

```
<Evt ID="ItemProcessStarted"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
    <Item>
      <ItemId>[ITEMID]</ItemId>
      <ModuleID>[MODULEID]</ModuleId>
      <ModuleName>[MODULENAME]</ModuleName>
      <TrackingNumber>[ TRACKINGNUMBER]</ TrackingNumber >
      <ShiftRegisterPos>[SHIFTREGISTERPOS]</ShiftRegisterPos>
      <Items Count="[ITEMCOUNT]">
          <Item>
            <ModuleID>[MODULEID]</ModuleId>
            <ModuleName>[MODULENAME]</ModuleName>
            <ItemId>[ITEMID]</ItemId>
            < TrackingNumber >[TRACKINGNUMBER]</TrackingNumber>
            <ShiftRegisterPos>[SHIFTREGISTERPOS]</ShiftRegisterPos>
          </Item>
          [...]
      <Items>
    </Item>
    <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ItemProcessStarted"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ItemProcessStarted" event:

The event signals the start for a specific item with it sub items and how many items are included for a specific module.

[ITEMID]
The unique identifier within the lot of the Item which is currently started.

[TRACKINGNUMBER]
If the Item has a serial number which needs to be tracked it will be included here – could also substitute the item ID

[SHIFTREGISTERPOS]
The assigned Slot in the Shift register to track it through the machine.

[ITEMCOUNT]
The Amount of items the specific Item has to group them correctly and make sure every item will be accounted for.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.16   ItemsProcessStarted

This event notifies about multiple item starts at the same time in the machine line or for any module, it contains all information to track the item through the machine including sub items if the item has any defined.

Event:

```
<Evt ID="ItemsProcessStarted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Items Itemcount="[ITEMCOUNT]">
        <Item>
            For Example:
        <ItemId>[ITEMID]</ItemId>
        <ModuleID>[MODULEID]</ModuleId>
        <ModuleName>[MODULENAME]</ModuleName>
        <TrackingNumber>[ TRACKINGNUMBER]</ TrackingNumber >
        <ShiftRegisterPos>[SHIFTREGISTERPOS]</ShiftRegisterPos>
        <Items Count="[ITEMCOUNT]">
            <Item>
                <ModuleID>[MODULEID]</ModuleId>
                <ModuleName>[MODULENAME]</ModuleName>
                <ItemId>[ITEMID]</ItemId>
                < TrackingNumber >[TRACKINGNUMBER]</TrackingNumber>
                <ShiftRegisterPos>[SHIFTREGISTERPOS]</ShiftRegisterPos
                >
            </Item>
                [...]
            </Items>
        </Item>
            [...]
        </Items>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ItemsProcessStarted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ItemsProcessStarted" event:

The event signals the start for a specific item with it sub items and how many items are included for a specific module.

[ITEMCOUNT]
The number of items which are included in this message.

[ITEMID]
The unique identifier within the lot of the Item which is currently started.

[TRACKINGNUMBER]
If the Item has a serial number which needs to be tracked it will be included here – could also substitute the item ID

[SHIFTREGISTERPOS]
The assigned Slot in the Shift register to track it through the machine.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.17   ItemProcessCompleted

This event notifies an item processing completion in the machine line or for any module.

Event:

```
<Evt ID="ItemProcessCompleted"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Item>
                For Example:
        <ModuleID>[MODULEID]</ModuleId>
        <ModuleName>[MODULENAME]</ModuleName>
        <ItemId>[ITEMID]</ItemId>
        <TrackingNumber>[TRACKINGNUMBER]</TrackingNumber>
        <ShiftRegisterPos>[SHIFTREGISTERPOS]</ShiftRegisterPos>
        <Result>[RESULT]</Result>
        <ResultData>[RESULTDATA]</ResultData>
            [...]

        <Items Count="[ITEMCOUNT]">
            <Item>
                <ModuleID>[MODULEID]</ModuleId>
                <ModuleName>[MODULENAME]</ModuleName>
                <ItemId>[ITEMID]</ItemId>
                <TrackingNumber>[ TRACKINGNUMBER]</TrackingNumber>
                <Result>[RESULT]</Result>
                <ResultData>[RESULTDATA]</ResultData>
            [...]
            </Item>
            [...]
         </Items>
        </Item>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ItemProcessCompleted"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ItemProcessCompleted" event:

The event signals the completion for a specific item with it sub items for a specific module with the given results.

[ITEMID]
The unique identifier within the lot of the Item which is currently started.

[TRACKINGNUMBER]
If the Item has a serial number which needs to be tracked it will be included here – could also substitute the item ID

[SHIFTREGISTERPOS]
The assigned Slot in the Shift register to track it through the machine.

[RESULT]
Overall Result, if the item was good or bad in the machine process / module.

[RESULTDATA]
All relevant information regarding the module:
ToDo: Needs to be defined or designed variable?
e.g Measurement Data for Vision.

[ITEMCOUNT]
The Amount of items the specific Item has to group them correctly and make sure every item will be accounted for.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.18   ItemsProcessCompleted

This event notifies about multiple item processing completions in the machine line or for any module.

Event:

```
<Evt ID="ItemsProcessCompleted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Items ItemCount="[ITEMCOUNT]">
                 For Example:
           <ModuleID>[MODULEID]</ModuleId>
           <ModuleName>[MODULENAME]</ModuleName>
           <ItemId>[ITEMID]</ItemId>
           <TrackingNumber>[TRACKINGNUMBER]</TrackingNumber>
           <ShiftRegisterPos>[SHIFTREGISTERPOS]</ShiftRegisterPos>
        <Result>[RESULT]</Result>
        <ResultData>[RESULTDATA]</ResultData>
             [...]
          <Items Count="[ITEMCOUNT]">
             <Item>
                 <ModuleID>[MODULEID]</ModuleId>
                 <ModuleName>[MODULENAME]</ModuleName>
                 <ItemId>[ITEMID]</ItemId>
                 <TrackingNumber>[ TRACKINGNUMBER]</TrackingNumber>
                 <Result>[RESULT]</Result>
                 <ResultData>[RESULTDATA]</ResultData>
             </Item>
             [...]
           </Items>
          </Item>
        </Items>

          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ItemsProcessCompleted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ItemsProcessCompleted" event:

The event signals the completion for a specific item with it sub items for a specific module with the given results.

[ITEMCOUNT]
The number of items which are included in this message.

[ITEMID]
The unique identifier within the lot of the Item which is currently started.

[TRACKINGNUMBER]
If the Item has a serial number which needs to be tracked it will be included here – could also substitute the item ID

[SHIFTREGISTERPOS]
The assigned Slot in the Shift register to track it through the machine.

[RESULT]
Overall Result, if the item was good or bad in the machine process / module.

[RESULTDATA]
All relevant information regarding the module:
ToDo: Needs to be defined or designed variable?
e.g Measurement Data for Vision.

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[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.19   ItemMoved

This event notifies about moving an item to another module. The module information defines the module where the item arrives.

Event:

```
<Evt ID="ItemMoved"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <ModuleID>[MODULEID]</ModuleId>
          <ModuleName>[MODULENAME]</ModuleName>
          <ItemId>[ITEMID]</ItemId>
          <TrackingNumber>[TRACKINGNUMBER]</TrackingNumber>
          <ShiftRegisterPos>[SHIFTREGISTERPOS]</ShiftRegisterPos>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ItemMoved"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ItemsProcessCompleted" event:

The event signals the completion for a specific item with it sub items for a specific module with the given results.

[ITEMID]
The unique identifier within the lot of the Item which is currently started.

[TRACKINGNUMBER]
If the Item has a serial number which needs to be tracked it will be included here – could also substitute the item ID

[SHIFTREGISTERPOS]
The assigned Slot in the Shift register to track it through the machine.

[RESULT]
Overall Result, if the item was good or bad in the machine process / module.

[RESULTDATA]
All relevant information regarding the module:
ToDo: Needs to be defined or designed variable?
e.g Measurement Data for Vision.

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[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.20 Control State Events

The following events are used to notify about the control state between the MES and the machine line.

2.17.4.21 ControlStateChanged

This event notifies about the previous and the current control state.

Event:

```
<Evt ID="ControlStateChanged"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <PreviousState>
               <State>[STATE]</State>
               <SubState>[SUBSTATE]</SubState>
          </PreviousState>
          <CurrentState>
               <State>[STATE]</State>
               <SubState>[SUBSTATE]</SubState>
          </CurrentState>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="GetControlStateResponse"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ControlStateChanged" event:

The event provides the previous and the current control state.

[STATE]
The control state of the machine defines the operating mode between the MES and the machine, this is described above under section Control States.

Possible values for state:
Online (Sub-states: Local, Remote)
Offline (No sub-state)

[SUBSTATE]
The sub-state is only required for the Online state. It specifies the accessibility of the machine in online control state.

Possible values for sub-state:
Local
Remote

Note: For the state Offline the sub-state will stay empty, but the message will contain the tag.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
ToDo	Define all error codes

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2.17.4.22   Material Events

The following events are used to notify about the material changes on the machine line.

2.17.4.23   MaterialReceived

This event notifies about incoming new material, e.g. if a new chip reel or a new curing hardware is applied to the machine line. It contains the material ID, which is usually provided as barcode on the material, this event doesn't mean the material is processed yet.

Event:

```
<Evt ID="MaterialReceived"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Material>
            <MaterialId>[MATERIALID]</MaterialId>
            <MaterialName>[MATERIALNAME]</MaterialName>
        </Material>
        <ModuleId>=[MODULEID]</ModuleId>
        <ModuleName>[MODULENAME]</ModuleName>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="MaterialReceived"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "MaterialReceived" event:

[MATERIALID]
The unique identifier of the material, usually the QR / Barcode which is associated with the material.

[MATERIALNAME]
The Name / Type of the Material which is removed from the machine module. It would be optional for the communication and will not be used to identify the material. But it has to be added for logging and debugging purpose

[MODULEID]
The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section), which used the specified material.

[MODULENAME]
The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Material not accepted
ToDo	Define all error codes

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2.17.4.24   MaterialProcessed

This event notifies about new used material, as soon as material is used by the machine, for example: automatic switch to a second input material slot. This event will be triggered.

Event:

```
<Evt ID="MaterialProcessed"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Material>
            <MaterialId>[MATERIALID]</MaterialId>
            <MaterialName>[MATERIALNAME]</MaterialName>
        </Material>
        <ModuleId>=[MODULEID]</ModuleId>
        <ModuleName>[MODULENAME]</ModuleName>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="MaterialProcessed"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "MaterialProcessed" event:

[MATERIALID]
The unique identifier of the material, usually the QR / Barcode which is associated with the material.

[MATERIALNAME]
The Name / Type of the Material which is removed from the machine module. It would be optional for the communication and will not be used to identify the material. But it has to be added for logging and debugging purpose

[MODULEID]
The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section), which used the specified material.

[MODULENAME]
The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Error
ToDo	Define all error codes

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2.17.4.25   MaterialLevel

This event notifies about the usage level for a material, for example a material counter, if a warning or error level is reached or the material is empty.

Event:

```
<Evt ID="MaterialLevel"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Material>
               <MaterialId>[TOOLID]</ToolId>
               <MaterialName>[TOOLNAME]</ToolName>
               <MaterialState>[TOOLWEARINGSTATE]</MaterialState>
               <MaterialLevel>[TOOLWEARINGLEVEL]</MaterialLevel>
          </Material>
          <ModuleId>=[MODULEID]</ModuleId>
          <ModuleName>[MODULENAME]</ModuleName>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="MaterialLevel"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ToolWearingLevel" event:

[MATERIALID]
The unique identifier of the material, usually the QR / Barcode which is associated with the material.

[MATERIALNAME]
The Name / Type of the Material which is removed from the machine module. It would be optional for the communication and will not be used to identify the material. But it has to be added for logging and debugging purpose

[MATERIALSTATE]
The material state provides the status of the material in the machine.

Wearing States	
Value	Description
0	OK
1	Warning (going to be empty soon)
2	Error (Empty)

[MATERIALLEVEL]
The material level is the current material counter. The counter will be reset on changing the materia and will have a warning and error level. The counter can be a simple up- or down counting number for an amount, length or similar.

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[MODULEID]

The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section), which used the specified material.

[MODULENAME]

The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Error
ToDo	Define all error codes

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2.17.4.26   MaterialRemoved

This event notifies about removed used material, e.g. if a chip reel or the curing hardware is removed. It contains the material ID which is saved by the software for that material.

Event:

```
<Evt ID="MaterialRemoved"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Material>
            <MaterialId>[MATERIALID]</MaterialId>
            <MaterialName>[MATERIALNAME]</MaterialName>
            <MaterialState>[TOOLWEARINGSTATE]</MaterialState>
            <MaterialLevel>[TOOLWEARINGLEVEL]</MaterialLevel>
        </Material>
        <ModuleId>=[MODULEID]</ModuleId>
        <ModuleName>[MODULENAME]</ModuleName>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="MaterialRemoved"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "MaterialRemoved" event:

[MATERIALID]
The unique identifier of the material, usually the QR / Barcode which is associated with the material.

[MATERIALNAME]
The Name / Type of the Material which is removed from the machine module. It would be optional for the communication and will not be used to identify the material. But it has to be added for logging and debugging purpose

[MATERIALSTATE]
The material state provides the status of the material in the machine.

Wearing States	
Value	Description
0	OK
1	Warning (going to be empty soon)
2	Error (Empty)

[MATERIALLEVEL]
The material level is the current material counter. The counter will be reset on changing the materia and will have a warning and error level. The counter can be a simple up- or down counting number for an amount, length or similar.

[MODULEID]
The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section), which used the specified material.

[MODULENAME]
The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

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[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Error
ToDo	Define all error codes

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2.17.4.27   Tool Events

The following events are used to notify about the tools or wearing parts changes on the machine line.

2.17.4.28   ToolReceived

This event notifies about incoming new tool or wearing parts, e.g. if a new curing hardware is applied to the machine line. It can contain the tool ID, which is usually provided as barcode on the tool or wearing part.

Event:

```
<Evt ID="ToolReceived"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Tool>
            <ToolId>[TOOLID]</ToolId>
            <ToolName>[TOOLNAME]</ToolName>
        </Tool>
        <ModuleId>=[MODULEID]</ModuleId>
        <ModuleName>[MODULENAME]</ModuleName>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ToolReceived"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ToolReceived" event:

[TOOLID]
The unique identifier of the tool or or wearing part, usually the QR / Barcode which is associated with the tool or wearing part.

[TOOLNAME]
The Name / Type of the tool or wearing part which is removed from the machine module. It would be optional for the communication and will not be used to identify the tool or wearing part. But it has to be added for logging and debugging purpose

[MODULEID]
The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section), which used the specified material.

[MODULENAME]
The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Tool not accepted
ToDo	Define all error codes

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2.17.4.29 ToolWearingLevel

This event notifies about the wearing status of the tool or wearing part, for example a tool counter, if it is reached or the part expired.

Event:

```
<Evt ID="ToolWearingLevel"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
         <Tool>
             <ToolId>[TOOLID]</ToolId>
             <ToolName>[TOOLNAME]</ToolName>
             <WearingState>[TOOLWEARINGSTATE]</WearingState>
             <WearingLevel>[TOOLWEARINGLEVEL]</WearingLevel>
         </Tool>
         <ModuleId>=[MODULEID]</ModuleId>
         <ModuleName>[MODULENAME]</ModuleName>
         <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ToolWearingLevel"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
         <Result>[RESULT]</Result>
         <Error>[ERRORCODE]</Error>
         <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ToolWearingLevel" event:

[TOOLID]
The unique identifier of the tool or or wearing part, usually the QR / Barcode which is associated with the tool or wearing part.

[TOOLNAME]
The Name / Type of the tool or wearing part which is removed from the machine module. It would be optional for the communication and will not be used to identify the tool or wearing part. But it has to be added for logging and debugging purpose

[WEARINGSTATE]
The wearing state provides the status of the tool or wearing part in the machine.

Wearing States	
Value	Description
0	OK
1	Warning (going to expire soon)
2	Error (Expired)

[WEARINGLEVEL]
The wearing level is the current tool or wearing part counter. The counter will be reset on changing the part and will have a warning and error level. The counter can be a simple up- or down counting number or also a time span.

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[MODULEID]

The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section), which used the specified material.

[MODULENAME]

The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Error
ToDo	Define all error codes

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2.17.4.30   ToolRemoved

This event notifies about removed used tool or wearing parts, e.g. if a new curing hardware is applied to the machine line. It can contain the tool ID, which is usually provided as barcode on the tool or wearing part.

Event:

```
<Evt ID="ToolRemoved"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Tool>
                <ToolId>[TOOLID]</ToolId>
                <ToolName>[TOOLNAME]</ToolName>
                <WearingState>[TOOLWEARINGSTATE]</WearingState>
                <WearingLevel>[TOOLWEARINGLEVEL]</WearingLevel>
          </Tool>
          <ModuleId>=[MODULEID]</ModuleId>
          <ModuleName>[MODULENAME]</ModuleName>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ToolRemoved"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "MaterialRemoved" event:

[TOOLID]
The unique identifier of the tool or or wearing part, usually the QR / Barcode which is associated with the tool or wearing part.

[TOOLNAME]
The Name / Type of the tool or wearing part which is removed from the machine module. It would be optional for the communication and will not be used to identify the tool or wearing part. But it has to be added for logging and debugging purpose

[WEARINGSTATE]
The wearing state provides the status of the tool or wearing part in the machine.

Wearing States	
Value	Description
0	OK
1	Warning (going to expire soon)
2	Error (Expired)

[WEARINGLEVEL]
The wearing level is the current tool or wearing part counter. The counter will be reset on changing the part and will have a warning and error level. The counter can be a simple up- or down counting number or also a time span.

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[MODULEID]

The module ID is the unique identifier of the module inside of the machine line. This will be used by the software to identify the module in the modules mapping table (see above under Modules section), which used the specified material.

[MODULENAME]

The module name is the name of the module inside the machine line. It is defined in the modules mapping table. It would be optional for the communication and will not be used to identify the module. But it has to be added for logging and debugging purpose

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Error
ToDo	Define all error codes

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2.17.4.31   Product Events

The following events are used to notify about the product changes on the machine line.

2.17.4.32   ProductCreated

This event notifies about product creation by a local user. MES creation will be covered by the ProductStore Event.

Event:

```
<Evt ID="ProductCreated"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Product>
               <Name>[PRODUCTNAME]</Name>
          </Product>
          <TimeStamp>[TIMESTAMP]</TimeStamp>

</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ProductCreated"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ProductCreated" event:

[PRODUCTNAME]
This product name is the name of the specific product created on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Error
ToDo	Define all error codes

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2.17.4.33 ProductSelected

This event notifies about product selection by user or by upload from MES system.

Event:

```
<Evt ID="ProductSelected"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Product>
              <Name>[PRODUCTNAME]</Name>
          </Product>
          <TimeStamp>[TIMESTAMP]</TimeStamp>

</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ProductSelected"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ProductSelected" event:

[PRODUCTNAME]
> This product name is the name of the specific product used on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.34   ProductUpdated

This event notifies about product update, e.g. change of settings by an local user.

Event:

```
<Evt ID="ProductUpdated"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Product>
               <Name>[PRODUCTNAME]</Name>
               <Update>
                    <Variable>
                         <Name>[NAME]</Name>
                         <Value>[VALUE]</Value>
                    </Variable>
               </Update>
               <TimeStamp>[TIMESTAMP]</TimeStamp>
          </Product>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ProductUpdated"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ProductUpdated" event:

[PRODUCTNAME]
      This product name is the name of the specific product available on the
      machine line.

[NAME]
The name of the specific Variable which was updated

[Value]
The value of the specific Variable which was updated

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.35   ProductDeleted

This event notifies about product deletion by user or from MES system.

Event:

```
<Evt ID="ProductDeleted"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Product>
            <Name>[PRODUCTNAME]</Name>
        </Product>
        <TimeStamp>[TIMESTAMP]</TimeStamp>

</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ProductDeleted"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ProductDeleted" event:

[PRODUCTNAME]
This product name is the name of the specific product used on the
machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.36   ProductStored

This event notifies that a product was stored from MES onto the machine.
This event will only be triggered if a new Product was created by MES not
from a local user.

Event:

```
<Evt ID="ProductStored"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Product>
               <Name>[PRODUCTNAME]</Name>
          </Product>
          <TimeStamp>[TIMESTAMP]</TimeStamp>

</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ProductStored"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ProductUpdated" event:

[PRODUCTNAME]
> This product name is the name of the specific product affected by this event

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product store failed
ToDo	Define all error codes

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2.17.4.37   ProductDownloaded

This event notifies that a product was loaded from the machine line onto the MES.

Event:

```
<Evt ID="ProductDownloaded"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Product>
            <Name>[PRODUCTNAME]</Name>
        </Product>
        <TimeStamp>[TIMESTAMP]</TimeStamp>

</Evt>
```

Event Acknowledge:

```
<EvtAck ID="ProductDownloaded"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "ProductDownloaded" event:

[PRODUCTNAME]
This product name is the name of the specific product affected by this
event

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product store failed
ToDo	Define all error codes

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2.17.4.38   OperatorCommandExecuted

This event notifies about operator command on the machine line.

Event:

```
<Evt ID="OperatorCommandExecuted"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <OperatorCommand>
            <Command>[OPERATORCOMMAND]</Command>
        </OperatorCommand>
        <TimeStamp>[TIMESTAMP]</TimeStamp>

</Evt>
```

Event Acknowledge:

```
<EvtAck ID="OperatorCommandExecuted"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "OperatorCommandExecuted" event:

[OPERATORCOMMAND]
   The operator command executed on the machine.

   ToDo: Define operator command more detailed.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.39 Lot Events

The following events are used to notify about the lot changes on the machine line.

2.17.4.40 LotCreated

This event notifies about lot creation by user or from MES system.

Event:

```
<Evt ID="LotCreated"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <Lot>
            <Name>[LOTNAME]</Name>
            <Count>[ITEMCOUNT]</Count>
            <Product>
                <Name>[PRODUCTNAME]</Name>
            </Product>
        </Lot>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="LotCreated"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "LotCreated" event:

[LOTNAME]
    The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
    The item count defines how many main items have to be produced. Any items can have sub items.

[PRODUCTNAME]
    This product name is the name of the specific product used on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.41 LotUpdated

This event notifies about lot change or updated by user or from MES system.

Event:

```
<Evt ID="LotUpdated"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
        <OriginalLot>
            <Name>[LOTNAME]</Name>
            <Count>[ITEMCOUNT]</Count>
            <Product>
                <Name>[PRODUCTNAME]</Name>
            </Product>
        <Original/Lot>
        <CurrentLot>
            <Name>[LOTNAME]</Name>
            <Count>[ITEMCOUNT]</Count>
            <Product>
                <Name>[PRODUCTNAME]</Name>
            </Product>
        </CurrentLot>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="LotUpdated"
    EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
        <Result>[RESULT]</Result>
        <Error>[ERRORCODE]</Error>
        <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "LotUpdated" event:

[LOTNAME]
    The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
    The item count defines how many main items have to be produced. Any
    items can have sub items.

[PRODUCTNAME]
    This product name is the name of the specific product used on the
    machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.42   LotDeleted

This event notifies about lot deletion by user or from MES system.

Event:

```
<Evt ID="LotDeleted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Lot>
                <Name>[LOTNAME]</Name>
                <Count>[ITEMCOUNT]</Count>
                <Product>
                     <Name>[PRODUCTNAME]</Name>
                </Product>
          </Lot>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="LotDeleted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "LotDeleted" event:

[LOTNAME]
    The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
    The item count defines how many main items have to be produced. Any items can have sub items.

[PRODUCTNAME]
    This product name is the name of the specific product used on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.43   LotStarted

This event notifies about lot start on the machine line.

Event:

```
<Evt ID="LotStarted"
      EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
            <Lot>
                  <Name>[LOTNAME]</Name>
                  <Count>[ITEMCOUNT]</Count>
                  <Product>
                        <Name>[PRODUCTNAME]</Name>
                  </Product>
            </Lot>
            <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="LotStarted"
      EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
            <Result>[RESULT]</Result>
            <Error>[ERRORCODE]</Error>
            <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "LotStarted" event:

[LOTNAME]
 The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
 The item count defines how many main items have to be produced. Any items can have sub items.

[PRODUCTNAME]
 This product name is the name of the specific product used on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.44   LotCompleted

This event notifies about lot completion on the machine line.

Event:

```
<Evt ID="LotCompleted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Lot>
               <Name>[LOTNAME]</Name>
               <Count>[ITEMCOUNT]</Count>
               <Product>
                    <Name>[PRODUCTNAME]</Name>
               </Product>
               <Result>[RESULTDATA]</Result>
               </Lot>
               <TimeStamp>[TIMESTAMP]</TimeStamp>
     </Evt>
```

Event Acknowledge:

```
<EvtAck ID="LotCompleted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "LotCompleted" event:

[LOTNAME]
The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
The item count defines how many main items have to be produced. Any items can have sub items.
ToDo: have to be produced or already produced?

[PRODUCTNAME]
This product name is the name of the specific product used on the machine line.

[RESULTDATA]
The result data contains details about the lot result.

ToDo: Define details about result data.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.45   LotAborted

This event notifies about lot abortion on the machine line.

Event:

```
<Evt ID="LotAborted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Lot>
               <Name>[LOTNAME]</Name>
               <Count>[ITEMCOUNT]</Count>
               <Product>
                     <Name>[PRODUCTNAME]</Name>
               </Product>
               <Result>[RESULTDATA]</Result>
          </Lot>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="LotAborted"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "LotAborted" event:

[LOTNAME]
 The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
 The item count defines how many main items have to be produced. Any
 items can have sub items.
 ToDo: have to be produced or already produced?

[PRODUCTNAME]
 This product name is the name of the specific product used on the
 machine line.

[RESULTDATA]
 The result data contains details about the lot result.

 ToDo: Define details about result data.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.46   LotPaused

This event notifies about lot pause on the machine line.

Event:

```
<Evt ID="LotPaused"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Lot>
               <Name>[LOTNAME]</Name>
               <Count>[ITEMCOUNT]</Count>
               <Product>
                    <Name>[PRODUCTNAME]</Name>
               </Product>
               <Result>[RESULTDATA]</Result>
          </Lot>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="LotPaused"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "LotPaused" event:

[LOTNAME]
      The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
      The item count defines how many main items have to be produced. Any
      items can have sub items.
      ToDo: have to be produced or already produced?

[PRODUCTNAME]
      This product name is the name of the specific product used on the
      machine line.

[RESULTDATA]
      The result data contains details about the lot result.

      ToDo: Define details about result data.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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2.17.4.47   LotResumed

This event notifies about lot resume on the machine line, can only happen on paused lots, since it would be otherwise a start.

Event:

```
<Evt ID="LotResumed"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]" SeqID="[SEQID]">
          <Lot>
               <Name>[LOTNAME]</Name>
               <Count>[ITEMCOUNT]</Count>
               <Product>
                    <Name>[PRODUCTNAME]</Name>
               </Product>
          </Lot>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</Evt>
```

Event Acknowledge:

```
<EvtAck ID="LotResumed"
     EquipID="[EQUIPMENTID]" EvtSeqID="[EVTSEQID]">
          <Result>[RESULT]</Result>
          <Error>[ERRORCODE]</Error>
          <TimeStamp>[TIMESTAMP]</TimeStamp>
</EvtAck>
```

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Definitions for "LotResumed" event:

[LOTNAME]
> The lot name defines the specific name of that lot on the machine line.

[ITEMCOUNT]
> The item count defines how many main items have to be produced. Any items can have sub items.

[PRODUCTNAME]
> This product name is the name of the specific product used on the machine line.

[ERRORCODE]

Error Codes	
Value	Description
0	OK
1	Product not available
ToDo	Define all error codes

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Appendixes

See also Document:

- Infineon_Biometric_SECSGEMInterface_CollectionEventMapping