

# High-Level Control to Business Systems Communication

**This document is an early draft. The content will change and should not be used without consulting the author.**

## Revision history

Version	Date	Author	Description
0.1	11-12-2023	AEF PPO	First iteration of the HLC to business system communication interface
0.2	07-02-2024	AEF	Added option to select and update the priority of production orders. Properties use dashes (-) instead of underscores (_) Added "request-id" property to header to be used with request/reply patterns.
0.3	09-04-2024	AEF	How an item is produced is now described through a process segment rather than directly through an associated bill of materials to support producing multiple items in a single process.
0.4	11-03-2025 24-06-2025	MIV PDA	Updates to types and telegrams. Release

## Review history

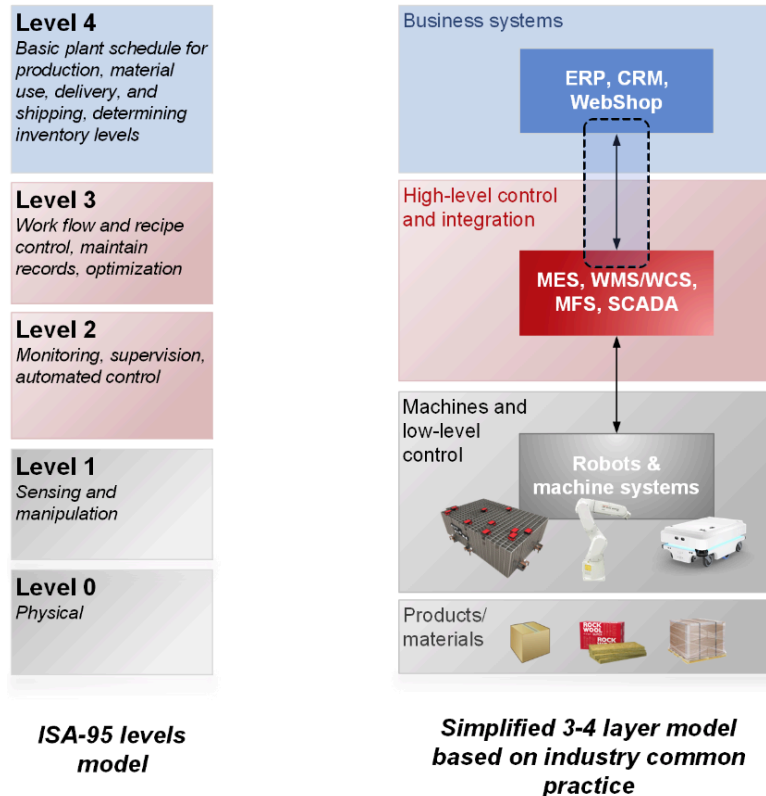
Version	Date	Reviewer	Notes / description
1.0	03-01-2024	AEF	Review
0.2	08-02-2024	SML PPO	Review
0.3	12-02-2024	SML	Review
0.4	13-03-2025 24-06-2025	AEF PDA	Review Release

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# 1 Introduction

This document describes the communication between the high-level control and integration system and business systems in the reference architecture for the 5G-ROBOT - 5G Enabled Autonomous Mobile Robotic Systems project. The document is a delivery for the 5G-ROBOT WP-2.



**Figure 1: Simplified 3-4-layer model for automation architectures**

The high-level control and integration layer is among others responsible for the vertical integration between IT-systems in the business layer, such as ERP and CRM systems, and OT-systems, robots and automation in the machines and low-level control layer, illustrated in Figure 1.

The systems in the business systems layer can have different responsibilities, e.g. management of internal and external resources, including tangible assets, financial resources, materials and human resources and incoming and outgoing orders. It facilitates the flow of information between all business functions inside the boundaries of the organization and manages the connections to outside stakeholders. Through this, all business operations are consolidated into a uniform and enterprise-wide system environment. The responsibilities of the systems in the business systems layer can range from simple to very complex depending on the business needs. Furthermore, some responsibilities can be handled either by systems in the business systems layer or in the high level and integration layer, e.g. MES and WMS functionality. In some cases, the responsibilities need to be shared between the two layers, as the response time to the systems in the business systems layer can be too long - e.g. due to usage of cloud solutions - to satisfy the needs in the lower layers.

The high-level control and integration layer is a key part of the supply chain, primarily aiming to control the movement and storage of materials and items within a warehouse and process the associated transactions,

including shipping, receiving, putaway and picking. It also directs the real-time activities within warehouses and distribution centers, keeping all machines and low-level control running as intended, maximizing the efficiency of material handling subsystems and often the activities of the warehouse associate themselves.

This interface specification is an extension of the Standard Interface specification [1].

## 1.1 References

ID	Document	Description
[1]	Standard Interfaces v1.0	The base interface description used for all the open interfaces. Found on Intelligent Systems website: <a href="https://www.intelligentsystems.dk/products-kep-customers-at-forefront-of-technology/">https://www.intelligentsystems.dk/products-kep-customers-at-forefront-of-technology/</a>
[2]	Domain Model v1.3	Defines various terms and concepts used for the domain. Found on Intelligent Systems website: <a href="https://www.intelligentsystems.dk/products-kep-customers-at-forefront-of-technology/">https://www.intelligentsystems.dk/products-kep-customers-at-forefront-of-technology/</a>
[3]	MQTT Protocol for Standard Interfaces v1.0	Protocol specification for using MQTT with the standard open interfaces. Found on Intelligent Systems website: <a href="https://www.intelligentsystems.dk/products-kep-customers-at-forefront-of-technology/">https://www.intelligentsystems.dk/products-kep-customers-at-forefront-of-technology/</a>
[4]	GS1 GTIN-14	<a href="https://www.gs1.org/standards/barcodes/application-identifiers/01?lang=en">https://www.gs1.org/standards/barcodes/application-identifiers/01?lang=en</a>
[5]	GS1 General Specifications Standard	<a href="https://ref.gs1.org/standards/genspecs/">https://ref.gs1.org/standards/genspecs/</a>
[6]	GS1 Unit of Measure Codes	<a href="https://www.gs1us.org/resources/data-hub-help-center/unit-of-measure-codes">https://www.gs1us.org/resources/data-hub-help-center/unit-of-measure-codes</a>
[7]	GS1 Batch or lot number	<a href="https://www.gs1.org/standards/barcodes/application-identifiers/10?lang=en">https://www.gs1.org/standards/barcodes/application-identifiers/10?lang=en</a>
[8]	GS1 GRAI	<a href="https://www.gs1.org/standards/id-keys/grai">https://www.gs1.org/standards/id-keys/grai</a>

## 1.2 Copyright and right to use under Apache License 2.0

The copyright on this document and any contained specifications, designs, etc. belongs to the company: Intelligent Systems A/S, Havnevej 11, DK-9560 Hadsund, DENMARK.

Any referenced 3rd party designs, technologies and or other IP shall remain with the original owners.

The reference architecture, designs and the included open standard integration interfaces are open and free to use under Apache License 2.0. For details please see <https://www.apache.org/licenses/LICENSE-2.0>.

## 1.3 Iterative development and expansion of the interface

The interface will be developed, tested and released through a number of iterations where the scope will be driven by the needs from end users, among others.

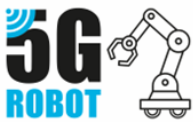
### 1.3.1 Future Releases

In future iterations the interface will support more use cases and different types of business systems, e.g. Webshops, MES and WMS, and other high-level control systems. The support of other high-level control systems will be relevant to integrate parts of the functionality of the high level and integration layer with existing high level control systems. An example could be if a factory has a High-Level Control system for their production lines, but wants to use AMRs or AGVs to improve their intra logistics.

Below is a list of ideas for future releases of the interface. The list is neither complete or decided, but is an un-prioritized list of potential features for future releases.

- Use of other communication methods (Kafka, REST, file-based)
- Schema Validation
- Master Data & synchronization
  - Product data
  - Locations
  - Container Definitions
  - Warehouse and Inventory
- Customer Orders & Shipping
- Expansion to Production & Manufacturing
- Palletizing
- Intra-, Inbound/Outbound logistics
- Use of Unified namespace

### 1.4 Background / 5G-Robot



Parts of this document / release was made in the **5G-Robot** project also known under the long name **5G-ENABLED AUTONOMOUS MOBILE ROBOTIC SYSTEMS** - the largest innovation project that has been launched under the Innovation Fund Denmark's (IFD) Grand Solutions program.

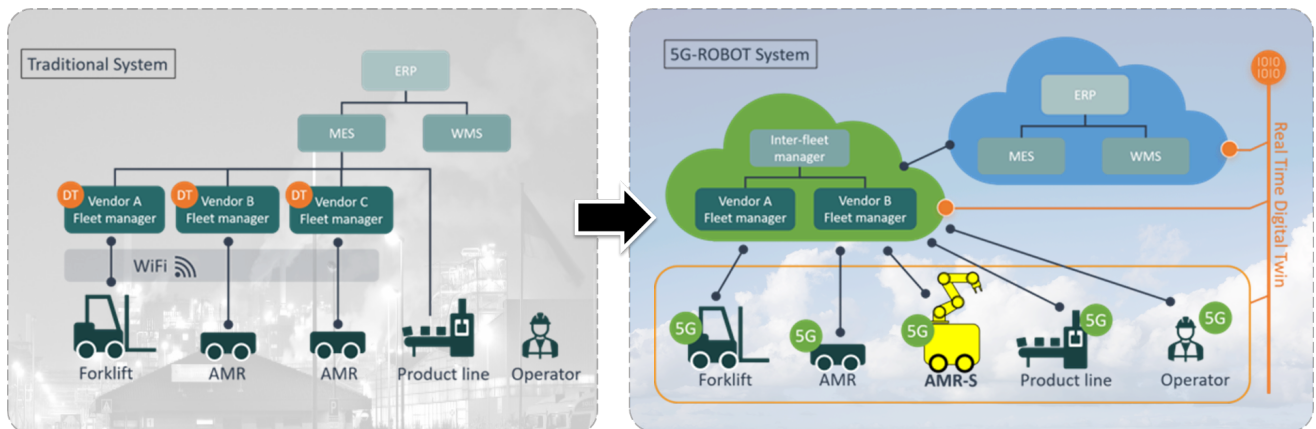
The groundbreaking project united Denmark's leading robot, automation and factory digitalization companies as technology vendors, research partners and industry-leading end-user companies.



*Illustration: Project partner logos.*

The aim of the project was to revolutionize manufacturing - paving the way to smart production and smart factories and the application of a number of new technologies in production and manufacturing including 5G wireless communication, cloud and edge computing and digital twin.

Intelligent Systems played a leading role in the project, providing the glue that ties the robotic solutions of the partners together making the work as one - i.e. one connected integrated intelligent manufacturing system.



*Illustration: The aim is to revolutionize manufacturing paving the way to smart production and smart factories.*

Read more about the 5G-Robot project here: <https://www.5gsmartproduction.aau.dk/5g-robot>

## 2 Terminology & Domain Model

This section describes the terms that are used throughout the document, their respective explanations and how they relate to one-another.

### 2.1 Glossary

Term	Description
<b>ERP</b>	The Enterprise Resource Planning system operates on the business systems layer and can manage internal and external resources, including tangible assets, financial resources, materials and human resources, among others. Also referred to as the Host system.
<b>WCS</b>	A Warehouse Control System directs the real-time activities within warehouses and distribution centers, keeping all machines and low-level control running as intended.
<b>WMS</b>	Warehouse management system. Handles inventory management and is part of the high-level control and integration layer.
<b>MES</b>	Manufacturing Execution System. Handles production equipment settings, processes and does the actual initiation of a production process scheduled in ERP.
<b>HLC</b>	The High-Level Control system is a general designation for systems in the high-level control and integration layers (layer 2 and 3 of the ISA-95 model). The HLC can also be a single system, consisting of a combination of WCS, WMS and MES.
<b>Item</b>	Primary inventory entity and lowest level of information. It describes the distinct physical object (or a number of physical objects that are indistinguishable). Also referred to as Product or Goods.
<b>Item Type</b>	Describes the general grouping of identical items, typically having the same GTIN/SKU.
<b>Item Type Variant</b>	Describes variants of items of a similar type.
<b>Production Order</b>	An Order describes what can be considered a "Task" or a "Job" for the system to perform, involving moving/transporting or producing items. An order consists of one or more Order Lines.
<b>Production Order Line</b>	Describes an Order in higher detail, e.g. detailing the Item Type to produce or which specific Item to transport.
<b>Unit of Measure / UoM</b>	The unit used to specify the quantity of an item e.g. pcs, carton, kg, ton, liter, cl, meter, cm.
<b>Bill of Materials / BoM</b>	Information about what materials, including the type and quantity, should be used for production.

## 2.2 Domain Model

This section contains the domain- and object models used for the interface.

Refer to the following concepts in the domain model [2]:

- Items Concept
- Production Order Concept

## 3 Communication

The telegram format for the interface can be read in the standard interface document [1].

### 3.1 Using the MQTT Protocol

Refer to [3] to see details for implementing the interface using the MQTT protocol.

Note that this interface overrides the MQTT protocol with the following values:

- Prefix is set to *host*
- Publisher is set to *host* for equipment (/system) and *hlc* for the HLC

Example topic for [Order Priority Update](#): *host/bs1914/host/order/priority*

## 4 Common Data Types

This section extends the data types presented in the standard interface document [1].

### 4.1 Order State

**Data type:** OrderState

Location State	Description
Created	Order has been created but is still being updated.
Ready	Order is ready to be processed so no more expected updates.
Started	Order has been started and updates are limited.
Completed	Order has been completed.
Cancelled	Order has been cancelled. It may have been partially fulfilled.

### 4.2 Order Line State

**Data type:** OrderLineState

Location State	Description
Created	Order has been created but is still being updated.
Ready	Order is ready to be processed so no more expected updates.
Started	Order has been started and updates are limited.
Completed	Order has been completed.
Cancelling	Cancel requested so trying to stop work on the order.
Cancelled	Order has been cancelled. It may have been partially fulfilled.
Paused	Order has been paused.

### 4.3 Order Type

**Data type:** OrderType

Location State	Description
INBOUND	Goods reception order.
OUTBOUND	Customer order.
INTERNAL	Internal order.

## 4.4 Order Priority

**Data type:** OrderPriority

A number representing the priority of an order. This determines how the HLC should schedule orders. The priority of an order can be changed after it has been sent to the HLC.

The priority order can have the following values, ordered by significance:

Priority	Numerical value
Very High	1
High	2
Normal	3
Low	4

## 4.5 Item Identification

**Data type:** ItemID

A unique identification of an item type, variant or a specific instance of an item. The data type can contain one of two types of identifiers: GTIN and SKU. Note that only one identifier should be used for a single ItemID.

Property	Type	Description
gtin	String	Optional. Cannot be used with sku. Refer to [4] and [5] for details.
sku	String	Optional. Cannot be used with gtin. Stock Keeping Unit.

### Example

```
Using GTIN
{
  "item-id": {
    "gtin": "00012345678905"
  }
}

Using SKU
{
  "item-id": {
    "sku": "PH_BLK_11"
  }
}
```

## 4.6 Item Identification and Quantity

**Data type:** ItemIDAndQuantity

A combination of an [ItemID](#) and a quantity with the unit of measurement.

Property	Type	Description
item-id	<a href="#">ItemID</a>	Item Identification.
quantity	Integer	Number of UOM in the item.
uom	String	Unit of measure. For a complete list, see [6].

### Example

```
{
  "item-id": {
    "sku": "PH_BLK_11"
  },
  "quantity": 1,
  "uom": "PCS"
}
```

## 4.7 Item Definition

**Data type:** ItemDefinition

This data type describes an item and is used for synchronization between the host and the HLC.

Property	Type	Description
item-id	<a href="#">ItemID</a>	Item Identification.
name	String	The name of the item.
description	String	A brief description of the item.

### Example

```
{
  "item-id": {
    "gtin": "01234567811"
  },
  "name": "PCB for phone with fuses",
  "description": "A phone PCB with fuses inserted into it"
}
```

## 4.8 Process Segment Definition

**Data type:** ProcessSegmentDefinition

This data type describes the process segment for producing one or more items, as well as which raw or semi-finished materials these items are made up of. The produced item may be a finished product for a customer or a semi-finished material.

Following a single process segment can result in one or more types of items being produced.

Property	Type	Description
id	UUID	ID of the process segment.
name	String	Name of the process segment.
produced-items	List of <a href="#">ItemIDAndQuantity</a>	The produced items from following this process segment.
materials	List of <a href="#">ItemIDAndQuantity</a>	The bill of materials for the process segment.

### Example

```
{
  "id": "5d29177b-8f73-4614-8873-71183b5de062",
  "name": "Example process segment",
  "produced-items": [
    {
      "item-id": {
        "gtin": "01234567811"
      },
      "quantity": 1,
      "uom": "PCS"
    }
  ],
  "materials": [
    {
      "item-id": {
        "gtin": "11876543210"
      },
      "quantity": 1,
      "uom": "PCS"
    }
  ]
}
```

## 4.9 Bill of Materials

**Data type:** BoM

This data type describes the raw or semi-finished materials that a specific item is made up of. This item may be a finished product for a customer or a semi-finished material.

The bill of materials should only be included if relevant for the HLC. For example, raw materials may not require a bill of materials if it is not applicable for the context.

**Note that this data type will not be used in the current iteration of the document. Please refer to [Process Segment](#) for similar functionality.**

Property	Type	Description
quantity	Integer	Number of UOM in the item.
uom	String	Unit of measure. For a complete list, see [6].
materials	List of <a href="#">ItemIDAndQuantity</a>	Materials for the item.

### Example

```
{
  "quantity": 1,
  "uom": "PCS"
  "materials": [
    {
      "item-id": {
        "sku": "PH_BLK_BOTTOM_COVER"
      },
      "quantity": 1,
      "uom": "PCS"
    },
    {
      "item-id": {
        "sku": "PH_PCB_01"
      },
      "quantity": 1,
      "uom": "PCS"
    },
    {
      "item-id": {
        "sku": "PH_BLK_TOP_COVER"
      },
      "quantity": 1,
      "uom": "PCS"
    }
  ]
}
```

## 4.10 Order Line

**Data type:** OrderLine

Defines an item which is part of an order.

Property	Type	Description
line-number	Integer	Line number field which may be used for sorting. Should start at 1 for the first order line in an order, and is incremented by one for each new order line.
state	OrderLineStyle or null	If the state can be derived from the telegram it is part of then it may be omitted.
item	<a href="#">ItemID</a>	Item Identification.

batch-id	String or null	The associated batch ID for the order line, if any.
best-before-date	Date or null	The best before date for the order line, if any.
uom	String	Unit of measure. For a complete list, see [6].
ordered-quantity	Integer or null	Number of UOM to be handled
fulfilled-quantity	Integer or null	Number of UOM that has been handled
unhandled-quantity	Integer or null	Number of UOM it is not possible to handle

### Example

```
{
  "line-number": 1,
  "state": "Ready",
  "item-id": {
    "gtin": "012345678905"
  },
  "batch-id": "18829",
  "uom": "PCE",
  "ordered-quantity": 1
}
```

## 4.11 Order

**Data type:** Order

Defines a basic order.

Property	Type	Description
order-identifier	String	An external ID used to identify the order when communicating with the host system.
description	String or null	A description that may be used to show the operator relevant information.
state	<a href="#">OrderState</a>	State of the order.
order-type	<a href="#">OrderType</a>	Type of order.
priority	<a href="#">OrderPriority</a>	The priority associated with the order.
container-type	String or null	<b>Optional.</b> Defines the load carrier, container, pallet in/on which the output/produced product(s) should be placed on.
planned-start-time	Date or null	Date and/or time the order is planned to state.
delivery-time	Date or null	Date and/or time the order must be finished by the HLC.
order-lines	<a href="#">OrderLine</a>	The order lines for the order.

		Max entries: 50.
--	--	------------------

### Example

```
{
  "order-identifier": "28282-2",
  "state": "Created",
  "order-type": "OUTBOUND",
  "priority": "High",
  "order-lines": [
    {
      "line-number": 1,
      "item-id": {
        "gtin": "012345678905"
      },
      "batch-id": "18829",
      "uom": "PCE",
      "ordered-quantity": 10
    },
    {
      "line-number": 2,
      "item-id": {
        "gtin": "012345678925"
      },
      "uom": "PCE",
      "ordered-quantity": 15
    }
  ]
}
```

## 4.12 Bill of Materials Item Identification

**Data type:** BomItemId

An item of a specific type. If more precision is required (e.g. specifying items from a specific batch), this data type allows for that flexibility.

The data type can contain one of three types of identifiers: [ItemId](#) or batch. Note that only one identifier should be used for a single BomItemId.

The data type is used when it is necessary to refer to e.g. the output of a production order/batch, so that the materials of that batch can be used as the input for another batch.

**Note that this data type will not be used in the current iteration of the document.**

Property	Type	Description
item-id	<a href="#">ItemId</a> or null	Cannot be used with batch or grai.
batch	String or null	Cannot be used with item-id or grai. See [7].
grai	String or null	Cannot be used with item-id or batch. See [8].

### Example

```
Using ItemID
{
  "bom-item-id": {
    "item-id": {
      "gtin": "012345678905"
    }
  }
}
```

```
Using batch
{
  "bom-item-id": {
    "batch": "10123456"
  }
}
```

```
Using GRAI
{
  "bom-item-id": {
    "grai": "01234567890123456789"
  }
}
```

### 4.13 Bill of Materials Line

**Data type:** BomLine

This object is essentially a variation of [OrderLine](#) but with different identification options to enable ERP to point out which instance of an item needs to be used as input for the product being built/produced.

**Note that this data type will not be used in the current iteration of the document.**

Property	Type	Description
bom-item-id	<a href="#">BomItemId</a>	Bill of Materials Item Identification
name	String	A telling name of the item.
quantity	Integer	Number of UOM in the item.
uom	String	Unit of measure. For a complete list, see [6].
bom	List of <a href="#">BomLine</a>	This is a recursive element and should be used with care. It is <b>specifically not</b> intended to describe a hierarchy of production orders which need to be executed as a tree structure.

## Example

```
{
  "bom-item-id": {
    "batch": "10123456"
  },
  "name": "XYZ Smartphone 2023",
  "uom": "PCE",
  "quantity": 1,
  "bom": []
}
```

## 4.14 Order Priority Update

**Data type:** OrderPriorityUpdate

This object is used to update order priority.

Property	Type	Description
order-identifier	String	An external ID used to identify the order when communicating with the host system.
priority	<a href="#">OrderPriority</a>	New priority of the order.

## Example

```
{
  "order-identifier": "182884-228-1",
  "priority": "High"
}
```

## 5 Error Types

This section extends the error types presented in the standard interface document [1].

The following list of errors are the ones referenced in this interface. The relevant Error IDs are listed for each telegram of which it is relevant.

Error ID	Error Message	Reason
CONTAINER_NOT_FOUND	Container not found	The <i>container-type</i> was not recognized. The error should contain the ID of the container type.
ITEM_NOT_FOUND	Item ID not recognized	An <i>item-id</i> was not recognized. The error should contain the ID of the item that was not recognized.
NO_BOM_FOR_ITEM	No BoM available for item	The bill of materials for a provided <i>item-id</i> could not be found. The error should contain the ID of the item for which the bill of materials could not be found.
ORDER_LINE_ITEM_NOT_FOUND	Order Line item not found	The <i>item-id</i> in an order line was not recognized. The error should contain the ID of the item not recognized.
ORDER_LINE_NOT_FOUND	Order Line not found	The <i>line-number</i> was not recognized. The error should contain the line number in the order
ORDER_NOT_FOUND	Order not found	The <i>order-id</i> was not recognized. The error should contain the ID of the order.
PROCESS_SEGMENT_NOT_FOUND	Process Segment ID not recognized	A <i>process-segment</i> was not recognized. The error should contain the ID of the process segment that was not recognized.
PRODUCT_NOT_FOUND	Item not found	The <i>item-id</i> was not recognized. The error should contain the ID of the product.

## 6 Messages

### 6.1 Synchronization

#### 6.1.1 Request Synchronization (HLC -> Host)

**Telegram Type ID:** sync.request

Sent when the HLC needs to synchronize with the host. After the host receives the message, it will send the requested master data (such as item definitions, see [Added/Updated Item Definitions](#)) to the HLC on their respective topics.

The HLC can include one or more [ItemIDs](#) or other resource IDs in the request to specify which resources it needs. If the *full-synchronization* property is true, the HLC requests that all information is forwarded to it. As this will typically require a large amount of data to be transferred, it is preferable to specify which resources are needed if possible.

#### Properties

Property	Type	Description
full-synchronization	Boolean or null. If null, defaults to false.	Specifies if a full synchronization is needed. This is typically done when the HLC and host system initially synchronizes.  If this value is false, the resources provided in the other properties should be used instead. If true, all data should be sent regardless of the data in the other properties.
items	List of <a href="#">ItemID</a>	Which items should be sent by the host. The HLC will primarily use this to request master data for a new item in the HLC. Requests for full synchronization of items should be reserved since it may block communication for a very long time.
process-segments	List of UUID	Which process segments should be sent by the host. The HLC will primarily use this to request data for unknown process segments received in orders. Requests for full synchronization of items should be reserved since it may block communication for a very long time.

#### Errors

The following error types can be returned by the HLC for this request:

- ITEM\_NOT\_FOUND
- PROCESS\_SEGMENT\_NOT\_FOUND

## Example

*Full synchronization request*

```
{
  "header": {...},
  "full-synchronization": "true",
  "items": []
}
```

*Partial synchronization request*

```
{
  "header": {...},
  "items": [
    {
      "gtin": "00012345678905"
    },
    {
      "sku": "PH_BLK_11"
    },
    {
      "gtin": "00012345678000"
    }
  ]
}
```

### 6.1.2 Synchronization Complete (Host -> HLC)

**Telegram Type ID:** sync.completed

Sent by the host when it has sent all data associated with the latest synchronization request ([Request Synchronization \(HLC -> Host\)](#)).

The UUID of the [Request Synchronization](#) message should be included as the *request-id* parameter in the header.

#### Properties

Property	Type	Description
request-id	UUID	Telegram UUID of the request for synchronization (located in the header).

## Example

```
{
  "header": {
    (...)
    "request-id": "480ddc37-84c1-449a-b274-50e088358231",
    (...)
  }
}
```

### 6.1.3 Added/Updated Item Definitions (Host -> HLC)

**Telegram Type ID:** sync.items

Sent by the host when one or more item definitions have been added or updated, or when requested by the HLC through the [Request Synchronization](#) message.

If the data for an item already exists in the HLC, it should update that entry.

#### Properties

Property	Type	Description
items	List of <a href="#">ItemDefinition</a>	List of items to add/update. Maximum size: 50.

#### Example

```
{
  "header": {...},
  "items": [
    {
      "item-id": {
        "gtin": "012345678905"
      },
      "name": "Tape",
      "description": "Single-sided tape"
    },
    {
      "item-id": {
        "gtin": "01234567811"
      },
      "name": "PCB for phone with fuses",
      "description": "A phone PCB with fuses inserted into it"
    }
  ]
}
```

### 6.1.4 Removed Item Definitions (Host -> HLC)

**Telegram Type ID:** sync.items.removed

Sent by the host when one or more item definitions should be removed from the HLC.

If an item is not recognized by the HLC, it should ignore that entry.

#### Properties

Property	Type	Description
items	List of <a href="#">ItemId</a>	Maximum size: 50.

## Example

```
{
  "header": {...},
  "items": [
    {
      "gtin": "00012345678905"
    },
    {
      "sku": "PH_BLK_11"
    },
    {
      "gtin": "00012345678000"
    }
  ]
}
```

### 6.1.5 Added/Updated Process Segment Definitions (Host -> HLC)

**Telegram Type ID:** sync.process-segments

Sent by the host when one or more process segments have been added or updated, or when requested by the HLC through the [Request Synchronization](#) message.

If the data for an item already exists in the HLC, it should update that entry.

#### Properties

Property	Type	Description
process-segments	List of <a href="#">ProcessSegmentDefinition</a>	List of process segments to add/update. Maximum size: 50.

## Example

```
{
  "header": {...},
  "process-segments": [
    {
      "id": "5d29177b-8f73-4614-8873-71183b5de062",
      "name": "Example process segment",
      "produced-items": [
        {
          "item-id": {
            "gtin": "01234567811"
          },
          "quantity": 1,
          "uom": "PCS"
        }
      ],
      "materials": [
        {
          "item-id": {
            "gtin": "11876543210"
          },

```

```

    "quantity": 1,
    "uom": "PCS"
  }
]
}
]
}

```

### 6.1.6 Removed Process Segment Definitions (Host -> HLC)

**Telegram Type ID:** sync.process-segments.removed

Sent by the host when one or more process segment definitions should be removed from the HLC.

If a process segment is not recognized by the HLC, it should ignore that entry.

#### Properties

Property	Type	Description
process-segments	List of UUID	UUID of the process segment. Maximum size: 50.

#### Example

```

{
  "header": {...},
  "process-segments": [
    "5d29177b-8f73-4614-8873-71183b5de062",
    "f2917b84-664b-43e3-a17f-32472ae0c67a"
  ]
}

```

## 6.2 General Order

### 6.2.1 Order Priority Update (Host -> HLC)

**Telegram Type ID:** order.priority

Sent by the host when the priority of an order, that was already sent to the HLC through an order telegram (production order, customer order, ...), is changed. Multiple orders can be updated in a single telegram.

**This telegram will likely be changed in future versions to allow for updating other aspects of the production order.**

#### Properties

Property	Type	Description
orders	List of <a href="#">OrderPriorityUpdate</a>	List of orders to update. Max items: 50.

## Errors

The following error types can be returned by the HLC for this request:

- ORDER\_NOT\_FOUND

## Example

```
{
  "header": {...},
  "orders": [
    {
      "order-identifier": "1564",
      "priority": "Normal"
    },
    {
      "order-identifier": "1565",
      "priority": "Low"
    }
  ]
}
```

### 6.2.2 Order Priority Update Complete (HLC -> Host)

**Telegram Type ID:** order.priority.completed

Sent by the HLC when it has updated all orders in the [Order Priority Update](#) request.

The UUID of the [Order Priority Update](#) message should be included as the *request-id* parameter in the header.

## Properties

Property	Type	Description
request-id	UUID	Telegram UUID of the request for the <a href="#">Production Order Priority Update</a> telegram (located in the header).

## Example

```
{
  "header": {
    (...)
    "request-id": "480ddc37-84c1-449a-b274-50e088358231",
    (...)
  }
}
```

### 6.2.3 Order Status Update (HLC -> Host)

**Telegram Type ID:** order.status

Sent by the HLC when the status of an order is updated.

## Properties

Property	Type	Description
order-identifier	String	ERP's identification for the production order.
state	<a href="#">OrderState</a>	New state of the order.

## Errors

The following error types can be returned by the HLC for this request:

- ORDER\_NOT\_FOUND

## Example

```
{
  "header": {...},
  "order-identifier": "1564",
  "state": "Started"
}
```

### 6.2.4 Orderline Status Update (HLC -> Host)

**Telegram Type ID:** orderline.status

Sent by the HLC when the status of an order line is updated.

## Properties

Property	Type	Description
order-identifier	String	ERP's identification for the production order.
line-number	Integer	Line number field which may be used for sorting. Should start at 1 for the first order line in an order, and is incremented by one for each new order line.
state	<a href="#">OrderLineStyle</a>	New state of the order.

## Errors

The following error types can be returned by the HLC for this request:

- ORDER\_NOT\_FOUND
- ORDER\_LINE\_NOT\_FOUND

## Example

```
{
  "header": {...},
  "order-identifier": "1564",
  "line-number": "4",
  "state": "Started"
}
```

## 6.3 Production orders

### 6.3.1 Production Order (Host -> HLC)

**Telegram Type ID:** production.order

When a production order is planned to be executed, the host sends it to the HLC. A single message can contain multiple orders.

#### Properties

Property	Type	Description
orders	List of <a href="#">Order</a>	Max items: 50.

#### Errors

The following error types can be returned by the HLC for this request:

- CONTAINER\_NOT\_FOUND
- NO\_BOM\_FOR\_ITEM
- ORDER\_LINE\_ITEM\_NOT\_FOUND

## Example

```
{
  "header": {...},
  "orders": [
    {
      "order-identifier": "28282-2",
      "state": "Created",
      "order-type": "OUTBOUND",
      "priority": "High",
      "order-lines": [
        {
          "line-number": 1,
          "item-id": {
            "gtin": "012345678905"
          },
          "batch-id": "18829",
          "uom": "PCE",
          "ordered-quantity": 10
        },
        {
          "line-number": 2,
          "item-id": {
```

```

    "gtin": "012345678925"
  },
  "uom": "PCE",
  "ordered-quantity": 15
}
]
}
]
}

```

### 6.3.2 Production Manifest (HLC -> Host)

**Telegram Type ID:** production.manifest

When a production order has been completed on equipment controlled by HLC, the HLC generates this message based on the data provided by the equipment, informing the ERP about the result of the production specified by the corresponding production order.

#### Properties

Property	Type	Description
order-identifier	String	ERP's identification for the production order.
order-lines	List of <a href="#">OrderLine</a>	Max items: 50.

#### Errors

The following error types can be returned by the HLC for this request:

- ORDER\_NOT\_FOUND
- PRODUCT\_NOT\_FOUND

#### Example

```

{
  "header": {...},
  "order-identifier": "1564",
  "order-lines": [
    {
      "line-number": 1,
      "item-id": {
        "gtin": "012345678905"
      },
      "batch-id": "18829",
      "uom": "PCE",
      "ordered-quantity": 10,
      "fulfilled-quantity": 10
    },
    {
      "line-number": 2,
      "item-id": {
        "gtin": "012345678925"
      },
      "uom": "PCE",
      "ordered-quantity": 20,

```

```
"fulfilled-quantity": 15,  
"unhandled-quantity": 5  
}  
]  
}
```