



Management Information System ICS

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THANKS ITS PARTNER LEVEL MEMBERS



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1 Introduction

This Interoperability Conformance Specification (ICS) document standardizes the base communication between the production *Devices* (*Workers*) and the *Manager* which is responsible for manufacturing planning, monitoring and execution of the print production *Process*. In the printing industry, such a system is commonly referred to as Management Information System (*MIS*). Therefore, this document is called the ‘MIS ICS Document’.

The *Conformance Requirements* specified in this document include basic job submission, job tracking and performance and resource monitoring – even in real time. This document defines a common technical integration level that is relevant for all production *Devices* in prepress, press and postpress. Examples of that common integration level are the job’s identifier (*@JobID*) or the human readable description of the job (*@DescriptiveName*). Both attributes are relevant for all production *Devices* and therefore are part of this *MIS ICS*.

1.1 Use of ICS Documents

CIP4’s ICSs are designed for use in a particular product domain for which CIP4 supplies a domain specific ICS, e.g., ▶ [MIS to CP ICS] or ▶ [Print Procurement ICS].

The correct implementation of any *Domain ICS* requires a common way to present data and to communicate between systems; this is the job of this ICS (i.e. the Management Information System ICS).

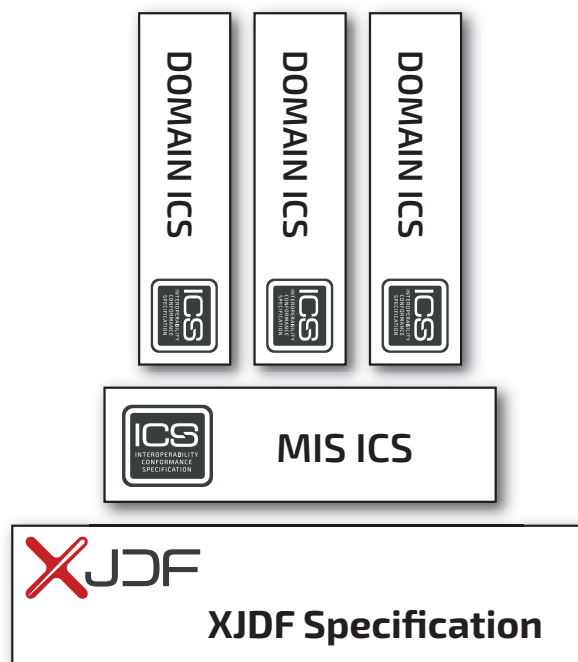
This ICS is intended to be used in conjunction with one or more *Domain ICS* specifications. However, simplistic *Device* integration (taking advantage of basic job submission, job tracking and real-time job and performance monitoring) can be achieved by utilizing the *MIS ICS* without a *Domain ICS*. Deeper integrations, such as sending settings to a *Device*, require the implementation to conform to the *MIS ICS* and an appropriate domain-specific ICS.

Note: Without a *Domain ICS*, both parties will be required to agree upon additional conventions.

1.1.1 XJDF Specification in Relation to the MIS ICS and Domain ICSs

The *MIS ICS* specifies that subset of the XJDF Specification which is required to ensure a base communication between production *Devices* and the leading production *Controller* system. Each *Domain ICS* document extends the *MIS ICS* in a particular domain (e. g. Conventional Printing, Digital Printing, Finishing, etc.), but is itself a subset of the XJDF Specification.

Figure 1-1: Relationship between the XJDF Specification, MIS ICS and Domain ICSs



1.2 Conventions Used in this Specification

Throughout this document a number of formatting and stylistic conventions have been employed that are intended to help the reader. These are intended to align with those of the **XJDF** specification. See ▶ [XJDF 2.1].

1.2.1 Document References

References to other publications are collated in an appendix, i.e. ▶ Appendix A References. Within the text these references use a meaningful short symbolic name that may be clicked to allow the reader to navigate directly to the full description in the appendix. These references use a common text style as described in the following section.

1.2.2 Text Styles

There are a number of text styles that are used to identify the various components of the specification. Some of the text styles support dynamic links; these allow the reader to click on the term and navigate to the definition of the term (if it is locally defined).

- **NodeInfo** An **XJDF** or **XJMF** element. Usually these are dynamic links leading to the definition of the element.
- **Process** A specific *Process* or *Gray Box* such as **ColorSpaceConversion** or **Rendering**. These can be dynamic links leading to the definition of the *Process*.
- **@Attribute** An **XJDF** or **XJMF** attribute within the context of an element.
- **"Value"** The content of an attribute.
- **XJDF** **XJDF** or **XJMF** are used when referring to the specification in general rather than elements with the same name.
- *Glossary Item* The document utilizes some specialist terms; these are defined in ▶ Table 1.2 Glossary and highlighted throughout the document.
- ▶ [XJDF 2.1] Identifies a reference to an item within this specification (such as a particular table, section etc) or to an entry in the references appendix. These are dynamic links leading to the item itself.
- <http://www.CIP4.org> A hyperlink reference to an external item.

1.2.3 XPath Notation

- **XJDF/@JobID** The document utilizes ▶ [XPath] notation when it is required to define the particular context for an item. It is particularly useful when there is a conditional term relating to the context, e.g. **XJDF[@Types = "DigitalPrinting"]** identifies an **XJDF Process** node for digital printing.

1.2.4 Specification of Cardinality

The following table illustrates the notation of *Manager* and *Worker Conformance Requirements* in ICS tables.

If an attribute, attribute value or element is not provided explicitly or implicitly by a table row of <all other values>, it is assumed to be out of scope. An empty cell for a *Conformance Level* specifies that the *Trait* is out of scope for that *Conformance Level*. Out of scope values MAY be written and MAY be processed, but a conforming processor NEED NOT support them. The implied cardinality of out of scope values is therefore w? r?.

Table 1.1: Specification of cardinality (Sheet 1 of 2)

NOTATION	NAME	DESCRIPTION
w	Write Required	When this cardinality indicator is applied to an attribute or element name, the <i>Trait</i> SHALL be written by the <i>Manager</i> or <i>Worker</i> . When this cardinality indicator is applied to an attribute value that is not a list type it specifies the only acceptable value. When this cardinality indicator is applied to an attribute value that is a list type, it specifies that the value SHALL be present in the list.
w?	Write Optional	The element, or attribute, or attribute value MAY be written by the <i>Manager</i> or <i>Worker</i> . When this cardinality indicator is applied to an attribute value that is a list type, it specifies that the value MAY be present in the list.

Table 1.1: Specification of cardinality (Sheet 2 of 2)

NOTATION	NAME	DESCRIPTION
w←	Write Conditional	When this cardinality indicator is applied to an attribute or element name, the <i>Trait</i> SHALL be written by the <i>Manager</i> or <i>Worker</i> depending on conditions. The details of the condition will be specified in the description. When this cardinality indicator is applied to an attribute value it specifies that the value is a valid selection from a list of acceptable values. When this cardinality indicator is applied to an attribute value that is a list type, it specifies that the value is a valid selection from a list of acceptable values that SHALL be present in the list.
w!	Write Forbidden	The element, or attribute, or attribute value SHALL NOT be written by the <i>Manager</i> or <i>Worker</i> . When this cardinality indicator is applied to an attribute value that is a list type, it specifies that the value SHALL NOT be present in the list.
r	Read Required	The element, or attribute, or attribute value SHALL be read by the <i>Manager</i> or <i>Worker</i> .
r?	Read Optional	The element, or attribute, or attribute value MAY be read by the <i>Manager</i> or <i>Worker</i> .
r←	Read Conditional	The element, or attribute, or attribute value SHALL be read by the <i>Manager</i> or <i>Worker</i> depending on conditions. The details of the condition will be specified in the description.

1.2.5 Conformance Terminology

This document uses exactly the same terminology as the **XJDF** specification to indicate the strictness of conformance. See ▶ [XJDF 2.1].

1.3 General Architecture

All transactions in an environment compliant to this ICS document SHALL conform to ▶ [XJDF 2.1].

1.3.1 XJDF and XJMF Interchange Protocol

Manager and *Worker* SHALL implement the bidirectional HTTP/HTTPS transport protocol as defined in ▶ [XJDF 2.1], section 'XJDF and XJMF Interchange Protocol'. Implementation of the unidirectional transport protocol via a hot folder is out of scope of this ICS document.

1.3.2 XJDF Packaging

Both *Manager* and *Worker* SHALL support unpackaged **XJDF** and **XJMF** and SHOULD support **XJDF** packaging as defined in ▶ [XJDF 2.1].

1.3.2.1 Referenced Assets

If an asset that is not packaged in a ZIP is referenced by an **XJDF** or **XJMF**, the producer of the **XJDF** or **XJMF** SHALL ensure that the asset is available for the *Consumer* at least until the asset has been successfully downloaded by the *Consumer* or the task associated with the **XJDF** or **XJMF** has been completed or aborted.

1.3.3 Precision of Timestamps

All timestamps SHOULD be provided with millisecond precision.

1.4 Glossary

This section defines terminology used throughout this document. References to other documents are indicated with square brackets, e.g. ▶ [XJDF 2.1].

Table 1.2: Glossary (Sheet 1 of 2)

TERM	DEFINITION
Conformance Level	Defines a subset of <i>Conformance Requirements</i> for an ICS.

Table 1.2: Glossary (Sheet 2 of 2)

TERM	DEFINITION
Conformance Requirement	A single requirement that a conforming XJDF enabled product SHALL meet. An ICS specifies a set of <i>Conformance Requirements</i> that a conforming XJDF enabled product SHALL meet in order to achieve interoperability with other conforming XJDF enabled products that meet the same <i>Conformance Requirements</i> .
Consumer	A <i>Manager</i> or <i>Worker</i> in a role where it consumes an XJDF instance or XJMF message, i.e., reads and processes an XJDF instance or XJMF message.
Controller	See ▶ [XJDF 2.1].
Device	See ▶ [XJDF 2.1].
Domain ICS	An ICS that specifies the <i>Conformance Requirements</i> for an XJDF enabled product in a specific domain. For example, a <i>Domain ICS</i> that includes binding is likely to have a requirement for a Stitching Process .
Heartbeat	A signal that is sent in regular intervals and that is not caused by a state change in the <i>Device</i> .
Manager	In the context of this ICS, <i>MIS</i> is the <i>Manager</i> .
MIS	See ▶ [XJDF 2.1].
Operator	A person responsible for the setup, running and operation of a <i>Device</i> .
Partition	See ▶ [XJDF 2.1].
Process	See ▶ [XJDF 2.1].
Trait	In the context of an element, a single sub-element of it, a single attribute of it or a single value of one of its attributes. In the context of the specification, a table for an element contains all <i>Traits</i> of the element.
Worker	The software that receives XJDF instances, XJMF messages and other data from a <i>Manager</i> . The <i>Worker</i> SHOULD appropriately process the data and MAY send information back to a <i>Manager</i> .
Workstep	See ▶ [XJDF 2.1].

2 Conformance

2.1 Conformance Requirements of all ICSs

This section defines the *Conformance Requirements* that apply to any ▶ [XJDF 2.1] based ICS.

A product conforming to any ICS:

- SHALL produce or consume **XJDF** instances that conform to the ▶ [XJDF 2.1] specification.
- SHALL meet all appropriate *Conformance Requirements* of the respective ICS.
- SHALL be able to read and write XML encoded in UTF-8.

Each ICS document defines *Conformance Requirements* for a subset of ▶ [XJDF 2.1].

The remainder of this ICS specifies *Conformance Requirements* that are specific to this ICS.

2.2 Conformance Levels

This MIS ICS specifies two *Conformance Levels* of *Conformance Requirements*. These levels differ mainly in the type of communication between the *Manager* (in the MIS) and the *Worker* (in the Device). The first level is intended to have a minimal viable product based on synchronous communication, while the second level extends communication by asynchronous signal messages.

Each level is represented by a column. To be conformant to a level of this ICS, an MIS SHALL conform to the *Manager* part and a Device SHALL conform to the *Worker* part of this ICS document.

MIS ICS *Conformance Levels* are incremental, therefore support for a particular *Conformance Level* requires support for all lower *Conformance Levels*.

Table 2.1: Conformance Levels

LEVEL OF THIS ICS	DESCRIPTION
1	This ICS levels includes support for: <ul style="list-style-type: none"> • Basic handshaking and bootstrapping. • Submission and return of XJDF documents as XML documents. • Synchronous response messages for job, <i>Device</i> and resource status queries.
2	This ICS levels includes support for: <ul style="list-style-type: none"> • Subscriptions and asynchronous signals for job, <i>Device</i> and resource status queries. • Scheduling jobs. • Pausing and resuming jobs. • ZIP packaging of XJMF, XJDF and referenced assets.

2.3 Certification

CIP4 no longer provides certification for ICSs. Vendors are encouraged to certify their products by ensuring that all requirements laid out in the respective ICS are met. Additional hints for self certification are provided in the descriptions and are marked with the label "**Conformance Test:**".

In addition to self certification, vendors are encouraged to verify the interoperability of their products with other vendor's products that also comply with a given ICS and to publish the results in the CIP4 ▶ [Interoperability Matrix]. CIP4 regularly organizes interoperability testing events called "Interops". In addition to providing an informal venue where vendors and developers can test the interoperability of their products, active work groups meet to discuss the details of the next ICS documents and specifications.

2.4 Extensions and Deprecated Items

Elements, attributes or attribute values (including NMTOKEN values) that are neither defined in ▶ [XJDF 2.1] nor defined in the respective *Domain ICS* or that are deprecated in ▶ [XJDF 2.1] are optional to read or write (w?/r?). That is, write support for **XJDF** extensions and deprecated *Traits* is allowed.

Note: Interoperability based on such *Traits* might be reduced.

3 XJDF Instance

This ICS specifies the **XJDF** elements that are not specific to any one of prepress, press or post press. These elements include the **XJDF** root node and a number of elements close to the root. This ICS also includes guidelines (rules) on the use of certain attributes in these and other elements.

3.1 XJDF

This section specifies the *Conformance Requirements* for attributes and elements of an **XJDF** node.

There are different *Conformance Requirements* for an **XJDF** sent by a *Manager* and one returned by a *Worker* as detailed in the following tables.

3.1.1 XJDF sent by a Manager

Table 3.1: XJDF Element sent by a Manager

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>DescriptiveName</i>	w?	w?	r	r	<i>@DescriptiveName</i> SHALL NOT be evaluated for automated workflow decisions. <i>@DescriptiveName</i> SHOULD be used to inform the <i>Operator</i> of additional context regarding the job.
<i>ICSVersions</i>	w	w	r?	r?	The <i>Manager</i> SHALL supply a set of NMTOKEN values, one for each ICS with which the XJDF instance complies.
MIS_L1-2.1	w	w!	r?		Specifies conformance to the <i>MIS ICS Conformance Level 1</i> .
MIS_L2-2.1	w!	w		r?	Specifies conformance to the <i>MIS ICS Conformance Level 2</i> .
<all other values>	w?	w?	r?	r?	<i>@ICSVersions</i> MAY contain the values specified in ICS documents that require conformance to this ICS.
<i>JobID</i>	w	w	r	r	See ▶ [XJDF 2.1].
<i>JobPartID</i>	w?	w?	r	r	See ▶ [XJDF 2.1].
<i>Types</i>	w	w	r	r	See ▶ [XJDF 2.1].
<i>Version</i>	w	w	r?	r?	See ▶ [XJDF 2.1].
2.1	w	w	r?	r?	Specifies conformance to XJDF version 2.1.
<i>AuditPool</i>	w	w	r?	r?	The <i>Manager</i> SHALL specify an <i>AuditPool</i> that contains audits regarding the creation of the XJDF . See ▶ Section 3.2.1 <i>AuditPool</i> sent by a <i>Manager</i> .
<i>ResourceSet</i> [@Name = "Device" and @Usage = "Input"]	w?	w?	r	r	See ▶ [XJDF 2.1].
<i>ResourceSet</i> [@Name = "NodeInfo" and @Usage = "Input"]	w	w	r	r	A <i>NodeInfo</i> resource SHALL be provided during submission.

3.1.2 XJDF returned by a Worker

Table 3.2: XJDF Element returned by a Worker

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ICSVersions</i>	r?	r?	w	w	The Worker SHALL return a set of NMTOKEN values, one for each ICS with which the XJDF instance complies.
MIS_L1-2.1	r?		w	w!	Specifies conformance to the MIS ICS Conformance Level 1.
MIS_L2-2.1		r?	w!	w	Specifies conformance to the MIS ICS Conformance Level 2.
<all other values>	r?	r?	w?	w?	@ <i>ICSVersions</i> MAY contain the values specified in ICS documents that require conformance to this ICS.
<i>JobID</i>	r	r	w	w	The value of @ <i>JobID</i> SHALL match the @ <i>JobID</i> value of the XJDF sent by the Manager.
<i>JobPartID</i>	r	r	w←	w←	The value of @ <i>JobPartID</i> SHALL match the @ <i>JobPartID</i> value of the XJDF if specified by the Manager.
<i>Types</i>	r	r	w	w	The value of @ <i>Types</i> SHALL contain the list of all values of the @ <i>Types</i> value of the XJDF sent by the Manager. Additional values MAY be inserted into the list of @ <i>Types</i> by the Worker in order to report back more details of processing.
<i>Version</i>	r?	r?	w	w	The value of @ <i>Version</i> SHALL match the @ <i>Version</i> value of the XJDF specified by the Manager.
2.1	r?	r?	w	w	Specifies conformance to XJDF version 2.1.
<i>AuditPool</i>	r?	r?	w	w	The Worker SHALL specify an <i>AuditPool</i> that has been updated with audits detailing information about the execution of the XJDF. See ▶ Section 3.2.2 AuditPool returned by a Worker.
<i>ResourceSet</i> [@Name = "NodeInfo" and @Usage = "Input"]	r	r	w	w	The Worker SHALL specify a <i>NodeInfo</i> resource with updated values of all the traits that were specified in the <i>NodeInfo</i> resource of the job submission.

3.2 AuditPool

There are different *Conformance Requirements* for the *AuditPool* in an XJDF sent by a Manager and one returned by a Worker as detailed in the following tables.

3.2.1 AuditPool sent by a Manager

Table 3.3: AuditPool Element sent by a Manager

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>AuditCreated</i>	w	w	r?	r?	<i>AuditCreated</i> SHALL be specified by the Manager to provide details about the software and time of creation of the XJDF.

3.2.1.1 AuditCreated

Table 3.4: AuditCreated Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	w	w	r?	r?	See ▶ [XJDF 2.1].

3.2.2 AuditPool returned by a Worker

AuditPool elements returned by a *Worker* contain the recorded results of a *Process*.

Table 3.5: AuditPool Element returned by a Worker

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>AuditNotification</i>	r	r	w←	w←	<i>AuditNotification</i> SHALL be specified to provide notifications of events with <i>@Class</i> = "Fatal" or <i>@Class</i> = "Error". Notifications for events with other values for <i>@Class</i> MAY be provided.
<i>AuditProcessRun</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>AuditResource</i>	r	r	w←	w←	<i>AuditResource</i> SHALL be specified by a <i>Worker</i> for any consumable resource that it monitors. See an appropriate <i>Domain ICS</i> for a list of applicable resources.
<i>AuditStatus</i>	r	r	w	w	See ▶ [XJDF 2.1].

3.2.2.1 AuditNotification

Table 3.6: AuditNotification Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>Notification</i>	r	r	w	w	See ▶ [XJDF 2.1].

3.2.2.2 AuditProcessRun

AuditProcessRun summarizes one execution of a *Workstep*.

Table 3.7: AuditProcessRun Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>ProcessRun</i>	r	r	w	w	See ▶ [XJDF 2.1].

3.2.2.2.1 ProcessRun

ProcessRun contains details of each individual *Workstep* execution.

Table 3.8: ProcessRun Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>End</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>EndStatus</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>Start</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>Part</i>	r	r	w←	w←	<i>Part</i> SHALL be specified if the <i>Workstep</i> applies to a <i>Partition</i> of the entire job.

3.2.2.3 AuditResource

Table 3.9: AuditResource Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>ResourceInfo</i>	r	r	w	w	See ▶ [XJDF 2.1].

3.2.2.4 AuditStatus

AuditStatus SHALL be specified for each unique combination of *DeviceInfo*/*@Status* and *DeviceInfo*/*@StatusDetails* or *DeviceInfo*/*JobPhase*/*@Status* and *DeviceInfo*/*JobPhase*/*@StatusDetails*.

Table 3.10: AuditStatus Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>DeviceInfo</i>	r	r	w	w	See ▶ [XJDF 2.1].

3.3 ResourceSet

A *ResourceSet* describes a set of one or more *Resource* elements that are logically grouped together. This ICS specifies the *Conformance Requirements* for specific instances of *ResourceSet* in ▶ Chapter 5 Resources. Domain ICSs will provide *Conformance Requirements* for other *ResourceSets*.

There are different *Conformance Requirements* for the *Resources* in an XJDF sent by a *Manager* and one returned by a *Worker* as detailed in the following tables.

3.3.1 ResourceSet sent by a Manager

Table 3.11: ResourceSet sent by a Manager

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Name</i>	w	w	r	r	See ▶ [XJDF 2.1].

Table 3.11: ResourceSet sent by a Manager

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Unit</i>	w←	w←	r?	r?	@Unit SHALL be specified to define the counter unit of all amount related attributes within this ResourceSet element. @Unit SHALL be specified if @Name="Component".
count	w←	w←	r?	r?	@Unit = "count" SHALL be used for item based processing, e.g., sheets.
m	w←	w←	r?	r?	@Unit SHALL be specified with a value of either "m" or "m2" for web based processing.
m2	w←	w←	r?	r?	@Unit SHALL be specified with a value of either "m" or "m2" for web based processing.
<all other values>	w?	w?	r?	r?	
<i>Resource</i>	w	w	r	r	See ▶ [XJDF 2.1].

3.3.1.1 Resource

Resource elements are child elements of a **ResourceSet** and describe the physical or logical entity in the *Partition* context that is defined in **Resource/Part**. This ICS specifies the *Conformance Requirements* for specific instances of a **Resource** in ▶ Chapter 5 Resources.

Table 3.12: Resource Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>AmountPool</i>	w?	w?	r?	r?	See ▶ [XJDF 2.1].
<i>Part</i>	w?	w?	r?	r?	See ▶ [XJDF 2.1].
<i>Specific Resource</i>	w	w	r	r	See ▶ [XJDF 2.1].

3.3.1.1.1 AmountPool

AmountPool is a container for the amount-related metadata of the **Resource**.

Table 3.13: AmountPool Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>PartAmount</i>	w	w	r?	r?	See ▶ [XJDF 2.1].

3.3.1.1.2 PartAmount

PartAmount provides a container for specifying amount-related attributes. The counter unit SHALL be defined in the appropriate **ResourceSet**/**@Unit**.

Table 3.14: PartAmount Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Amount</i>	w	w	r?	r?	See ▶ [XJDF 2.1].
Part	w←	w←	r?	r?	Part SHALL be specified if the amounts refer to a <i>Partition</i> that is more granular than Resource/Part .

3.3.2 ResourceSet returned by a Worker

A *Worker* SHALL provide **ResourceSet** in the context of **ResourceInfo** and MAY provide any number in the context of **XJDF**.

Table 3.15: ResourceSet returned by a Worker

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Name</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>Unit</i>	r?	r?	w	w	@Unit SHALL be specified to define the counter unit of all amount related attributes within this ResourceSet element. @Unit SHALL be specified if @Name="Component" .
count	r?	r?	w←	w←	@Unit = "count" SHALL be used for item based processing, e.g., sheets.
m	r?	r?	w←	w←	@Unit SHALL be specified with a value of either "m" or "m2" for web based processing.
m2	r?	r?	w←	w←	@Unit SHALL be specified with a value of either "m" or "m2" for web based processing.
<all other values>	r?	r?	w?	w?	
Resource	r	r	w	w	See ▶ [XJDF 2.1].

3.3.2.1 Resource

Resource elements are child elements of a **ResourceSet** and describe the physical or logical entity in the *Partition* context that is defined in **Resource/Part**. This ICS specifies the *Conformance Requirements* for specific instances of a **Resource** in ▶ Chapter 5 Resources.

Table 3.16: Resource Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
AmountPool	r?	r?	w?	w?	See ▶ [XJDF 2.1].
Part	r?	r?	w?	w?	See ▶ [XJDF 2.1].
Specific Resource	r	r	w	w	See ▶ [XJDF 2.1].

3.3.2.1.1 AmountPool

AmountPool is a container for the amount-related metadata of the **Resource**.

Table 3.17: AmountPool Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>PartAmount</i>	r?	r?	w	w	See ▶ [XJDF 2.1].

3.3.2.1.2 PartAmount

PartAmount provides a container for specifying amount-related attributes. The counter unit SHALL be defined in the appropriate *ResourceSet/@Unit*.

Table 3.18: PartAmount Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Amount</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>Waste</i>	r?	r?	w←	w←	@ <i>Waste</i> SHALL be specified by the <i>Worker</i> if it is capable of differentiating between good and waste for the products it produces and knows the relationship of this resource to good and waste products.
<i>Part</i>	r?	r?	w←	w←	<i>Part</i> SHALL be specified if the amounts refer to a <i>Partition</i> that is more granular than <i>Resource/Part</i> .

4 XJMF Message

This ICS specifies the **XJMF** messages that are common to all areas where **XJMF** is used.

This ICS describes both the **XJMF** message formats and the transfer protocol. *Managers* and *Workers* SHALL support the HTTP protocol and SHOULD use the HTTPS protocol, for sending and receiving messages. For the remainder of this document, whenever HTTP is referenced, HTTPS is implied and SHOULD be preferred. It is strongly encouraged to implement HTTPS to enable authentication and encryption when using **XJMF** in an insecure or open environment.

The following table specifies the *Conformance Requirements* for message types for *Managers* and *Workers*. The specific *Conformance Requirements* for each message type is described later in this chapter. *Managers* and *Workers* MAY support other message types.

Table 4.1: XJMF Message Types (Sheet 1 of 2)

MESSAGE TYPE	MESSAGE FAMILY	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
		1	2	1	2	
<i>KnownDevices</i>	<i>Query</i>	w	w	r	r	See ▶ [XJDF 2.1].
	<i>Response</i>	r	r	w	w	
<i>KnownMessages</i>	<i>Query</i>	w	w	r	r	See ▶ [XJDF 2.1].
	<i>Response</i>	r	r	w	w	
<i>KnownSubscriptions</i>	<i>Query</i>		w←		r	<i>KnownSubscriptions</i> SHALL be supported by the <i>Manager</i> if it creates subscriptions and handles signals.
	<i>Response</i>		r←		w	
<i>ModifyQueueEntry</i>	<i>Command</i>	w	w	r	r	See ▶ [XJDF 2.1].
	<i>Response</i>	r	r	w	w	
<i>Notification</i>	<i>Query</i>		w←		r	<i>Notification</i> SHALL be supported by the <i>Manager</i> if it creates subscriptions and handles signals.
	<i>Response</i>		r←		w	
	<i>Signal</i>		r←		w	
<i>QueueStatus</i>	<i>Query</i>	w	w	r	r	See ▶ [XJDF 2.1].
	<i>Response</i>	r	r	w	w	
<i>Resource</i>	<i>Query</i>	w	w	r	r	If the <i>Manager</i> supports <i>Resource Query</i> with <i>Subscription</i> , it shall support reading the <i>Signal</i> from the <i>Worker</i> .
	<i>Response</i>	r	r	w	w	
	<i>Signal</i>		r←		w	
<i>ReturnQueueEntry</i>	<i>Command</i>	r	r	w	w	See ▶ [XJDF 2.1].
	<i>Response</i>	w	w	r	r	
<i>Status</i>	<i>Query</i>	w	w	r	r	If the <i>Manager</i> supports <i>Status Query</i> with <i>Subscription</i> , it shall support reading the <i>Signal</i> from the <i>Worker</i> .
	<i>Response</i>	r	r	w	w	
	<i>Signal</i>		r←		w	

Table 4.1: XJMF Message Types (Sheet 2 of 2)

MESSAGE TYPE	MESSAGE FAMILY	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
		1	2	1	2	
<i>StopPersistentChannel</i>	<i>Command</i>		w←		r	<i>StopPersistentChannel</i> SHALL be supported by the <i>Manager</i> if it creates subscriptions and handles signals.
	<i>Response</i>		r←		w	
<i>SubmitQueueEntry</i>	<i>Command</i>	w	w	r	r	See ▶ [XJDF 2.1].
	<i>Response</i>	r	r	w	w	

4.1 XJMF

The **XJMF** root element SHALL contain one or more specific **XJMF** messages. These messages provide more detailed information or instructions. The following table contains the *Conformance Requirements* for the **XJMF** element that contains a specific **XJMF** message.

Table 4.2: XJMF Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Version</i>	w r?	w r?	r? w	r? w	See ▶ [XJDF 2.1].
2.1	w r	w r	r w	r w	
<i>Header</i>	w r?	w r?	r? w	r? w	If the message is forwarded by a <i>Controller</i> , this <i>Header</i> element SHALL contain the <i>Controller's</i> details and SHALL NOT be the actual <i>Device's</i> details. Note: The <i>Device's</i> details SHALL be present in the specific message element's <i>Header</i> .
<message element>	w r	w r	r w	r w	At least one message element SHALL be specified; multiple message elements MAY be specified.

4.1.1 Header

The *Header* provides information about the sender of an audit, message or **XJMF**.

Table 4.3: Header Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>AgentName</i>	w r?	w r?	r? w	r? w	See ▶ [XJDF 2.1].
<i>AgentVersion</i>	w r?	w r?	r? w	r? w	See ▶ [XJDF 2.1].
<i>DeviceID</i>	w r?	w r?	r? w	r? w	See ▶ [XJDF 2.1].
<i>ICSVersions</i>	w r?	w r?	r? w	r? w	The <i>Manager</i> and <i>Worker</i> SHALL supply a set of NMTOKEN values, one for each ICS with which the parent element of the <i>Header</i> complies.

Table 4.3: Header Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
MIS_L1-2.1	w r?	w!	r? w	w!	Specifies conformance to the <i>MIS ICS Conformance Level 1</i> .
MIS_L2-2.1	w!	w r?	w!	r? w	Specifies conformance to the <i>MIS ICS Conformance Level 2</i> .
<all other values>	w? r?	w? r?	r? w?	r? w?	@ <i>ICSVersions</i> MAY contain the values specified in ICS documents that require conformance to this ICS.
<i>Time</i>	w r?	w r?	r? w	r? w	@ <i>Time</i> SHALL be specified with a value representing the time when this message was written. @ <i>Time</i> SHALL NOT be used as a means of tracking processing time.

4.1.2 Notification

The **Notification** element SHALL contain details of any error when processing an **XJMF**.

Table 4.4: Notification Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Class</i>	w r?	w r?	r? w	r? w	See ▶ [XJDF 2.1].
Comment	w← r?	w← r?	r? w←	r? w←	Comment SHALL be specified if additional information such as a stack trace is available.

4.1.2.1 Comment

See ▶ [XJDF 2.1].

4.2 KnownDevices

The **KnownDevices** query message requests information about the *Devices* that are controlled by a *Worker*. In case that the *Worker* is already a *Device*, information about the current *Device* SHALL be provided.

4.2.1 QueryKnownDevices

QueryKnownDevices SHALL be sent from the *Manager* to a *Worker* to request all *Devices* that are controlled by the *Worker* instance.

Table 4.5: QueryKnownDevices Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
Header	w	w	r?	r?	Header SHALL contain detailed information about the <i>Manager</i> application.

4.2.2 ResponseKnownDevices

ResponseKnownDevices is a synchronous response to the **QueryKnownDevices** message that SHALL be sent from the *Worker* to the *Manager*.

Table 4.6: ResponseKnownDevices Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ReturnCode</i>	r	r	w	w	@ <i>ReturnCode</i> SHALL be specified with a value of "0" if the QueryKnownDevices was successful. @ <i>ReturnCode</i> SHALL be specified with a suitable XJMF return code if the QueryKnownDevices was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
<i>Device</i>	r	r	w←	w←	If the QueryKnownDevices was successful, one <i>Device</i> element SHALL be specified for each <i>Device</i> controlled by the <i>Worker</i> .
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>Notification</i>	r	r	w←	w←	If the QueryKnownDevices was unsuccessful, <i>Notification</i> SHALL be specified.

4.2.2.1 Device

Device SHALL be specified to provide more details about a controlled **XJMF Device**.

Table 4.7: Device Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>CostCenterID</i>	r	r	w←	w←	@ <i>CostCenterID</i> SHALL be provided if available.
<i>DescriptiveName</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>DeviceClass</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>DeviceID</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>ICSVersions</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>JDFVersions</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>Manufacturer</i>	r	r	w	w	@ <i>Manufacturer</i> SHOULD be specified with an identical value for all <i>Devices</i> from the same manufacturer.
<i>PresentationURL</i>	r	r	w←	w←	@ <i>PresentationURL</i> SHALL be provided if available.
<i>Revision</i>	r	r	w←	w←	@ <i>Revision</i> SHALL be provided if available.
<i>SerialNumber</i>	r	r	w←	w←	@ <i>SerialNumber</i> SHALL be provided if available.
<i>URLSchemes</i>	r	r	w	w	See ▶ [XJDF 2.1].
http	r	r	w	w	Both <i>Manager</i> and <i>Worker</i> SHALL support this protocol.
https	r?	r?	w←	w←	Both <i>Manager</i> and <i>Worker</i> SHOULD support this protocol.
<all other values>			w!	w!	

4.3 KnownMessages

KnownMessages returns a list of all message types that are supported by the *Worker*.

4.3.1 QueryKnownMessages

QueryKnownMessages SHALL be sent from the *Manager* to a *Worker* to request information about all **XJMF** messages that are supported by the *Worker*.

Table 4.8: QueryKnownMessages Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
Header	w	w	r?	r?	Header SHALL be specified with detailed information about the <i>Manager</i> application.

4.3.2 ResponseKnownMessages

ResponseKnownMessages is a synchronous response to the **QueryKnownMessages** message that SHALL be sent from the *Worker* to the *Manager*.

Table 4.9: ResponseKnownMessages Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
ReturnCode	r	r	w	w	@ ReturnCode SHALL be specified with a value of "0" if the QueryKnownMessages was successful. @ ReturnCode SHALL be specified with a suitable XJMF return code if the QueryKnownMessages was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
Header	r?	r?	w	w	See ▶ [XJDF 2.1].
MessageService	r	r	w←	w←	If the QueryKnownMessages was successful, one MessageService element SHALL be provided for each XJMF message supported by the <i>Worker</i> .
Notification	r	r	w←	w←	If the QueryKnownMessages was unsuccessful, Notification SHALL be specified.

4.3.2.1 MessageService

Table 4.10: MessageService Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
ResponseModes	r	r	w	w	See ▶ [XJDF 2.1].
Type	r	r	w	w	See ▶ [XJDF 2.1].
URLSchemes	r	r	w	w	See ▶ [XJDF 2.1].
http	r	r	w	w	Both <i>Manager</i> and <i>Worker</i> SHALL support this protocol.
https	r?	r?	w←	w←	Both <i>Manager</i> and <i>Worker</i> SHOULD support this protocol.
<all other values>			w!	w!	

4.4 KnownSubscriptions

The **KnownSubscriptions** message requests information about a *Worker*'s existing subscriptions.

4.4.1 QueryKnownSubscriptions

QueryKnownSubscriptions SHALL be sent from the *Manager* to a *Worker* to request information about the *Worker*'s existing subscriptions.

Table 4.11: QueryKnownSubscriptions Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>		w		r?	<i>Header</i> SHALL contain detailed information about the <i>Manager</i> application.

4.4.2 ResponseKnownSubscriptions

ResponseKnownSubscriptions is a synchronous response to the **QueryKnownSubscriptions** message that SHALL be sent from the *Worker* to the *Manager*.

Table 4.12: ResponseKnownSubscriptions Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ReturnCode</i>		r		w	@ <i>ReturnCode</i> SHALL be specified with a value of "0" if the QueryKnownSubscriptions was successful. @ <i>ReturnCode</i> SHALL be specified with a suitable XJMF return code if the QueryKnownSubscriptions was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
<i>Header</i>		r?		w	See ▶ [XJDF 2.1].
<i>Notification</i>		r		w←	If the QueryKnownSubscriptions was unsuccessful, <i>Notification</i> SHALL be specified.
<i>SubscriptionInfo</i>		r		w←	If the QueryKnownSubscriptions was successful, exactly one <i>SubscriptionInfo</i> SHALL be specified for each subscription.

4.4.2.1 SubscriptionInfo

Table 4.13: SubscriptionInfo Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ChannelID</i>		r		w	@ <i>ChannelID</i> SHALL contain the <i>Worker</i> 's internal id that is used to maintain this subscription.
<i>DeviceID</i>		r		w	See ▶ [XJDF 2.1].
<i>MessageType</i>		r		w	See ▶ [XJDF 2.1].
<i>Subscription</i>		r		w	<i>Subscription</i> SHALL contain a copy of the <i>Subscription</i> element of the query message that originally initiated this <i>Subscription</i> .

4.5 ModifyQueueEntry

ModifyQueueEntry SHALL be sent from the *Manager* to a *Worker* to modify a queue entry.

4.5.1 CommandModifyQueueEntry

The **CommandModifyQueueEntry** XJMF message SHALL be sent from the *Manager* to the *Worker* to initiate this transaction.

Table 4.14: CommandModifyQueueEntry Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	w	w	r?	r?	<i>Header</i> SHALL be specified with detailed information about the <i>Manager</i> .
<i>ModifyQueueEntryParams</i>	w	w	r	r	

4.5.1.1 ModifyQueueEntryParams

Table 4.15: ModifyQueueEntryParams Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Operation</i>	w	w	r	r	See ▶ [XJDF 2.1].
<i>Abort</i>	w←	w←	r	r	
<i>Hold</i>		w←		r	
<i>Remove</i>	w←	w←	r	r	
<i>Resume</i>		w←		r	
<all other values>	w?	w?	r?	r?	
<i>QueueFilter</i>	w	w	r	r	See ▶ [XJDF 2.1].

4.5.1.2 QueueFilter

Table 4.16: QueueFilter Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>QueueEntryIDs</i>	w	w	r	r	<i>@QueueEntryIDs</i> SHALL be specified with a value that refers to the <i>QueueEntry</i> / <i>@QueueEntryID</i> of the queue entries that SHALL be modified.

4.5.2 ResponseModifyQueueEntry

ResponseModifyQueueEntry is a synchronous response to the **CommandModifyQueueEntry** message that SHALL be sent from the *Worker* to the *Manager*.

Table 4.17: ResponseModifyQueueEntry Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ReturnCode</i>	r	r	w	w	@ReturnCode SHALL be specified with a value of "0" if the CommandModifyQueueEntry was successful. @ReturnCode SHALL be specified with a suitable XJMF return code if the CommandModifyQueueEntry was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>Notification</i>	r	r	w←	w←	If the CommandModifyQueueEntry was unsuccessful, Notification SHALL be specified.
<i>QueueEntry</i>	r	r	w←	w←	If the CommandModifyQueueEntry was successful, one QueueEntry SHALL be specified by the <i>Worker</i> for each queue entry whose status has been changed by the CommandModifyQueueEntry message.

4.5.2.1 QueueEntry

Table 4.18: QueueEntry Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Activation</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>EndTime</i>	r	r	w←	w←	@EndTime SHALL be specified if the job has finished.
<i>JobID</i>	r	r	w	w	@JobID SHALL be specified with a value that matches that of the XJDF/@JobID of the job being processed.
<i>JobPartID</i>	r	r	w←	w←	@JobPartID SHALL be specified with a value that matches that of the XJDF/@JobPartID of the job being processed, if it was specified by the <i>Manager</i> .
<i>QueueEntryID</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>StartTime</i>	r	r	w←	w←	@StartTime SHALL be specified if the job has started.
<i>Status</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>StatusDetails</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>SubmissionTime</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>Part</i>	r	r	w←	w←	Part SHALL be specified with values that match those of the XJDF/ResourceSet[@Name = "NodeInfo"]/Resource/Part of the job being processed.

4.6 Notification

Notification messages publish events associated with a *Worker*.

4.6.1 QueryNotification

QueryNotification SHALL be sent from the *Manager* to a *Worker* to subscribe to asynchronous **SignalNotification** messages containing *Worker* events.

Table 4.19: QueryNotification Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
Header		w		r?	Header SHALL be specified with detailed information about the <i>Manager</i> application.
NotificationFilter		w?		r	NotificationFilter MAY be specified by the <i>Manager</i> if a filter should be applied to the SignalNotification messages sent by the <i>Worker</i> .
Subscription		w←		r	Subscription SHALL be specified to set up a subscription to SignalNotification messages. Note: QueryNotification messages without a Subscription are out of scope for this ICS.

4.6.1.1 NotificationFilter

NotificationFilter is specified to filter event notifications sent by the *Worker*.

Table 4.20: NotificationFilter Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
Classes		w		r	See ▶ [XJDF 2.1].

4.6.1.2 Subscription

Subscription is specified to set up a subscription to **SignalNotification** messages.

Table 4.21: Subscription Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
ChannelMode		w		r	See ▶ [XJDF 2.1].
FireAndForget		w←		r	@ ChannelMode = " FireAndForget " SHALL be supported.
Reliable		w?		r←	@ ChannelMode = " Reliable " SHOULD be supported.
URL		w		r	@ URL SHALL specify the <i>Manager</i> 's endpoint URL to receive the subscribed SignalNotification messages.
http://...		w←		r	Both <i>Manager</i> and <i>Worker</i> SHALL support this protocol.
https://...		w←		r?	Both <i>Manager</i> and <i>Worker</i> SHOULD support this protocol.
<all other values>		w!			

4.6.2 ResponseNotification

ResponseNotification is a synchronous response to the **QueryNotification** message that SHALL be sent from the *Worker* to the *Manager*.

Table 4.22: ResponseNotification Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ReturnCode</i>		r		w	@ <i>ReturnCode</i> SHALL be specified with a value of "0" if the QueryNotification was successful. @ <i>ReturnCode</i> SHALL be specified with a suitable XJMF return code if the QueryNotification was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
<i>Header</i>		r?		w	See ▶ [XJDF 2.1].
<i>Notification</i>		r		w←	If the QueryNotification was unsuccessful, Notification SHALL be specified.

4.6.3 SignalNotification

SignalNotification messages SHALL be sent from the *Worker* to the *Manager* to notify the *Manager* about events that occurred at the *Worker*. **SignalNotification** messages SHALL be sent immediately when the event has occurred to ensure real-time tracking.

If a **NotificationFilter** was provided in the **QueryNotification**, only matching events SHALL be sent from the *Worker* to the *Manager*.

Table 4.23: SignalNotification Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ChannelMode</i>		r		w	@ <i>ChannelMode</i> SHALL be a copy of the value of Subscription / @ <i>ChannelMode</i> of the initiating subscription element.
<i>Header</i>		r?		w	See ▶ [XJDF 2.1].
<i>Notification</i>		r		w	See ▶ [XJDF 2.1].

4.6.4 Notification

The **Notification** element contains information about individual events that occur during production.

Table 4.24: Notification Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Class</i>		r		w	See ▶ [XJDF 2.1].
<i>Event</i>		r?		w←	Exactly one of Event or Milestone SHALL be specified.
<i>Milestone</i>		r?		w←	Exactly one of Event or Milestone SHALL be specified.

4.6.4.1 Event

Table 4.25: Event Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>EventID</i>		r		w	@ <i>EventID</i> SHALL provide the event's identifier. Custom event identifiers SHALL be unique within the <i>Worker</i> 's context. Identical events SHALL specify the same value. Values from ▶ [XJDF 2.1] Appendix A, section 'Status Details' SHOULD be used.
<i>EventValue</i>		r		w	@ <i>EventValue</i> SHALL provide a human readable description of the event.

4.6.4.2 Milestone

Table 4.26: Milestone Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>MilestoneType</i>		r		w	See ▶ [XJDF 2.1].

4.7 QueueStatus

QueueStatus requests information about the current state of a *Worker*'s queue.

4.7.1 QueryQueueStatus

Table 4.27: QueryQueueStatus Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	w	w	r?	r?	<i>Header</i> SHALL be specified with detailed information about the <i>Manager</i> application.
<i>QueueStatusParams</i>	w	w	r	r	See ▶ [XJDF 2.1].

4.7.1.1 QueueStatusParams

Table 4.28: QueueStatusParams Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>UpdateGranularity</i>	w	w	r	r	See ▶ [XJDF 2.1].
All	w←	w←	r	r	
<all other values>	w?	w?	r?	r?	
<i>QueueFilter</i>	w?	w?	r	r	See ▶ [XJDF 2.1].

4.7.1.2 QueueFilter

Table 4.29: QueueFilter Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>StatusList</i>	w?	w?	r	r	See ▶ [XJDF 2.1].

4.7.2 ResponseQueueStatus

The *ResponseQueueStatus* message is a synchronous response to the *QueryQueueStatus* message. The *ResponseQueueStatus* message SHALL be sent from the *Worker* to the *Manager*.

Table 4.30: ResponseQueueStatus Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ReturnCode</i>	r	r	w	w	@ <i>ReturnCode</i> SHALL be specified with a value of "0" if the <i>QueryQueueStatus</i> was successful. @ <i>ReturnCode</i> SHALL be specified with a suitable XJMF return code if the <i>QueryQueueStatus</i> was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>Notification</i>	r	r	w←	w←	If the <i>QueryQueueStatus</i> was unsuccessful, <i>Notification</i> SHALL be specified.
<i>Queue</i>	r	r	w←	w←	If the <i>QueryQueueStatus</i> was successful, <i>Queue</i> SHALL be specified even if it is empty.

4.7.2.1 Queue

Table 4.31: Queue Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>QueueSize</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>QueueEntry</i>	r	r	w←	w←	All <i>QueueEntry</i> elements that match <i>QueueFilter</i> SHALL be specified.

4.7.2.2 QueueEntry

Table 4.32: QueueEntry Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Activation</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>EndTime</i>	r	r	w←	w←	@ <i>EndTime</i> SHALL be specified if the job has finished.
<i>JobID</i>	r	r	w	w	@ <i>JobID</i> SHALL be specified with a value that matches that of the XJDF/@ <i>JobID</i> of the job being processed.

Table 4.32: QueueEntry Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>JobPartID</i>	r	r	w←	w←	@ <i>JobPartID</i> SHALL be specified with a value that matches that of the <i>XJDF/@JobPartID</i> of the job being processed, if it was specified by the <i>Manager</i> .
<i>QueueEntryID</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>StartTime</i>	r	r	w←	w←	@ <i>StartTime</i> SHALL be specified if the job has started.
<i>Status</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>StatusDetails</i>	r	r	w←	w←	@ <i>StatusDetails</i> SHALL be specified if available.
<i>SubmissionTime</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>Part</i>	r	r	w←	w←	<i>Part</i> SHALL be specified with values that match those of the <i>XJDF/ResourceSet[@Name = "NodeInfo"]/Resource/Part</i> of the job being processed.

4.8 Resource

Resource messages report information about the resource consumption or production by a *Worker*. The specific resources that SHALL be reported are defined by the appropriate *Domain* ICSSs.

4.8.1 QueryResource

QueryResource SHALL be sent from the *Manager* to a *Worker* to synchronously query for a **ResponseResource** message or to subscribe to asynchronous **SignalResource** messages containing the *Worker's* resource usage.

Table 4.33: QueryResource Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	w	w	r?	r?	<i>Header</i> SHALL be specified with detailed information about the <i>Manager</i> application.
<i>ResourceQuParams</i>	w	w	r	r	<i>ResourceQuParams</i> SHALL specify details of the SignalResource or ResponseResource messages that are requested by the <i>Manager</i> from the <i>Worker</i> .
<i>Subscription</i>		w←		r	<i>Subscription</i> SHALL be specified to set up a subscription to SignalResource messages.

4.8.1.1 ResourceQuParams

ResourceQuParams specifies details of the resource messages that are requested by the *Manager* and are to be supplied by the *Worker*.

Table 4.34: ResourceQuParams Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Scope</i>	w	w	r	r	See ▶ [XJDF 2.1].
<i>Job</i>	w←	w←	r	r	@ <i>Scope</i> = " <i>Job</i> " SHALL be supported by the <i>Worker</i> .
<all other values>	w?	w?	r?	r?	

4.8.1.2 Subscription

Table 4.35: Subscription Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ChannelMode</i>		w		r	See ▶ [XJDF 2.1].
FireAndForget		w←		r	@ <i>ChannelMode</i> = "FireAndForget" SHALL be supported.
Reliable		w←		r←	@ <i>ChannelMode</i> = "Reliable" SHOULD be supported.
<i>RepeatTime</i>		w!			@ <i>RepeatTime</i> SHALL NOT be specified by the <i>Manager</i> .
<i>URL</i>		w		r	@ <i>URL</i> SHALL specify the <i>Manager</i> 's endpoint URL receiving the subscribed signal resource messages.
http://...		w←		r	Both <i>Manager</i> and <i>Worker</i> SHALL support this protocol.
https://...		w←		r?	Both <i>Manager</i> and <i>Worker</i> SHOULD support this protocol.
<all other values>		w!			

4.8.2 ResponseResource

ResponseResource is a synchronous response to the **QueryResource** message that SHALL be sent from the *Worker* to the *Manager*.

Table 4.36: ResponseResource Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ReturnCode</i>	r	r	w	w	@ <i>ReturnCode</i> SHALL be specified with a value of "0" if the QueryResource was successful. @ <i>ReturnCode</i> SHALL be specified with a suitable XJMF return code if the QueryResource was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>Notification</i>	r	r	w←	w←	If the QueryResource was unsuccessful, Notification SHALL be specified.
<i>ResourceInfo</i>	r	r	w←	w←	If the QueryResource was successful and if it did not specify a Subscription element, ResourceInfo SHALL be specified. If the QueryResource was successful and if it specified a Subscription element, ResourceInfo SHALL NOT be specified.

4.8.3 SignalResource

SignalResource messages SHALL be sent from the *Worker* to the *Manager*'s endpoint URL (**Subscription/@URL**) to notify the *Manager* about the *Worker*'s resource usage. **SignalResource** messages SHALL be sent immediately when a job finishes, i.e., close to when the **CommandReturnQueueEntry** message is sent.

Table 4.37: SignalResource Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ChannelMode</i>		r		w	@ <i>ChannelMode</i> SHALL be a copy of the value of Subscription/@ChannelMode of the initiating subscription element.
<i>Header</i>		r?		w	See ▶ [XJDF 2.1].
<i>ResourceInfo</i>		r		w	See ▶ [XJDF 2.1].

4.9 ReturnQueueEntry

ReturnQueueEntry returns a queue entry from a *Worker* to a *Manager* once processing is completed.

4.9.1 CommandReturnQueueEntry

The **CommandReturnQueueEntry** XJMF message SHALL be sent from the *Worker* to the *Manager* to initiate this transaction.

Table 4.38: CommandReturnQueueEntry Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].
<i>ReturnQueueEntryParams</i>	r	r	w	w	See ▶ [XJDF 2.1].

4.9.1.1 ReturnQueueEntryParams

Table 4.39: ReturnQueueEntryParams Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>QueueEntryID</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>URL</i>	r	r	w	w	@ <i>URL</i> SHALL be specified and SHALL reference the XJDF document containing the job report.
<i>http://...</i>	r	r	w←	w←	Both <i>Manager</i> and <i>Worker</i> SHALL support this protocol.
<i>https://...</i>	r?	r?	w←	w←	Both <i>Manager</i> and <i>Worker</i> SHOULD support this protocol.
<i><local url></i>		r	w!	w←	Local URLs SHALL NOT be specified unless ReturnQueueEntry is used in the context of XJDF packaging.
<i><all other values></i>			w!	w!	

4.9.2 ResponseReturnQueueEntry

ResponseReturnQueueEntry is a synchronous response to the **CommandReturnQueueEntry** message that SHALL be sent from the *Manager* to the *Worker*.

Table 4.40: ResponseReturnQueueEntry Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
ReturnCode	w	w	r	r	@ReturnCode SHALL be specified with a value of "0" if the CommandReturnQueueEntry was successful. @ReturnCode SHALL be specified with a suitable XJMF return code if the CommandReturnQueueEntry was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
Header	w	w	r?	r?	Header SHALL be specified with detailed information about the <i>Manager</i> .
Notification	w←	w←	r	r	If the CommandReturnQueueEntry was unsuccessful, Notification SHALL be specified.

4.10 Status

The **Status** message queries the general status of a *Worker* and the status of jobs associated with a *Worker*.

4.10.1 QueryStatus

QueryStatus SHALL be sent from the *Manager* to a *Worker* to synchronously query the *Worker*'s status, or to subscribe to asynchronous **SignalStatus** messages.

Table 4.41: QueryStatus Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
Header	w	w	r?	r?	Header SHALL be specified with detailed information about the <i>Manager</i> application.
StatusQuParams	w	w←	r	r	StatusQuParams SHALL NOT be specified if a Subscription element is specified.
Subscription		w←		r	Subscription SHALL be specified to set up a subscription to SignalStatus messages. Subscription SHALL NOT be specified if a StatusQuParams element is specified.

4.10.1.1 StatusQuParams

Table 4.42: StatusQuParams Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
QueueEntryID	w	w	r	r	@QueueEntryID SHALL be specified with a value that identifies a unique queue entry. Only JobPhase elements associated with that queue entry SHALL be specified in a DeviceInfo element in the ResponseStatus message.

4.10.1.2 Subscription

Table 4.43: Subscription Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ChannelMode</i>		w		r	See ▶ [XJDF 2.1].
FireAndForget		w←		r	@ <i>ChannelMode</i> = " FireAndForget " SHALL be supported.
Reliable		w←		r←	@ <i>ChannelMode</i> = " Reliable " SHOULD be supported.
<i>RepeatTime</i>		w		r	See ▶ [XJDF 2.1]. Note: Some <i>Devices</i> have limitations with regard to short repeat intervals; <i>Domain ICSs</i> may provide additional requirements.
<i>URL</i>		w		r	@ <i>URL</i> SHALL be specified with a value identifying the <i>Manager's</i> endpoint URL to which the subscribed SignalStatus messages SHALL be sent.
http://...		w←		r	Both <i>Manager</i> and <i>Worker</i> SHALL support this protocol.
https://...		w←		r?	Both <i>Manager</i> and <i>Worker</i> SHOULD support this protocol.
<all other values>		w!			

4.10.2 ResponseStatus

ResponseStatus is a synchronous response to the **QueryStatus** message that SHALL be sent from the *Worker* to the *Manager*.

Table 4.44: ResponseStatus Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ReturnCode</i>	r	r	w	w	@ <i>ReturnCode</i> SHALL be specified with a value of "0" if the QueryStatus was successful. @ <i>ReturnCode</i> SHALL be specified with a suitable XJMF return code if the QueryStatus was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
DeviceInfo	r	r	w←	w←	If the QueryStatus was successful and it did not specify a Subscription element, DeviceInfo SHALL be specified. If the QueryStatus was successful and it specified a Subscription element, DeviceInfo SHALL NOT be specified.
Header	r?	r?	w	w	See ▶ [XJDF 2.1].
Notification	r	r	w←	w←	If the QueryStatus was unsuccessful, Notification SHALL be specified.

4.10.3 SignalStatus

SignalStatus messages SHALL be used to update the *Manager* about the *Worker's* current status as specified in the subscription details. **SignalStatus** messages are triggered by both event and time changes.

Subscription/**@RepeatTime** specifies the time based *Heartbeat*: an XJMF **SignalStatus** message SHALL be sent from the *Worker* to the *Manager's* endpoint URL (specified in **Subscription**/**@URL**) every **Subscription**/**@RepeatTime** seconds. For details about time based signals see ▶ [XJDF 2.1].

Event based **SignalStatus** messages are triggered in addition to time based **SignalStatus** messages. Event based **SignalStatus** messages SHALL be sent from the *Worker* to the *Manager* whenever a *Device* or job status change has occurred.

A status change is considered to have occurred when a new *DeviceInfo/JobPhase/@EndTime* is set. See ▶ [XJDF 2.1] for details.

Event based *SignalStatus* messages SHALL be sent without undue delay to enable the *Manager* to track the job in real time.

Table 4.45: *SignalStatus* Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ChannelMode</i>		r		w	<i>@ChannelMode</i> SHALL be a copy of the value of <i>Subscription/@ChannelMode</i> of the initiating subscription element.
<i>DeviceInfo</i>		r		w	See ▶ [XJDF 2.1].
<i>Header</i>		r?		w	See ▶ [XJDF 2.1].

4.11 StopPersistentChannel

The *StopPersistentChannel* command message unsubscribes the *Manager* from a *Worker* for the defined type of signal messages.

4.11.1 CommandStopPersistentChannel

CommandStopPersistentChannel SHALL be sent from the *Manager* to a *Worker* to unsubscribe to asynchronous signal messages from a *Worker*.

CommandStopPersistentChannel SHALL only unsubscribe signals from a single endpoint URL.

Note: Unsubscribing from multiple endpoint URLs requires the use of multiple command messages.

Table 4.46: *CommandStopPersistentChannel* Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>		w		r?	<i>Header</i> SHALL be specified with detailed information about the <i>Manager</i> application.
<i>StopPersChParams</i>		w		r	See ▶ [XJDF 2.1].

4.11.1.1 StopPersChParams

StopPersChParams specifies details of the signal messages sent by the *Worker* that are to be unsubscribed.

Table 4.47: *StopPersChParams* Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>MessageType</i>		w?		r	<i>@MessageType</i> SHALL specify the signal message type to be unsubscribed. If <i>@MessageType</i> is not specified, then persistent channels for all message types SHALL be unsubscribed.
<i>SignalNotification</i>		w←		r	<i>@MessageType</i> = " <i>SignalNotification</i> " SHALL be specified to unsubscribe to <i>SignalNotification</i> messages.
<i>SignalResource</i>		w←		r	<i>@MessageType</i> = " <i>SignalResource</i> " SHALL be specified to unsubscribe to <i>SignalResource</i> messages.
<i>SignalStatus</i>		w←		r	<i>@MessageType</i> = " <i>SignalStatus</i> " SHALL be specified to unsubscribe to <i>SignalStatus</i> messages.

Table 4.47: StopPersChParams Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<all other values>		w?		r?	
URL		w		r	@URL SHALL specify the <i>Manager's</i> endpoint URL for which signal messages SHALL be unsubscribed.

4.11.2 ResponseStopPersistentChannel

ResponseStopPersistentChannel message is a synchronous response to the **CommandStopPersistentChannel** message. The **ResponseStopPersistentChannel** message SHALL be sent from the *Worker* to the *Manager*.

Table 4.48: ResponseStopPersistentChannel Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
ReturnCode		r		w	@ReturnCode SHALL be specified with a value of "0" if the CommandStopPersistentChannel was successful. @ReturnCode SHALL be specified with a suitable XJMF return code if the CommandStopPersistentChannel was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
Header		r?		w	See ▶ [XJDF 2.1].
Notification		r		w←	If the CommandStopPersistentChannel was unsuccessful, Notification SHALL be specified.
SubscriptionInfo		r		w←	If the CommandStopPersistentChannel was successful, SubscriptionInfo SHALL be specified and shall provide a list of subscriptions being removed.

4.11.2.1 SubscriptionInfo

SubscriptionInfo SHALL contain information of a removed subscription.

Table 4.49: SubscriptionInfo Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
ChannelID		r		w	@ChannelID SHALL contain the <i>Workers</i> internal id that is used to maintain this subscription.
DeviceID		r		w	See ▶ [XJDF 2.1].
MessageType		r		w	See ▶ [XJDF 2.1].
Subscription		r		w	Subscription SHALL contain the Subscription element of the query message that originally initiated this Subscription .

4.12 SubmitQueueEntry

SubmitQueueEntry initially submits a queue entry from a *Manager* to a *Worker*.

4.12.1 CommandSubmitQueueEntry

The **CommandSubmitQueueEntry** XJMF message SHALL be sent from the *Manager* to the *Worker* to initiate this transaction.

Table 4.50: CommandSubmitQueueEntry Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Header</i>	w	w	r?	r?	<i>Header</i> SHALL be specified with detailed information about the <i>Manager</i> application.
<i>QueueSubmissionParams</i>	w	w	r	r	See ▶ [XJDF 2.1].

4.12.1.1 QueueSubmissionParams

Table 4.51: QueueSubmissionParams Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ReturnJMF</i>	w	w	r	r	@ <i>ReturnJMF</i> SHALL be specified to define the target URL where the ReturnQueueEntry command SHALL be sent once the job is completed.
http://...	w←	w←	r	r	Both <i>Manager</i> and <i>Worker</i> SHALL support this protocol.
https://...	w←	w←	r?	r?	Both <i>Manager</i> and <i>Worker</i> SHOULD support this protocol.
<all other values>	w!	w!			
<i>URL</i>	w	w	r	r	@ <i>URL</i> SHALL be specified and SHALL reference the XJDF document containing the job information.
http://...	w←	w←	r	r	Both <i>Manager</i> and <i>Worker</i> SHALL support this protocol.
https://...	w←	w←	r?	r?	Both <i>Manager</i> and <i>Worker</i> SHOULD support this protocol.
<local url>	w!	w←		r	Local URLs SHALL NOT be specified unless SubmitQueueEntry is used in the context of XJDF packaging.
<all other values>	w!	w!			

4.12.2 ResponseSubmitQueueEntry

ResponseSubmitQueueEntry is a synchronous response to the **CommandSubmitQueueEntry** message that SHALL be sent from the *Worker* to the *Manager*. The response message SHALL contain either queue entry information, if the submission was successful, or error details that SHALL be provided as **Notification**.

Table 4.52: ResponseSubmitQueueEntry Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>ReturnCode</i>	r	r	w	w	@ <i>ReturnCode</i> SHALL be specified with a value of "0" if the CommandSubmitQueueEntry was successful. @ <i>ReturnCode</i> SHALL be specified with a suitable XJMF return code if the CommandSubmitQueueEntry was unsuccessful. See ▶ [XJDF 2.1] section 'Return Codes'.
<i>Header</i>	r?	r?	w	w	See ▶ [XJDF 2.1].

Table 4.52: ResponseSubmitQueueEntry Message

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Notification</i>	r	r	w←	w←	If the <i>CommandSubmitQueueEntry</i> was unsuccessful, <i>Notification</i> SHALL be specified.
<i>QueueEntry</i>	r	r	w←	w←	If the <i>CommandSubmitQueueEntry</i> was successful, <i>QueueEntry</i> SHALL be specified.

4.12.2.1 QueueEntry

Table 4.53: QueueEntry Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>QueueEntryID</i>	r	r	w	w	@ <i>QueueEntryID</i> SHALL be specified with the identifier of the queue entry. This identifier SHALL be generated by the <i>Worker</i> and SHALL be used by the <i>Manager</i> in subsequent transactions when referring to that queue entry.
<i>Status</i>	r	r	w	w	@ <i>Status</i> SHALL be specified with the status of the submitted job. Note: Typically this value is "Waiting".

5 Resources

5.1 Device

Device describes the physical properties of the main *Device* that SHALL execute an **XJDF Process**.

5.1.1 ResourceSet

Table 5.1: ResourceSet for Device Resource

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Name</i>	w	w	r	r	See ▶ [XJDF 2.1].
Device	w	w	r	r	
<i>Usage</i>	w	w	r	r	See ▶ [XJDF 2.1].
Input	w	w	r	r	
Resource	w	w	r	r	See ▶ [XJDF 2.1].

5.1.2 Resource

Table 5.2: Resource for Device Resource

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
AmountPool	w!	w!			See ▶ [XJDF 2.1].
Device	w	w	r	r	See ▶ [XJDF 2.1].

5.1.3 Device

Table 5.3: Device Resource

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>DeviceID</i>	w	w	r	r	See ▶ [XJDF 2.1].

5.2 NodeInfo

5.2.1 NodeInfo sent by a Manager

5.2.1.1 ResourceSet

Table 5.4: ResourceSet for NodeInfo Resource

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Name</i>	w	w	r	r	See ▶ [XJDF 2.1].
NodeInfo	w	w	r	r	
<i>Usage</i>	w	w	r	r	See ▶ [XJDF 2.1].
Input	w	w	r	r	
Resource	w	w	r	r	See ▶ [XJDF 2.1].

5.2.1.2 Resource

Table 5.5: Resource for NodeInfo Resource

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
AmountPool	w!	w!			See ▶ [XJDF 2.1].
NodeInfo	w	w	r	r	See ▶ [XJDF 2.1].

5.2.1.3 NodeInfo

Table 5.6: NodeInfo Resource

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>End</i>		w?		r	The Worker SHALL consider @End when scheduling execution of this job.
<i>Start</i>		w?		r	The Worker SHALL consider @Start when scheduling execution of this job.
<i>Status</i>	w	w	r	r	@Status = "Waiting" SHALL be specified in the context of a SubmitQueueEntry message.
Waiting	w	w	r	r	
<all other values>	w!	w!			

5.2.2 NodeInfo returned by a Worker

5.2.2.1 ResourceSet

Table 5.7: ResourceSet for NodeInfo Resource

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Name</i>	r	r	w	w	See ▶ [XJDF 2.1].
NodeInfo	r	r	w	w	
<i>Usage</i>	r	r	w	w	See ▶ [XJDF 2.1].
Input	r	r	w	w	
Resource	r	r	w	w	See ▶ [XJDF 2.1].

5.2.2.2 Resource

Table 5.8: Resource for NodeInfo Resource

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
AmountPool			w!	w!	See ▶ [XJDF 2.1].
NodeInfo	r	r	w	w	See ▶ [XJDF 2.1].

5.2.2.3 NodeInfo

Table 5.9: NodeInfo Resource

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>End</i>		r		w?	See ▶ [XJDF 2.1].
<i>Start</i>		r		w?	See ▶ [XJDF 2.1].
<i>Status</i>	r	r	w	w	See ▶ [XJDF 2.1].
Aborted	r	r	w←	w←	
Completed	r	r	w←	w←	
<all other values>			w!	w!	

6 Subelements

6.1 DeviceInfo

DeviceInfo represents the state of a *Device*.

Table 6.1: DeviceInfo Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>CounterUnit</i>	r	r	w←	w←	<i>@CounterUnit</i> SHALL be specified to define the counter unit of all counter and amount related attributes within this DeviceInfo element (including any subelements). <i>@CounterUnit</i> SHALL be specified if Components are being produced.
count	r	r	w←	w←	<i>@CounterUnit</i> = " count " SHALL be specified for sheet based processing.
m	r	r	w←	w←	<i>@CounterUnit</i> SHALL be specified with a value of either " m " or " m2 " for web based processing.
m2	r	r	w←	w←	<i>@CounterUnit</i> SHALL be specified with a value of either " m " or " m2 " for web based processing.
<all other values>	r?	r?	w?	w?	
<i>EndTime</i>	r	r	w←	w←	<i>@EndTime</i> SHALL be specified in the context of an AuditStatus . <i>@EndTime</i> SHALL be specified when <i>@Status</i> or <i>@StatusDetails</i> have changed when compared to previous states in the context of a ResponseStatus or SignalStatus message. <i>@EndTime</i> SHALL NOT be specified where a JobPhase is ongoing, in either a ResponseStatus or Heartbeat SignalStatus message.
<i>Speed</i>	r	r	w←	w←	If known by the <i>Worker Device</i> , <i>@Speed</i> SHALL be specified with a value of the machine's speed in the units specified in <i>@CounterUnit</i> per hour. <i>@Speed</i> SHALL be specified if individual Components are being produced and production speed can be measured.
<i>Status</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>StatusDetails</i>	r	r	w←	w←	See ▶ [XJDF 2.1].
Good	r	r	w←	w←	<i>@StatusDetails</i> = " Good " SHALL be specified if a good production counter is active.
Waste	r	r	w←	w←	<i>@StatusDetails</i> = " Waste " SHALL be specified if a waste production counter is active.
<all other values>	r?	r?	w?	w?	
<i>TotalProductionCounter</i>	r	r	w←	w←	If known by the <i>Worker Device</i> , <i>@TotalProductionCounter</i> SHALL be specified with a value of the current total machine production counter in the units specified in <i>@CounterUnit</i> .

Table 6.1: DeviceInfo Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>JobPhase</i>	r	r	w←	w←	<p><i>JobPhase</i> SHALL be specified in the context of an <i>AuditStatus</i>.</p> <p><i>JobPhase</i> SHALL be specified if the current <i>Device</i> is either processing or has processed a job in the context of a <i>ResponseStatus</i> or <i>SignalStatus</i> message.</p>

6.1.1 JobPhase

JobPhase represents the state of a job.

Table 6.2: JobPhase Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<i>Amount</i>	r	r	w←	w←	<p>If known by the <i>Worker Device</i>, <i>@Amount</i> SHALL be specified with the total good amount produced or processed during this job phase in the units specified in <i>DeviceInfo/ @CounterUnit</i>.</p> <p><i>@Amount</i> SHALL be specified if <i>Components</i> are being produced.</p> <p>Note: Some <i>Devices</i>, such as die cutters or guillotine cutters, track the amounts of input components rather than the amounts of output components.</p>
<i>EndTime</i>	r	r	w←	w←	<p><i>@EndTime</i> SHALL be specified in the context of an <i>AuditStatus</i>.</p> <p><i>@EndTime</i> SHALL be specified when <i>@Status</i> or <i>@StatusDetails</i> have changed when compared to previous states in the context of a <i>ResponseStatus</i> or <i>SignalStatus</i> message.</p> <p><i>@EndTime</i> SHALL NOT be specified where a <i>JobPhase</i> is ongoing, in either a <i>ResponseStatus</i> or <i>Heartbeat SignalStatus</i> message.</p>
<i>JobID</i>	r	r	w	w	<i>@JobID</i> SHALL be specified with a value that matches that of the <i>XJDF/ @JobID</i> of the job being processed.
<i>JobPartID</i>	r	r	w←	w←	<i>@JobPartID</i> SHALL be specified with a value that matches that of the <i>XJDF/ @JobPartID</i> of the job being processed, if it was specified by the <i>Manager</i> .
<i>StartTime</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>Status</i>	r	r	w	w	See ▶ [XJDF 2.1].
<i>Aborted</i>	r	r	w←	w←	
<i>Cleanup</i>	r	r	w←	w←	A <i>Worker</i> SHALL specify this value during the cleanup phase for a <i>Device</i> that has such a phase for each job.
<i>Completed</i>	r	r	w←	w←	
<i>InProgress</i>	r	r	w←	w←	
<i>Setup</i>	r	r	w←	w←	A <i>Worker</i> SHALL specify this value during the setup phase for a <i>Device</i> that has such a phase for each job.
<i>Stopped</i>	r	r	w←	w←	

Table 6.2: JobPhase Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
Suspended	r	r	w←	w←	
Waiting			w!	w!	
StatusDetails	r	r	w←	w←	See ▶ [XJDF 2.1].
Good	r	r	w←	w←	@StatusDetails = "Good" SHALL be specified if good products were produced.
Waste	r	r	w←	w←	@StatusDetails = "Waste" SHALL be specified if waste was produced.
<all other values>	r?	r?	w?	w?	
Waste	r	r	w←	w←	If known by the Worker Device, @Waste SHALL be specified with the value of the total waste produced or processed during this job phase in the units specified in DeviceInfo/CounterUnit.
Part	r	r	w←	w←	Part SHALL be specified in the case of Partitioning.

6.2 Part

Part elements define the context in which the individual resource is used. Details of Partitioning will be defined by the appropriate Domain ICS. The MIS ICS only defines the structure of Partitioning.

Table 6.3: Part Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<Defined by Domain ICS Documents>					

6.3 ResourceInfo

ResourceInfo specifies information about the usage of one type of resource.

Table 6.4: ResourceInfo Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
JobID	r	r	w	w	@JobID SHALL be specified with a value that matches that of the XJDF/@JobID of the job being processed.
JobPartID	r	r	w←	w←	@JobPartID SHALL be specified with a value that matches that of the XJDF/@JobPartID of the job being processed, if it was specified by the Manager.
Scope	r	r	w	w	@Scope SHALL be specified with a value that matches the value of ResourceQuParams/@Scope of the initiating query in the context of a ResponseResource or SignalResource message.
Job	r	r	w←	w←	@Scope SHALL be specified with a value of "Job" when ResourceInfo is specified in the context of an AuditResource.

Table 6.4: ResourceInfo Element

NAME OR VALUE	MANAGER LEVEL		WORKER LEVEL		DESCRIPTION
	1	2	1	2	
<all other values>	r	r	w←	w←	See ▶ [XJDF 2.1].
ResourceSet	r	r	w	w	See ▶ [XJDF 2.1].

Appendix A

A References

Table A.5: Normative References

TERM	DEFINITION
[Interoperability Matrix]	<i>CIP4 Interoperability Matrix</i> Produced by: CIP4 Organization Available at: http://www.CIP4.org
[MIS to CP ICS]	<i>Management Information Systems to Conventional Printing ICS</i> Version 2.1 Date: To be released Produced by: CIP4 Organization Available at: http://www.CIP4.org
[Print Procurement ICS]	<i>Print Procurement ICS</i> Version 2.1 Date: To be released Produced by: CIP4 Organization Available at: http://www.CIP4.org
[XJDF 2.1]	<i>Exchange Job Definition Format Specification</i> Version 2.1 Date: August 2020 Produced by: CIP4 Organization Available at: http://www.CIP4.org
[XPath]	<i>XML Path Language (XPath) 2.0 (Second Edition)</i> <i>Version W3C Recommendation 14 December 2010</i> Date: 14 December 2010 Produced by: World Wide Web Consortium (W3C) Available at: https://www.w3.org/TR/xpath20/

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