Management Information System ICS

Version 1.7

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CIP4 ORGANIZATION

CIP4 THANKS ITS PARTNER LEVEL MEMBERS

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1 Introduction

The *MIS* plays a central role in a *MIS*-managed print shop. The *MIS* is normally the conduit between the print shop's customers and the print shop's production facilities (and sub-contractors). As a result, an *MIS* supports two major interfaces:

- With the print shop's customers – primarily **JDF** *Product Intent*
- With the print shop's production facilities – primarily **JDF** *Process* definitions

This ICS specifies the generic parts of the *Manager* interface (in an *MIS*) when it communicates with the *Worker* interface (in production workflow components, such as *Devices*). It also specifies the corresponding generic parts of the *Worker* interface (in a *Device*) when it communicates with the *Manager* interface (in an *MIS*).

This ICS includes:

- Specifications of **JDF** Elements that are not specific to any one of prepress, press or postpress
- ***AuditPool*** elements for job costing
- Specifications of **JMF** messages used for resource synchronization, job tracking/costing and *Device* utilization statistics.
- Creating and managing *Persistent Channels*

Definitions that are specific to only one of prepress, press or postpress are described in separate *Domain ICS* documents.

This ICS describes the data flow in a print shop in a *MIS*-managed environment. However, this data flow does not necessarily also apply to non-*MIS*-managed environments.

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 Prepress 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 the ▸ [Base ICS], ▸ [Messaging ICS] and this ICS (i.e. the Management Information System ICS). These ICSs are not intended to be used in isolation and SHOULD always be used in conjunction with one or more *Domain ICS* specifications.

1.2 Gray Boxes

An *MIS* will typically use *Gray Boxes*, to specify the *Processes* and resources that are of real interest to the *MIS*, that is, everything the *MIS* needs to track the production of output resources.

A *Gray Box* has a specific goal and declares a loosely defined (and possibly incomplete) combination of **JDF** *Processes* to achieve its goal.

A *Worker* receiving a *Gray Box* SHOULD fill in the missing or incomplete details of any necessary *Processes* or resources.

1.3 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 **JDF** specification. See ▸ [JDF 1.7].

1.3.1 Document References

References to other publications are collated in ▸ 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.

1.3.2 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*** — A **JDF** or **JMF** element. Usually these are dynamic links leading to the definition of the element.
- **Process** — A *Gray Box* or specific *Process* such as **ColorSpaceConversion** or **Rendering**. These can be dynamic links leading to the definition of the *Process*.

- *@Attribute* — A **JDF** or **JMF** attribute within the context of an element.
- "Value" — The content of an attribute.
- **JDF** — **JDF** or **JMF** 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.
- ▸ [JDF 1.7] — 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.

1.3.3 XPath Notation

- ***JDF***/@*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., ***JDF***[@*Type* = "DigitalPrinting"] identifies a **JDF** *Process Node* for digital printing.

1.3.4 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

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

1.3.5 Conformance Terminology

This document uses exactly the same terminology as the **JDF** specification to indicate the strictness of conformance. See ▸ [JDF 1.7].

1.4 Certification

Vendors are encouraged to certify their implementations against one of the levels as specified in ▸ Table 2.1 Conformance Levels. Certification against the ICS for the *Worker* role SHOULD be performed with three types of data:

- The physical printed output or an equivalent electronic representation.
- The **JMF** messages or returned **JDF** file.
- *Operator* interface on the *Device*.

Additional hints for self certification are provided in the descriptions and are marked with the label "**Conformance Test:**".

1.5 Changes from Version 1.5

This version of the Management Information Systems ICS represents a significant revision from earlier versions. In part this is cosmetic to align the document with the latest CIP4 document standards; in part it is organizational to align the structure with all other ICS documents that have been also been revised in this cycle.

In addition to the above there have also been a number of changes made to improve the usefulness of this ICS.

The large magnitude of changes since version 1.5 makes it difficult to list all changes, but the following differences are notable.

1.5.1 Additions

- For clarity, some schema default values have been explicitly required.
- *Conformance Requirements* for ***JDF*** nodes, both root and child nodes, returned by a *Worker* have been specified and clarified.
- Discussion of *Gray Boxes* has been moved to here from the ▸ [MIS to Prepress ICS].
- Support requirements for ***NodeInfo*** in *Gray Boxes* and *Process* nodes have been added.
- A number of items have been moved to here from the ▸ [Base ICS]. Examples of *Traits* that were moved are:
  - All amount and waste handling, including all *Conformance Requirements* for ***Component*** and ***ResourceLink*** elements.
  - All *Conformance Requirements* for the ***AuditPool*** element, the abstract audit element and the complete list of specific audit elements.
- *Conformance Requirements* for audit elements and **JMF** messages have been aligned, which might require additional support of some *Traits*.
- The *@Time* attribute is now required for all signals from *Worker* to *Manager*.
- ***DeviceInfo***/*@StatusDetails* and ***JobPhase***/*@StatusDetails* are now conditionally required in ***Status*** messages.
- Discussion of persistent channels has been moved to here from the ▸ [Messaging ICS].
- Requirements for the ***JMF*** root element have been added.
- Handshaking for reliable signals has been clarified.

1.5.2 Removals

- Inherited *Traits* from the ▸ [Base ICS] and ▸ [Messaging ICS] (previously shown as colored rows) have been removed.
- Some conformance statements that duplicate those in ▸ [JDF 1.7], ▸ [Base ICS] or ▸ [Messaging ICS] have been removed.
- This ICS no longer supports the concept of test run.
- Support for the value ***Contact***/*@ContactTypes*="Administrator" has been removed.
- Support for lot handling has been removed.
- This ICS only supports global subscriptions.
- *Conformance Requirements* for the use of *@AcknowledgeURL* and ***Acknowledge*** messages have been removed. **Note:** This is not to say that their use has been precluded, rather the ICS remains silent and their use or not is implementation dependent.
- Signals from *Manager* to *Worker* are no longer based on subscriptions.
- Signals from *Worker* to *Manager* that are not based on subscriptions are out of scope.
- The ***Registration*** and ***NewJDF*** messages are out of scope.

1.5.3 Modifications

- Various minor *Conformance Requirements* have been loosened.
- Where single tables were used to describe many usages of nodes or resources, the different usages are now broken out into separate tables.
- Some restrictions on human readable ***Comment*** elements have been loosened.
- Customer ***Contact*** resources can now be specified with ***Company*** and/or ***Person*** elements.
- *Conformance Requirements* for the deprecated ***Media***/@*Grade* have been replaced by *Conformance Requirements* for ***Media***/@*ISOPaperSubstrate*.
- *Conformance Requirements* for the deprecated ***ResourceQuParams***/@*Context* have been replaced by *Conformance Requirements* for ***ResourceQuParams***/@*Scope*.
- *Conformance Requirements* for ***Response*** messages to optional ***Command*** and ***Query*** messages are explicitly specified.

1.6 Glossary

This section defines terminology used throughout this document. References to other documents are indicated with square brackets, e.g., ▸ [JDF 1.7].

Table 1.2: Glossary

TERM	DEFINITION
Combined Process	See ▸ [JDF 1.7].
Conformance Level	See ▸ [Base ICS].
Conformance Requirement	See ▸ [Base ICS].
Device	See ▸ [JDF 1.7].
Domain ICS	See ▸ [Base ICS].
Final Product	The product that was ordered by the customer.
Gray Box	See ▸ [JDF 1.7].
Heartbeat	A signal that is sent in regular intervals and that is not caused by a state change in the *Device*.
Hot Folder	See ▸ [Base ICS].
JDF	See ▸ [JDF 1.7].
JMF	See ▸ [JDF 1.7].
Machine	See ▸ [JDF 1.7].
Manager	In the context of this ICS, *MIS* is the *Manager*. See also ▸ [Base ICS].
MIS	See ▸ [JDF 1.7].
Node	See ▸ [JDF 1.7].
Operator	A person responsible for the setup, running and operation of a *Device*.
Partition	See ▸ [JDF 1.7].
Persistent Channel	See ▸ [Messaging ICS].
Process	See ▸ [JDF 1.7].
Process Group	See ▸ [JDF 1.7].
Product Intent	See ▸ [JDF 1.7].
Trait	See ▸ [Base ICS].
Worker	See ▸ [Base ICS].

2 Conformance

2.1 Conformance Levels

This **ICS** specifies three *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*).

To be conformant to a level of this **ICS** (as specified in the first column of the table below), an *MIS* SHALL conform to the *Manager* part and a *Device* SHALL conform to the *Worker* part of this ICS and to the indicated *Conformance Level* requirements of this ICS and the ▸ [Base ICS] and ▸ [Messaging ICS] as shown in ▸ Table 2.1 Conformance Levels below.
Note: *MIS* ICS *Conformance Levels* are incremental, i.e., support for a particular *Conformance Level* requires support for all lower *Conformance Levels*, except for the ▸ [Base ICS] levels 1 and 2 that are themselves non incremental.

Table 2.1: Conformance Levels

LEVEL OF THIS ICS	LEVEL OF BASE ICS	LEVEL OF MESSAGING ICS	DESCRIPTION
1	1	–	This combination of ICS levels includes: • Job submission using a *Hot Folder*. This combination of levels requires support of file level communication.
2	2	1	This combination of ICS levels includes: • All the functionality of the previous combination of ICS levels. • Job submission as required by ▸ [Messaging ICS] Level 1. • Costing using the ***AuditPool*** in the **JDF** returned to the *MIS*. • Support of **JMF** signals and *Persistent Channels*. • Resource synchronization using **JMF** messages. • Full support of ▸ [Messaging ICS] level 1. This combination of levels requires support of network communication.
3	2	1	This combination of ICS levels includes: • All the functionality of the previous combination of ICS levels. • Costing using reliable *Persistent Channels* with **JMF** ***Resource*** and ***Status*** signals. • ***Resource Command*** messages to update job scheduling using ***NodeInfo***.

3 JDF Instance

This ICS specifies the *Conformance Requirements* for an *MIS* and a Worker that are not specific to any one of prepress, press or postpress, with the objective to enable the successful production of a *Final Product* which MAY be comprised of one or more *Products*.

JDF instances consist of 'Product', *Process Group*, and *Process Nodes*. A 'Product' *Node* describes the *Final Product* or partial product the customer will receive; **JDF** *Product Intent* resources define the characteristics of this *Final Product*.

JDF product *Nodes* SHALL contain *Product Intent* resources. In other words, if the intent cannot be described or is not available, the root *Node* of the **JDF** instance SHALL be a *Process* or a *Process Group*. Product intent resources SHALL only describe those product characteristics that the customer supplies. Product intent resources SHALL describe the customer's view of a job. Intent resources SHALL NOT describe details of the production *Process* for which the customer has no knowledge (e.g., the individual printed sheets that make up the text of a brochure).

There SHOULD be a ***JDF*** *Node* to describe each of these, i.e., a ***JDF*** *Node* for the *Final Product* and a ***JDF*** *Node* for each of its child products. The *Final Product* SHOULD be described in the ***JDF*** root *Node*; each product in a child ***JDF*** product *Node*. The *Gray Boxes* that are used to describe the *Processes* required to create a single product SHALL be children of the product's *Node*.

If the *Final Product* is comprised of a single product then the *Conformance Requirements* for a ***JDF*** product *Node* MAY be combined with the ***JDF*** root *Node*.

3.1 JDF

▸ Table 3.4 JDF Root Node - Worker to Manager specifies the *Conformance Requirements* for attributes and elements for a ***JDF*** *Node* whether it is a root *Node* or a subnode. Most of the attributes and elements have the same *Conformance Requirements* whether the *Node* is a root *Node* or a subnode. Those that differ are marked with "w←" and the description column specifies the conditions.

When a *Manager* submits a **JDF** instance to a *Worker*, all **JDF** *Nodes* contained within the instance SHALL conform to these *Conformance Requirements*. When a *Worker* returns a **JDF** instance to a *Manager*, all **JDF** *Nodes* contained within the instance SHALL conform to these *Conformance Requirements*.

3.1.1 JDF Root Node

The root node SHALL be one of a *Process* node, a *Gray Box* or a product node (i.e., ***JDF***/@*Type* = "Product"). The root node SHALL conform to the requirements of the root node and SHALL conform to the requirements for the specific type of node.

3.1.1.1 JDF Root Node - Manager to Worker

Table 3.1: JDF Root Node - Manager to Worker (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
ICSVersions	w	w	w	r?	r?	r?	See ▸ [Base ICS].
MIS_L1-1.7	w	w!	w!	r?			Specifies conformance to the Management Information System ICS *Conformance Level* 1.
MIS_L2-1.7	w!	w	w!		r?		Specifies conformance to the Management Information System ICS *Conformance Level* 2.
MIS_L3-1.7	w!	w!	w			r?	Specifies conformance to the Management Information System ICS *Conformance Level* 3.

Table 3.1: JDF Root Node - Manager to Worker (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
<all other values>	w←	w←	w←	r?	r?	r?	@*ICSVersions* SHALL contain all the values specified in the ICS documents that are required for conformance to this ICS as specified in ▸ Table 2.1 Conformance Levels. @*ICSVersions* MAY additionally contain the values specified in other ICS documents that require conformance to this ICS.
RelatedJobID	w←	w←	w←	r?	r?	r?	@*RelatedJobID* SHALL be specified if @*RelatedJobPartID* is specified.
RelatedJobPartID	w?	w?	w?	r?	r?	r?	@*RelatedJobPartID* MAY be specified if the *Node* parameters are the same as the *Node* parameters of the @*RelatedJobPartID*.
Type	w	w	w	r	r	r	See ▸ [JDF 1.7].
AuditPool	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
Comment	w?	w?	w?	r?	r?	r?	See ▸ [JDF 1.7].

Table 3.2: JDF Root Node - Manager to Worker Input Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
CustomerInfo	w?	w?	w?	r?	r?	r?	***CustomerInfo*** SHOULD be specified as an input resource to the root **JDF** node.
NodeInfo	w	w	w	r	r	r	See ▸ [JDF 1.7].

Table 3.3: JDF Root Node - Manager to Worker Output Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION

3.1.1.2 JDF Root Node - Worker to Manager

Table 3.4: JDF Root Node - Worker to Manager (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ICSVersions	r?	r?	r?	w	w	w	See ▸ [Base ICS].
MIS_L1-1.7	r?			w	w!	w!	Specifies conformance to the Management Information System ICS *Conformance Level* 1.
MIS_L2-1.7		r?		w!	w	w!	Specifies conformance to the Management Information System ICS *Conformance Level* 2.

Table 3.4: JDF Root Node - Worker to Manager (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
MIS_L3-1.7			r?	w!	w!	w	Specifies conformance to the Management Information System ICS *Conformance Level* 3.
<all other values>	r?	r?	r?	w←	w←	w←	*@ICSVersions* SHALL contain all the values specified in the ICS documents that are required for conformance to this ICS as specified in ▸ Table 2.1 Conformance Levels. *@ICSVersions* MAY additionally contain the values specified in other ICS documents that require conformance to this ICS.

Table 3.5: JDF Root Node - Worker to Manager Input Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION

Table 3.6: JDF Root Node - Worker to Manager Output Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION

3.1.2 JDF Product Node

This section applies to both root product nodes and partial product nodes.

This ICS imposes no restrictions upon the order of *Gray Boxes* and **JDF** *Process* nodes in a product node, however, the *Manager* MAY order the *Process* nodes and *Gray Boxes* in their expected order of execution by linking their respective output resources and input resources.

Table 3.7: JDF Product Node

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Type	w	w	w	r	r	r	See ▸ [JDF 1.7].
Product	w	w	w	r	r	r	
JDF (Gray Box)	w←	w←	w←	r	r	r	At least one *Process* node or *Gray Box* SHALL be specified in the entire **JDF** document.
JDF (Process)	w←	w←	w←	r	r	r	At least one *Process* node or *Gray Box* SHALL be specified in the entire **JDF** document.
JDF (Product)	w?	w?	w?	r	r	r	Partial products MAY be specified.

Table 3.8: JDF Product Node - Input Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL	DESCRIPTION
CustomerInfo	w?	w?	w?	r?	r?	r?	***CustomerInfo*** MAY be specified as an input resource to *Product Nodes* if *Products* for multiple customers are specified, e.g., in the case of ganging.

Table 3.9: JDF Product Node - Output Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Component	w	w	w	r	r	r	See ▸ [JDF 1.7].

3.1.3 JDF Gray Box

3.1.3.1 JDF Gray Box - Manager to Worker

Table 3.10: JDF Gray Box - Manager to Worker

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Category	w	w	w	r	r	r	*@Category* SHALL be specified with values specified in a *Domain ICS*.
Type	w	w	w	r	r	r	See ▸ [JDF 1.7].
ProcessGroup	w	w	w	r	r	r	
<all other values>	w!	w!	w!				
Types	w	w	w	r	r	r	*@Types* SHALL be specified with values specified in a *Domain ICS*.
Comment	w?	w?	w?	r?	r?	r?	See ▸ [JDF 1.7].
JDF (Product)	w!	w!	w!				See ▸ [JDF 1.7].

Table 3.11: JDF Gray Box - Manager to Worker Input Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL	DESCRIPTION
NodeInfo	w	w	w	r	r	r	See ▸ [JDF 1.7].
Resource (Consumable)		w←	w←		r←	r←	The *Manager* SHALL provide all consumable resources for which it requires consumption information. The *Worker* SHALL support any requests for consumable resources that it consumes and can track.

Table 3.12: JDF Gray Box - Manager to Worker Output Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION

3.1.3.2 JDF Gray Box - Worker to Manager

Table 3.13: JDF Gray Box - Worker to Manager

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Type	r	r	r	w	w	w	See ▸ [JDF 1.7].
ProcessGroup	r	r	r	w	w	w	
Types	r	r	r	w	w	w	The value of @*Types* MAY be updated if the *Gray Box* is expanded by the *Worker*. See ▸ [JDF 1.7].
AuditPool	r?	r	r	w	w	w	**Conformance Test:** The *Manager* SHALL record the actual processing time retrieved from ***PhaseTime*** element logged against the job.
Comment	r?	r?	r?	w?	w?	w?	See ▸ [JDF 1.7].

Table 3.14: JDF Gray Box - Worker to Manager Input Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL	DESCRIPTION
Resource (Consumable)		r	r		w←	w←	The *Worker* SHALL report consumption values for all consumable resources that were specified by the *Manager*.

Table 3.15: JDF Gray Box - Worker to Manager Output Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION

3.1.4 JDF Process Node

3.1.4.1 JDF Process Node - Manager to Worker

Table 3.16: JDF Process Node - Manager To Worker

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Category	w	w	w	r	r	r	@*Category* SHALL be specified with values specified in a *Domain ICS*.
Type	w	w	w	r	r	r	See ▸ [JDF 1.7].
Combined	w←	w←	w←	r	r	r	
ProcessGroup	w!	w!	w!				
Product	w!	w!	w!				
<all other values>	w?	w?	w?	r	r	r	@*Type* SHALL be specified with values that are specified in a *Domain ICS*.
Types	w←	w←	w←	r	r	r	@*Types* SHALL be specified if @*Type* = "Combined", and SHALL NOT be specified for any other value of @*Type*. @*Types* SHALL be specified with values specified in a *Domain ICS*.
Comment	w?	w?	w?	r?	r?	r?	See ▸ [JDF 1.7].
JDF	w!	w!	w!				See ▸ [JDF 1.7].

Table 3.17: JDF Process Node - Manager to Worker Input Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2		WORKER LEVEL 1	WORKER LEVEL 2		DESCRIPTION
NodeInfo	w	w	w	r	r	r	See ▸ [JDF 1.7].
Resource (Consumable)		w←	w←		r←	r←	The *Manager* SHALL provide all consumable resources for which it requires consumption information. The *Worker* SHALL support any requests for consumable resources that it consumes and can track.

Table 3.18: JDF Process Node - Manager to Worker Output Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION

3.1.4.2 JDF Process Node - Worker to Manager

Table 3.19: JDF Process Node - Worker to Manager

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Type	r	r	r	w	w	w	See ▸ [JDF 1.7].
Product				w!	w!	w!	
ProcessGroup				w!	w!	w!	
<all other values>	r	r	r	w?	w?	w?	The value of @*Type* SHALL NOT be modified by the *Worker*. See ▸ [JDF 1.7].
Types	r	r	r	w	w	w	The value of @*Types* MAY be updated if the *Gray Box* is expanded by the *Worker*. See ▸ [JDF 1.7].
AuditPool	r	r	r	w	w	w	**Conformance Test:** The *Manager* SHALL record the actual processing time retrieved from ***PhaseTime*** element logged against the job.
Comment	r?	r?	r?	w?	w?	w?	See ▸ [JDF 1.7].
JDF				w!	w!	w!	See ▸ [JDF 1.7].

Table 3.20: JDF Process Node - Worker to Manager Input Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL	DESCRIPTION
Resource (Consumable)		r	r		w←	w←	The *Worker* SHALL report consumption values for all consumable resources that were specified by the *Manager*.

Table 3.21: JDF Process Node - Worker to Manager Output Resources

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION

3.2 AuditPool

There are different *Conformance Requirements* for the ***AuditPool*** in a **JDF** 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 3.22: AuditPool Element sent by a Manager

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Created	w	w	w	r?	r?	r?	***Created*** SHALL be specified by the *Manager* to provide details about the software and time of creation of the **JDF**.

3.2.1.1 Created

Table 3.23: Created Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
AgentName	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
AgentVersion	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
ID	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
TimeStamp	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].

3.2.2 AuditPool returned by a Worker

When a *Worker* returns a **JDF** instance to a *Manager*, the *Worker* SHALL return the same **JDF** instance that it received from the *Manager* except for certain parts of the **JDF** instance that a *Worker* MAY modify. In particular, the *Worker* SHALL add information into the ***AuditPool*** of the *Process Node* that was executed.

Table 3.24: AuditPool Element returned by a Worker

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Created	r?	r?	r?	w←	w←	w←	If the *Worker* creates the *Node*, it SHALL write the ***Created*** audit element.
Modified	r?	r?	r?	w?	w?	w?	The *Worker* SHOULD specify the ***Modified*** audit if it has significantly modified the **JDF**.
PhaseTime		r	r		w	w	See ▸ [JDF 1.7].
ProcessRun	r?	r?	r?	w	w	w	The *Worker* SHALL specify one ***ProcessRun*** audit element as the last audit element relating to each execution of the *Node*.
ResourceAudit		r	r		w?	w?	The *Domain ICS* for the *Worker* specifies the types of consumable resources for which consumption SHALL be reported and for which the ***ResourceAudit*** SHALL be specified.

3.2.2.1 Created

Table 3.25: Created Element

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
AgentName	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
AgentVersion	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
ID	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
TimeStamp	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].

3.2.2.2 Modified

Table 3.26: Modified Element

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
AgentName	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
AgentVersion	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
ID	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
TimeStamp	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].

3.2.2.3 PhaseTime

A ***PhaseTime*** audit SHALL be specified for each continuous time period that has a unique combination of ***PhaseTime***/@*Status* and ***PhaseTime***/@*StatusDetails*.
Note: ***PhaseTime*** is aligned with ***Status Signals*** and will typically cover a time period that begins with the start of the first matching ***JobPhase*** in a ***Status Signal*** and ends with the last matching ***JobPhase*** in a ***Status Signal***.

The following paragraphs discuss overlapping ***PhaseTime*** elements versus overlapping ***ModulePhase*** elements.

This ICS defines a single method to supply audit elements for *Devices* with modules, namely audit elements with overlapping ***PhaseTime*** elements.

The ***PhaseTime*** elements MAY overlap only if each ***PhaseTime*** separately contains one or more non-identical ***ModulePhase*** elements. The ***ModulePhase*** elements indicate which modules were used during the entire ***PhaseTime***.

The ***PhaseTime*** attributes @*Status*, @*Start* and @*End* indicate the status and duration of the phase for all modules specified by ***ModulePhase*** subelements. The ***AuditPool*** MAY contain multiple ***PhaseTime*** audits that have the same @*Status* value. When reporting the duration of a particular state, the *Manager* SHALL sum the durations for all ***PhaseTime*** elements that have an appropriate matching value in @*Status*.
Note: Duration is calculated from the @*Start* and @*End* attributes.

Table 3.27: PhaseTime Element (Sheet 1 of 3)

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
AgentName		r?	r?		w	w	See ▸ [JDF 1.7].
AgentVersion		r?	r?		w	w	See ▸ [JDF 1.7].
End		r	r		w	w	**Conformance Test:** The *Manager* SHALL create job costing based upon the ***PhaseTime*** elements, calculating the duration specified by @*Start* and @*End*.

Table 3.27: PhaseTime Element (Sheet 2 of 3)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID		r	r		w	w	**Conformance Test:** The *Manager* SHALL NOT create costing data from the same ***PhaseTime*** more than once.
refID		r	r		w←	w←	Once a ***PhaseTime*** is supplied, it SHALL NOT be modified. If the *Worker* determines that a previously supplied ***PhaseTime*** is incorrect, it SHALL supply another ***PhaseTime*** with the correct data, and specify the incorrect ***PhaseTime*** element's @*ID* value in @*refID*. **Conformance Test:** If a ***PhaseTime*** references another ***PhaseTime*** via @*refID*, the *Manager* SHALL replace any costing data in the referenced ***PhaseTime*** with the costing data from the referencing ***PhaseTime***.
Start		r	r		w	w	**Conformance Test:** See @*End*.
Status		r	r		w	w	See ▸ [JDF 1.7].
Cleanup		r	r		w←	w←	A *Worker* SHALL specify this value during the cleanup phase for a *Device* that has such a phase for each job. The duration of @*Status* = "CleanUp" SHALL be included in the costing.
InProgress		r	r		w←	w←	The duration of @*Status* = "InProgress" SHALL be included in the costing.
Setup		r	r		w←	w←	A *Worker* SHALL specify this value during the setup phase for a *Device* that has such a phase for each job. The duration of @*Status* = "Setup" SHALL be included in the costing.
Stopped		r	r		w←	w←	The duration for @*Status*="Stopped" MAY be excluded from the costing.
Suspended		r	r		w←	w←	The duration of @*Status*="Suspended" SHALL be excluded from the costing.
<all other values>		r	r		w?	w?	
TimeStamp		r?	r?		w	w	See ▸ [JDF 1.7].
Activity		r?	r?		w?	w?	
Comment		r?	r?		w?	w?	
Device		r	r		w?	w?	
Employee		r	r		w?	w←	***Employee*** SHALL be specified if the *Device* responsible for this ***PhaseTime*** requires an *Operator* for normal operation and ***Employee***/@*Roles* contains "Operator". ***Employee*** SHALL NOT be specified for unattended *Devices*.
MISDetails		r	r		w←	w←	***MISDetails*** SHALL be specified if known to the *Worker*, either via ***NodeInfo*** or by *Operator* input.

Table 3.27: PhaseTime Element (Sheet 3 of 3)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ModulePhase		r?	r?		w?	w?	
Part		r?	r?		w←	w←	If ***PhaseTime*** doesn't describe all parts of a *Process*, then the *Worker* SHALL supply this ***Part*** element and it SHALL specify the parts of a *Process* that this ***PhaseTime*** belongs to.

3.2.2.3.1 Activity

Activity allows for the specification of *Device* and *Operator* tasks. One use case is to specify the group of *Operators* that is assigned to the *Device* and/or job, where each *Operator* performs a different task (e.g., *Machine Operator* and assistants).

Table 3.28: Activity Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ActivityID		r←	r←		w←	w←	@*ActivityID* specifies the activity being performed. This ID is unique, site specific and internal to the *MIS*. At least one of @*ActivityID* and @*ActivityName* SHALL be specified.
ActivityName		r←	r←		w←	w←	At least one of @*ActivityID* and @*ActivityName* SHALL be specified.
PersonalID		r	r		w←	w←	@*PersonalID* SHALL be specified if an *Operator* was involved in this phase.
StartTime		r	r		w	w	See ▸ [JDF 1.7].

3.2.2.3.2 ModulePhase

See ***PhaseTime*** for a discussion about overlapping ***PhaseTime*** elements versus overlapping ***ModulePhase*** elements.

Table 3.29: ModulePhase Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
DeviceID		r?	r?		w	w	See ▸ [JDF 1.7].
DeviceStatus		r?	r?		w	w	See ▸ [JDF 1.7].
ModuleType		r?	r?		w	w	See ▸ [JDF 1.7].

3.2.2.4 ProcessRun

Table 3.30: ProcessRun Element (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
AgentName	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].

Table 3.30: ProcessRun Element (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
AgentVersion	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
Duration	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
End	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
EndStatus	r?	r?	r?	w	w	w	See ▸ [JDF 1.7]. **Note:** This ICS no longer supports the concept of test run.
Aborted	r?	r?	r?	w←	w←	w←	
Completed	r?	r?	r?	w←	w←	w←	
<all other values>				w!	w!	w!	
ID	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
Start	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
TimeStamp	r?	r?	r?	w	w	w	See ▸ [JDF 1.7].
Part	r?	r?	r?	w←	w←	w←	If this ***ProcessRun*** doesn't describe all parts of a *Process*, then the *Worker* SHALL supply one or more ***Part*** elements that SHALL specify the parts of a *Process* that this ***ProcessRun*** belongs to.

3.2.2.5 ResourceAudit

ResourceAudit elements SHALL be specified to record the consumption of a resource by the *Worker*.

Table 3.31: ResourceAudit Element (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
AgentName		r?	r?		w	w	See ▸ [JDF 1.7].
AgentVersion		r?	r?		w	w	See ▸ [JDF 1.7].
ID		r	r		w	w	**Conformance Test:** The *Manager* SHALL NOT create costing data from the same ***ResourceAudit*** more than once.
Reason		r	r		w?	w?	See ▸ [JDF 1.7].
PlanChange		r	r		w←	w←	The *Manager* SHALL NOT create costing entries for ***ResourceAudits*** with @*Reason* = "PlanChange".
ProcessResult		r	r		w←	w←	
<all other values>		r?	r?		w?	w?	

Table 3.31: ResourceAudit Element (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
refID		r	r		w←	w←	Once a ***ResourceAudit*** is supplied, it SHALL NOT be modified. If the *Worker* determines that a previously supplied ***ResourceAudit*** is incorrect, it SHALL supply another ***ResourceAudit*** with the correct data, and specify the incorrect ***ResourceAudit*** element's *@ID* value in *@refID*. **Conformance Test:** If a ***ResourceAudit*** references another ***ResourceAudit*** via *@refID*, the *Manager* SHALL update any costing data in the referenced ***ResourceAudit*** with the costing data from the ***ResourceAudit*** whose *@ID* value matches the value *@refID*.
TimeStamp		r?	r?		w	w	See ▸ [JDF 1.7].
Part		r?	r?		w←	w←	***Part*** elements SHALL be specified for those *Partitions* of a *Process* that this ***ResourceAudit*** belongs to.
ResourceLink		r	r		w	w	***ResourceLink*** SHALL be a copy of the ***ResourceLinkPool***/***ResourceLink*** and SHALL reference a resource that was consumed or modified during the execution of the *Process*.

3.2.2.5.1 ResourceLink

Table 3.32: ResourceLink Element (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ActualAmount		r	r		w←	w←	If ***AmountPool*** is not specified, the *Worker* SHALL specify *@ActualAmount* for any physical resource that it produces or consumes. *Domain ICSs* MAY specify additional requirements for updating *@ActualAmount* for any specific kind of physical resource. *@ActualAmount* SHALL NOT be specified if ***AmountPool*** is specified. **Conformance Test:** The *Manager* SHALL create costing entries for the quantity specified in this *@ActualAmount*.
MinStatus		r?	r?		w←	w←	*@MinStatus* SHALL be specified if a *Worker* adds a new ***ResourceLink***. **Conformance Test:** The *Worker* SHALL NOT execute **JDF** *Nodes* that have one or more input resources with a *@Status* value "lower" than the value specified in *@MinStatus*. See ▸ [JDF 1.7].

Table 3.32: ResourceLink Element (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
AmountPool		r?	r?		w?	w?	The *Worker* MAY create the ***AmountPool***, if it does not exist, before it returns the **JDF** to the *Manager*. If the *Worker* creates the ***AmountPool***, the *Worker* SHALL move @*ActualAmount*, @*Amount*, @*MaxAmount* and @*MinAmount* to ***AmountPool/PartAmount*** and assume that amounts in the ***ResourceLink*** need to go into the *Partition* whose @*Condition* has a value of "Good".
Part		r	r		w?	w?	See ▸ [JDF 1.7].

3.2.2.5.2 AmountPool

Table 3.33: AmountPool Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
PartAmount		r	r		w	w	See ▸ [JDF 1.7].

3.2.2.5.3 PartAmount

If a *Worker* can distinguish between good and waste, it SHALL supply the waste amount in ***PartAmount***/@*ActualAmount* with ***PartAmount***/***Part***/@*Condition* = "Waste" and SHALL supply the good amount excluding the waste amount in ***PartAmount***/@*ActualAmount* with ***PartAmount***/***Part***/@*Condition* = "Good".

Table 3.34: PartAmount Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ActualAmount		r	r		w	w	A *Worker* SHOULD update @*ActualAmount* of any physical resource that it produces or consumes. *Domain ICSs* MAY specify additional requirements for updating @*ActualAmount* for any specific kind of physical resource. **Conformance Test:** The *Manager* SHALL create costing entries for the quantity specified in this @*ActualAmount*.
Part		r	r		w	w	See ▸ [JDF 1.7].

3.2.2.5.4 Part

This ICS has no *Conformance Requirements* for ***PartAmount***/***Part*** other than those for @*Condition*.

Table 3.35: Part Element (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Condition		r	r		w←	w←	@*Condition* SHALL be specified if a *Worker* can distinguish between good and waste..

Table 3.35: Part Element (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
Good		r	r		w←	w←	
Waste		r	r		w←	w←	
<all other values>					w!	w!	

4 Messages

This chapter discusses the *Conformance Requirements* for **JMF** messages.

4.1 Message Types

The following table specifies the *Conformance Requirements* for message types that *Managers* and *Workers* SHALL support. The specific details of *Conformance Requirements* for each message type is described later in this chapter. *Managers* and *Workers* SHALL support all message types required by the ▸ [Messaging ICS] and MAY support other message types, if so they SHALL conform to the *Conformance Requirements* of those message types.

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

MESSAGE TYPE	MESSAGE FAMILY	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
		1	2	3	1	2	3	
KnownSubscriptions	***Query***		w	w		r	r	***KnownSubscriptions*** messages are used by the *Manager* to avoid creating duplicate subscriptions.
	Response		r	r		w	w	
Notification	***Signal***		w←	w←		r?	r?	***Notification*** messages are sent by the *Manager* to inform all workflow components that a particular processing stage has been completed. If the *Manager* can detect the completion of production stages, it SHALL send a ***Signal*** message after the completion of each stage.
Resource Updating Scheduling Information	***Command***			w			r	These ***Resource*** messages are used by the *Manager* to update scheduling information for the *Worker*.
	Response			r			w	
Resource Tracking Resource Consumption	***Query***		w	w		r	r	These ***Resource*** messages are used by the *Manager* to request updates from the *Worker* regarding resource consumption. The *Worker* SHALL support any requests for consumable resources that it consumes and can track.
	Response		r	r		w	w	
	Signal		r	r		w←	w←	
	Signal Response			w			r	
Resource Synchronizing Resource Catalogs	***Command***		w	w		r	r	These ***Resource*** messages are used by the *Manager* to synchronize the *Worker's* resource catalogs with its own.
	Response		r	r		w	w	
Resource Requesting a Worker's Resource Catalog	***Query***		w	w		r	r	These ***Resource*** messages are used by the *Manager* to request a *Worker's* resource catalog.
	Response		r	r		w	w	
Status	***Query***		w	w		r	r	***Status*** messages are provided to allow the *Manager* to subscribe for and receive *Device* status messages from the *Worker*.
	Response		r	r		w	w	
	Signal		r	r		w	w	
	Signal Response			w			r	

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

MESSAGE TYPE	MESSAGE FAMILY	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
StopPersistentChannel	***Command***		w	w		r	r	***StopPersistentChannel*** messages are used by the *Manager* to unsubscribe from existing subscriptions.
	Response		r	r		w	w	

4.2 JMF

This ICS describes the use of **JMF** in an *MIS* controlled environment. The following table specifies the details of **JMF** specific to this ICS. For additional conformance requirements, see ▸ [Messaging ICS].

Table 4.2: JMF Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ICSVersions	w← r?	w← r?	w← r?	r? w←	r? w←	r? w←	See ▸ [Base ICS].
MIS_L1-1.7	w r?	w!	w!	r? w	w!	w!	Specifies conformance to the Management Information System ICS *Conformance Level* 1.
MIS_L2-1.7	w!	w r?	w!	w!	r? w	w!	Specifies conformance to the Management Information System ICS *Conformance Level* 2.
MIS_L3-1.7	w!	w!	w r?	w!	w!	r? w	Specifies conformance to the Management Information System ICS *Conformance Level* 3.
<all other values>	w← r?	w← r?	w← r?	r? w←	r? w←	r? w←	@*ICSVersions* SHALL contain all the values specified in the ICS documents that are required for conformance to this ICS as specified in ▸ Table 2.1 Conformance Levels. @*ICSVersions* MAY additionally contain the values specified in other ICS documents that require conformance to this ICS.

4.3 JMF Handshaking

4.3.1 Persistent Channels

A *Manager* or *Worker* sends **JMF** ***Signals*** to another *Device* in what is called a *Persistent Channel*.
Note: Hard wired ***Signals***, i.e., ***Signals*** that are not based on a ***Subscription*** are out of scope for this ICS.

4.3.1.1 Creating Persistent Channels

Persistent Channels SHALL be created by sending a ***Query*** message that includes a ***Subscription*** element.

4.3.1.2 Managing Persistent Channels

A *Manager* SHOULD monitor the status of *Persistent Channels* by using the ***KnownSubscriptions Query***. A *Worker* SHALL respond to a ***KnownSubscriptions Query*** with a ***KnownSubscriptions Response*** that contains one ***SubscriptionInfo*** for every *Persistent Channel* that matches the ***Query***.

4.3.1.3 Reliable Signaling

A *Persistent Channel* MAY be declared reliable by the *Manager* by providing ***Subscription***/@*ChannelMode* = "Reliable". If ***Subscription***/@*ChannelMode* = "Reliable" the *Worker* SHALL set ***Signal***/@*ChannelMode* = "Reliable" for all ***Signals*** triggered by the ***Subscription***.

If ***Subscription***/@*ChannelMode* = "Reliable" is received but not supported by the *Worker*, the *Worker* SHALL fail the request and return a ***Response***/@*ReturnCode* = "13".

The *Manager* SHALL respond to a ***Signal***/@*ChannelMode* = "Reliable" with a valid ***Response*** message.

4.3.1.4 Closing Persistent Channels

Closing a *Persistent Channel* means that additional messages related to the subscription SHALL NOT be created. Messages previously created MAY still be pending delivery. A *Manager* SHALL be able to receive and process further messages at the URL defined in the original subscription.

A *Persistent Channel* SHALL be closed by sending a ***StopPersistentChannel Command***.

All ***Subscription*** *Producers* and *Consumers* SHALL support ***StopPersistentChannel Command***.

4.3.1.5 Persistent Channel Conformance

This ICS does not require any *Persistent Channel* support. The conformance for processing and managing *Persistent Channels* is provided here to ensure that all *Domain ICSs* that are based on this ICS have the same *Conformance Requirements* for *Persistent Channels*.

4.4 KnownSubscriptions

4.4.1 Query

Table 4.3: KnownSubscriptions Query Message

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID		w	w		r	r	@*ID* SHALL be unique for all messages initiated by the same sender. Any ***Response*** message SHALL provide a copy of this @*ID* in @*refID*.
Type		w	w		r	r	See ▸ [JDF 1.7].
KnownSubscriptions		w	w		r	r	
SubscriptionFilter		w?	w?		r	r	See ▸ [JDF 1.7].

4.4.1.1 SubscriptionFilter

Table 4.4: SubscriptionFilter Element (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ChannelID		w?	w?		r	r	**Conformance Test:** The *Consumer* SHALL respond with ***SubscriptionInfo*** elements that match the value of @*ChannelID*.
DeviceID		w?	w?		r	r	**Conformance Test:** The *Consumer* SHALL respond with ***SubscriptionInfo*** elements that match the value of @*DeviceID*.
URL		w?	w?		r	r	**Conformance Test:** The *Consumer* SHALL respond with ***SubscriptionInfo*** elements that match the value of @*URL*.
http:...		w←	w←		r	r	Both *Manager* and *Worker* SHALL support this protocol.

Table 4.4: SubscriptionFilter Element (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
https:...		w←	w←		r?	r?	Both *Manager* and *Worker* SHOULD support this protocol.
<all other values>		w!	w!				

4.4.2 Response

Note: The *Producer* in the following ***Response*** table is returning the response to the *Consumer*. The ***Query*** *Producer* is the ***Response*** *Consumer*, and the ***Response*** *Producer* is the ***Query*** *Consumer*.

Table 4.5: KnownSubscriptions Response Message

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID		r?	r?		w	w	@*ID* SHALL be unique for all messages initiated by the same sender.
refID		r	r		w	w	See ▸ [JDF 1.7].
ReturnCode		r	r		w	w	See ▸ [JDF 1.7].
Type		r	r		w	w	See ▸ [JDF 1.7].
KnownSubscriptions		r	r		w	w	
SubscriptionInfo		r	r		w←	w←	The *Producer* SHALL return one ***SubscriptionInfo*** element for each subscription that matches the ***KnownSubscriptions Query***/***SubscriptionFilter***.

4.4.2.1 SubscriptionInfo

Table 4.6: SubscriptionInfo Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ChannelID		r?	r?		w	w	See ▸ [JDF 1.7].
Family		r?	r?		w	w	See ▸ [JDF 1.7].
MessageType		r?	r?		w	w	See ▸ [JDF 1.7].
SenderID		r?	r?		w	w	See ▸ [JDF 1.7].
Subscription		r?	r?		w	w	All existing subscriptions matching the ***SubscriptionFilter*** SHALL be returned, including all existing *Traits* of those subscriptions.

4.5 Notification

When a job is completed and delivered to the customer, the various systems that contributed to the production are able to do housekeeping, archiving, cleanup of the job's assets etc. Because the final completion of the job can be much later than the completion of the execution of a *Process* on a *Device*, all *Devices* SHOULD be informed of the final completion of the job when it happens. The *MIS* SHALL use a **JMF** ***Signal*** message of @*Type* = "Notification" for this purpose. See ▸ [JDF 1.7].

The *Manager* SHALL send these ***Signal*** messages to the *Worker* without the need for the *Worker* to subscribe or for the *Manager* being able to accept query messages and subscriptions. The *MIS* SHALL send the ***Signal*** messages for a job to all *Workers* that the *MIS* has submitted the **JDF** instance to.

Milestone Signals MAY be used to provide high level job status from the *Worker* to the *Manager* but are out of scope of this ICS.

4.5.1 Signal

An *MIS*, acting as the *Manager*, SHALL send the ***Notification Signal*** message described in this section to all *Workers* that the *MIS* has submitted the **JDF** instance to, after the condition as specified by ***Milestone***/@*MilestoneType* has been reached.

Table 4.7: Notification Signal Message

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
ChannelMode		w	w		r	r	See ▸ [JDF 1.7].
FireAndForget		w	w		r	r	
ID		w	w		r	r	See ▸ [JDF 1.7].
refID		w!	w!				See ▸ [JDF 1.7].
Type		w	w		r	r	See ▸ [JDF 1.7].
Notification		w	w		r	r	
Notification		w	w		r	r	See ▸ [JDF 1.7].

4.5.1.1 Notification

Table 4.8: Notification Element

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
Class		w	w		r	r	See ▸ [JDF 1.7].
Event		w←	w←		r	r	
<all other values>		w?	w?		r?	r?	
JobID		w	w		r	r	**Conformance Test:** The *Worker* SHALL apply this notification to the specified job using the value of @*JobID*.
Type		w	w		r	r	See ▸ [JDF 1.7].
Milestone		w←	w←		r	r	
<all other values>		w?	w?		r?	r?	
Milestone		w←	w←		r	r	***Milestone*** SHALL be specified if @*Type* = "Milestone".

4.5.1.2 Milestone

Table 4.9: Milestone Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
MilestoneType		w	w		r	r	See ▸ [JDF 1.7].
JobCompletedSuccessfully		w←	w←		r	r	@*MilestoneType* = "JobCompletedSuccessfully" SHALL be specified as the last milestone for a job. **Conformance Test:** The *Worker* SHALL mark the job as completed.
PostPressCompleted			w←			r?	
PrePressCompleted			w←			r?	
PressCompleted			w←			r?	
ShippingCompleted			w←			r?	
<all other values>		w?	w?		r?	r?	

4.6 Resource

Resource messages are provided for updating scheduling, reporting resource consumption, and synchronizing resource catalogs.

4.6.1 Resource Messages for Updating Scheduling Information

Resource messages are used by the *Manager* to update scheduling information for the *Worker*.

4.6.1.1 Command

Resource Command message for exchanging ***NodeInfo*** resources used for updating scheduling information.

Table 4.10: Resource Command Message for Updating Scheduling Information

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID			w			r	See ▸ [JDF 1.7].
Type			w			r	See ▸ [JDF 1.7].
Resource			w			r	
ResourceCmdParams			w			r	See ▸ [JDF 1.7].

4.6.1.1.1 ResourceCmdParams

ResourceCmdParams used when updating scheduling information.

Table 4.11: ResourceCmdParams Element for Updating Scheduling Information (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
JobID			w			r	See ▸ [JDF 1.7].
JobPartID			w			r	See ▸ [JDF 1.7].

Table 4.11: ResourceCmdParams Element for Updating Scheduling Information (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ResourceName			w			r	See ▸ [JDF 1.7].
NodeInfo			w			r	This ICS only has a *Conformance Requirement* for commands to update ***NodeInfo*** resources.
UpdateMethod			w			r	See ▸ [JDF 1.7].
Incremental			w			r	The resource SHALL NOT be replaced. Only the resource's @*Start* and/or @*End* attributes SHALL be updated. **Conformance Test:** The new values for the @*Start* and @*End* scheduling attributes are shown in the *Worker's* user interface.
Part			w←			r	***Part*** SHALL be specified if the ***NodeInfo*** resource is *Partitioned* and only part of that resource needs to be modified. **Conformance Test:** Only the selected *Partition* is updated. All unselected *Partitions* remain unchanged.
NodeInfo			w			r	See ▸ [JDF 1.7].

4.6.1.2 Response

Response to a ***Resource Command*** request for updating scheduling information.

Table 4.12: Response to a Resource Command for Updating Scheduling Information

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID			r			w	See ▸ [JDF 1.7].
refID			r			w	See ▸ [JDF 1.7].
ReturnCode			r			w	See ▸ [JDF 1.7].
Type			r			w	See ▸ [JDF 1.7].
Resource			r			w	

4.6.2 Resource Messages for Tracking Resource Consumption

Resource messages are used by the *Manager* to request updates from the *Worker* regarding resource consumption.

4.6.2.1 Query

Resource Query message used by the *Manager* to subscribe for resource consumption ***Signals***.

Table 4.13: Resource Query Message for Subscribing to Resource Consumption Signals (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID		w	w		r	r	See ▸ [JDF 1.7].

Table 4.13: Resource Query Message for Subscribing to Resource Consumption Signals (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
Type		w	w		r	r	See ▸ [JDF 1.7].
Resource		w	w		r	r	
ResourceQuParams		w	w		r	r	See ▸ [JDF 1.7].
Subscription		w	w		r	r	See ▸ [JDF 1.7].

4.6.2.1.1 ResourceQuParams

ResourceQuParams used to subscribe for resource consumption ***Signals***.

Conformance Test:
The *Worker* SHALL create a *Persistent Channel* according to the filters specified in this ***ResourceQuParams***.

Table 4.14: ResourceQuParams Element for Subscribing for Resource Consumption Signals

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
Classes		w	w		r	r	See ▸ [JDF 1.7].
Consumable		w←	w←		r	r	
<all other values>		w?	w?		r?	r?	
Exact		w?	w?		r	r	See ▸ [JDF 1.7].
JobID		w!	w!				See ▸ [JDF 1.7].
JobPartID		w!	w!				See ▸ [JDF 1.7].
QueueEntryID		w!	w!				See ▸ [JDF 1.7].
ResourceID		w!	w!				See ▸ [JDF 1.7].
ResourceName		w?	w?		r	r	See ▸ [JDF 1.7].
Scope		w	w		r	r	See ▸ [JDF 1.7].
Job		w	w		r	r	

4.6.2.2 Response

Response to a ***Query*** with a ***Subscription*** requesting ***Signals*** to track resource consumption.

Table 4.15: Response to a Query Message for Subscribing to Resource Consumption Signals (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
Acknowledged					w!	w!	See ▸ [JDF 1.7].
ID		r	r		w	w	See ▸ [JDF 1.7].
refID		r	r		w	w	See ▸ [JDF 1.7].
ReturnCode		r	r		w	w	See ▸ [JDF 1.7].

Table 4.15: Response to a Query Message for Subscribing to Resource Consumption Signals (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Subscribed		r	r		w	w	See ▸ [JDF 1.7].
Type		r	r		w	w	See ▸ [JDF 1.7].
Resource		r	r		w	w	

4.6.2.3 Signal

Resource Signal message containing resource consumption information.

Table 4.16: Signal for Resource for Tracking Resource Consumption

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ChannelMode		r?	r		w	w	The value of @*ChannelMode* SHALL be the value of ***Subscription***/@*ChannelMode* of the subscription that initiated the *Persistent Channel*.
FireAndForget		r?	r		w←	w←	
Reliable		r?	r		w?	w←	**Conformance Test:** The *Worker* SHALL resend the **JMF** if no response element was received. The *Worker* MAY retry when a response with a non-zero value in @*ReturnCode* was received.
ID		r	r		w	w	See ▸ [JDF 1.7].
refID		r	r		w	w	See ▸ [JDF 1.7].
Time		r	r		w	w	When a ***Signal*** is resent as part of a reliable channel, @*Time* SHALL hold the same value as the first occurrence of the failed ***Signal***.
Type		r	r		w	w	See ▸ [JDF 1.7].
Resource		r	r		w	w	
ResourceInfo		r	r		w	w	See ▸ [JDF 1.7].
ResourceQuParams		r	r		w	w	***ResourceQuParams*** SHALL be specified even if it does not specify any *Traits*, i.e., it is empty.

4.6.2.3.1 ResourceInfo

Table 4.17: ResourceInfo Element for Tracking Resource Consumption

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ActualAmount		r	r		w←	w←	@*ActualAmount* SHALL specify the current accumulated amount of the resource that has been consumed or produced. @*ActualAmount* SHALL NOT be specified if ***AmountPool*** is specified. **Conformance Test:** If the *Manager* does costing using signals, then the *Manager* SHALL record the resource consumption in its database.
DeviceID		r	r		w←	w←	@*DeviceID* SHALL be specified if necessary to disambiguate the location of a resource when a *Worker* is returning cumulative resource information from its controlled *Devices*.
ProductID		r	r		w←	w←	The *Worker* SHALL specify either @*ProductID* or ***Resource*** but SHALL NOT specify both. If specified, @*ProductID* SHALL be a copy of the @*ProductID* provided by the *Manager*. **Conformance Test:** The *Manager* SHALL identify the resource using the @*ProductID*.
AmountPool		r	r		w←	w←	***AmountPool*** specifies the current accumulated amount of the resource that has been consumed per ***Part***. ***AmountPool*** SHALL be specified if a ***Part*** is being executed. **Conformance Test:** If the *Manager* does costing using signals then the *Manager* SHALL record the resource consumption in its database.
Comment		r?	r?		w?	w?	See ▸ [JDF 1.7].
MISDetails		r?	r?		w?	w?	See ▸ [JDF 1.7].
Resource		r	r		w←	w←	The *Worker* SHALL specify either ***Resource*** or @*ProductID* but SHALL NOT specify both.

4.6.2.3.2 ResourceQuParams

ResourceQuParams is returned by the *Worker* as part of a resource consumption signal.

Table 4.18: ResourceQuParams Element for Tracking Resource Consumption (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
JobID		r	r		w←	w←	If the ***Resource*** was consumed within the context of a job, then @*JobID* SHALL refer to the job the resource signal was sent for. **Conformance Test:** The *Manager* SHALL record the resource consumption against the correct job.

Table 4.18: ResourceQuParams Element for Tracking Resource Consumption (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
JobPartID		r	r		w←	w←	If the ***Resource*** was consumed within the context of a job, then @*JobPartID* SHALL refer to the job part the resource signal was sent for.
QueueEntryID		r?	r?		w←	w←	If the ***Resource*** was consumed within the context of a job, then @*QueueEntryID* SHALL refer to the job the resource signal was sent for.
Part		r	r		w←	w←	If the ***Resource*** was consumed within the context of a job that contained parts, then ***Part*** SHALL refer to the job parts the ***Resource Signal*** was sent for.

4.6.2.4 Signal Response

A ***Signal Response*** to a ***Resource Signal*** containing resource consumption information SHALL be sent for reliable signals.

Table 4.19: Response to a Signal Message for Tracking Resource Consumption

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Acknowledged			w!				Responses to reliable signals SHALL NOT be acknowledged.
ID			w			r	See ▸ [JDF 1.7].
refID			w			r	See ▸ [JDF 1.7].
ReturnCode			w			r	See ▸ [JDF 1.7].
Type			w			r	See ▸ [JDF 1.7].
Resource			w			r	

4.6.3 Resource Messages for Synchronizing Resource Catalogs from Manager to Worker

Resource messages are used by the *Manager* to synchronize the *Workers*' resource catalogs with its own.

4.6.3.1 Command

Resource Command message used for synchronizing resource catalogs from *Manager* to *Worker*.

Table 4.20: Resource Command Message for Synchronizing Resource Catalogs

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID		w	w		r	r	See ▸ [JDF 1.7].
Type		w	w		r	r	See ▸ [JDF 1.7].
Resource		w	w		r	r	
ResourceCmdParams		w	w		r	r	See ▸ [JDF 1.7].

4.6.3.1.1 ResourceCmdParams

ResourceCmdParams used for synchronizing resource catalogs.

Table 4.21: ResourceCmdParams Element for Synchronizing Resource Catalogs

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
Exact		w	w		r	r	See ▸ [JDF 1.7].
false		w	w		r	r	
JobID		w!	w!				See ▸ [JDF 1.7].
JobPartID		w!	w!				See ▸ [JDF 1.7].
QueueEntryID		w!	w!				See ▸ [JDF 1.7].
ResourceName		w	w		r	r	The *Worker* SHALL synchronize the resource indicated by the value in *@ResourceName*. The *Domain ICS* for the *Worker* specifies the types of resources for which synchronization SHALL be supported. **Conformance Test:** The *Worker* responds according to the filters as specified in this element.
Contact		w←	w←		r←	r←	***Contact*** resources SHALL be supported by *Worker Devices* that have registered users/logins.
Employee		w←	w←		r←	r←	***Employee*** resources SHALL be supported by *Worker Devices* that are operated in attended mode.
Media		w←	w←		r←	r←	***Media*** resources SHALL be supported by *Worker Devices* that consume ***Media***/*@MediaType* = "Paper". Only ***Media*** of *@MediaType* = "Paper" SHALL be provided by the *Manager*.
<all other values>		w?	w?		r?	r?	
UpdateMethod		w	w		r	r	*@UpdateMethod* SHALL be specified to inform the *Worker* how the one or more resources in this ***ResourceCmdParams*** SHALL be applied by the *Worker*.
Complete		w←	w←		r?	r?	
Incremental		w←	w←		r	r	
Remove		w←	w←		r?	r?	
Contact		w←	w←		r←	r←	***Contact*** SHALL be specified by the *Manager* if *@ResourceName* = "Contact" is specified. ***Contact*** SHALL be supported by the *Worker* if *@ResourceName* = "Contact" is supported.
Employee		w←	w←		r←	r←	***Employee*** SHALL be specified by the *Manager* if *@ResourceName* = "Employee" is specified. ***Employee*** SHALL be supported by the *Worker* if *@ResourceName* = "Employee" is supported.
Media (Paper)		w←	w←		r←	r←	***Media*** SHALL be specified by the *Manager* if *@ResourceName* = "Media" is specified. ***Media*** SHALL be supported by the *Worker* if *@ResourceName* = "Media" is supported.
Part		w!	w!				See ▸ [JDF 1.7].

4.6.3.2 Response

The ***Resource Response*** contains the results of the *Workers'* actions to the *Manager's* request.

Table 4.22: Response to a Resource Command for Synchronizing Resource Catalogs

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
ID		r	r		w	w	See ▸ [JDF 1.7].
refID		r	r		w	w	See ▸ [JDF 1.7].
ReturnCode		r	r		w	w	See ▸ [JDF 1.7].
Type		r	r		w	w	See ▸ [JDF 1.7].
Resource		r	r		w	w	
ResourceInfo		r	r		w	w	This ***Response*** SHALL contain one ***ResourceInfo*** item for each resource that is included in the instigating command.

4.6.3.2.1 ResourceInfo

Table 4.23: ResourceInfo Element for Synchronizing Resource Catalogs

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
CommandResult		r	r		w	w	See ▸ [JDF 1.7].
Merged		r	r		w←	w←	
New		r	r		w←	w←	
Rejected		r	r		w←	w←	
Removed		r	r		w←	w←	
Replaced		r	r		w←	w←	
ProductID		r	r		w	w	See ▸ [JDF 1.7].
ResourceName		r	r		w	w	See ▸ [JDF 1.7].

4.6.4 Resource Messages for Requesting a Worker's Resource Catalog

Resource messages are used by the *Manager* for requesting a *Worker's* resource catalog.

4.6.4.1 Query

Query Resource message used for resource synchronization from *Worker* to *Manager*.

Table 4.24: Resource Query Message for Requesting a Worker's Resource Catalog (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
ID		w	w		r	r	See ▸ [JDF 1.7].
Type		w	w		r	r	See ▸ [JDF 1.7].

Table 4.24: Resource Query Message for Requesting a Worker's Resource Catalog (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
Resource		w	w		r	r	
ResourceQuParams		w	w		r	r	

4.6.4.1.1 ResourceQuParams

ResourceQuParams used for resource synchronization from *Worker* to *Manager*.

The *Worker* 'read' requirement in this table only applies to a *Worker* that has a paper catalog with *Worker*-specific IDs.

Table 4.25: ResourceQuParams Element for Requesting a Worker's Resource Catalog

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
JobID		w!	w!				See ▸ [JDF 1.7].
JobPartID		w!	w!				See ▸ [JDF 1.7].
QueueEntryID		w!	w!				See ▸ [JDF 1.7].
ResourceDetails		w	w		r	r	See ▸ [JDF 1.7].
Brief		w←	w←		r	r	
Full		w←	w←		r	r	
ResourceName		w	w		r	r	Other ICSs MAY define additional requirements for this attribute.
Media		w←	w←		r	r	
<all other values>		w?	w?		r?	r?	
Scope		w	w		r	r	See ▸ [JDF 1.7].
Allowed		w←	w←		r	r	
Present		w←	w←		r	r	
<all other values>		w!	w!				
Part		w!	w!				See ▸ [JDF 1.7].

4.6.4.2 Response

This section contains the *Worker* ***Response*** to the ***Query Resource*** used by the *Manager* to pull resource synchronization information from the *Worker*.

For this ***Response*** message, the *Worker's* 'write' requirement applies only to a *Worker* that has a paper catalog with *Worker*-specific IDs.

Table 4.26: Response to a Resource Query Message for Requesting a Worker's Resource Catalog (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
ID		r	r		w	w	See ▸ [JDF 1.7].
refID		r	r		w	w	See ▸ [JDF 1.7].

Table 4.26: Response to a Resource Query Message for Requesting a Worker's Resource Catalog (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ReturnCode		r	r		w	w	See ▸ [JDF 1.7].
Type		r	r		w	w	See ▸ [JDF 1.7].
Resource		r	r		w	w	
ResourceInfo		r	r		w	w	This ***Response*** SHALL contain one ***ResourceInfo*** item for each resource in the *Worker's* paper catalog.

4.6.4.2.1 ResourceInfo

Table 4.27: ResourceInfo Element used for Response to Query Message for Requesting a Worker's Resource Catalog

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Media		r	r		w←	w←	***Media*** SHALL be specified if ***Query***/***ResourceQuParams***/@*ResourceName* = "Media".

4.7 Status

Status messages are provided to allow the *Manager* to subscribe for and receive *Device* status messages from the *Worker*.

4.7.1 Query

Query Status messages are used by the *Manager* to subscribe for updates from the *Worker* regarding job and *Device* status.

Table 4.28: Status Query Message

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID		w	w		r	r	See ▸ [JDF 1.7].
Type		w	w		r	r	See ▸ [JDF 1.7].
Status		w	w		r	r	
StatusQuParams		w	w		r	r	See ▸ [JDF 1.7].
Subscription		w	w		r	r	See ▸ [JDF 1.7].

4.7.1.1 StatusQuParams

Table 4.29: StatusQuParams Element (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
DeviceDetails		w	w		r	r	See ▸ [JDF 1.7].
Brief		w←	w←		r	r	

Table 4.29: StatusQuParams Element (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Details		w←	w←		r	r	
Modules		w←	w←		r	r	
None		w←	w←		r	r	
<all other values>		w?	w?		r?	r?	
EmployeeInfo		w?	w?		r?	r?	*Domain ICSs* can specify stronger requirements. Employee details are essential for *MIS*. It is therefore highly recommended for the *Manager* to request ***Employee*** resources for *Devices* that have one or more *Operators*.
JobDetails		w	w		r	r	See ▸ [JDF 1.7].
Brief		w	w		r	r	
JobID		w!	w!				See ▸ [JDF 1.7].
JobPartID		w!	w!				See ▸ [JDF 1.7].
QueueEntryID		w!	w!				See ▸ [JDF 1.7].
QueueInfo		w!	w!				See ▸ [JDF 1.7].

4.7.2 Response

This section contains the *Worker* ***Response*** to a ***Status Query*** from the *Manager*.

Table 4.30: Status Response Message

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Acknowledged					w!	w!	Response to subscriptions SHALL NOT be acknowledged.
ID		r	r		w	w	See ▸ [JDF 1.7].
refID		r	r		w	w	See ▸ [JDF 1.7].
ReturnCode		r	r		w	w	See ▸ [JDF 1.7].
Subscribed		r	r		w	w	See ▸ [JDF 1.7].
Type		r	r		w	w	See ▸ [JDF 1.7].
Status		r	r		w	w	

4.7.3 Signal

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

Subscription/@*RepeatTime* specifies the time based *Heartbeat*: a **JMF** ***Status Signal*** 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 *Heartbeat* signals see ▸ [JDF 1.7].

Event based ***Status Signals*** are triggered in addition to time based ***Status Signals***. Event based ***Status Signals*** 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 ▸ [JDF 1.7] for details.

Event based ***Status Signals*** SHALL be sent without undue delay to enable the *Manager* to track the job in real time and a new ***PhaseTime*** audit SHALL be provided.

Table 4.31: Status Signal Message

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID		r	r		w	w	See ▸ [JDF 1.7].
ChannelMode		r?	r		w	w	The value of @*ChannelMode* SHALL be the value of ***Subscription***/@*ChannelMode* of the subscription that initiated the *Persistent Channel*.
FireAndForget		r?	r		w←	w←	
Reliable		r?	r		w?	w←	**Conformance Test:** The *Worker* SHALL resend the **JMF** if no response element was received. The *Worker* MAY retry when a response with a non-zero value in @*ReturnCode* was received.
refID		r	r		w	w	See ▸ [JDF 1.7].
Time		r	r		w	w	When a ***Signal*** is resent as part of a reliable channel, @*Time* SHALL hold the same value as the first occurrence of the failed ***Signal***.
Type		r	r		w	w	See ▸ [JDF 1.7].
Status		r	r		w	w	
DeviceInfo		r	r		w	w	See ▸ [JDF 1.7].

4.7.3.1 DeviceInfo

Table 4.32: DeviceInfo Element (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
DeviceID		r	r		w	w	**Conformance Test:** The *Manager* SHALL identify the *Device* using the value of @*DeviceID*.
DeviceOperationMode		r	r		w←	w←	@*DeviceOperationMode* SHALL be specified by the *Worker* for an attended *Device*. The *Worker* MAY supply it for an unattended *Device*. **Conformance Test:** The *Manager* SHALL NOT create *Job* costing from messages with @*DeviceOperationMode* = "NonProductive" or @*DeviceOperationMode* = "Maintenance".
DeviceStatus		r	r		w	w	**Conformance Test:** The *Manager* SHALL update the displayed status of the *Device*.
ProductionCounter		r?	r?		w←	w←	@*ProductionCounter* SHALL be specified if the *Worker's Device* produces countable output (e.g., a press or folding machine).

Table 4.32: DeviceInfo Element (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Speed		r?	r?		w←	w←	@*Speed* SHALL be specified if a *Worker's Device* produces countable output (e.g., a press or folding machine).
StatusDetails		r	r		w←	w←	See ▸ [JDF 1.7].
Good		r	r		w←	w←	@*StatusDetails* = "Good" SHALL be specified if a good production counter is active.
Waste		r	r		w←	w←	@*StatusDetails* = "Waste" SHALL be specified if a waste production counter is active.
<all other values>		r?	r?		w?	w?	
TotalProductionCounter		r?	r?		w←	w←	@*TotalProductionCounter* SHALL be specified if a *Worker's Device* produces countable output (e.g., a press or folding machine). **Note:** This value is a count since the birth of the *Machine*; it is probably the best value for calculating interval quantities.
Activity		r?	r?		w?	w?	See ▸ [JDF 1.7].
Comment		r?	r?		w?	w?	***Comment*** MAY be specified for comments that are specific to the *Device's* context. ***Comment*** SHALL NOT be specified for comments that relate to the job's context.
Employee		r	r		w←	w←	***Employee*** SHALL be specified if a *Device* requires an *Operator* for normal operation and ***Employee***/@*Roles* contains "Operator". ***Employee*** SHALL NOT be specified for unattended *Devices*.
JobPhase		r	r		w←	w←	The *Worker* SHALL specify one ***JobPhase*** element for each job on the *Device* that is 'active' or whose @*Status* has just changed to "Completed", "Aborted" or "Suspended". **Note:** See ▸ [JDF 1.7] for an explanation of 'active'. The *Worker* SHALL NOT supply any ***JobPhase*** elements during a non-productive time (e.g., maintenance or lack of jobs) except to convey information about jobs whose @*Status* has just changed to "Completed", "Aborted" or "Suspended".
ModuleStatus		r?	r?		w?	w?	A *Worker* MAY supply ***ModuleStatus*** elements to show the status of individual modules of its *Device*. Examples of modules are: • Printing units of an offset press. • Individual *Machines* for a *Device* that supports multiple physical *Machines*.

4.7.3.2 JobPhase

Table 4.33: JobPhase Element (Sheet 1 of 3)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Amount		r?	r?		w←	w←	@*Amount* specifies the cumulative amount produced since the **JDF** *Node* started executing. @*Amount* SHALL be specified if the *Worker's Device* produces countable output (e.g., a press or folding machine). If a *Worker* can distinguish between good and waste, it SHALL supply the waste amount in @*Waste* and then exclude the waste amount from @*Amount*.
EndTime		r?	r?		w?	w←	@*EndTime* specifies the end time of this ***JobPhase***. @*EndTime* SHALL be specified in the final ***Status Signal*** for the ***JobPhase***.
JobID		r	r		w	w	See ▸ [JDF 1.7].
JobPartID		r	r		w←	w←	@*JobPartID* SHALL be specified if known. **Conformance Test:** The *Manager* SHALL update the status of this job part only.
PhaseAmount		r?	r?		w?	w←	@*PhaseAmount* SHALL be specified with a value that is the cumulative amount produced during this ***JobPhase***. @*PhaseAmount* SHALL be specified if the *Worker's Device* produces countable output (e.g., a press or folding machine) and can track amounts for individual phases. If a *Worker* can distinguish between good and waste, it SHALL supply the waste amount in @*PhaseWaste* and then exclude the waste amount from @*PhaseAmount*.
PhaseStartTime		r?	r?		w?	w	@*PhaseStartTime* specifies the start time of this ***JobPhase***.
PhaseWaste		r?	r?		w?	w←	@*PhaseWaste* SHALL be specified with a value that is the cumulative amount of waste produced during this ***JobPhase***. @*PhaseWaste* SHALL be specified if the *Worker's Device* produces countable output (e.g., a press or folding machine), can track amounts for individual phases and can distinguish between good and waste. In that case, it SHALL supply the waste amount in @*PhaseWaste* and then exclude the waste amount from @*PhaseAmount*.
StartTime		r?	r?		w?	w	@*StartTime* specifies the date and time the **JDF** *Node* started executing.
Status		r	r		w	w	**Conformance Test:** The *Manager* SHALL update the displayed status of this ***JobPhase***.
Aborted		r	r		w←	w←	
Cleanup		r	r		w←	w←	A *Worker* SHALL specify this value during the cleanup phase for a *Device* that has such a phase for each job.

Table 4.33: JobPhase Element (Sheet 2 of 3)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Completed		r	r		w←	w←	
InProgress		r	r		w←	w←	
Setup		r	r		w←	w←	A *Worker* SHALL specify this value during the setup phase for a *Device* that has such a phase for each job.
Stopped		r	r		w←	w←	
Suspended		r	r		w←	w←	
Waiting					w!	w!	
<all other values>		r	r		w?	w?	
StatusDetails		r	r		w←	w←	See ▸ [JDF 1.7].
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?	
TotalAmount		r?	r?		w?	w?	@*TotalAmount* specifies the amount to be produced.
Waste		r?	r?		w←	w←	@*Waste* specifies the cumulative amount of waste produced since the **JDF** *Node* started executing. @*Waste* SHALL be specified if the *Worker's Device* produces countable output (e.g., a press or folding machine). If a *Worker* can distinguish between good and waste, it SHALL supply the waste amount in @*Waste* and then exclude the waste amount from @*Amount*.
Activity		r?	r?		w?	w?	See ▸ [JDF 1.7].
Comment		r?	r?		w?	w?	***Comment*** MAY be specified for comments that are specific to the job's context. ***Comment*** SHALL NOT be specified for comments that relate to the *Device's* context.
MISDetails		r?	r?		w?	w?	See ▸ [JDF 1.7].
ModuleStatus		r?	r?		w?	w?	A *Worker* MAY supply ***ModuleStatus*** elements to show the status of individual modules used for this ***JobPhase***.

Table 4.33: JobPhase Element (Sheet 3 of 3)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Part		r?	r?		w←	w←	***Part*** specifies the part worked on. If the output resource of the *Process* is *Partitioned*, the *Worker* SHALL supply at least one ***Part***. Each ***Part*** SHALL have all levels of *Partitioning* for the **JDF** *Node*. The receiving *Manager* MAY consolidate the information from multiple *Partitions* into a single *Partition*, e.g., it MAY consolidate the information on a per 'Separation' to a per 'Sheet'. Other *Domain ICSs* MAY specify other *Conformance Requirements* for the ***Part*** element.

4.7.3.3 ModuleStatus

Table 4.34: ModuleStatus Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
DeviceStatus		r	r		w	w	**Conformance Test:** The *Manager* SHALL update the displayed status of this module.
<all values>		r	r		w←	w←	
ModuleID		r	r		w←	w←	At least one of @*ModuleID* or @*ModuleIndex* SHALL be specified.
ModuleIndex		r	r		w←	w←	At least one of @*ModuleID* or @*ModuleIndex* SHALL be specified. **Note:** @*ModuleIndex* uses zero base indexing.

4.7.4 Signal Response

A ***Signal Response*** to a ***Status Signal*** from the *Manager* SHALL be sent for reliable signals.

Table 4.35: Response to a Status Signal Message

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Acknowledged			w!				Responses to reliable signals SHALL NOT be acknowledged.
ID			w			r	See ▸ [JDF 1.7].
refID			w			r	See ▸ [JDF 1.7].
ReturnCode			w			r	See ▸ [JDF 1.7].
Type			w			r	See ▸ [JDF 1.7].
Status			w			r	

4.8 StopPersistentChannel

4.8.1 Command

Table 4.36: StopPersistentChannel Command Message

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ID		w	w		r	r	@*ID* SHALL be unique for all messages initiated by the same sender. The ***Response*** message SHALL provide a copy of this @*ID* in @*refID*.
Type		w	w		r	r	See ▸ [JDF 1.7].
StopPersistentChannel		w	w		r	r	
StopPersChParams		w	w		r	r	See ▸ [JDF 1.7].

4.8.1.1 StopPersChParams

Table 4.37: StopPersChParams Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ChannelID		w?	w?		r	r	The ***JMF***/***Query***/@*ID* in the query message that the *Manager* sent to create a *Persistent Channel*. If @*ChannelID* is specified, then @*DeviceID* SHOULD also be specified. **Conformance Test:** The *Worker* does not create any further signals whose ***JMF***/***Signal***/@*refID* matches @*ChannelID*.
DeviceID		w?	w?		r	r	**Conformance Test:** The *Worker* does not create any further signals whose ***JMF***/@*SenderID* matches @*DeviceID*.
URL		w	w		r	r	@*URL* specifies the receiver of the messages and SHALL match the original subscription URL. **Conformance Test:** The *Worker* does not send any further signals to the specified URL.
http:...		w←	w←		r	r	Both *Manager* and *Worker* SHALL support this protocol.
https:...		w←	w←		r?	r?	Both *Manager* and *Worker* SHOULD support this protocol.
<all other values>		w!	w!				

4.8.2 Response

Table 4.38: StopPersistentChannel Response Message

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
ID		r?	r?		w	w	@*ID* SHALL be unique for all messages initiated by the same sender.
refID		r	r		w	w	See ▸ [JDF 1.7].
ReturnCode		r	r		w	w	See ▸ [JDF 1.7]
Type		r	r		w	w	See ▸ [JDF 1.7].
StopPersistentChannel		r	r		w	w	

5 Resources

5.1 Resource

The abstract consumable ***Resource*** is used as a basis for resource consumption reporting.

5.1.1 Abstract Consumable Resource - Manager to Worker

Table 5.1: Abstract Consumable Resource - Manager to Worker

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
Class		w	w		r	r	See ▸ [JDF 1.7].
Consumable		w	w		r	r	
ID		w	w		r?	r?	See ▸ [JDF 1.7].
ProductID		w	w		r	r	See ▸ [JDF 1.7].
Status		w	w		r	r	See ▸ [JDF 1.7].
Available		w←	w←		r	r	
Unavailable		w←	w←		r	r	
<all other values>		w?	w?		r	r	

5.1.2 Abstract Consumable Resource - Worker to Manager

Table 5.2: Abstract Consumable Resource - Worker to Manager

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
Class		r	r		w	w	See ▸ [JDF 1.7].
Consumable		r	r		w	w	
ID		r?	r?		w	w	See ▸ [JDF 1.7].
ProductID		r	r		w←	w←	*@ProductID* SHALL be specified if known to the *Worker*.
Status		r	r		w	w	See ▸ [JDF 1.7].
Available		r	r		w←	w←	
Unavailable		r	r		w←	w←	
<all other values>		r	r		w?	w?	

5.2 Company

Table 5.3: Company Resource

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
OrganizationName	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
ProductID	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].

5.3 Component

Each *Product Node* SHALL link to at least one output ***Component***. If a root *Product Node* links to an output ***Component***, that ***Component*** is the *Final Product*. If any other *Product Node* links to an output ***Component***, that ***Component*** is a 'partial product'.

▸ Table 5.4 Component Resource shows the *Conformance Requirements* for output ***Component*** resources.

Table 5.4: Component Resource

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ComponentType	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
FinalProduct	w←	w←	w←	r?	r?	r?	@*ComponentType* SHALL be specified with the value of "FinalProduct" for a ***Component*** that represents the single finished product that the customer ordered.
<all other values>	w?	w?	w?	r?	r?	r?	
Dimensions	w←	w←	w←	r?	r?	r?	@*Dimensions* SHALL be specified if @*ComponentType* contains the value "FinalProduct".
ProductType	w←	w←	w←	r?	r?	r?	@*ProductType* SHALL be specified by the *Manager* for a partial product so that the *Worker* can take special action based on the type of product.
BackCover	w←	w←	w←	r?	r?	r?	
Body	w←	w←	w←	r?	r?	r?	For non-cover sections of bound products and self-cover products.
Cover	w←	w←	w←	r?	r?	r?	For covers of bound products.
FlatWork	w←	w←	w←	r?	r?	r?	For non-bound, non-folded products or products that only have packaging folds.
Folded	w←	w←	w←	r?	r?	r?	For non-bound folded products.
FrontCover	w←	w←	w←	r?	r?	r?	
Insert	w←	w←	w←	r?	r?	r?	For parts in a bound product that require independent page numbering.
<all other values>	w?	w?	w?	r?	r?	r?	

5.4 Contact

5.4.1 Contact for Customer

This ***Contact*** is used to provide details of the customer.

Table 5.5: Contact Resource for Customer

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ContactTypes	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
Customer	w	w	w	r?	r?	r?	
<all other values>	w?	w?	w?	r?	r?	r?	
ProductID	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
Company	w←	w←	w←	r?	r?	r?	***Contact*** SHALL specify at least one of ***Company*** or ***Person***.
Person	w←	w←	w←	r?	r?	r?	***Contact*** SHALL specify at least one of ***Person*** or ***Company***.

5.4.2 Contact for Operator

This ***Contact*** is used to provide details of the *Operator* in resource synchronization messages.

Table 5.6: Contact Resource for Operator

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ContactTypes		w	w		r	r	See ▸ [JDF 1.7].
Employee		w	w		r	r	
<all other values>		w?	w?		r?	r?	
ProductID		w	w		r	r	See ▸ [JDF 1.7].
Person		w	w		r?	r?	See ▸ [JDF 1.7].

5.5 CustomerInfo

Table 5.7: CustomerInfo Resource (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
CustomerID	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
CustomerJobName	w←	w←	w←	r?	r?	r?	@*CustomerJobName* SHALL be specified if the customer provides a specific name for the job.
CustomerOrderID	w←	w←	w←	r?	r?	r?	@*CustomerOrderID* SHALL be specified if the customer provides a specific identifier for the job.

Table 5.7: CustomerInfo Resource (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
CustomerProjectID	w?	w?	w?	r?	r?	r?	@*CustomerProjectID* SHOULD be specified if the customer provides one for grouping multiple jobs into a single order.
Contact	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].

5.6 Device

Table 5.8: Device Resource

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
DeviceClass		r?	r?		w?	w?	@*DeviceClass* SHOULD be specified if it is known by the *Worker*.
DeviceID		r	r		w	w	**Conformance Test:** The *Manager*, when costing a job based upon an hourly rate, SHALL use a cost rate selected using the value of @*DeviceID*.

5.7 Employee

The ***Employee*** resource can be used for multiple distinct requirements.

5.7.1 CSR

Customer Service Representative.

Table 5.9: CSR Employee Resource

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
PersonalID	w	w	w	r?	r?	r?	@*PersonalID* SHALL have the same value as @*ProductID*.
ProductID	w	w	w	r?	r?	r?	@*ProductID* SHALL have the same value as @*PersonalID*.
Roles	w	w	w	r?	r?	r?	See ▸ [JDF 1.7].
CSR	w	w	w	r?	r?	r?	
<all other values>	w?	w?	w?	r?	r?	r?	

5.7.2 Operator

Table 5.10: Operator Employee Resource

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
PersonalID		r	r		w	w	@*PersonalID* SHALL have the same value as @*ProductID*.
ProductID		r?	r?		w	w	@*ProductID* SHALL have the same value as @*PersonalID*.
Roles		r	r		w	w	See ▸ [JDF 1.7].
Assistant		r?	r?		w←	w←	
Operator		r	r		w←	w←	
<all other values>		r?	r?		w?	w?	

5.7.3 Resource Synchronization

Table 5.11: Employee Synchronization Resource

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
PersonalID		w	w		r	r	@*PersonalID* SHALL have the same value as @*ProductID*.
ProductID		w	w		r	r	@*ProductID* SHALL have the same value as @*PersonalID*.
Roles		w	w		r?	r?	**Conformance Test:** The *Worker* SHALL retain the identification of the ***Employee*** with @*Roles*="Operator".
Assistant		w←	w←		r	r	
CSR		w←	w←		r	r	
Operator		w←	w←		r	r	
<all other values>		w?	w?		r?	r?	
Person		w	w		r	r	See ▸ [JDF 1.7].

5.8 Media

The media resource is used for resource synchronization.

Conformance Test:
In the following table, for all attributes with a *Worker* "read" requirement, the *Worker* SHALL include the value in its media catalog.

Conformance Test:
In the following table, for all attributes with a *Manager* "read" requirement, the *Manager* SHALL include the value in its database.

Table 5.12: Media Resource

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
Brand		w r	w r		r w	r w	See ▸ [JDF 1.7].
DescriptiveName		w r	w r		r w	r w	See ▸ [JDF 1.7].
Dimension		w r	w r		r w	r w	See ▸ [JDF 1.7].
Grade		w? r	w? r		r w?	r w?	**Note:** @*Grade* has been deprecated in JDF 1.6; @*ISOPaperSubstrate* SHOULD be used instead.
ISOPaperSubstrate		w? r	w? r		r w?	r w?	See ▸ [JDF 1.7].
MediaQuality		w? r	w? r		r w?	r w?	See ▸ [JDF 1.7].
MediaType		w r	w r		r w	r w	See ▸ [JDF 1.7].
Paper		w r	w r		r w	r w	
ProductID		w r?	w r?		r w?	r w?	See ▸ [JDF 1.7].
Thickness		w? r	w? r		r w?	r w?	See ▸ [JDF 1.7].
Weight		w r	w r		r w	r w	See ▸ [JDF 1.7].
GeneralID[@*IDUsage* = "DeviceProductID"]		r?	r?		w←	w←	***GeneralID*** SHALL be specified by a *Worker* that has a paper catalog with *Worker*-specific IDs.
GeneralID		r?	r?		w?	w?	All other uses of ***GeneralID*** are out of scope.

5.8.1 GeneralID

Table 5.13: GeneralID Element

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
IDUsage		r	r		w	w	See ▸ [JDF 1.7].
DeviceProductID		r	r		w	w	
IDValue		r	r		w	w	See ▸ [JDF 1.7].

5.9 MISDetails

Table 5.14: MISDetails Resource

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
CostType		r	r		w?	w?	**Conformance Test:** The *Manager* SHALL store the values of @*CostType* against the actual hours.
<all values>		r	r		w←	w←	
DeviceOperationMode		r	r		w←	w←	@*DeviceOperationMode* SHALL be specified by the *Worker* for an attended *Device*. @*DeviceOperationMode* MAY be specified by the *Worker* for an unattended *Device*. **Note:** As the *Device* is unattended there is no *Operator* available to place the *Device* in a specific operational mode. In such cases the *Worker* NEED NOT specify @*DeviceOperationMode*. If @*DeviceOperationMode* is not specified, the *MIS* can still create costing entries. **Conformance Test:** If @*DeviceOperationMode* is specified, the *Manager* SHALL only create costing entries when @*DeviceOperationMode* = "Productive".
<all values>		r	r		w←	w←	
WorkType		r	r		w?	w?	**Conformance Test:** The *Manager* SHALL store the value of @*WorkType* against the actual hours.
<all values>		r	r		w←	w←	

5.10 NodeInfo

5.10.1 NodeInfo - JDF Node Input Resource

If scheduling is required, it SHALL be specified in a ***JDF NodeInfo*** resource.

Table 5.15: NodeInfo Resource - JDF Node Input Resource

NAME OR VALUE	MANAGER LEVEL 1	2	3	WORKER LEVEL 1	2	3	DESCRIPTION
End	w?	w?	w?	r?	r?	r?	@*End* MAY be specified for scheduling information.
Start	w?	w?	w?	r?	r?	r?	@*Start* MAY be specified for scheduling information.
BusinessInfo	w!	w!	w!				See ▸ [JDF 1.7].
Employee	w←	w←	w←	r?	r?	r?	***Employee*** SHALL be specified in the **JDF** root *Node* and MAY be specified in **JDF** sub *Nodes*. The ***Employee*** is an internal customer service representative.

5.10.2 NodeInfo - ResourceCmdParams Element

Table 5.16: NodeInfo Resource - ResourceCmdParams Element

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
End			w←			r	@*End* SHALL be specified and used in conjunction with @*Start* to determine scheduling information. At least one of @*Start* or @*End* SHALL be specified.
Start			w←			r	@*Start* SHALL be specified and used in conjunction with @*End* to determine scheduling information. At least one of @*Start* or @*End* SHALL be specified.
BusinessInfo			w!				See ▸ [JDF 1.7].

5.11 Person

Table 5.17: Person Subelement

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
DescriptiveName	w	w	w	r←	r←	r←	@*DescriptiveName* SHALL be specified with the full name of the person. @*DescriptiveName* SHALL be read when ***Person*** is specified in a response to a ***Resource Query*** for resource synchronization.
FamilyName	w←	w←	w←	r←	r←	r←	@*FamilyName* SHALL be specified if known. @*FamilyName* SHALL be read when ***Person*** is specified in a response to a ***Resource Query*** for resource synchronization.
FirstName	w←	w←	w←	r←	r←	r←	@*FirstName* SHALL be specified if known. @*FirstName* SHALL be read when ***Person*** is specified in a response to a ***Resource Query*** for resource synchronization.
ProductID	w	w	w	r←	r←	r←	@*ProductID* SHALL be read when ***Person*** is specified in a response to a ***Resource Query*** for resource synchronization.

6 Subelements

6.1 Comment

6.1.1 Comment - JDF Root Node

This ***Comment*** element is specified by the *Manager* in the ***JDF*** root node

Table 6.1: JDF Comment

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
Name	w	w	w	r	r	r	See ▸ [JDF 1.7].
JobDescription	w←	w←	w←	r?	r?	r?	The *Manager* MAY provide a description of the overall job.
<all other values>	w?	w?	w?	r?	r?	r?	
<Content of Element>	w	w	w	r←	r←	r←	When displaying the content, any formatting (e.g., whitespace or newline) SHALL be preserved in the output. **Conformance Test: - Worker:** The *Worker* SHALL display the content of the ***Comment*** if possible.

6.1.2 Comment - Manager to Worker Gray Box/Process Node

Table 6.2: JDF Comment

NAME OR VALUE	MANAGER LEVEL			WORKER LEVEL			DESCRIPTION
	1	2	3	1	2	3	
Name	w	w	w	r	r	r	See ▸ [JDF 1.7].
Description	w←	w←	w←	r?	r?	r?	The *Manager* SHOULD provide a description of the *Gray Box*.
Instruction	w←	w←	w←	r?	r?	r?	The *Manager* MAY provide instructions for the *Gray Box* to the *Operator*.
JobDescription	w!	w!	w!				
OperatorText	w!	w!	w!				
<all other values>	w?	w?	w?	r?	r?	r?	
<Content of Element>	w	w	w	r←	r←	r←	When displaying the content, any formatting (e.g., whitespace or newline) SHALL be preserved in the output. **Conformance Test - Worker:** The *Worker* SHALL display the content of the ***Comment*** if possible.

6.1.3 Comment - Worker to Manager

Table 6.3: JDF Comment

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Author	r?	r?	r?	w?	w?	w?	*@Author* SHOULD be specified by the *Worker* to identify the employee that generated the ***Comment*** if the *Worker* and *Manager* do not have a synchronized list of employee identifiers.
Name	r	r	r	w	w	w	See ▸ [JDF 1.7].
JobDescription				w!	w!	w!	
OperatorText	r	r	r	w?	w?	w?	The *Worker* MAY provide comments from an *Operator*.
<all other values>	r?	r?	r?	w?	w?	w?	
PersonalID	r?	r?	r?	w?	w?	w?	*@PersonalID* SHOULD be specified by the *Worker* to identify the employee that generated the ***Comment*** if the *Worker* and *Manager* have a synchronized list of employee identifiers.
<Content of Element>	r	r	r	w	w	w	When displaying the content, any formatting (e.g., whitespace or newline) SHALL be preserved in the output. **Conformance Test - Manager:** The *Manager* SHALL retain the content of the ***Comment*** and allow for its retrieval and display as required.

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 6.4: Part Element

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
<Defined by Domain ICS Documents>							

6.3 Subscription

The ***Subscription*** element is used by query messages to create *Persistent Channels*.

Table 6.5: Subscription Element (Sheet 1 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
ChannelMode		w	w		r	r	See ▸ [JDF 1.7].
FireAndForget		w←	w←		r	r	A level 3 *Worker* SHALL honor both reliable and non-reliable subscriptions.

Table 6.5: Subscription Element (Sheet 2 of 2)

NAME OR VALUE	MANAGER LEVEL 1	MANAGER LEVEL 2	MANAGER LEVEL 3	WORKER LEVEL 1	WORKER LEVEL 2	WORKER LEVEL 3	DESCRIPTION
Reliable		w?	w←		r?	r	A level 3 *Manager* SHALL subscribe for reliable signals if the *Worker* is a level 3 *Worker*.
MinDelayTime		w?	w?		r	r	**Conformance Test:** Signals related to this ***Subscription*** are not sent any more frequently than this interval. Reliable signals SHALL NOT be retried more frequently than the interval specified by @*MinDelayTime*.
RepeatTime		w?	w?		r	r	@*RepeatTime* SHALL NOT be less than @*MinDelayTime*. **Conformance Test:** Signals are generated at the interval specified (+/- 10%).
RetryPolicy			w			r	See ▸ [JDF 1.7].
DiscardAtNextSignal			w←			r?	The *Worker* MAY only discard messages that were created as a result of the elapse of the @*RepeatTime*. The *Worker* SHALL repeat messages (as for "RetryForever") created as a result of a status transition as described in ▸ Section 7.2.2 When to Send a Status Signal.
RetryForever			w←			r	@*RetryPolicy* = "RetryForever" SHALL be interpreted as no less than 72 hours. The **JMF** retry SHALL survive a reboot of the *Worker*, but results after a power failure of the *Worker* are implementation dependent.
URL		w	w		r	r	**Conformance Test:** Signals are delivered to the specified URL.

7 Conformance Rules

7.1 Job Submission

In the normal case, the *MIS* creates a print job and submits it to the production *Device*. In some cases, a production *Device*, such as a prepress *Device*, creates a print job. In this case, the customer submits a content file for a job that the *MIS* has not yet created. In other cases, the *Device* splits an existing job into different production jobs. In these cases where the *MIS* doesn't initially create a job, the *Device Worker* SHALL ask the *MIS Manager* to create a job and submit it to the *Device Worker*.

7.2 JMF Messages

7.2.1 Goals

Within the scope of this ICS, the description is limited to the use of **JMF** messages for the following main goals:

1. Job tracking
2. Job costing (limited)
3. *Device* monitoring and (utilization) analysis
4. Material consumption

7.2.1.1 Job Tracking

The *MIS* generates the job tracking information from the combination of the attribute values in the ***DeviceInfo*** and ***JobPhase*** elements.

7.2.1.2 Job Costing

The *MIS* MAY generate the job costing information from the combination of the attribute values in the ***DeviceInfo*** and ***JobPhase*** elements. However, with *Conformance Level* 2 of this ICS, there is no guarantee that the *MIS* will be provided with a complete set of messages. It is possible that communication between a *Device* and the *MIS* be unavailable for a period of time, for whatever reason. In such a situation, a *Device* MAY retry sending the messages.

With *Conformance Level* 3 of this ICS, both the *Manager* and the *Worker* SHALL support reliable channels by adding *@ChannelMode* = "Reliable" in the ***Subscription***. In reliable mode the *Worker* SHALL resend the **JMF** if no response element is received. The *Worker* MAY retry when a response with a non-zero value in *@ReturnCode* is received. The order of the messages SHALL be maintained and sent as separate signal elements to maintain the correct Signal/*@Time* value of each signal. Multiple signal elements MAY be combined in a single **JMF**.

After a *Device* has completed a job and returned the **JDF** instance to the *MIS*, the *MIS* MAY interpret the ***AuditPool*** information in the **JDF** instance to create, update and/or modify the costing information that was gathered from previous **JMF** messages. The *MIS* MAY use business rules to limit updates and/or modifications to costing information.

7.2.1.3 Device Monitoring and Analysis

The *MIS* SHALL generate the *Device* monitoring and analysis information from a combination of the attribute values in the ***DeviceInfo*** and ***JobPhase*** elements.

Because non-productive time is not related to any particular production job, non-productive time will not appear in the ***AuditPool*** information of any **JDF** instances returned to the *MIS*. Therefore the *MIS* has to rely solely on the information retrieved from **JMF** messages to create complete *Device* monitoring and analysis information.

7.2.1.4 Resource Consumption

A *Device* that, during the execution of a *Node*, consumes resources whose *@Class* = "Consumable" SHALL notify the *MIS* by sending a **JMF** signal resource message. See ***Resource Signal***.

7.2.2 When to Send a Status Signal

A *Device* SHALL send a **JMF** ***Status Signal*** to the *MIS* each time one of the attributes of the previous status signal has changed. These changes include (but are not limited to) a change in the:

- Status of a job
- Part of the job that is being produced (either identified by *@JobPartID* or potentially by a *Partition* key)

- Employee(s) operating the *Device*

If a *Device* sends status signal messages in response to a subscription, the *Device* SHALL honor the @*RepeatTime* attribute. It is up to the *MIS* to decide how to handle status signal messages that do not indicate a change in status and/or job. The *MIS* MAY merge the data from the intermediate status signal messages or ignore them all together.

The status signal message indicates to the *MIS* the moment in time when a transition takes place, like the indication of the start of a new status. Please note that the ***JobPhase***/@*PhaseAmount* and ***JobPhase***/@*PhaseWaste* attributes indicate the amount produced since the start of the phase. Special attention is required for the transition between a ***JobPhase*** with production amounts to a ***JobPhase*** without productions amounts, such as from "Running" to "Stopped". For these transitions the *Device* SHALL generate two status signal messages. The first one is a copy of the previous signal messages, except for the values of ***JobPhase***/@*PhaseAmount* and ***JobPhase***/@*PhaseWaste*. In the second one, the attributes are updated to show the new status of the *Device*. This will give the *MIS* immediate feedback about the produced amounts in the closed phase.

7.2.2.1 Financial Period Costing/Analysis

The *MIS* can solely rely on the reliable **JMF** status signal messages (in *Conformance Level* 3) to produce complete and accurate costing of a job.

7.3 Job Completion

In a complete **JDF** workflow, the *Manager* that submits a **JDF** instance to a queue will get back the **JDF** instance when the processing of the **JDF** instance on the *Device* has completed. The returned **JDF** instance SHALL contain information generated by the production *Device*. This information consists of:

- An ***AuditPool*** element about the actual processing at the *Device*
- Updated ***ResourceLink*** information (for example, amounts)
- Information required by subsequent *Processes* (for example, preview resources)

The *MIS* can use this information to update the status of the job and to provide updated resource information to the next production *Process* for the job.

7.3.1 AuditPool Returned to the MIS

The *MIS* MAY generate the job costing information from the combination of the attribute values in the ***DeviceInfo*** and ***JobPhase*** elements of **JMF** status signals. However, in *Conformance Level* 2 there is no guarantee that the *Device* will provide the *MIS* with a complete set of messages. For example, it is possible that communication between a *Device* and the *MIS* be unavailable for a period of time, for whatever reason. Therefore, the *Device* SHALL supply a complete ***AuditPool***.

The *MIS* MAY interpret the ***AuditPool*** information in the **JDF** either to create the costing information or to update and/or modify the costing information that the *MIS* gathered from **JMF** messages.

7.3.1.1 When to Close Audits

The *Device* SHALL close an audit (***PhaseTime***) and start a new one each time one of the attributes of the previous audit has changed. These changes include (but are not limited to) a change in the:

- Status of a job
- Part of the job that is being produced (either identified by @*JobPartID* or by a *Partition* key)
- Employee(s) operating the *Device*

Appendix A

A References

Table A.1: Normative References

TERM	DEFINITION
[Base ICS]	*Base ICS* Version: 1.7 Date: February 2024 Produced by: CIP4 Organization Available at: http://www.CIP4.org
[JDF 1.7]	*Job Definition Format Specification* Version 1.7 Date: August 2020 Produced by: CIP4 Organization Available at: http://www.CIP4.org
[Messaging ICS]	*Messaging ICS* Version: 1.7 Date: February 2024 Produced by: CIP4 Organization Available at: http://www.CIP4.org
[MIS to Prepress ICS]	*MIS to Prepress ICS* Version: 1.7 Date: To be released Produced by: CIP4 Organization Available at: http://www.CIP4.org
[XPath]	*XML Path Language (XPath) 2.0 (Second Edition)* *Version W3C Recommendation 14 December 2010* Date: 14 December 2010 Produced by: World Wide Web Consortium (W3C) Available at: https://www.w3.org/TR/xpath20/

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