



The Printer Working Group

Common Log Format (PWG-LOG)

Status: Approved

Abstract: This standard defines a common log format for hardcopy device events that can be used with existing logging protocols such as SYSLOG. While the focus of this format is on security and auditing of devices, it also supports logging of arbitrary events such as those defined by the IPP Event Notifications and Subscriptions (RFC 3995) specification.

This document is a PWG Candidate Standard. For a definition of a "PWG Candidate Standard", see: <ftp://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf>

This document is available electronically at:

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-ids-log10-20130401-5110.3.docx>
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For additional information regarding the Printer Working Group visit:

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About the Imaging Device Security Work Group

The Imaging Device Security (IDS) working group is chartered to enable Hardcopy Device support in the Network Assessment Protocols that measure and assess the health of client computers and other devices that are attached to enterprise class networks.

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Implementers of this specification are encouraged to join the IDS Mailing List in order to participate in any discussions of the specification. Suggested additions, changes, or clarification to this specification, should be sent to the IDS Mailing list for consideration.

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1. Introduction

Logging is a critical component for security monitoring, compliance auditing, maintenance, and accounting in hardcopy devices. This standard defines a common log format for hardcopy device events that can be used with existing logging protocols such as The Syslog Protocol [RFC5424]. The Syslog protocol also supports the use of existing secure transport services such as Transport Layer Security v1.2 [RFC5246] and the Transport Layer Security (TLS) Transport Mapping for Syslog [RFC5425].

While the focus of this format is on security and auditing of devices as defined in IEEE Std 2600™-2008 [IEEE2600] [IEEE2600.1] [IEEE2600.2] [IEEE2600.3] [IEEE2600.4], it also supports logging of arbitrary events such as those defined by the IPP: Event Notifications and Subscriptions [RFC3995] specification.

2. Terminology

This section defines the following terms that are used throughout this document:

2.1 Conformance Terminology

Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD, SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as defined in Key words for use in RFCs to Indicate Requirement Levels [RFC2119].

2.2 Other Terminology

In addition, the following terms are imported or generalized from other source documents:

FQDN: The Fully Qualified Domain Name of a Printer as defined in Domain Names - Implementation and Specification [RFC1035].

Imaging Device: A printer or multifunction device capable of performing print, scan, copy, or facsimile functions, or a projector or monitor capable of displaying images.

Job: A data object, created and managed by a Service, that contains the description, processing, and status information of a Job submitted by a User. The Job can contain zero or more Document objects.

Service: An Imaging Service (or MFD Service) that accepts and processes requests to create, monitor and manage Jobs, or to directly support other Imaging Services in an imaging-specific way (i.e., the Resource Service). The Service accepts and processes requests to monitor and control the status of the Service itself and its associated Resources. A Service may be hosted either locally or remotely to the MFD.

TitleCase: A keyword that uses concatenated words with capital [UNICODE] letters at the beginning of each word. TitleCase keywords can be easily converted to and from keywords using hyphenated words, e.g., "InputTrayMissing" and "input-tray-missing".

2.3 Acronyms and Organizations

HIPAA: Health Insurance Portability and Accountability Act

IANA: Internet Assigned Numbers Authority, <http://www.iana.org/>

IEEE: Institute of Electrical and Electronics Engineers, <http://www.ieee.org/>

IETF: Internet Engineering Task Force, <http://www.ietf.org/>

IP: Internet Protocol

IPP: Internet Printing Protocol

ISO: International Organization for Standardization, <http://www.iso.org/>

MIB: Management Information Base

MFD: Multi-Function Device

PWG: Printer Working Group, <http://www.pwg.org/>

RFC: Request For Comments

URI: Uniform Resource Identifier

UUID: Universally Unique Identifier

3. Requirements

3.1 Rationale for PWG Common Log Format

The Syslog Protocol [RFC5424] [RFC5425] [RFC5426] defines a standard log message format with attached machine-readable key/value parameters and human-readable message content.

The PWG Common Log Format should therefore:

1. Define a common message format to support encoding and storing of Imaging Device log messages;
2. Define Imaging Device-specific parameters necessary to support automated analysis of log data;
3. Define Imaging Device-specific parameters necessary to support common regulatory requirements;
4. Define Imaging Device-specific parameters necessary to support basic accounting of device usage; and
5. Define Imaging Device-specific parameters necessary to support security auditing.

3.2 Use Cases

3.2.1 Log Analysis at a Physician's Office

John manages the Imaging Devices at a physician's office. He monitors and audits the devices for US HIPAA [US-HIPAA] compliance to ensure that only authorized users are printing, copying, or faxing documents, and that outgoing documents are directed at authorized recipients.

3.2.2 Log Analysis for Managed Print Services

Jill provides reprographics services to several companies in her area. She uses secure logging from leased Imaging Devices to her service office to track the usage of those devices, generate monthly billing statements, and schedule supply deliveries and service appointments as needed.

3.2.3 Log Analysis for Printer Maintenance

Bob is in charge of ordering printer supplies and replacement parts for a school's printers. He uses Imaging Device log files to look for low-supply and printer fault conditions and orders new supplies and replacement parts as needed.

3.3 Out of Scope

The following items are considered out of scope for this specification:

1. Definition of interfaces necessary for remote retrieval of log files.
2. Strategies for automated log analysis.
3. Billing algorithms.
4. Supply and service scheduling algorithms.
5. Log retention policies.
6. Data protection policies aside from requirements to support them.

3.4 Design Requirements

The PWG Common Log Format design requirements are:

1. Define Imaging Device-specific parameters in support of the use cases; and
2. Define a Syslog Protocol binding of the common log format.

4. PWG Common Log Format

The Syslog Protocol [RFC5424] supports secure logging of plain text messages with attached key/value pairs and date/time information. The PWG Common Log Format uses the Syslog message format with a PWG parameter block. Imaging Devices **MUST** use this format both for internal logging and for logs distributed off the device.

4.1 General Message Format

The general message format is as follows:

```
<PRI> 1 YYYY-MM-DDTHH:MM:SS.SSSSSSZ HOSTNAME - - - [PWG PARAMETER="VALUE"  
...] MESSAGE
```

PRI is the message priority and is composed of a facility code followed by a severity code. Imaging Devices **MUST** use the following severity codes as defined in the Syslog Protocol specification:

- 3 for error conditions,
- 4 for warning conditions, and
- 6 for informational or report messages.

Imaging Devices **SHOULD** use facility code 6 ("line printer subsystem") which yields PRI values of:

- 63 for error conditions,
- 64 for warning conditions, and
- 66 for informational or report messages.

The date (YYYY-MM-DD) and time (HH:MM:SS.SSSSSSZ) **MUST** be present to ensure that the correct timestamp is recorded.

HOSTNAME is the FQDN or numeric IP address used by the service. The value "-" **MAY** be used; however, Imaging Devices **SHOULD** make reasonable attempts to discover their FQDN if it is not configured by the administrator.

The PARAMETER="VALUE" pairs are specific to the type of event being logged. Because the Syslog protocol only requires a server to support a 480 byte line buffer, Imaging Devices **SHOULD** use the abbreviated parameter names.

The MESSAGE value contains the <service>StateMessage or JobStateMessage strings [PWG5108.1], as appropriate.

4.1.1 Mapping Message Severity to/from IPP Severity Suffixes

The severity code in the PRI value of a message maps directly to the three defined severity suffixes for IPP "printer-state-reasons" keyword values in section 4.4.12 of the

IPP/1.1 Model and Semantics [RFC2911]. Table 1 lists the severity codes and the corresponding IPP severity suffixes.

Table 1 - Mapping the Severity Code to IPP Severity Suffixes

Severity Code	IPP Severity Suffix
3	-error
4	-warning
6	-report

4.2 Service Message Format

Every service message **MUST** provide the general parameters defined in section 5.1 and the service parameters defined in section 5.2. The MESSAGE text corresponds to the <service>StateMessage value.

4.3 Job Message Format

Every job message **MUST** provide the general parameters defined in section 5.1 and the job parameters defined in section 5.3. The MESSAGE text corresponds to the JobStateMessage value.

4.4 Example Messages

Bad authorization service configured:

```
63 1 2010-10-18T12:34:56.789012Z printer.example.com - - - [PWG NL="en-US" E="SecurityInvalidAuthenticationService" IAJ="F" ST="Idle" SR="" SUU="urn:uuid:21c85055-f117-3781-4029-efb0ebcd9954" URI="ipp://printer.example.com/ipp"] ActiveDirectory server 'ad.example.com' does not exist.
```

Authentication failure when processing a print job creation request:

```
63 1 2010-10-18T12:34:56.789012Z printer.example.com - - - [PWG NL="en-US" E="PrintJobCreated" S="client-error-not-authenticated" UH="client.example.com" URI="ipp://printer.example.com/ipp"] Refused print job - not authenticated.
```

Successful print job creation with an authenticated user:

```
66 1 2010-10-18T12:34:56.789012Z printer.example.com - - - [PWG NL="en-US" E="PrintJobCreated" S="successful-ok" ST="Pending" UH="client.example.com" UN="example user" UR="user" URI="ipp://printer.example.com/ipp" UU="urn:uuid:052cc3a5-1269-3296-45eb-e437bf9419b5" JID="123" JUU="urn:uuid:70fe0e41-1e92-3189-6dbe-bb459dc93296"] Created job 123, 42 page PDF document.
```

Progress messages, the first from the service and the second for the job itself:

```
66 1 2010-10-18T12:34:56.789012Z printer.example.com - - - [PWG NL="en-US" E="PrintStateChanged" IAJ="T" ST="Processing" SR="" SUU="urn:uuid:21c85055-f117-3781-4029-efb0ebcd9954" URI="ipp://printer.example.com/ipp"] Started printing job 123.
66 1 2010-10-18T12:34:56.789012Z printer.example.com - - - [PWG NL="en-US" E="PrintJobStateChanged" ST="Processing" JID="123" JUU="urn:uuid:70fe0e41-1e92-3189-6dbe-bb459dc93296" JIC="0" JR="" UN="example user" URI="ipp://printer.example.com/ipp" UU="urn:uuid:052cc3a5-1269-3296-45eb-e437bf9419b5"] Started printing job 123.
```

Printer state changes - out of paper and cover open:

```
64 1 2010-10-18T12:34:56.789012Z printer.example.com - - - [PWG NL="en-US" E="PrintStateChanged" IAJ="T" ST="Processing" SR="media-empty-warning" SUU="urn:uuid:21c85055-f117-3781-4029-efb0ebcd9954" URI="ipp://printer.example.com/ipp"] The printer is out of paper.
63 1 2010-10-18T12:34:56.789012Z printer.example.com - - - [PWG NL="en-US" E="PrintStateChanged" IAJ="F" ST="Stopped" SR="cover-open-error" SUU="urn:uuid:21c85055-f117-3781-4029-efb0ebcd9954" URI="ipp://printer.example.com/ipp"] The printer cover is open.
```

Print job processing resumes after the correction of the printer conditions:

```
66 1 2010-10-18T12:34:56.789012Z printer.example.com - - - [PWG NL="en-US" E="PrintStateChanged" IAJ="T" ST="Processing" SR=" " SUU="urn:uuid:21c85055-f117-3781-4029-efb0ebcd9954" URI="ipp://printer.example.com/ipp"] The printer has resumed printing.
```

Print job has completed printing:

```
66 1 2010-10-18T12:34:56.789012Z printer.example.com - - - [PWG NL="en-US" E="PrintJobStateChanged" ST="Completed" JID="123" JUU="urn:uuid:70fe0e41-1e92-3189-6dbe-bb459dc93296" JIC=42" JR=" " UN="example user" URI="ipp://printer.example.com/ipp" UU="urn:uuid:052cc3a5-1269-3296-45eb-e437bf9419b5"] Finished printing job 123.
```

5. PWG Parameter Definitions

The following sections describe the parameters defined by this specification. For each parameter, a primary name is listed along with an accepted abbreviation, if any, in parenthesis.

5.1 General Event Parameters

5.1.1 DeviceUUID (DUU)

DeviceUUID specifies the globally-unique 45-octet "urn:uuid:" URI associated with the Imaging Device as defined in A Universally Unique Identifier (UUID) URN Namespace [RFC4122].

5.1.2 Event (E)

The Event specifies the type of event being logged. Event names are TitleCase keywords. The following standard event names were originally defined by the IPP: Event Notifications and Subscriptions [RFC3995]. The <service> names were originally defined by the MFD Model and Common Semantics [PWG5108.1]:

- <service>Authentication; user authentication was attempted
- <service>ConfigChanged; the service configuration was (or was not) changed
- <service>Identification; user identification was attempted
- <service>QueueOrderChanged; the order of jobs was (or was not) changed
- <service>Restarted; the service was (or was not) restarted
- <service>Shutdown; the service was (or was not) shut down
- <service>StateChanged; the service state did (or did not) change state
- <service>Stopped; the service was (or was not) stopped
- <service>JobCompleted; a job has (or has not) completed
- <service>JobConfigChanged; a job was (or was not) reconfigured
- <service>JobCreated; a job was (or was not) created
- <service>JobForwarded; job data was (or was not) forwarded
- <service>JobStateChanged; a job did (or did not) change state
- <service>JobStopped; a job did (or did not) stop

Service names include "Copy", "EmailIn", "EmailOut", "FaxIn", "FaxOut", "Print", "Resource", "Scan", "System", and "Transform". Most log events map directly from the corresponding IPP notification events; however, logged events are sent both for success and failure.

Additional event names may also come from the IANA Printer MIB [IANA-MIB] registry for prtAlertCodeTC - names from this registry have their first letter capitalized to convert them to TitleCase form.

5.1.3 LogNaturalLanguage (NL)

The LogNaturalLanguage specifies the language used for all messages.

5.1.4 Status (S)

The Status specifies the status code returned to the Client for the request, if any. The value is either the StatusString as defined in [PWG5108.1] or a TitleCase version of a registered IANA IPP status code string as defined in section 13.1 of [RFC2911], e.g., "ClientErrorNotFound" for "client-error-not-found".

5.1.5 <service>URI (URI)

The URI specifies the service URI.

5.1.6 UserHost (UH)

The UserHost specifies the FQDN or numeric IP address of the user associated with the service or job operation.

5.1.7 UserName (UN)

The UserName specifies the name of the user associated with the service or job operation.

5.1.8 UserRole (UR)

The UserRole specifies the role of the user associated with the service or job operation. The following example roles are defined in the IDS Security Model specification [IDS-MODEL]:

"Administrator", a user who is authorized to manage all aspects of a device or service,

"FieldTechnician", a user that is allowed to install physical devices, accessories, and imaging services, and

"GroupMember", a user that is allowed to access any operation and resources allowed for the assigned group,

"Guest", a user who has limited and temporary access to basic imaging functions such as print, fax or scan.

"LocalUser", a user who is interacting with an Imaging Device or Service from within physical proximity to the device or service),

"NetworkAdministrator", a user who is authorized to manage network configuration and access parameters of the device and services,

"Operator", the user who typically oversees the printer and is allowed to query and control the printer, jobs and documents based on site policy,

"Owner", the user who owns a particular work object such as a print job, an imaging service or device, or a service registration,

"ReadOnlyUser", This is a role that allows a user to only perform query and read operations on the managed elements,
"RemoteUser", a user who is interacting with an Imaging Device or Service from a remote location (i.e. a location not within physical proximity to a device),
"SecurityAdministrator", a user who is authorized to manage security aspects of the device and services, such as defining access by user roles, installing security certificates, etc.,
"ServiceTechnician", a user that is allowed to perform authorized repair and servicing of the physical device,
"User", a user who is authorized to perform normal hard copy and imaging operations,

The actual mapping of user privileges to roles is implementation-specific.

5.1.9 UserURI (UU)

UserURI specifies the URI of the user associated with the service or job operation. The value is typically a UUID encoded as defined in A Universally Unique Identifier (UUID) URN Namespace [RFC4122] or an email address encoded as defined in The "mailto:" URI scheme [RFC6068], although any valid URI may be supplied.

5.2 Service Events and Parameters

5.2.1 <service>IsAcceptingJobs (IAJ)

<service>IsAcceptingJobs specifies a boolean value indicating that the service is (T) or is not (F) accepting new jobs.

5.2.2 <service>State (ST)

<service>State specifies the current state of the device:

- Unknown; the service has just been created
- Down; the service is offline
- Testing; the service is offline and running tests
- Idle; the service is waiting to process a job
- Processing; the service is processing a job
- Stopped; the service has been stopped and is not processing jobs

These values are described in detail in section 4.7 of the MFD Model and Common Semantics [PWG5108.1].

5.2.3 <service>StateReasons (SR)

<service>StateReasons specifies zero or more TitleCase reasons associated with the current state, separated by commas. For the Print service, the IANA registry for the IPP "printer-state-reasons" attribute [IANA-IPP] provides the definitive list of valid

<service>StateReasons strings (converted to TitleCase), with the exception that the "none" value should be mapped to the empty string or by omitting the <service>StateReasons parameter.

5.2.4 <service>UUID (SUU)

<service>UUID specifies the globally-unique 45-octet "urn:uuid:" URI associated with the service as defined in A Universally Unique Identifier (UUID) URN Namespace [RFC4122].

5.3 Job Events and Parameters

5.3.1 JobID (JID)

JobID specifies an integer representing the job for the service as defined in sections 2.4 and 4.3.2 of the Internet Printing Protocol/1.1: Model and Semantics [RFC2911].

5.3.2 JobUUID (JUU)

JobUUID specifies the globally-unique 45-octet "urn:uuid:" URI representing the job for the service as defined in A Universally Unique Identifier (UUID) URN Namespace [RFC4122].

5.3.3 JobImagesCompleted (JIM)

JobImagesCompleted specifies the number of images completed for the job so far.

5.3.4 JobImpressionsCompleted (JIC)

JobImpressionsCompleted specifies the number of impressions completed for the job so far.

5.3.5 JobDestinationURI (JD)

JobDestinationURI specifies one or more destination URIs associated with the Job event being reported, separated by commas.

5.3.6 JobState (JS)

JobState specifies the current job state:

- Pending
- PendingHeld
- Processing
- ProcessingStopped
- Canceled
- Aborted
- Completed

5.3.7 JobStateReasons (JR)

JobStateReasons specifies zero or more TitleCase reasons associated with the current job state, separated by commas. For the Print service, the IANA registry for the IPP "job-state-reasons" [IANA-IPP] attribute provides the definitive list of valid JobStateReasons strings (converted to TitleCase), with the exception that the "none" value should be mapped to the empty string or by omitting the JobStateReasons parameter.

5.3.8 JobAccountingID (JA)

JobAccountingID specifies an identifier, such as a billing number, for accounting purposes.

5.3.9 JobAccountingUserName (JAUN)

JobAccountingUserName specifies the user name for accounting purposes.

5.3.10 JobAccountingUserURI (JAUU)

JobAccountingUserURI specifies the user's URI for accounting purposes. The value is typically a UUID encoded as defined in A Universally Unique Identifier (UUID) URN Namespace [RFC4122] or an email address encoded as defined in The "mailto:" URI scheme [RFC6068], although any valid URI may be supplied.

6. Conformance Requirements

Imaging Devices that conform to this specification MUST:

1. Support logging using the Syslog protocol [RFC5424];
2. Protect log data that is stored on the Imaging Device from disclosure to unauthorized entities or any modification;
3. Protect log data in transit off the Imaging Device from disclosure to unauthorized entities or any modification;
4. Use the PWG Common Log Format for log files that can be accessed remotely;
5. Use the key/value pairs defined in section 5.1, 5.2, and 5.3 of this document;
6. Use UTF-8 and Byte-Order Marks as defined in section 8 of this document; and
7. Conform to the security considerations defined in section 9 of this document.

7. IANA and PWG Considerations

This section provides the registration information to be used by the Printer Working Group for the registration of the PWG Common Log Format event keywords. The values defined in this specification are contained in Table 2. The general rule is to convert the IPP event name [IANA-IPP] to TitleCase, remove any leading "Printer" from the name, and then prepend the service name. Thus, "printer-config-changed" for the Scan service becomes "ScanConfigChanged".

Table 2 - PWG Event Names

PWG Event	IPP Event
<service>Authentication	
<service>ConfigChanged	printer-config-changed
<service>Identification	
<service>QueueOrderChanged	printer-queue-order-changed
<service>Restarted	printer-restarted
<service>Shutdown	printer-shutdown
<service>StateChanged	printer-state-changed
<service>Stopped	printer-stopped
<service>JobCompleted	job-completed
<service>JobConfigChanged	job-config-changed
<service>JobCreated	job-created
<service>JobStateChanged	job-state-changed
<service>JobStopped	job-stopped

8. Internationalization Considerations

For interoperability and basic support for multiple languages, conforming Printer implementations MUST support the UTF-8 [STD63] encoding of Unicode [UNICODE] [ISO10646]. However, unlike the recommendations in [UNICODE], Unicode messages MUST be preceded by a Unicode Byte Order Mark (BOM) as described in Syslog section 6.4 [RFC5424]. For internal or file-based logging, the BOM is OPTIONAL and MUST appear only at the beginning of the file, if included.

Note that the use of a BOM is not in agreement with Unicode recommendations [UNICODE].

9. Security Considerations

Security considerations are defined in section 8 of The Syslog Protocol [RFC5424] and Signed Syslog Messages [RFC5848]. An Imaging Device MUST protect log messages from alteration or unauthorized disclosure both on the device and when distributed outside the device. Imaging Devices SHOULD support Signed Syslog Messages [RFC5848] to protect log messages from alteration, and Transport Layer Security v1.2 [RFC5246] and the Transport Layer Security (TLS) Transport Mapping for Syslog [RFC5425] to protect log messages when distributed outside the device. When transmitting log messages via UDP, Datagram Transport Layer Security Version 1.2 [RFC6347] and Datagram Transport Layer Security (DTLS) Transport Mapping for Syslog [RFC6012] SHOULD be used.

10. References

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Implementers of this specification document are encouraged to join the IDS Mailing List in order to participate in any discussions of clarification issues and review of registration proposals for additional attributes and values.

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