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INTERNATIONAL STANDARD

Information technology – UPnP Device Architecture – Part 9-1: Imaging Device Control Protocol – Printer Device



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INFORMATION TECHNOLOGY – UPNP DEVICE ARCHITECTURE –

Part 9-1: Imaging Device Control Protocol – Printer Device

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The list of all currently available parts of the ISO/IEC 29341 series, under the general title *Universal plug and play (UPnP) architecture*, can be found on the IEC web site.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

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ORIGINAL UPNP DOCUMENTS
(informative)

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UPnP Document Title	**ISO/IEC 29341 Part**
UPnP Device Architecture 1.0	ISO/IEC 29341-1
UPnP Basic:1 Device	ISO/IEC 29341-2
UPnP AV Architecture:1	ISO/IEC 29341-3-1
UPnP MediaRenderer:1 Device	ISO/IEC 29341-3-2
UPnP MediaServer:1 Device	ISO/IEC 29341-3-3
UPnP AVTransport:1 Service	ISO/IEC 29341-3-10
UPnP ConnectionManager:1 Service	ISO/IEC 29341-3-11
UPnP ContentDirectory:1 Service	ISO/IEC 29341-3-12
UPnP RenderingControl:1 Service	ISO/IEC 29341-3-13
UPnP MediaRenderer:2 Device	ISO/IEC 29341-4-2
UPnP MediaServer:2 Device	ISO/IEC 29341-4-3
UPnP AV Datastructure Template:1	ISO/IEC 29341-4-4
UPnP AVTransport:2 Service	ISO/IEC 29341-4-10
UPnP ConnectionManager:2 Service	ISO/IEC 29341-4-11
UPnP ContentDirectory:2 Service	ISO/IEC 29341-4-12
UPnP RenderingControl:2 Service	ISO/IEC 29341-4-13
UPnP ScheduledRecording:1	ISO/IEC 29341-4-14
UPnP DigitalSecurityCamera:1 Device	ISO/IEC 29341-5-1
UPnP DigitalSecurityCameraMotionImage:1 Service	ISO/IEC 29341-5-10
UPnP DigitalSecurityCameraSettings:1 Service	ISO/IEC 29341-5-11
UPnP DigitalSecurityCameraStillImage:1 Service	ISO/IEC 29341-5-12
UPnP HVAC_System:1 Device	ISO/IEC 29341-6-1
UPnP HVAC_ZoneThermostat:1 Device	ISO/IEC 29341-6-2
UPnP ControlValve:1 Service	ISO/IEC 29341-6-10
UPnP HVAC_FanOperatingMode:1 Service	ISO/IEC 29341-6-11
UPnP FanSpeed:1 Service	ISO/IEC 29341-6-12
UPnP HouseStatus:1 Service	ISO/IEC 29341-6-13
UPnP HVAC_SetpointSchedule:1 Service	ISO/IEC 29341-6-14
UPnP TemperatureSensor:1 Service	ISO/IEC 29341-6-15
UPnP TemperatureSetpoint:1 Service	ISO/IEC 29341-6-16
UPnP HVAC_UserOperatingMode:1 Service	ISO/IEC 29341-6-17
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UPnP Dimming:1 Service	ISO/IEC 29341-7-10
UPnP SwitchPower:1 Service	ISO/IEC 29341-7-11
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UPnP LANDevice:1 Device	ISO/IEC 29341-8-2
UPnP WANDevice:1 Device	ISO/IEC 29341-8-3
UPnP WANConnectionDevice:1 Device	ISO/IEC 29341-8-4
UPnP WLANAccessPointDevice:1 Device	ISO/IEC 29341-8-5
UPnP LANHostConfigManagement:1 Service	ISO/IEC 29341-8-10
UPnP Layer3Forwarding:1 Service	ISO/IEC 29341-8-11
UPnP LinkAuthentication:1 Service	ISO/IEC 29341-8-12
UPnP RadiusClient:1 Service	ISO/IEC 29341-8-13
UPnP WANCableLinkConfig:1 Service	ISO/IEC 29341-8-14
UPnP WANCommonInterfaceConfig:1 Service	ISO/IEC 29341-8-15
UPnP WANDSLLinkConfig:1 Service	ISO/IEC 29341-8-16
UPnP WANEthernetLinkConfig:1 Service	ISO/IEC 29341-8-17
UPnP WANIPConnection:1 Service	ISO/IEC 29341-8-18
UPnP WANPOTSLinkConfig:1 Service	ISO/IEC 29341-8-19
UPnP WANPPPConnection:1 Service	ISO/IEC 29341-8-20
UPnP WLANConfiguration:1 Service	ISO/IEC 29341-8-21
UPnP Printer:1 Device	ISO/IEC 29341-9-1
UPnP Scanner:1.0 Device	ISO/IEC 29341-9-2
UPnP ExternalActivity:1 Service	ISO/IEC 29341-9-10
UPnP Feeder:1.0 Service	ISO/IEC 29341-9-11
UPnP PrintBasic:1 Service	ISO/IEC 29341-9-12
UPnP Scan:1 Service	ISO/IEC 29341-9-13
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UPnP QosDevice:1 Service	ISO/IEC 29341-10-10
UPnP QosManager:1 Service	ISO/IEC 29341-10-11
UPnP QosPolicyHolder:1 Service	ISO/IEC 29341-10-12
UPnP QoS Architecture:2	ISO/IEC 29341-11-1
UPnP QOS v2 Schema Files	ISO/IEC 29341-11-2

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UPnP Document Title	ISO/IEC 29341 Part
UPnP QosDevice:2 Service	ISO/IEC 29341-11-10
UPnP QosManager:2 Service	ISO/IEC 29341-11-11
UPnP QosPolicyHolder:2 Service	ISO/IEC 29341-11-12
UPnP RemoteUIClientDevice:1 Device	ISO/IEC 29341-12-1
UPnP RemoteUIServerDevice:1 Device	ISO/IEC 29341-12-2
UPnP RemoteUIClient:1 Service	ISO/IEC 29341-12-10
UPnP RemoteUIServer:1 Service	ISO/IEC 29341-12-11
UPnP DeviceSecurity:1 Service	ISO/IEC 29341-13-10
UPnP SecurityConsole:1 Service	ISO/IEC 29341-13-11

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1. Overview and Scope

This device template is compliant with the UPnP Device Architecture, Version 1.0.

Printer:1 provides the following functionality:

- *Printing*

This device template does not address:

- *Faxing*

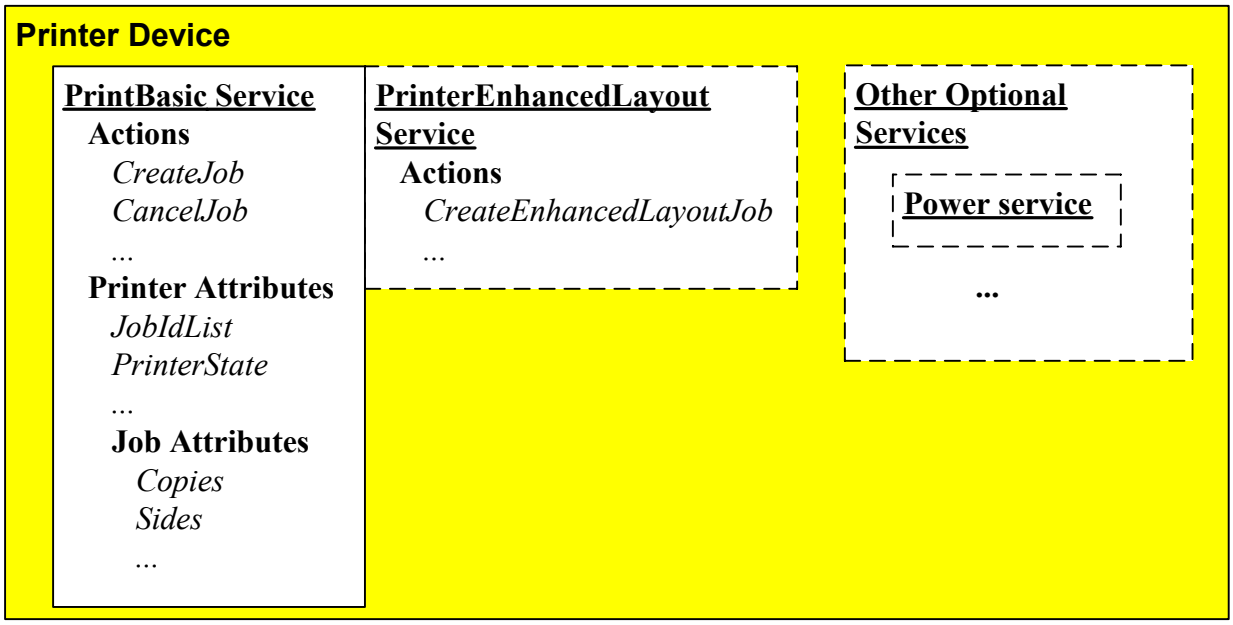

Figure 1 Printer:1 Functional Diagram

The above model illustrates a Printer device with the required service of PrintBasic Service. The PrintBasic Service includes print-related attributes along with all job-related attributes (e.g., JobName, DocumentFormat, Copies, etc). The number of Jobs accepted by the service is vendor dependent. Other jobs that may be queued to print are not accessible to the client. However, it is possible to get a list of all jobs using a JobIDList attribute (a comma-separated list of JobIDs) and cancel a specific job using the JobID. The JobIDList attribute enables a control point to obtain the JobID of the active job. In this model, printer-related events, as well as all job-related events, are sent to the subscribed clients. The client must filter for their specific job events.

The PrintBasic Service is mandatory in a Printer Device. Additional services may be present. One of these optional services is the PrintEnhancedLayout Service. The PrintEnhancedLayout Service extends the PrintBasic service with additional operations and semantics. The PrintEnhancedLayout Service makes use of the Printer and Job attributes from the PrintBasic Service.

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2. Device Definitions

2.1. Device Type

The following device type identifies a device that is compliant with this template:

urn:**schemas-upnp-org:device**:*printer:1*

2.2. Device Model

Products that expose devices of the type **urn:schemas-upnp-org:device:***Printer:1* must implement minimum version numbers of all required embedded devices and services specified in the table below.

Table 1: Device Requirements for *urn:schemas-upnp-org:Printer:1*

DeviceType	Root	Req. or Opt.[1]	ServiceType	Req. or Opt.[1]	Service ID[2]
Printer:1	*Root*	*R*	*PrintBasic:1*	*R*	*ServiceId=1*
			PrintEnhancedLayout:1	*O*	*ServiceId=2*

[1] R = Required, O = Optional, X = Non-standard.
[2] Prefixed by urn:**upnp-org**:**serviceId**: .

2.2.1. Description of Device Requirements

The PrintBasic Service is a required service for a Print Device.

2.2.2. Relationships Between Services

The Printer Device only mandates one service, the PrintBasic Service. When an PrintEnhancedLayout Service is implemented, it has strong ties to the PrintBasic Service. The PrintEnhancedLayout Service makes use of the Printer and Job attributes from the PrintBasic Service. These attributes hold the printer and job information for both services. The PrintEnhancedLayout Service extends the PrintBasic service with additional operations and semantics.

2.3. Theory of Operations

2.3.1. Discovery

When a device is added to the network, the UPnP discovery protocol allows that device to advertise its services to user control points on the network. The UPnP discovery protocol is based on SSDP. The Printer device must announce itself as 1) a root device, 2) a device UUID for its device type, and 3) a device type. The PrintBasic Service must announce itself as a service. A total of 4 packets would be transmitted during the announcement of a Printer Device on the network.

2.3.2. Job Submittal

The following illustrates how job submission to a Printer Device works using the PrintBasic service. The steps are equivalent to a job submittal (CreateJob) for the PrintEnhancedLayout service:

1) The User Control Point sends the Action “CreateJob” to the PrintBasic Service Control URL. If the action is accepted, the CreateJob in-arguments will be used to initialize the PrintBasic Service job attributes in the Action State Table of the PrintBasic Service.

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2) The CreateJob response will include the following information:

   - PrintBasic Service's Job specific data sink URL for sending the Job data using an HTTP POST from the client. The content of the data sink URL is implementation specific.

3) If the User Control Point (UCP) wants job-related events for the submitted job, the UCP sends the GENA Subscribe request to the eventSubURL for the PrintBasic Service.

4) The UCP sends an HTTP POST with the job data to the PrintBasic Service's Job-specific data sink URL.

If the User Control Point registered for job-related events, then events would be sent each time the PrinterState and the JobState changes.

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3. XML Device Description

```
<?xml version="1.0"?>
<root xmlns="urn:schemas-upnp-org:device-1-0">
  <specVersion>
    <major>1</major>
    <minor>0</minor>
  </specVersion>
  <URLBase>base URL for all relative URLs</URLBase>
  <device>
    <deviceType>urn:schemas-upnp-org:device:Printer:1</deviceType>
    <friendlyName>short user-friendly title</friendlyName>
    <manufacturer>manufacturer name</manufacturer>
    <manufacturerURL>URL to manufacturer site</manufacturerURL>
    <modelDescription>long user-friendly title</modelDescription>
    <modelName>model name</modelName>
    <modelNumber>model number</modelNumber>
    <modelURL>URL to model site</modelURL>
    <serialNumber>manufacturer's serial number</serialNumber>
    <UDN>uuid:UUID</UDN>
    <UPC>Universal Product Code</UPC>
    <iconList>
      <icon>
        <mimetype>image/format</mimetype>
        <width>horizontal pixels</width>
        <height>vertical pixels</height>
        <depth>color depth</depth>
        <url>URL to icon</url>
      </icon>
      XML to declare other icons, if any, go here
    </iconList>
    <serviceList>
      <service>
        <serviceType>urn:schemas-upnp-
org:service:PrintBasic:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:1</serviceId>
        <SCPDURL>URL to service description</SCPDURL>
        <controlURL>URL for control</controlURL>
        <eventSubURL>URL for eventing</eventSubURL>
      </service>
The PrintEnhancedLayout is an optional service
      <service>
        <serviceType>urn:schemas-upnp-
org:service:PrintEnhancedLayout:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:2</serviceId>
        <SCPDURL>URL to service description</SCPDURL>
        <controlURL>URL for control</controlURL>
        <eventSubURL>URL for eventing</eventSubURL>
      </service>
 Declarations for other services defined by a UPnP Forum working
      committee (if any) go here
      Declarations for other services added by UPnP vendor (if any) go here
    </serviceList>
    <deviceList>
      Description of embedded devices added by UPnP vendor (if any) go here
    </deviceList>
    <presentationURL>URL for presentation</presentationURL>
  </device>
</root>
```

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