



EPSON

Common Mobile Print Client

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Common Mobile Print Client

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Introduction

While printing is still printing – nothing new there ... however, there is a paradigm shift moving forward ...

- “Driverless Printing” (from a User’s Point-Of-View)
- “Cloud Printing” (& Mobile Printing & Desktop Printing)
- “Print Any-Where from Any-Device to Any-Printer”
- “No Inherit Operating System Print System”
- “A Print Job” (Job Ticket + Print Content)
- “Services not Devices”

OS

Past: User ⇔ Dialog ⇔ Driver ⇔ Printer

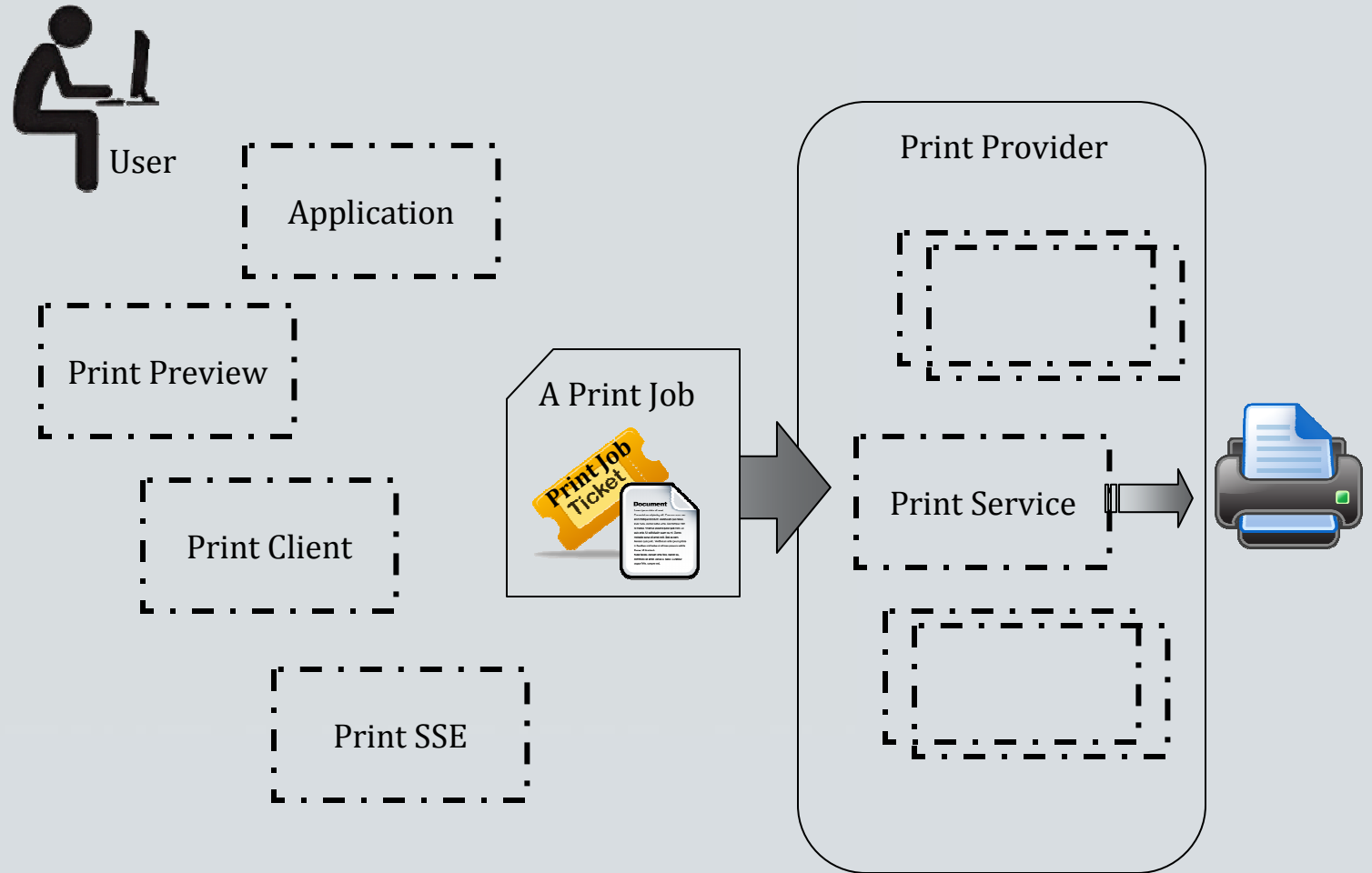
-- Where the Driver does the “Print Processing” --

Today: User ⇔ Print Client ⇔ Print Service ⇔ Printer

-- Does the Print Service or does the Printer do the “Print Processing”? Or can it be both? --

Are these Real Differences or Just Semantic Differences?

Examine Printing Components



Start in the middle with the Print Job Ticket



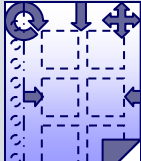
Who does what?

- Who generates the Print Job Ticket?
 - The Application – NO, does not care !
 - The application does not need (want!) to support or even need (want!) to understand print or printing or printers. (Will see later that it does have to help in the area of preview.)
 - A Print Service – NO, only processes Print Jobs
 - A Print Service does not have to concern itself with how the Print Job (ticket and content) were created; only how to execute a Print Job.
 - This leaves the Print Client (with or without GUI) !!!!!
 - The Print Client acts as the bridge between the application and a Print Service. It is concerned capturing the User Print Intent and creating a Print Job; not what is printed or the actual printing or the actual printer.





The Print Client (1)

- The Print Client is the bridge between an application and a Print Service; therefore,
 - From the Application
 -  the Print Client will need to know parametric attribute values of the Print Content but not the actual Print Content.
 - Since only the Application knows the actual content and format, it is the Applications responsibility to generate a displayable format of the content when necessary; thus, supporting the preview of the Print Content. Why?
 - This isolates the Print Client from ever knowing or possessing the Print Content (a security issue), So what choices are there for preview...
 - » 1. The application directly supports preview of the content based on job ticket attributes
 - Not really a good choice – now the application has to understand Job Ticket details
 -  » 2. Use of a separate Print Preview entity that interfaces with the Application and receives preview related job attributes from the Print Client. The Print Preview can be ...
 - “integrated with” the application,
 - located on the User’s (Client’s) device
 - a secure Cloud Service.
 - An alternative is to use a pictorial representation of the Job Ticket options
 - »  The simplest and easiest for all Applications if acceptable to the user
 - » Can be used a default functionality
 - » Can be part of the Print Client since there is no actual Print Content
 - » Can be used to augment the Print Client Preview

The Print Client (2)

- *The Print Client is the bridge between an application and a Print Service; therefore,*
 - From the Print Service
 - The Print Client will need to know about a User selected Print Service and capability data. The Print Client obtains this information from the Print Provider (not discussed here). The Print Client does not know or manage Print Services.
 - From the Print Provider
 - The Print Provider manages Print Services
 - » The Print Provider may manage “Print Service-to-User” access.
 - The Print Provider interfaces with a User for select an specific Print Service
 - » May require User login to obtain domain or User specific access to a Print Service

A circular logo with a yellow-to-orange gradient center, surrounded by a white ring and a grey outer ring. The text 'CMPD' is written in bold black letters across the center.

CMPD

Print Capability Data

“Print Capability Data” is defined to be

- The Physical Printer’s Capabilities

Plus

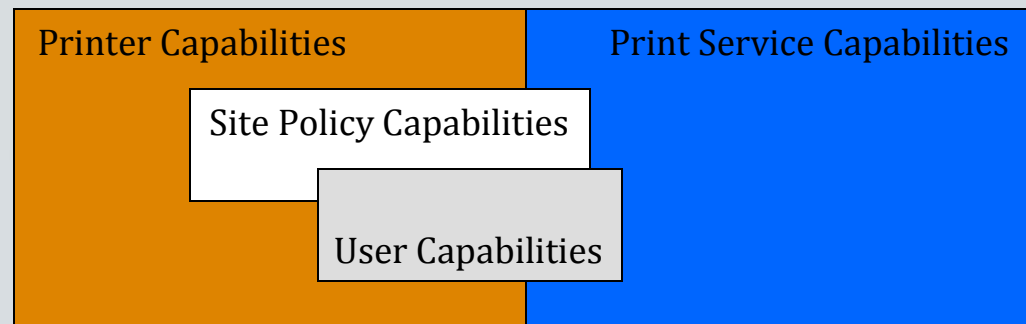
- The Print Service’s Capabilities

Filtered by

- The Site-Policy Capabilities (Restrictions)

Filtered by

- The User-Capability (Restrictions)





Where are we now?

- The Print Provider provides a User selected Print Service
 - Print Capability provided to Print Client
- The Print Client creates a Print Job
 - Print Job = Print Job Ticket + Print Content Reference

Missing Piece

- The Print Preview



The Print Preview

- So far, the Print Client has no access to the User's Print Content
 - and never will !!!
 - In fact, the Print Client does not have to be the same security domain as the Application or any other print entity!!!
 - But the Print Preview, since would have a copy or representation of the Print Content does have to
 - be in the same security domain or
 - utilize security connectivity.
- We will discuss the case of being in the same security domain.
 - Remember the Application ...
 - ... does not care about printing or Print Preview,
 - ... it does, however, understands the content format

This implies the creation of a separate entity to provide Print Preview.



Print Preview File

- In order to isolate the Application from printing, including the Print Preview,
 - the Application must provide a representation of the Print Content.
 - The simplest solution is a rasterized Print Preview File
 - **The Print Preview File must be simple and small.**
 - Note there is some parametric information about the content that is also needed.
- After experimentation it has been determined that, even for desktop display, a small rasterized format is sufficient for a Print Preview. Specifically,
 - While maintaining the aspect ratio of the original content; the content is rasterized such that the shortest dimension (width or height) is equal to 200 pixels.
 - This allows for a minimum of 3 to 1 magnification.
 - This allows for a small size representation on a page-to-page basis



Print Preview Image Details

- An individual rasterized content page, called a Preview Image is...
 - ... rendered with margins areas encoded as “white-space”.
 - ... scaled such the shortest dimension of the content page size is equal to 200 pixel while maintaining the content page aspect ratio.
 - ... encoded using the sRGB color space.
 - ... encoded using 8-bit value for each color space component.
 - ... encoded with an image line size of $n*4*8$ -bits.
 - ... encoded with a “0” bit values when actual image is less than $n*4*8$ -bits.
 - ... encoded with no compression.
 - ... pre-padded with a reserved header consisting of $128*8$ -bits.
- All pages of the content will have the same size Preview Image dimensions

Note: This is not PWG Raster

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Print Preview File Details

- A single Print Preview File (PPF) contains a ...
 - ... set of file parametric data
 - File Type Indicator ('P', 'P', 'F')
 - PPF Format Major Version Number (0 ⇔ 255)
 - PPF Format Minor Version Number (0 ⇔ 255)
 - Print Content Parametric Data (2108*8-bits)
 - Number of Preview Images (pages) (1 ⇔ 2³¹-1)
 - Preview Image Pixel Width (1 ⇔ 2³¹-1)
 - Preview Image Pixel Height (1 ⇔ 2³¹-1)
 - Media Width (mm)
 - Media Height (mm)
 - Media Color (sRGB component values)
 - Orientation (0, 90, 180, 270)

and

- ... N number of sequenced Preview Images
 - For the entire content.

Print Content Parametric Data Details

- A single Print Preview File (PPF) contains a ...
 - ... set of content parametric data
 - File Type Indicator (‘P’, ‘C’, ‘F’)
 - PPF Format Major Version Number (0 ⇔ 255)
 - PPF Format Minor Version Number (0 ⇔ 255)
 - Print Content URI (1024*8-bits)
 - Number of Preview Images (pages) (1 ⇔ 2³¹-1)
 - Preview Image Pixel Width (1 ⇔ 2³¹-1)
 - Preview Image Pixel Height (1 ⇔ 2³¹-1)
 - Media Width (mm)
 - Media Height (mm)
 - Media Color (sRGB component values)
 - Content Orientation (00=Landscape, FF=Portrait)
 - Duplex (00=None, FF=Front/Back)
 - Location (1052*8-bits)
 - Time (12*8-bits)





Print Time Details

```
typedef struct {  
    gpBIT16          year;  
    gpBIT16          month;  
    gpBIT16          day;  
    gpBIT16          hour;  
    gpBIT16          minutes;  
    gpBIT16          seconds;  
} gpTime, *epT;
```

Print Location Details

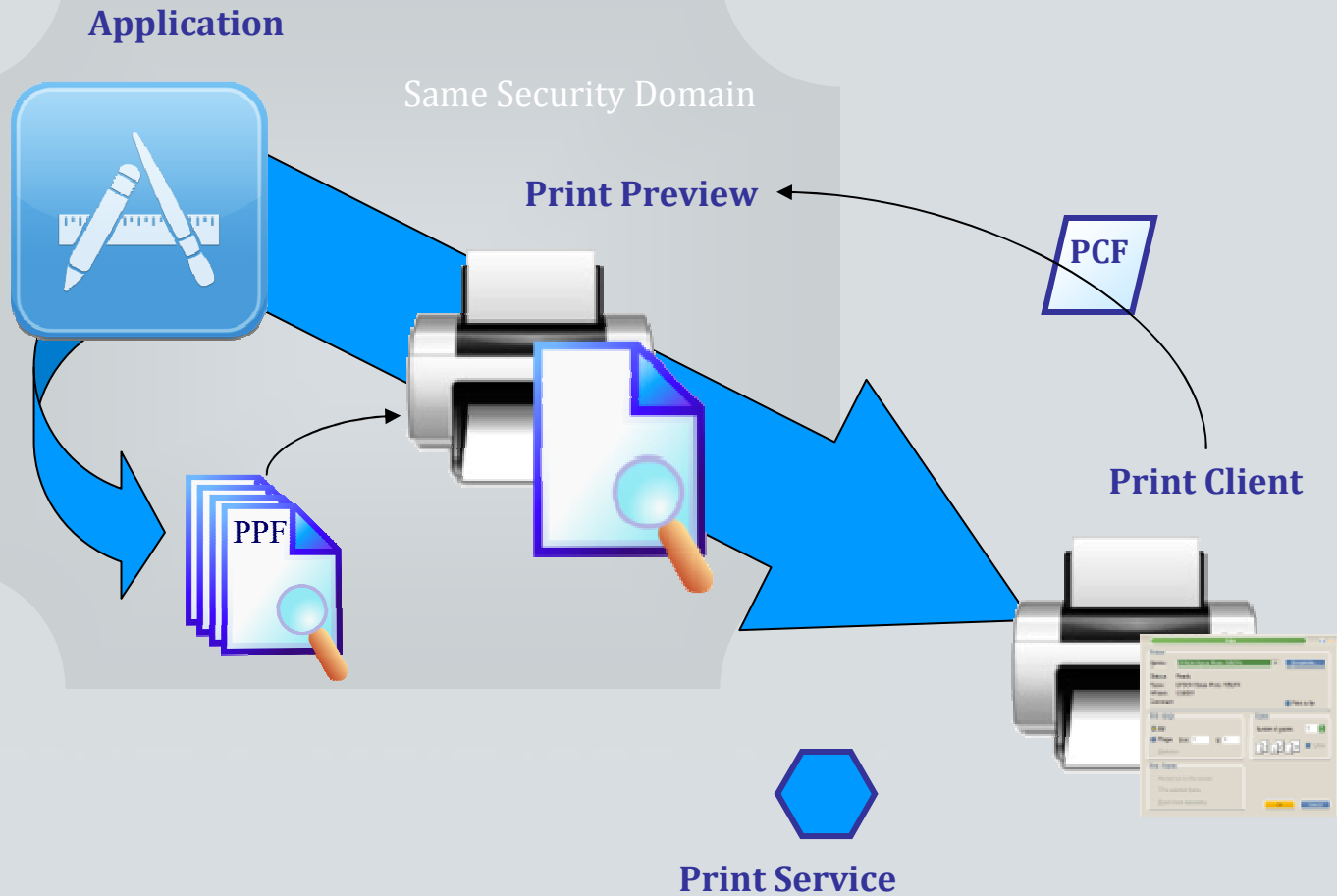
```
typedef struct {  
    gpINT32          latitude;  
    gpINT32          longitude;  
    gpINT32          altitude;  
    gpCHAR           namedLocation[1024];  
    gpBIT8           localNetworkDomain[4];  
} gpLocation, *epL;
```



Example Print Preview File Sizes

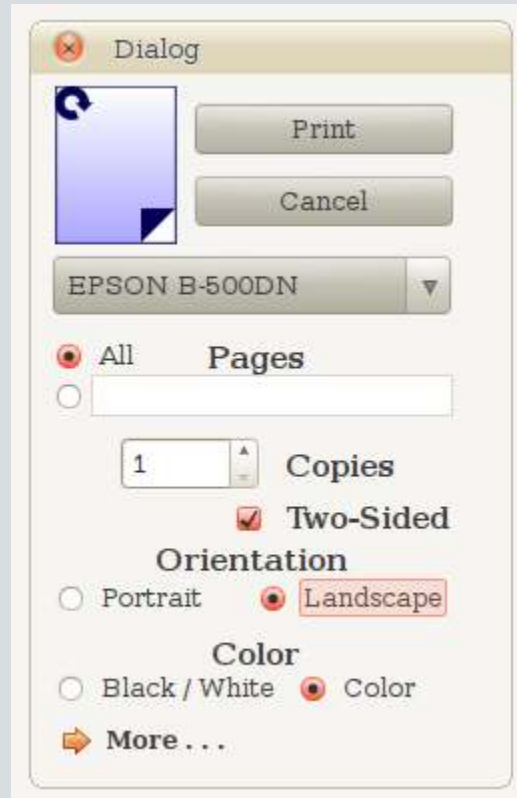
- A4
 - Header = 2.14k * 8-bits
 - Single Preview Image = $[128 + 3*200*200*(\sqrt{2})]*8\text{bits} \approx 166\text{k} * 8\text{-bits}$
 - 100 Page Document $\approx 16\text{M} * 8\text{-bits}$
- Letter
 - Header = 2.14k * 8-bits
 - Single Preview Image = $[128 + 3*200*200*(1.29)]*8\text{bits} \approx 152\text{k} * 8\text{-bits}$
 - 100 Page Document $\approx 14.8\text{M} * 8\text{-bits}$
- 4x6 Photo
 - Header = 2.14k * 8-bits
 - Single Preview Image = $[128 + 3*200*200*(1.6)]*8\text{bits} \approx 188\text{k} * 8\text{-bits}$
 - 1 Page Document $\approx 190\text{k} * 8\text{-bits}$

Application to Print Client





Sample Mobile Print Client



- NetBeans 7.1.1
 - Linux / Windows
 - Qt Application
 - 99.99% C-Code
 - 1 Qt C++ Code Header File
 - Abstracted to C-Code #defines
 - Not using Qt "auto layout"
- [Most Mobile Device use QT versus GTK]

Print Client



← A Test Control to Change Display Size

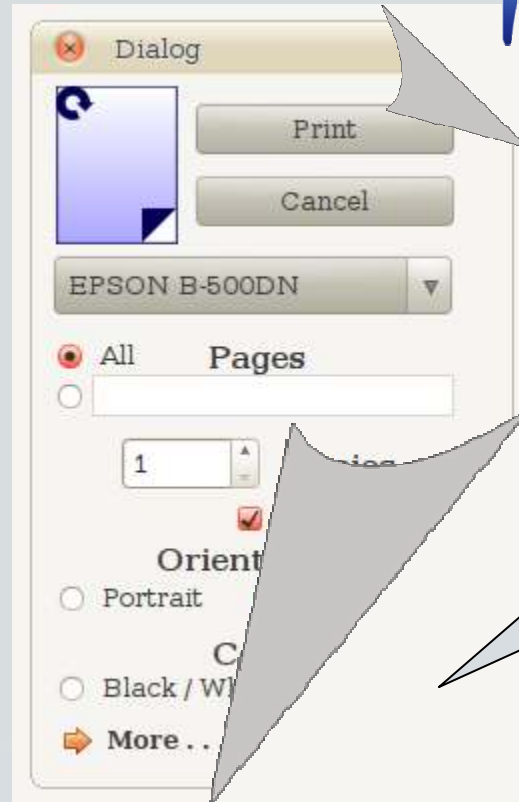


Under the Covers



Print Capabilities:

- Printer Capabilities Plus
- Print Service Capabilities Plus
- User Capabilities Plus
- Site Policy Capabilities



Accounting Services

Transform Services

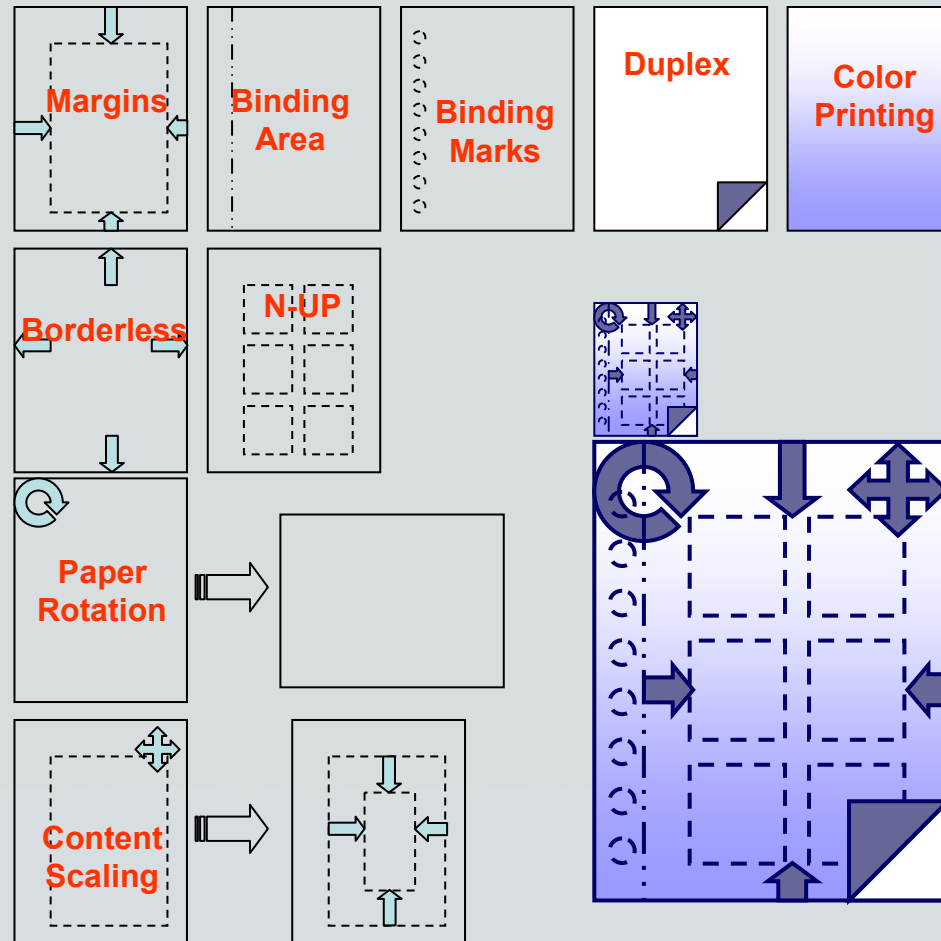
Vendor Extension

Printer Work Group's

Print Job Ticket

Media Standardized Names

Print Client Iconic Preview

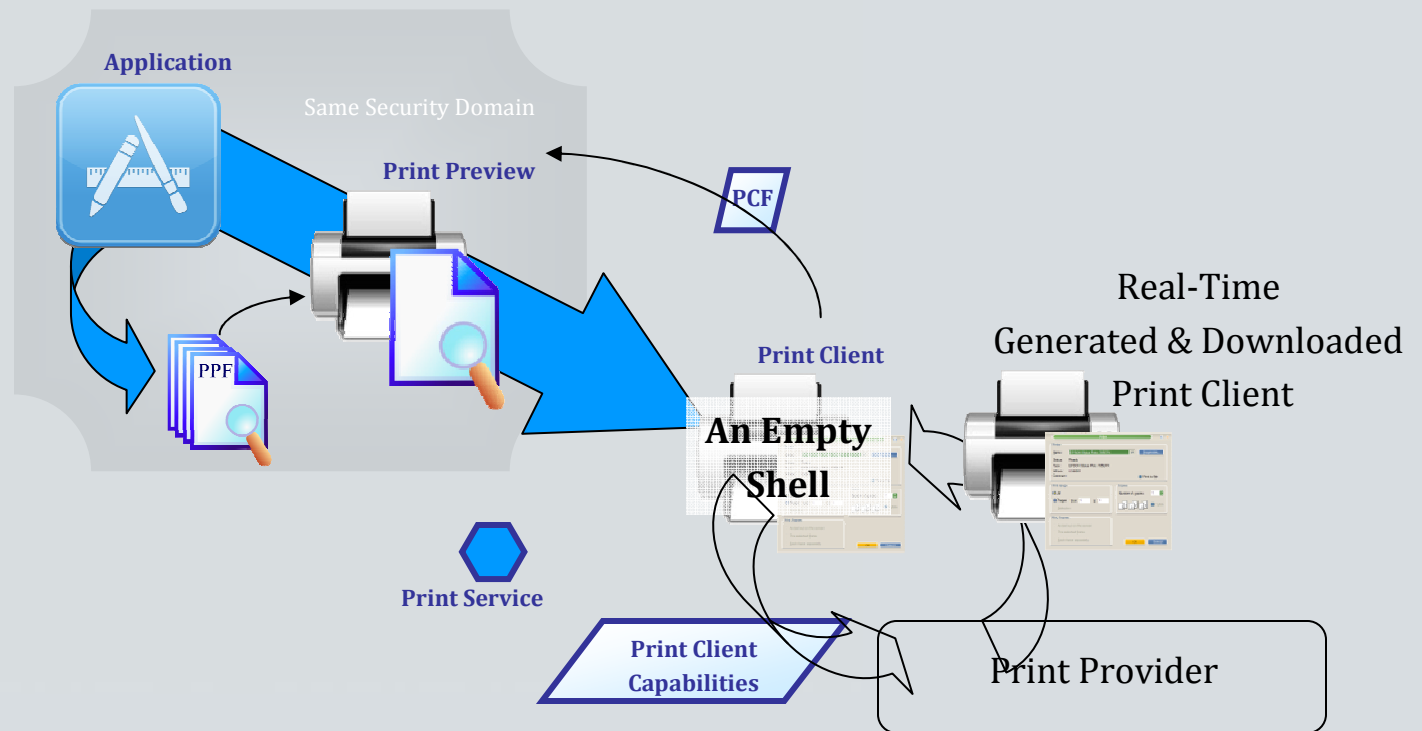


Supported Else Where:
1. Number of Copies
2. Media Size/Type

Real-Time Downloadable Print Client

Details in the works

- Print Client Capabilities





Print Client Capabilities

```
typedef struct {  
    gpBIT32      pixelWidth;      /* Width of display in pixels */  
    gpBIT32      pixelHeight;     /* Height of display in pixels */  
    gpBOOL       rotational;      /* Display support rotation */  
    DISPLAY_COLOR colorType;      /* Support display color type */  
    gpBIT32      numColor;        /* Number colors supported */  
    gpRGB_8_COLOR colors[256];    /* N (max=256) RGB colors */  
    gpBOOL       scrollable;       /* Display is scrollable (or fixed) */  
    DISPLAY_SELECTION selectType; /* User input selection mode */  
    DISPLAY_MODE mode;           /* Text Hierarchy or Windowing */  
    CLIENT_ENCODING encoding;    /* Code type for client */  
    /* More details for windowing or text mode (font size) may be needed. */  
} gpPrintClientCapability;
```

Preliminary
Work in Progress



Print Client Capability – Details 1

```
enum {  
    DC_NONE,                /* There is no display */  
    DC_BLACK_WHITE,        /* Display is black/white */  
    DC_N_COLOR,            /* Display has N number of colors */  
    DC_INDEX_COLOR,        /* Display using index colors */  
    DC_COLOR                /* Display supports RB 8-bit color */  
} DISPLAY_COLOR;
```

```
typedef struct {  
    gpBIT8r;  
    gpBIT8g;  
    gpBIT8b;  
} gpRGB_8_COLOR;
```

```
enum {  
    DS_NONE,                /* There is no display */  
    DS_NAV_KEYS,            /* Use of navigation key (arrows) */  
    DS_STYLUS,              /* Use of Pen Stylus */  
    DS_ONE_FINGER_TOUCH,    /* Use of one finger touch */  
    DS_TWO_FINGER_TOUCH     /* Use of two finger touch */  
} DISPLAY_SELECTION;
```

**Preliminary
Work in Progress**

Print Client Capability – Details 2

```
enum {  
    DM_NONE,                /* There is no display      */  
    DM_TEXT_HIERARCHY,     /* Text hierarchy menus    */  
    DM_WINDOWING           /* Support for button, menus, etc */  
} DISPLAY_MODE;
```

```
enum {  
    PCE_NONE,              /* There is not display    */  
    PCE_HTML_5,           /* Uses HTML 5 encoding    */  
    PCD_JAVA_SCRIPT       /* Uses Java Script        */  
} CLIENT_ENCODING
```

**Preliminary
Work in Progress**



Communication Protocols

Many / (All!!!)

Print Client ↔ Print Preview

File

Signal

Socket

Message Queue

Anonymous Pipes

Named Pipes

Semaphore

Message Passing

Memory-Mapped File

Others

.....

.....

.....

.....

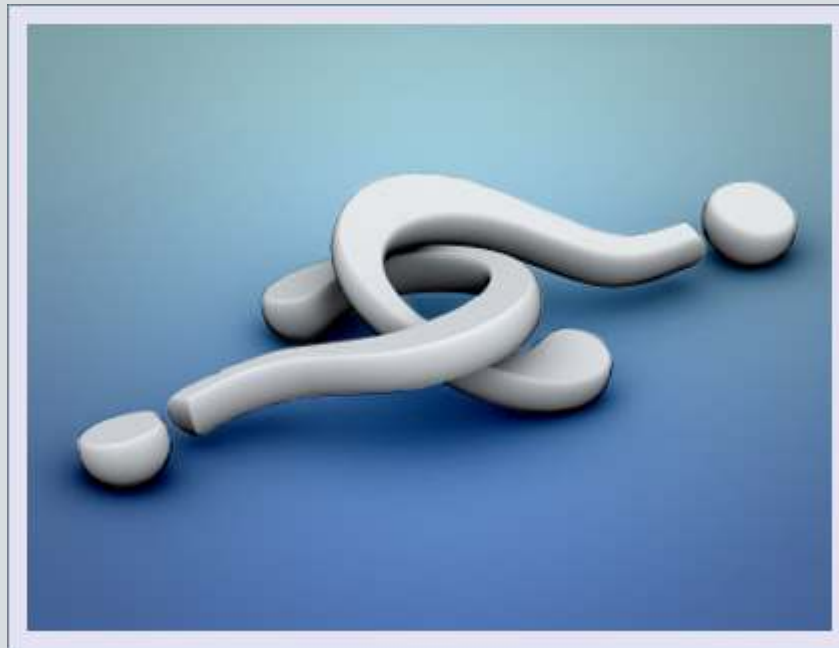
.....





EOP

End-Of-Presentation





Standards Used (1/4)

[Print Job Ticket 1.0]

"PWG Print Job Ticket and Associated Capabilities",

Peter Zehler,

January 17, 2012

<ftp://ftp.pwg.org/pub/pwg/mfd/wd/wd-sm20-printjobticket10-20120117.pdf>

[RFC2911]

"Internet Printing Protocol/1.1 Model and Semantics", RFC2911,

T. Hastings, R. Herriot, R. deBry, S. Isaacson, P. Powell,

September 2000

<ftp://ftp.rfc-editor.org/in-notes/rfc2911.txt>

[RFC3381]

"Internet Printing Protocol (IPP): Job Progress Attributes", RFC3381,

T. Hastings, H. Lewis, R. Bergman,

September 2002,

<ftp://ftp.rfc-editor.org/in-notes/rfc3381.txt>

[PWG5100.1]

"Internet Printing Protocol (IPP): finishings attribute values extension", PWG5100.1-2001,

T. Hastings, D. Fulman,

February 2001,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippfinishings10-20010205-5100.1.pdf>

[PWG5100.2]

Internet Printing Protocol (IPP): "output-bin" attribute extension,

Tom Hastings, Ron Bergman

February 7, 2001,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippoutputbin10-20010207-5100.2.pdf>



Standards Used (2/4)

[PWG5100.3]

"Internet Printing Protocol (IPP): Production Printing Attributes Set1", PWG5100.3-2001,
T. Hastings, K. Ocke,
February 2001,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippprodprint10-20010212-5100.3.pdf>

[PWG5100.5]

"Internet Printing Protocol (IPP): Document Object", PWG5100.5-2003,
T. Hastings, D. Carney, P. Zehler,
October 2003,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippdocobject10-20031031-5100.5.pdf>

[PWG5100.6]

"Internet Printing Protocol (IPP): Page Overrides", PWG5100.6-2003,
P. Zehler, K. Ocke, R. Herriot,
October 2003,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-ipppageoverride10-20031031-5100.6.pdf>

[PWG5100.7]

"Internet Printing Protocol (IPP): Job Extensions", PWG5100.7-2003,
T. Hastings, P. Zehler,
October 2003,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippjobext10-20031031-5100.7.pdf>

[PWG 5100.11]

"Internet Printing Protocol(IPP): Job and Printer Extensions - Set 2 (JPS2)"
Tom Hastings, Don Fullman,
October 30, 2010,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext10-20101030-5100.11.pdf>



Standards Used (3/4)

[PWG5101.1]

"Media Standardized Names", PWG5101.1-2001,
Ron Bergman, Tom Hastings
February 2002,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-pwgmsn10-20020226-5101.1.pdf>

[PWG5101.5]

"PrintService Working Group (PWG) Semantic Model", PWG5101.5-2004,
P. Zehler, S. Albright, T. Hastings,
January 2004,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-sm10-20040120-5105.1.pdf>

[PWG5108.1]

"MFD Model and Common Semantics Version 1.0", PWG5108.1-2011,
W. Wagner, P. Zehler,
April 2011,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-sm20-mfdmodel10-20110415-5108.1.pdf>

[PWG5108.2]

"Network Scan Service Semantic Model and Service Interface", PWG5108.02-2009,
Nancy Chen, Peter Zehler,
April 2009,

<ftp://ftp.pwg.org/pub/pwg/candidates/cs-sm20-scan10-20090410-5108.02.pdf>

[JPS3]

"IPP: Job and PrintService Extensions – Set 3", PWG5108.1-2011,
M. Sweet, I. McDonald,
April 2011,

<ftp://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippjobprinterext3v10-20110802-rev.pdf>

Standards Used (4/4)

[rfc4122]

“A Universally Unique Identifier (UUID) URN Namespace”

P. Leach, M. Mealling, R. Salz,

July 2005,

<http://www.ietf.org/rfc/rfc4122.txt>



CMPD



Print Preview Details

Support Level - 1

Level	PWG:PJT Attribute or Values	Impact on Print Preview
1	docProc.numberUp	Number of doc pages per preview/print page.
1	docProc.numberUpPresDir	Layout of number-up on preview/print page.
1	docProc.mediaXDim	Size of preview/printed pages.
1	docProc.mediaYDim	Size of preview/printed pages.
1	docProc.orientation	Orientation of preview/printed pages.
1	docProc.pageRanges	Show only the specific preview/printed pages.
1	docProc.printColorMode	Color mode to show preview/printed pages.
1	docProc.sides	Show edge aspect of sides for preview pages.
1	docProc.xImagePosition	Show location of image on preview pages.
1	docProc.yImagePosition	Show location of image on preview pages.
1	docProc.coverFront	Add document front cover preview page.

Level 1 is intended for low-end mobile solutions;
Level 2 is intended for mobile and modest desktop printing; and, finally,
Level 3 is for advanced desktop (office) and production printing.

Level 2 includes all Level 1 support and Level 3 includes all Level 2 and Level 1 support.



Print Preview Details

Support Level - 2

Level	PWG:PJT Attribute or Values	Impact on Print Preview
2	docProc.separatorSheets.where	Add separator sheet preview pages.
2	jobProc.coverBack	Add job back cover preview page.
2	jobProc.coverFront	Add job front cover preview page.
2	docProc.finishing	Show finishing type on preview pages.
2	docProc.finishingCol.stitching.refEdge	Show finishing at ref edge on preview pages.
2	docProc.finishingCol.stitching.offset	Show finishing at offset on preview pages.
2	docProc.finishingCol.stitching.location	Show finishing at locations on preview pages.
2	docProc.xImageShift	Show shift of image on preview pages.
2	docProc.xSide1ImageShift	Show shift of image on preview pages.
2	docProc.xSide2ImageShift	Show shift of image on preview pages.
2	docProc.yImageShift	Show shift of image on preview pages.
2	docProc.ySide1ImageShift	Show shift of image on preview pages.
2	docProc.ySide2ImageShift	Show shift of image on preview pages.



Print Preview Details

Support Level - 3

Level	PWG:PJT Attribute or Values	Impact on Print Preview
3	docProc.forceFrontSide	Simplex indicated pages on preview pages.
3	docProc.impositionTemplate	NOT SUPPORT AT THIS TIME
3	docProc.insertSheet.insertAfterPage	Add insert sheet to preview pages.
3	docProc.insertSheet.insertCount	Add insert sheets to preview pages.
3	jobProc.accountingSheets	Add accounting sheet (sim) to preview pages.
3	jobProc.errorSheet	Add job error sheet (sim) to preview pages.
3	jobProc.finishing	Show finishing type on preview pages.
3	jobProc.finishingCol.stitching.refEdge	Show finishing at ref edge on preview pages.
3	jobProc.finishingCol.stitching.offset	Show finishing at offset on preview pages.
3	jobProc.finishingCol.stitching.location	Show finishing at locations on preview pages.
3	jobProc.overrides.pages	Show override to doc/pages of preview pages
3	jobProc.overrides.docNums	Documents to apply overrides for preview pages
3	jobProc.overrides.element	Actual override to be applied to preview pages
3	jobProc.overrides.elementValue	Override value to be applied to preview pages.
3	docProc.coverBack	Add document back cover preview page.



PWG Print Job Ticket(1)

- PWG Print Job Ticket Specification
 - Status: Working Draft: Interim
 - Date: September 23, 2011
- PWG Print Job Ticket - Minimum Requirements
 - Descriptive Print Job Ticket Elements

Element Name	Group	Conformance
Compression/ CompressionSupplied	PrintJobDescription	Conditional
DocumentFormat/ DocumentFormatSupplied	PrintJobDescription	Required
DocumentUri ¹	DocumentDescription	Required
JobName	PrintJobDescription	Required
JobOriginatingUserName	PrintJobDescription	Required

PWG Semantic Model Print Job Ticket

<ftp://ftp.pwg.org/pub/pwg/mfd/wd/wd-sm20-printjobticket10-20110923.pdf>

Schema ftp://ftp.pwg.org/pub/pwg/mfd/schemas/PwgPrintJobTicket_v1.145.zip

PWG Print Job Ticket(2)

- PWG Print Job Ticket - Minimum Requirements – Con't
 - Processing Print Job Ticket Elements

Element Name	Group	Conformance
JobCopies or Copies	PrintJobProcessing or PrintDocumentProcessing	Required
JobFinishings or Finishings { JogOffset, None, Punch, Staple, StapleBottomLeft, StapleBottomRight, StapleDualBottom, StapleDualLeft, StapleDualRight, StapleDualTop, StapleTopLeft, StapleTopRight,}	PrintJobProcessing or PrintDocumentProcessing	Conditional
Media	PrintDocumentProcessing	Required
MediaType	PrintDocumentProcessing	Required
MustHonor or JobRequiredElements	PrintJobTicket or PrintJobProcessing	Required



PWG Print Job Ticket(3)

- PWG Print Job Ticket - Minimum Requirements – Con't
 - Processing Print Job Ticket Elements – Con't

Element Name	Group	Conformance
OrientationRequested	PrintDocumentProcessing	
PageRanges	PrintDocumentProcessing	Required
PrintColorMode	PrintDocumentProcessing	Conditional
Quality	PrintDocumentProcessing	Required
Sides	PrintDocumentProcessing	Conditional
CharsetConfigured {utf-8}	PrintServiceDescription	Implicit
MediaBottomMarginSupported, MediaLeftMarginSupported, MediaRightMarginSupported, MediaTopMarginSupported	PrintServiceDescription	Required
Resolution (Or maybe PwgRasterDocumentResolutionSupported)	PrintDocumentProcessing (PrintServiceDescription)	Required
VersionsSupported (or namespace of ticket)	PrintServiceDescription	Required

