Color Management Design and Workflow in the AFP Environment

October 21, 2012

Yue Qiao, Ph.D
AFP Consortium
Ricoh Production Print Solutions

Presentation Outline

- Introduction to AFP/AFPC
- Introduction to AFP architecture
- ICC based AFP color management architecture
- ICC metadata tag AFP implementation
- Quick comparison AFP VS. PDF

Advanced Function Presentation (AFP)

- A family of related communication and data architectures that have become the de-facto international standard for production print and high-volume output environments.
- AFP is primarily used in large enterprises for production variable data printing (VDP).
- The major concepts include object-driven structures, print integrity, resource management, and support for high print speeds.
- Used worldwide by most of the largest corporations (banking, finance, insurance) to produce statements, bills, marketing collateral and other high volume, business critical output.

AFP History

- Historically developed by IBM and published as an external reference
- 2004 – Vendors collaborated with IBM on AFP color management under bi-lateral agreement
- 2009 – Open AFP Consortium created
- Present – All new AFP architecture is developed by the AFPC.

AFPC Membership (36)

CORE (6)

- IBM
- ISIS Papyrus
- MPI Tech
- Océ
- Ricoh
- Xerox

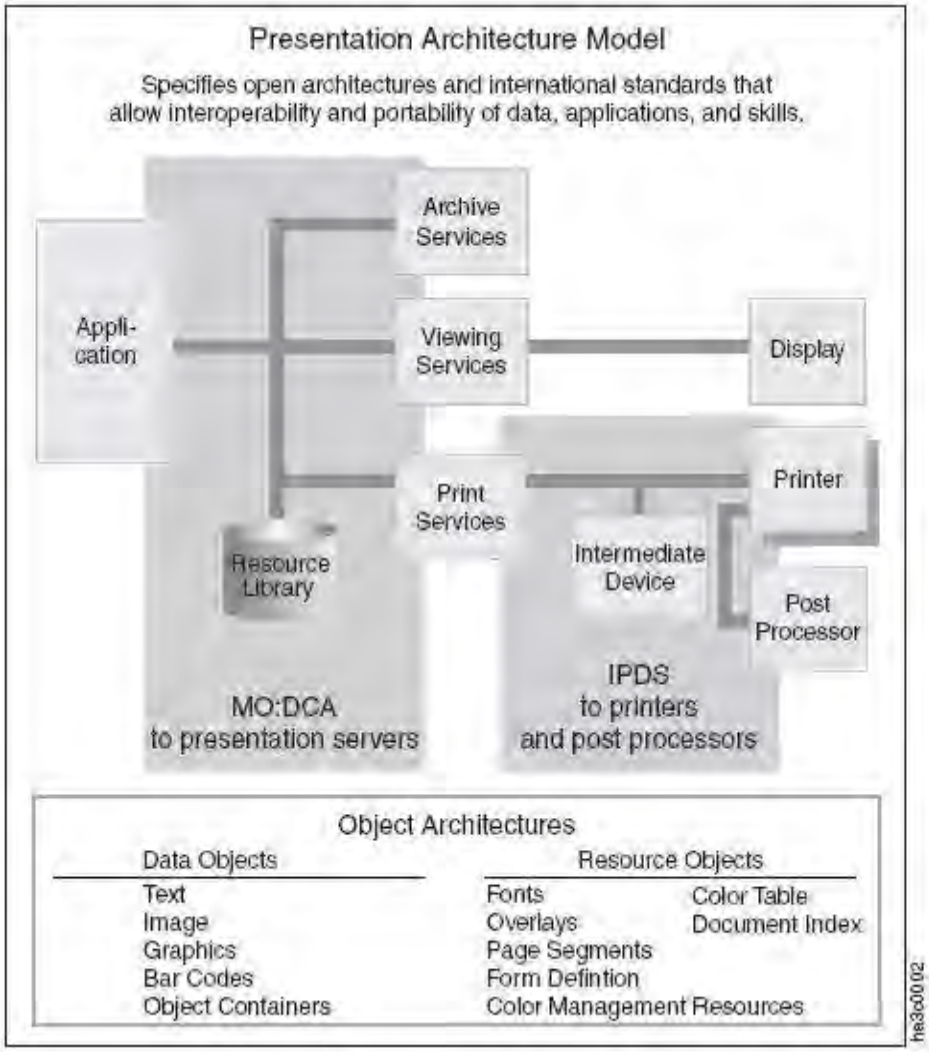
PARTICIPATING (23)

- Actuate
- ASG
- Assentis
- CDP
- Cincom
- Compart
- Crawford
- CRE-DO
- DocPath
- Elixir
- FIS
- GMC
- HP
- Inventive Designers
- Kodak
- Lexmark
- OpenText
- Oracle
- Pitney Bowes
- Printsoft
- Sefas
- Solimar
- Xeikon

ASSOCIATE (7)

- COPI
- Dataexpert
- eBilling
- Gemadec
- LRS
- RISO Kagu
- TAGG Informatique

The AFP Presentation Architecture Model



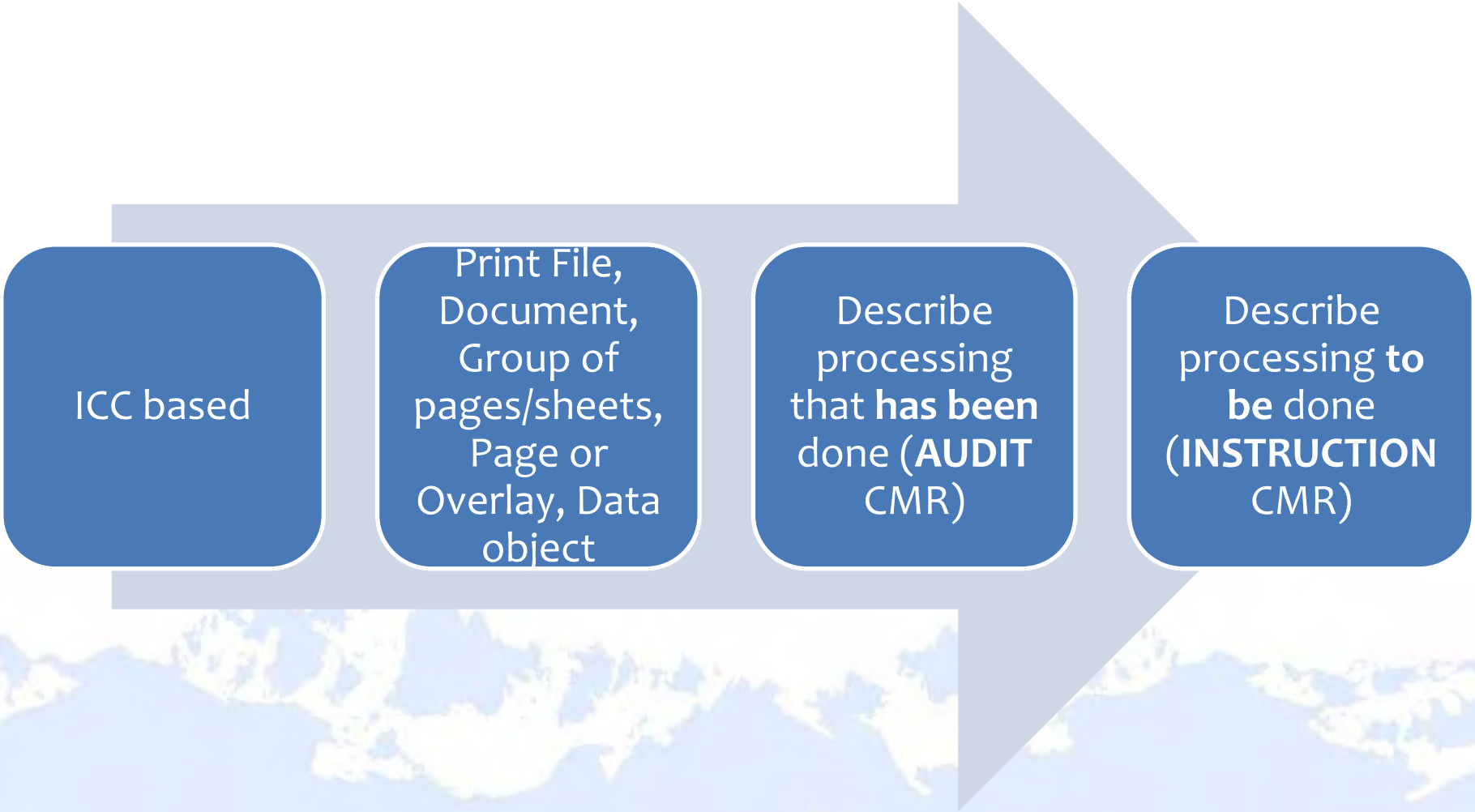
AFP Architecture Design Focus

- Efficient and fast speed printing
  - An AFP job has streams of data with variety of resources
  - Data are merged on the fly
  - Fully dynamic with minimum data without duplication
- Reliable printing
  - Bidirectional communication
  - Error recovery without requiring assistance from people
- Easy to use /automatic selection

AFP Color Management Architecture

- Color management related information:
  - ICC profile
  - Halftone
  - Tone transfer curves
  - Etc
- Defined as Color Management Resources (CMRs) to render a print file, page, or data object with color fidelity.
- Each CMR has a header and data
  - ICC profile is wrapped with the AFP format to ensure efficient resource processing

Color Conversion CMR



CMR Syntax: Header—Device Specific Fields

Length in Bytes	Offset	Type	Name	Range	Meaning	M/O
4	0-3	4-byte UBIN	Length	X'000000A4' - X'FFFFFFFF'	CMR length, including length field	M
4	4-7	CODE	CMRSig	X'434D5239'	Signature of this CMR	M
2	8-9			X'0000'	Reserved: should be set to zero	M
	CMR Name starts here. It is composed of bytes 10 - 155.					
16	10-25	UTF16	CMRAlias	No restriction	Human-readable alias	M
4	26-29	UTF16	CMRType	HT (X'0048 0054')	Halftone	M
				TC (X'0054 0043')	Tone Transfer Curve	
				CC (X'0043 0043')	Color Conversion	
				LK (X'004C 004B')	Link Color Conversion	
				IX (X'0049 0058')	Indexed	
14	30-43	UTF16	CMRVersion	ddd.ddd (where 'd' is a decimal digit character) generic	CMRVersion Number or "generic"	M
10	44-53	UTF16	ManufacturerName	See description name or @@@@@	Name of the manufacturer	M
12	54-65	UTF16	DeviceType	See description type or @@@@@@	Type of the device	M
6	66-71	UTF16	DeviceModel	See description model or @@@	Model of the device	M

CMR Syntax: Header—media specific fields

6	72-77	UTF16	MediaBrightness	0-100 for print media; Zxy for screens; @@@	For print media, it's the percentage of light reflected from the media. For screen, it's a CIE illuminant.	M
6	78-83	UTF16	MediaColor		Color of the media:	M
				noc (X'006E 006F 0063')	no-color	
				wht (X'0077 0068 0074')	white	
				pnk (X'0070 006E 006B')	pink	
				ylw (X'0079 006C 0077')	yellow	
				blu (X'0062 006C 0075')	blue	
				grn (X'0067 0072 006E')	green	
				buf (X'0062 0075 0066')	buff	
				gdr (X'0067 0064 0072')	goldenrod	
				red (X'0072 0065 0064')	red	
				gry (X'0067 0072 0079')	gray	
				ivy (X'0069 0076 0079')	ivory	
				org (X'006F 0072 0067')	orange	
				Any other three-character value which contains no ('@')	custom	
				@@@(X'0040 0040 0040')	not specified	
4	84-87	UTF16	MediaFinish		Surface characteristics of the media	M
				no (X'006E 006F')	none	
				gl (X'0067 006C')	glossy	
				hg (X'0068 0067')	high-gloss	
				sg (X'0073 0067')	semi-gloss	
				st (X'0073 0074')	satin	
				mt (X'006D 0074')	matte	
				@@ (X'0040 0040')	not specified	
6	88-93	UTF16	MediaWeight	1-999 @@@	The basic weight of the paper	M

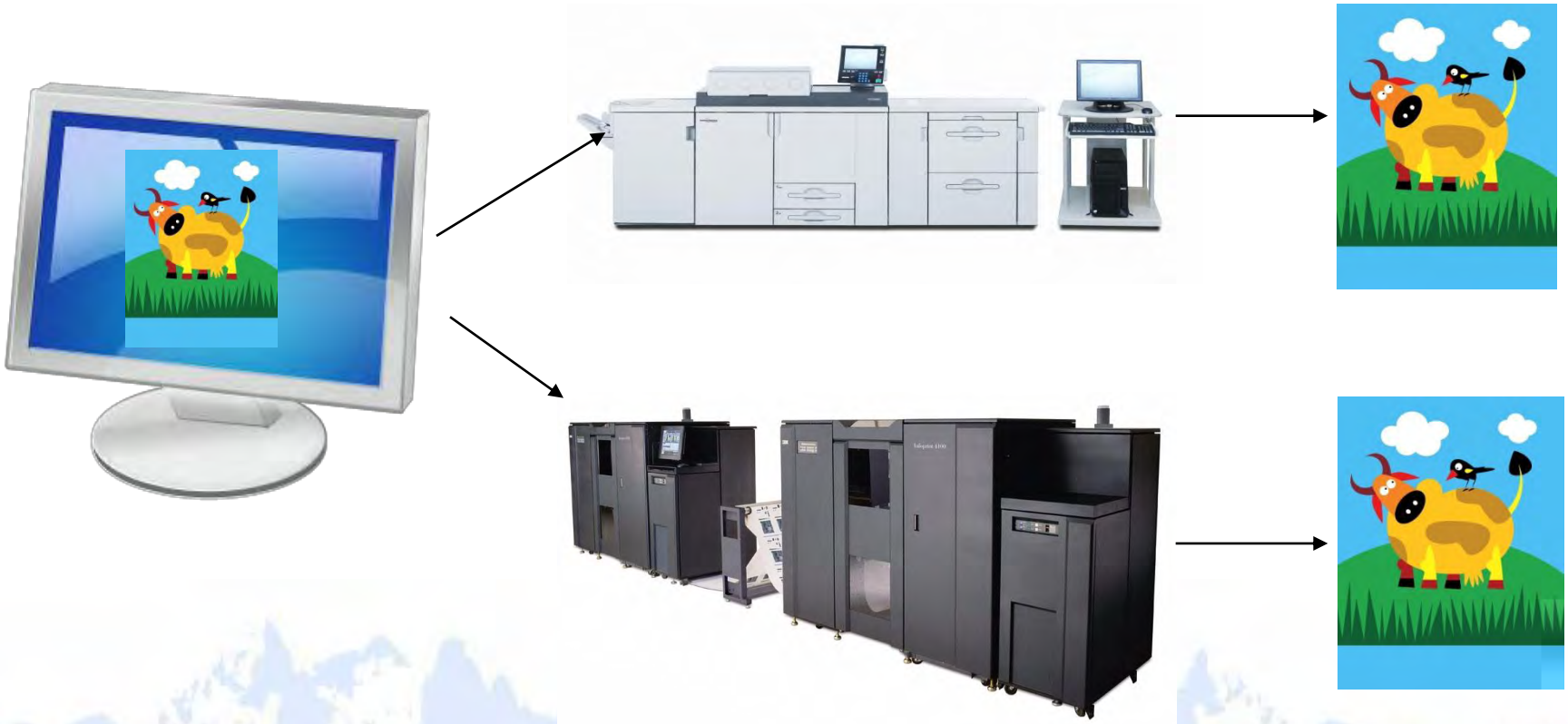
CMR Syntax: Header—CMR Property Fields

10	94-103	UTF16	Prop1	See description No restriction	CMRType property-specific field 1	M
12	104-115	UTF16	Prop2	See description No restriction	CMRType property-specific field 2	M
8	116-123	UTF16	Prop3	See description No restriction	CMRType property-specific field 3	M
8	124-131	UTF16	Prop4	See description No restriction	CMRType property-specific field 4	M
8	132-139	UTF16	Prop5	See description No restriction	CMRType property-specific field 5	M
16	140-155	UTF16		@@@@@@@@	Reserved - should be set to @@@@@@@@	M
	CMR Name ends here. It is composed of bytes 10 - 155.					

ICC Dictionary tag type/Metadata tag

- The purpose is to create tag structure to identify conditions under which an ICC profile is created to help automatic profile selection
- Conditions are name and values pairs filled in the metadata tag in the structure of dictionary Tag type format
- AFPC has made a set of registry at ICC
- Infoprint has implemented metadata tag for automatic profile selection in the controller

AFP Color Management Enabled Printers
Infoprint 5000 series and C900



Support both AFP and PDF/PS

AFP – PDF/VT Compared

	AFP	PDF
Heritage	Variable Data Speed	Graphics
Open	AFPC (ISO pending)	ISO
Print Streaming	Yes	No
Error Recovery	Architected	No
Variable Data Performance	Architected	Controller Dependent
Reference Resources	Architected	Adding (PDF/VT-2)
Container Architecture	Contains PDF	Does not contain AFP
Color Management	ICC Based	ICC Based
Image Transparency	PDF container	Live
Metadata (XMP)	Adding	Yes
Authentication	Adding	Digital Signature
Archive Format	Adding	Defined (PDF/A)

Thank You!