

AFPC

AFP Consortium

Update on AFP and the AFP Consortium (AFPC)

SHARE 2009
Denver, Colorado
August 25, 2009

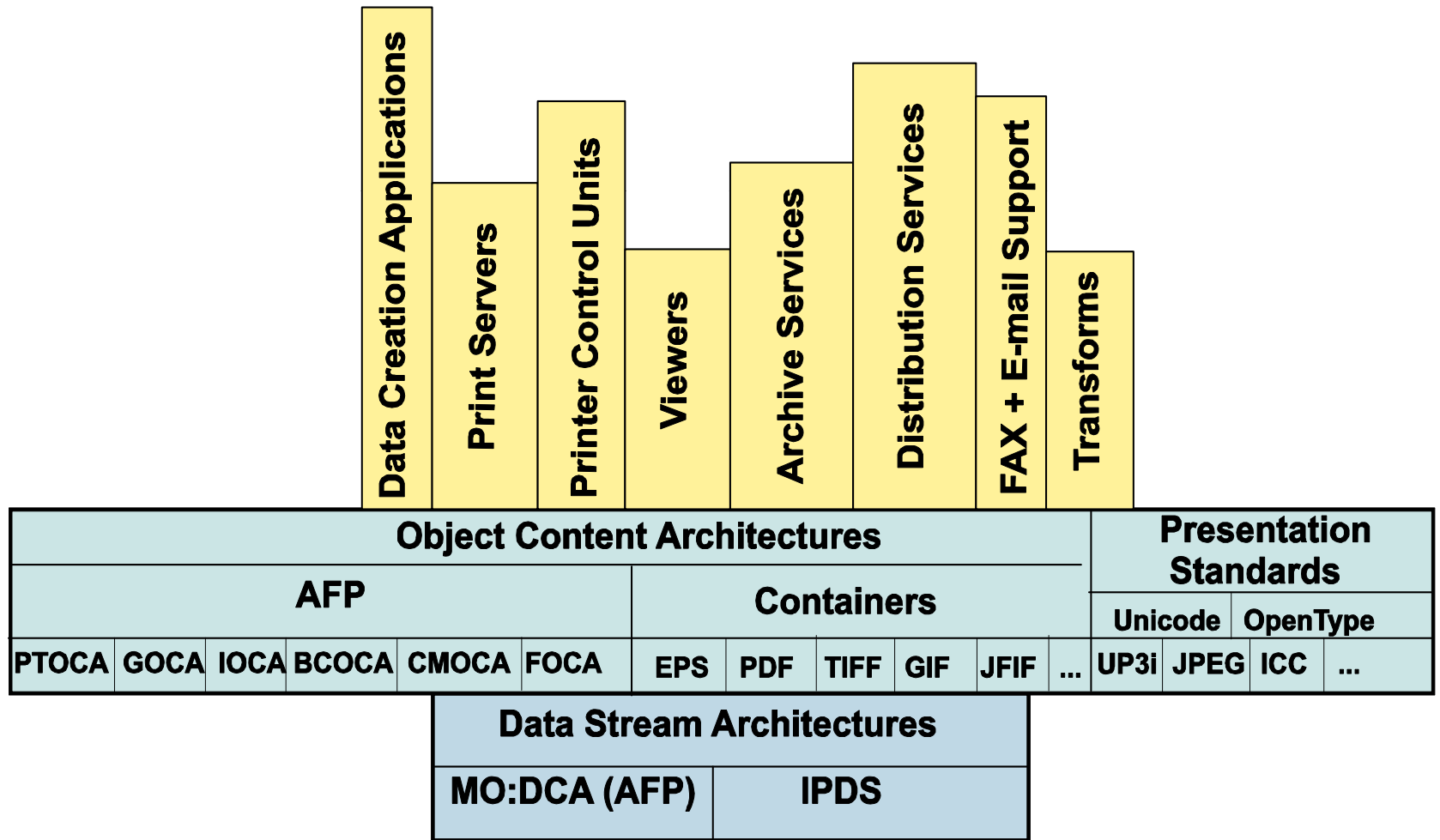
Reinhard Hohensee
Distinguished Engineer
InfoPrint Solutions Company



Agenda

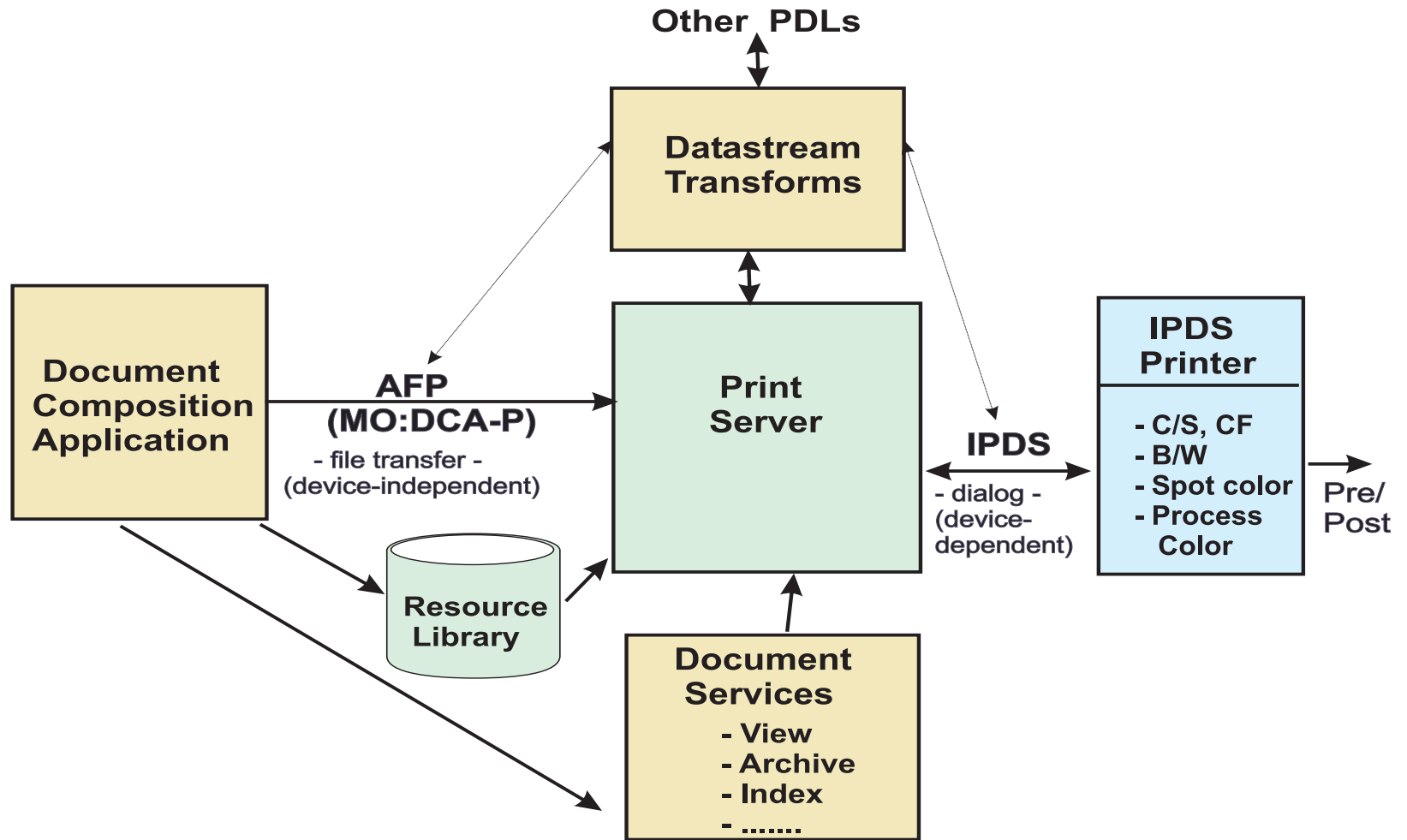
- What is AFP
- History – road to open industry standard
- Why/how to join AFPC
- Why AFP for production variable-data print
- Future directions
- Summary
- Q & A

AFP: A group of products and systems for managing presentable information that is based on a set of formal presentation architectures





Typical AFP System





AFP History

- AFP was developed by IBM in the early 1980s to support all-points-addressable printing on the 3800 printer; the first AFP products shipped in 1984 – PSF/MVS, 3800-3
- AFP continued to be developed by the Printing Systems Division of IBM throughout the 1980s and 1990s and became the de-facto industry standard for monochrome transaction printing (statements, bills, etc.); significant enhancements include:
 - Index/view
 - N-up print
 - Document finishing
 - Outline fonts
- The colorization of AFP started in the late 1990s (in support of the InfoColor 130+ printer); with the adoption of ICC-based color management in 2006 AFP became a leading-edge full-color presentation architecture
- With the industry transition to open standards, IBM embarked on a path to open the AFP architecture starting in 2004, which culminated in the formation of the incorporated AFPC in 2009



AFP Color Consortium (AFPCC)

- Formed (at the invitation of IBM) in October 2004
- Initial membership was 16 companies
- Scope was limited to developing a comprehensive color management capability within the AFP architecture
- Work progressed very well – the AFP Color Management Architecture (ACMA) was formally approved by AFPCC on January 20, 2006 and has been published; see www.afpcolor.org :
 - Overview document - *AFP Color Management Architecture (ACMA) Release 1*
 - Significant updates to the MO:DCA, IPDS, and AFP Line Data data streams; see updated references
 - New architecture reference – *Color Management Object Content Architecture (CMOCA) Reference*
 - *Provides syntax for wrapping ICC profiles and other color management objects so they can be processed as AFP resources*
- Addition of comprehensive ICC-based color management gives AFP color capabilities matched by few presentation architectures

AFPC

AFP Consortium (AFPC)

AFP Consortium

- In May, 2006, IBM announced intent to open development of the **complete** AFP architecture to the AFPC; this was accepted by all members in September, 2006
- As a result, the AFPC transitioned to the **AFP Consortium (AFPC)**
 - Customer benefits
 - More consistent implementations, therefore better interoperability of products
 - Broader choice of vendors and products
 - Better investment protection - standards have industry staying power
- New scope of AFPC work :
 - Data streams - MO:DCA, IPDS, AFP Line Data
 - Object Architectures:

AFP GOCA (vector graphics)	BCOCA (bar codes)
CMOCA (color management resources)	FOCA (fonts)
IOCA (image)	PTOCA (text)



AFPC (contd)

- To complete the transition of AFP to a fully open industry standard, the AFPC was incorporated into a non-profit corporation on February 25, 2009
- Incorporation allows the AFPC to function as a vendor-neutral open standards body that is a legal entity
 - Able to own trademarks for terms such as AFP, MO:DCA, IPDS, CMOCA, ...
 - Able to own copyrights to architecture documents such as specifications, white papers, etc.
 - Can collect membership dues to fund activities to promote AFP:
 - AFPC participation and booth at conferences such as XPLOR, OnDemand
 - Marketing activities
 - Compliance and certification activities
 - Can negotiate with 3rd parties on behalf of AFPC members, e.g. for licenses to software, ICC profiles, etc.



AFPC (contd)

- Corporation run by an annually elected Board of Directors (BOD) and their appointed/elected officers
- In recognition of IBM/InfoPrint's work on AFP for the past 25 years, InfoPrint is identified as the "**Founder**" of the AFPC and has the right to appoint a standing director to the BOD
- AFPC governing body:
 - Board of Directors (BOD) for 2009:
 - Jeff Paterra, InfoPrint - Sr. VP & GM, Technology & Solutions Development
 - Michele Pracchi, Océ – Sr. VP Corporate Software Development
 - Dennis Ladd, StreamServe – President and CEO
 - Paul Gerelle, MPI Tech – Director
 - Roberto Anzola, ISIS Papyrus - Board Director and Manager of Research and Development
 - Officers for 2009:
 - President and Secretary: Harry Lewis, InfoPrint - Program Manager Intellectual Property & Open Standards
 - Treasurer: Paul Gerelle, MPI Tech – Director



AFPC (contd)

- AFPC membership & annual dues
 - Core Member (\$10K):
 - govern AFPC, nominate candidate for BOD, nominate candidate for officer position, elect BOD
 - Participate in development of AFP (meetings, workgroups, architecture voting, etc.)
 - InfoPrint, as Founder, is a Core Member
 - Participating Member (\$5K):
 - Participate in development of AFP (meetings, workgroups, architecture voting, etc.)
 - Associate Member (\$1K):
 - Observe the workings of the AFPC (see internal architecture docs, etc., but no active participation, no architecture voting)
- How can I join?
 - AFPC Bylaws: “....Any natural person or entity with a significant interest in developing and promoting the AFP architecture and products and services based on the AFP architecture may be a member....”
 - Application must be approved by the BOD
 - Contact myself (reinhard.hohensee@infoprint.com) or Harry Lewis (harry.lewis@infoprint.com)



AFPC (contd)

- AFPC Website - see www.afpcolor.org :
 - List of members and links to member websites
 - Architecture publications
 - All current architecture references
 - Addendums to current references
 - White papers
 - New content:
 - IOCA Reference (November 2008)
 - MO:DCA Addendum 1 (Image Resolution triplet; September 2008)
 - MO:DCA Addendum 2 (Multipage Containers; September 2008)
 - MO:DCA-L Reference
 - Presentations (XPLOR, DRUPA, SHARE, etc.)



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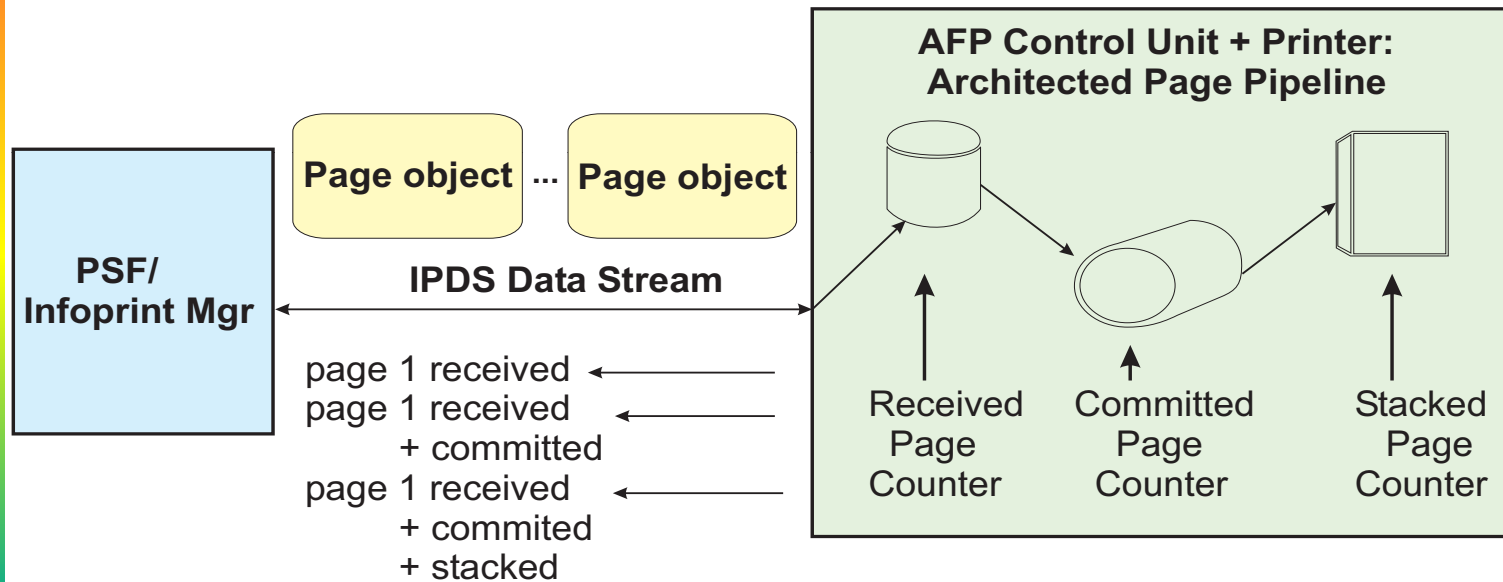
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Why AFP for production variable-data print?

There are other PDLs and print architectures that are used in the industry, e.g. PostScript, VIP, VPS, PPML, ..., what makes AFP ideal for monochrome and color variable data print?

Why AFP: print integrity

Every page is guaranteed to print as defined,
or an error is generated



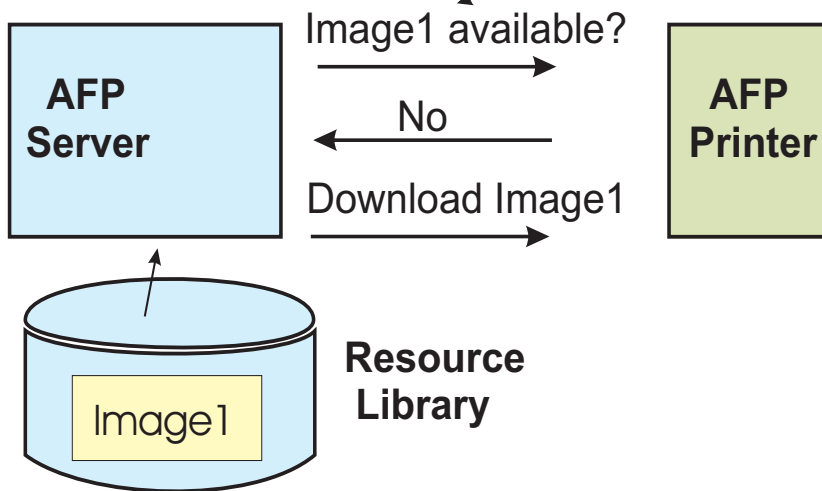
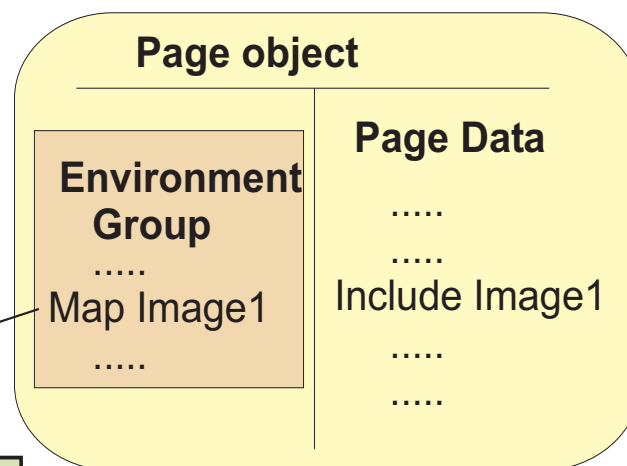
Bi-directional IPDS protocol and architected printer pipeline allow server to track every page until stacked; errors result in server-directed page-level recovery



Why AFP: resource management - load once, RIP once, then reuse

Avoids redundant storage, transmission, and processing of data

- Environment Group processed before page data
- Map structure triggers resource query and download only if needed

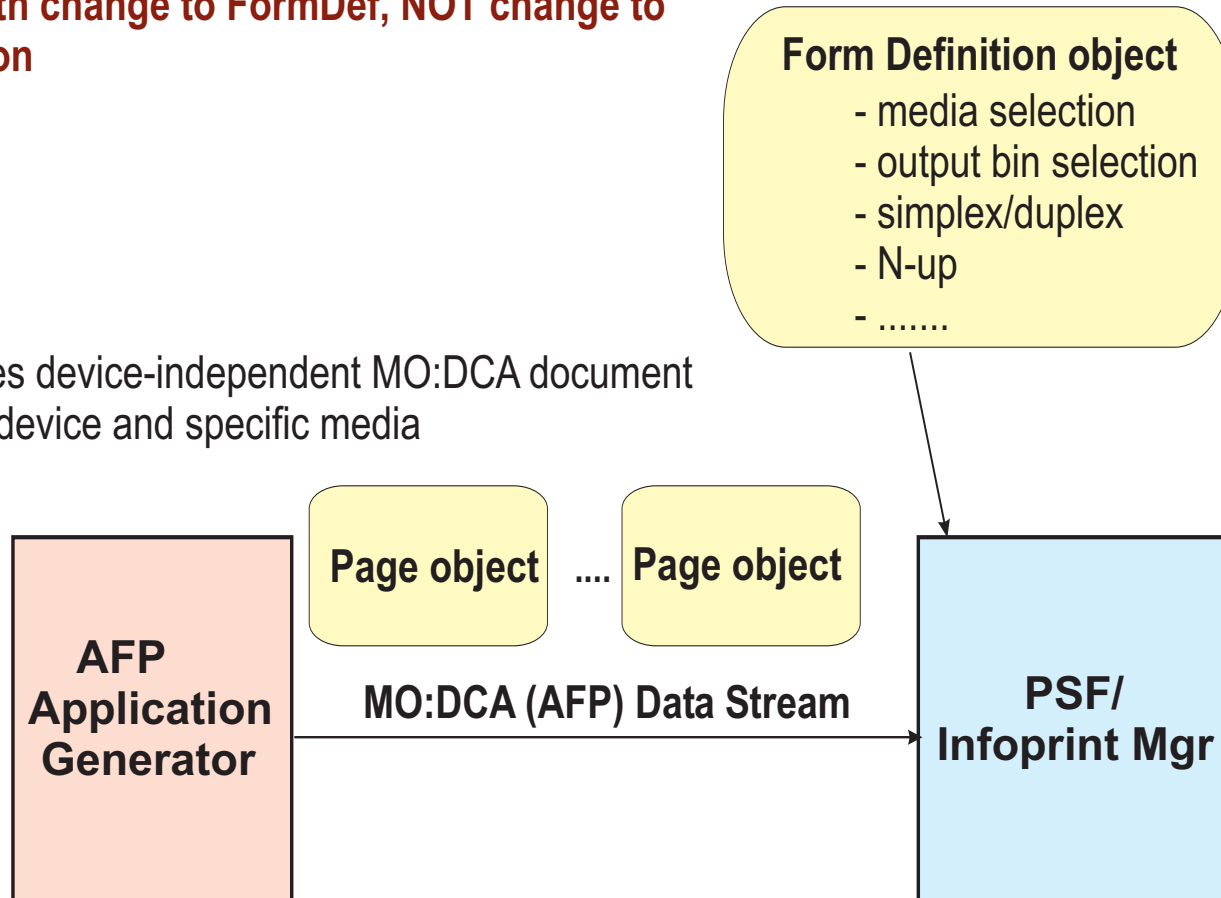




Why AFP: job ticket (Formdef) external to data stream

Redirect document to different device or different media with change to FormDef, NOT change to application

Formdef ties device-independent MO:DCA document to specific device and specific media

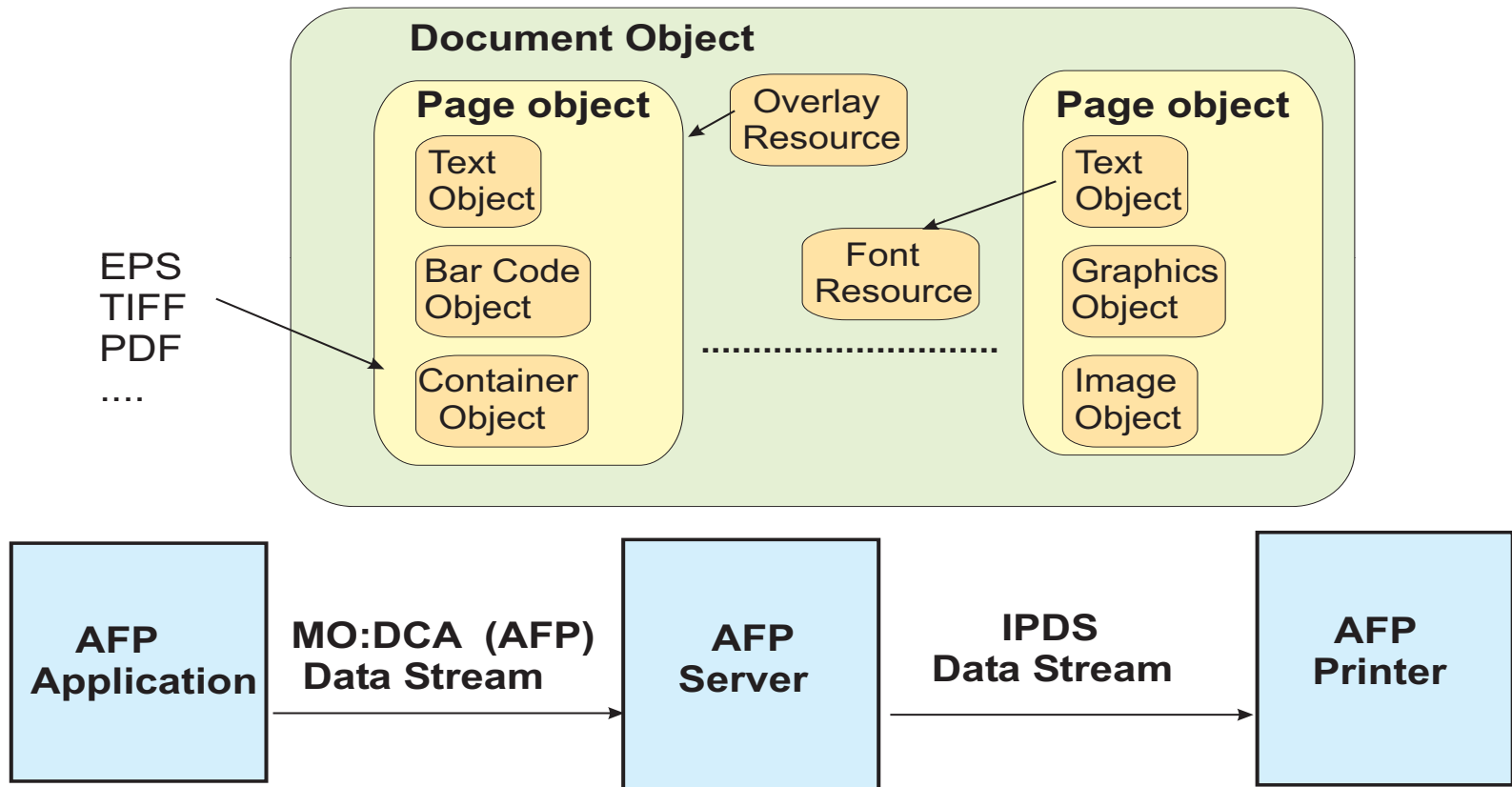




Why AFP: support for ultra high-speed (>>1000 ppm) color printing

- Color printing involves significantly more data than monochrome printing (32 bit CMYK data vs 1 bit bi-level data)
- Brute force alone won't solve the problem; need underlying architecture that is designed from the ground up for speed
- AFP architecture provides what is needed:
 - Sequential structure allows processing to start with first bytes in printfile
 - Object-oriented structure leverages parallel processing of sheets, pages, objects
 - Extensive resource management for static repeating data – download and RIP once, re-use many times
 - Fast native text (PTOCA) and graphics (GOCA)
 - Efficient, tuned native image format (IOCA)

High speed printing (contd) - object-oriented structure allows parallel processing

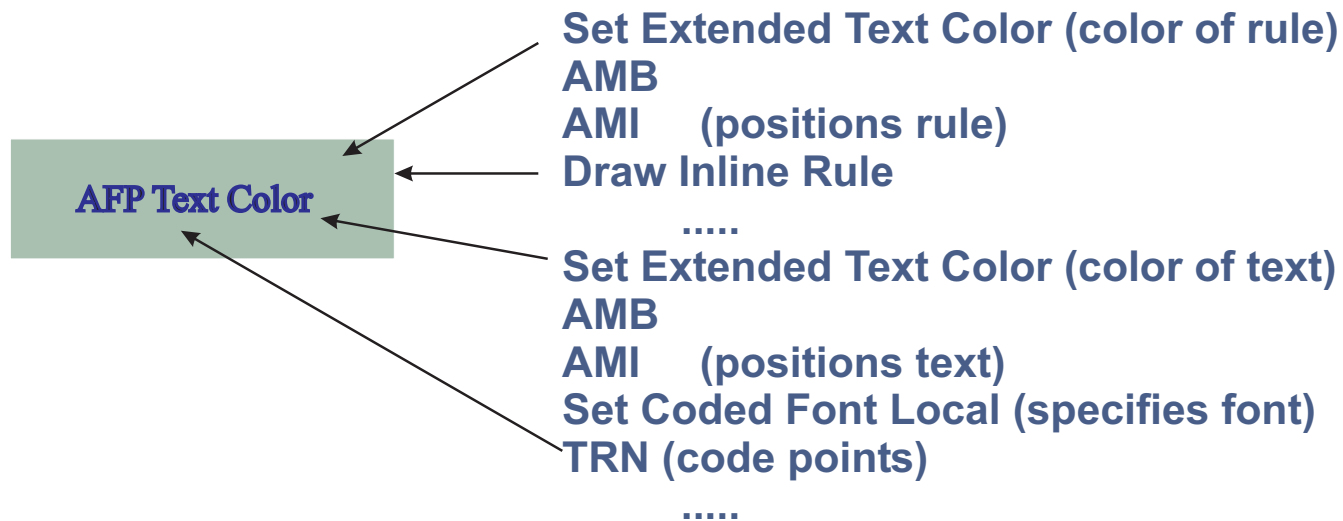


All data in printfile is structured in self-contained objects - document objects, page objects, data objects, resource objects; this supports parallel object processing



High speed printing (contd) – high-speed text

- Variable data is mostly text; AFP text is in highly efficient PTOCA format
 - Doesn't require setup of complex graphics state
 - Simple hex control sequences define and position text
 - Can be processed at print speeds > 2000 pages/min

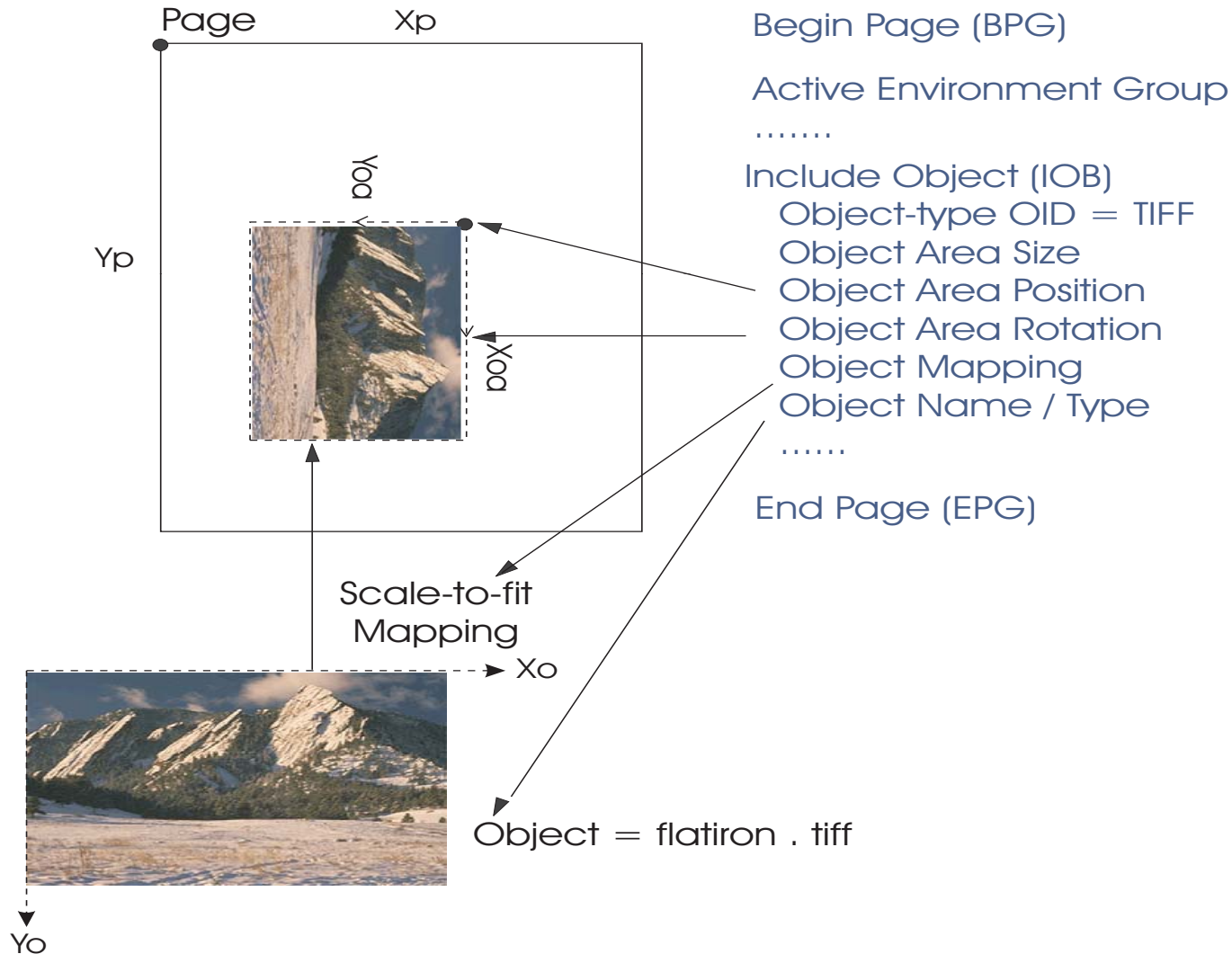




Why AFP: support for industry-standard data formats

- Much color data is generated (scan, photo, etc.) in formats such as TIFF and PDF
- To enable simple and flexible document composition, AFP was extended in the late 1990s with a “container” architecture
 - AFP container architecture allows customers to integrate popular de-facto standard data formats such as EPS, PDF, TIFF, GIF, and JPEG (JFIF) into their AFP printfiles and workflows
 - Industry standard data formats can be mixed as peer objects with traditional AFP data formats – e.g. everything that can be done with IOCA can be done with TIFF, and AFP pages can contain any combination of IOCA, TIFF, EPS, PTOCA, etc.
 - Industry standard formats can be processed as AFP resources – download once, re-use multiple times, for high print performance
 - Industry standard formats can easily be included on an AFP page using an Include Object (IOB) structured field that can scale, rotate, position the data

Support for industry-standard data formats (contd) - Include Object (IOB)





Why AFP: support for TrueType/OpenType fonts and Unicode allows globalization of applications

- Scalable outline font technology used on the Windows and Mac platforms; most prevalent font technology in the industry
- Strategic replacement for FOCA raster fonts (!!) and FOCA outline fonts
- Benefits for AFP customers:
 - Provides greater choice of typefaces, particularly non-Latin typefaces
 - Allows migration to the same single font technology on all presentation platforms, e.g. Windows, zOS, AIX
 - Provides ability to generate applications on authoring platforms, .e. Windows and Mac, and print without font substitutions in server or printer
 - Provides ability to transform to/from other PDLs, e.g. PS/PDF, without font substitutions
 - Provides basis for future, more advanced support of complex non-Latin scripts, e.g. Arabic, Hebrew, Indic, Thai
 - Bi-di (e.g. right-to-left) printing
 - Contextual glyph selection
 - Composed characters



TrueType/OpenType fonts (contd)

- Fonts are installed and used as is – they are not altered and they are not wrapped in an AFP container; therefore they can be shared with non-AFP applications
- Librared fonts are accessed via a Resource Access Table (RAT) which is indexed with the full font name from the data stream and provides the platform-specific file name
- Fonts must support Unicode encoding (almost all do)
- Fonts can be installed as part of a TrueType Collection file (TTC)
 - File with common header and multiple TTF/OTFs that share tables
 - File size reduction with TTC if fonts share large number of glyphs



TrueType/OpenType fonts (contd)

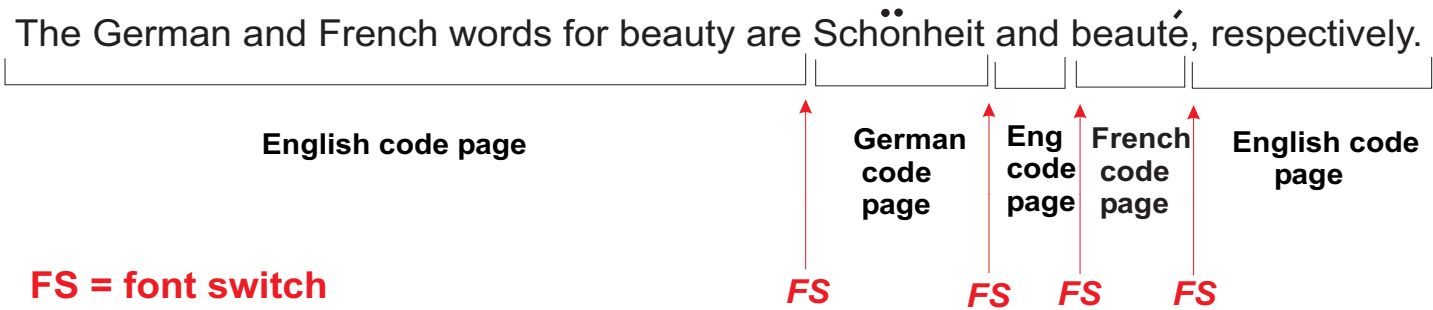
- Fonts can be ‘linked’:
 - Provides ability to add additional characters (TTF/OTF file format restricts number of characters in a given font to 64K) and user-defined characters (UDCs)
 - Fonts “font1”, “font a”, “font b”, and “font c” are treated logically as a single font; base font (font1) is always processed first, followed by the first linked font (font a), then the second linked font (font b), etc.



ffn = full font name

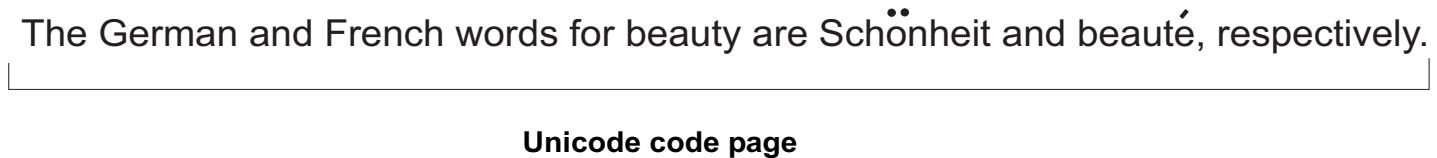
TrueType/OpenType fonts (contd) – Unicode

Current Environment



**** Application needs to understand scripts and code pages ****

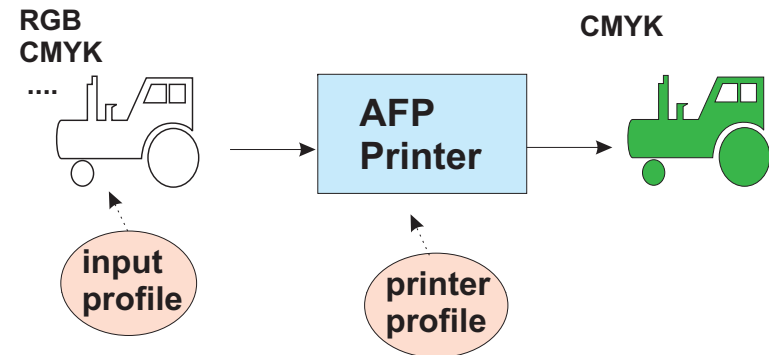
Unicode Environment



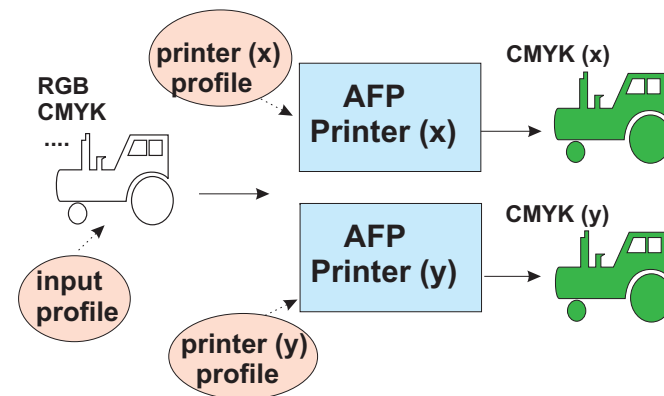
**** Application only needs to understand Unicode ****

Why AFP: advanced color management

- **Accurate** output color if input color properly defined



- **Consistent** output color and grayscale simulation on different devices driven by different applications

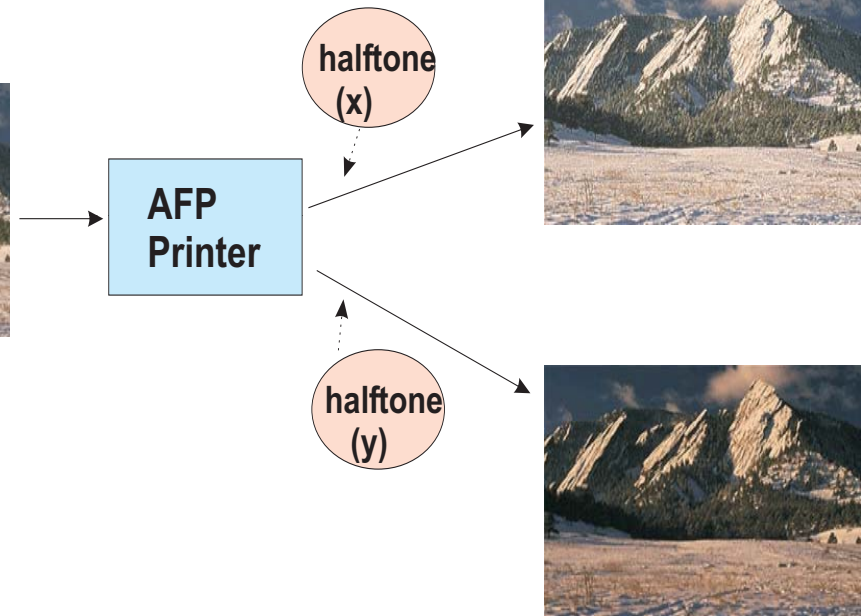


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Advanced color management (contd)

AFP Consortium

- **Tuneable** output color



- **High-speed** color conversions: integrate ICC profiles as AFP resources to leverage performance gains from AFP resource management
- **Standards (ICC) based** architecture



Advanced color management (contd)

- AFP color management is based on ICC profiles and ICC color management concepts
- ICC profiles and other color management structures are integrated into AFP using a new AFP object – the **AFP Color Management Resource (CMR)**:
 - Provides wrapper for ICC profiles (which are not modified) and other color management constructs such as tone transfer curves and halftones
 - Defined in a new formal architecture under the AFP Architecture umbrella – the **Color Management Object Content Architecture (CMOCA)**
 - New CMOCA Architecture Reference (S550-0511), available at www.afpcolor.org
 - Allows color management constructs like ICC profiles, tone transfer curves, halftones, to be **processed as AFP resources** – download once, reference multiple times, capture in device, package in inline resource group, etc.



Advanced color management (contd): CMR types

- **Color Conversion (CC) CMRs:** contain ICC profiles (in their ICC-defined syntax) that convert a device-specific color to/from the device-independent ICC Profile Connection Space (PCS)
- **Tone Transfer Curve (TTC) CMRs:** one-dimensional curves that are used to modify the values of a particular color component, e.g. cyan
- **Halftone (HT) CMRs:** screens that are applied to multibit data
- **Indexed (IX) CMRs:** mappings of indexed (numbered) colors in the data stream to output device colors or colorant combinations; can support Pantone colors
- **Link Color Conversion (LK) CMRs:** Look-up tables (LUTs) that convert directly from a device-specific input color space in the data to the device-specific output color space of the presentation device without going through the PCS
 - LK CMRs are not referenced in the data stream - they are generated by the Resource Installer and processed automatically by the system; cut color conversion time



Advanced color management (contd): CMR processing mode

- Specifies why a CMR was created and how it should be processed
- Is specified as part of the CMR reference in the data stream
- Is not part of the CMR definition, i.e. when a CMR is created it can be used in audit or instruction processing mode
- Processing modes
 - **Audit:** an audit CMR specifies color-management processing that **has been done** on a document component; for example it may specify a color conversion that has been done on the data (similar to an ICC **input** profile)
 - **Instruction:** an instruction CMR specifies color-management processing that **is to be done** on a document component; for example it may specify a color conversion that is to be applied to the data (similar to an ICC **output** profile)
 - **Link:** a link CMR is used to convert an input color space in the presentation data directly to the output color space of the presentation device without going through the PCS (similar to an ICC **device link** profile)

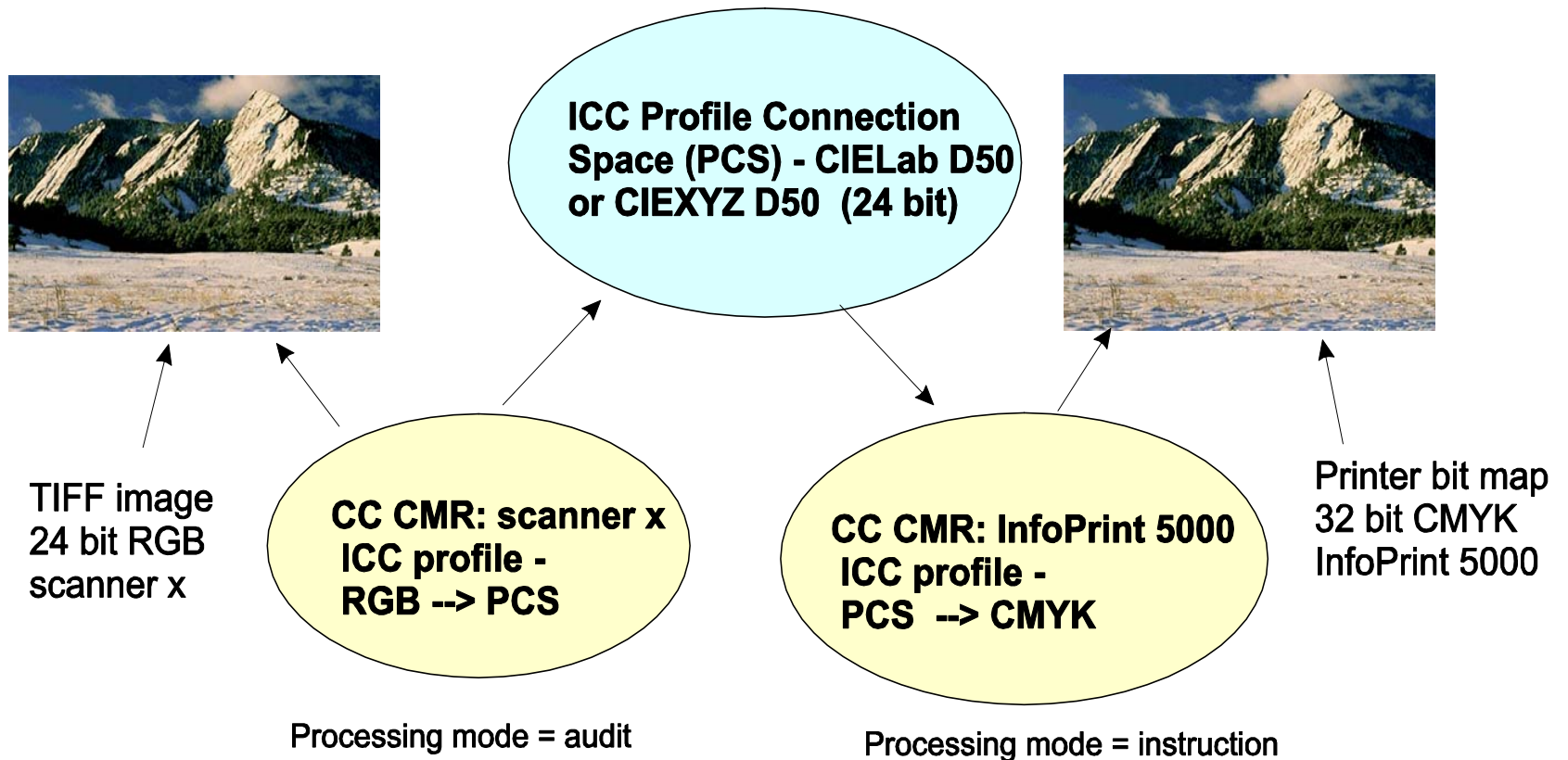


Advanced color management (contd) – association of CMRs with objects

- CMRs can be associated with document components at **all levels of the MO:DCA document hierarchy**:
 - Print file (highest)
 - Document
 - Group of pages/sheets
 - Page/overlay
 - Data object (lowest)
- A CMR at a lower level always overrides – for that document component only – a conflicting CMR at a higher level
 - Example: CC CMR at print file level defines RGB = scanner(y) RGB, CC CMR at page(n) level defines RGB = scanner(x) RGB. According to rule, since CC CMRs conflict, all RGB for page(n) is interpreted as scanner(x) RGB



Advanced color management (contd) – CC CMR processing





Future Directions

- Improve interoperability of AFP products (from AFPC members)
 - Define conformance level(s)
 - Compliance testing
 - Certification
- Develop extensions to allow AFP workflows to better interoperate with other workflows – PDF, XML, web, view, archive,
 - Develop more robust and flexible metadata architecture
 - NOPs are unarchitected
 - Tag Logical Element structured fields (TLEs) are limited to attribute name/value pairs
- Integrate new object containers into AFP as their industry acceptance and use increases
 - SVG? PNG?
- Investigate integration of JDF into AFP
- Improve communications with customers, users, and user groups

If you want to get more involved, please send us a note!!

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Summary

- AFP has shown unique longevity as a presentation architecture, dating back to 1984
- AFP started out as an IBM-owned architecture but was positioned on an “open” path by IBM in 2004 and is now a fully open industry standard owned, developed, and maintained by the AFP Consortium (AFPC)
- Various AFPC membership levels are available, ranging from Core (\$10K), to Participating (\$5K), to Associate (\$1K)
- With the recent addition of OpenType/Unicode support and ICC-based color management, AFP is uniquely structured to support modern mission-critical, multi-language, variable-data color workflows



AFP Consortium

- Q & A

Questions?