Imaging Processing Pipeline for Color Printers & Printing Systems

Session II

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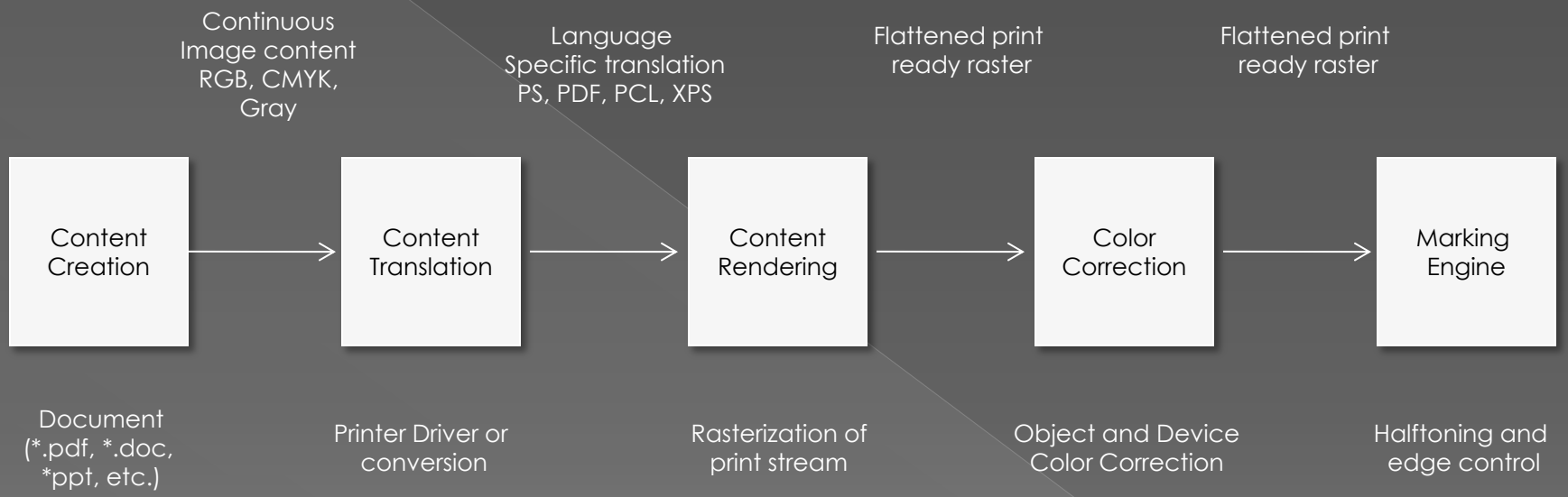
Outline

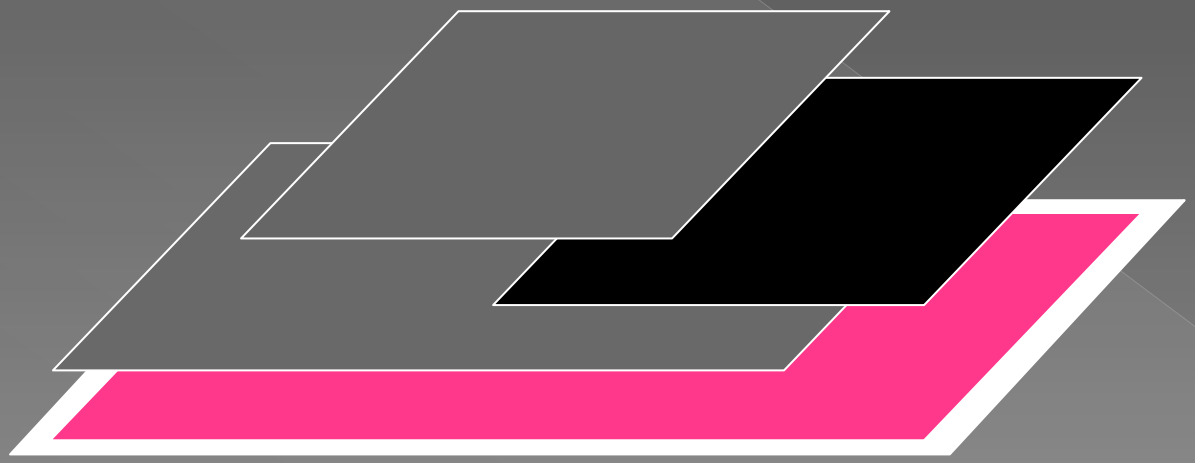
- End-to-end document imaging workflow
- Rendering Stream
- Color Management

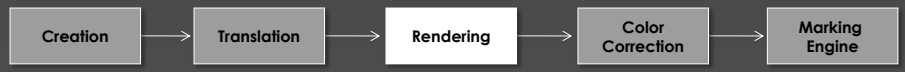
End to End Document Imaging



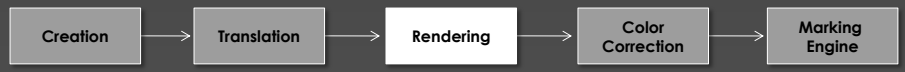
Rendering Stream

- Text, vector and raster objects are sent sequentially in Z-order
- Sometimes the page can be split into bands
- Z-Order is preserved within a Band

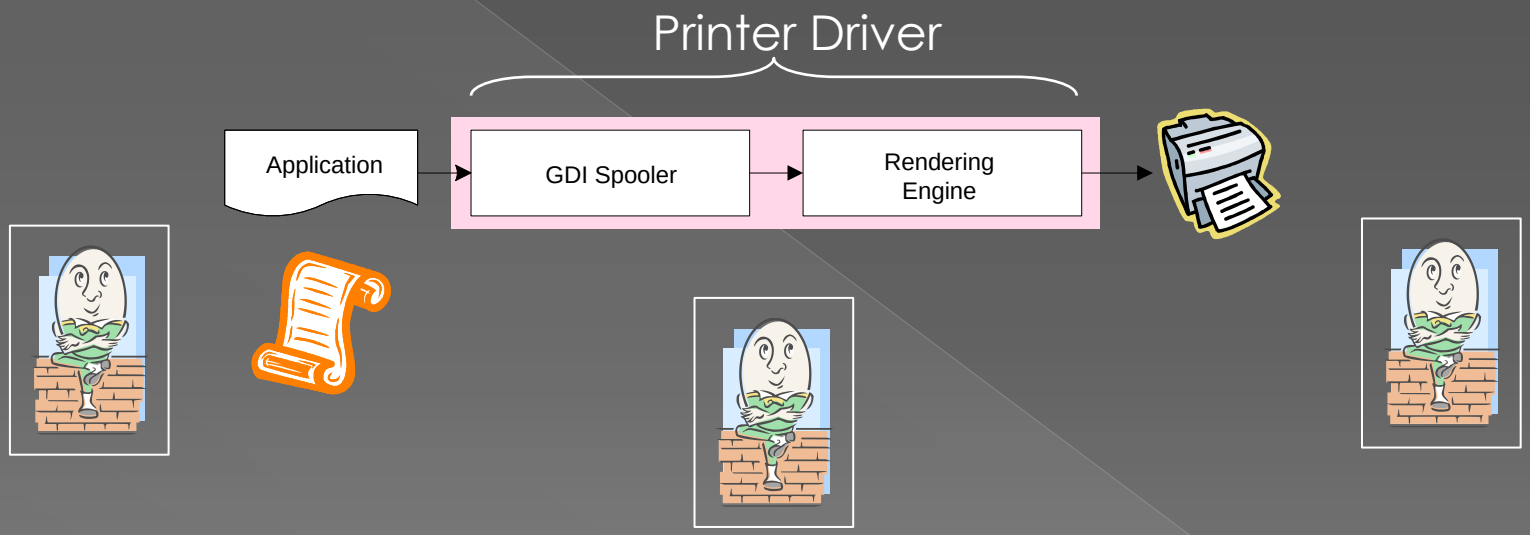




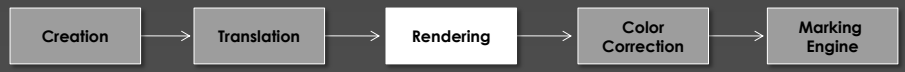
- Host Based Rendering
  - PC rendering
- Device Based Rendering
  - Embedded Solution
- Server Based Rendering
  - Hybrid solution



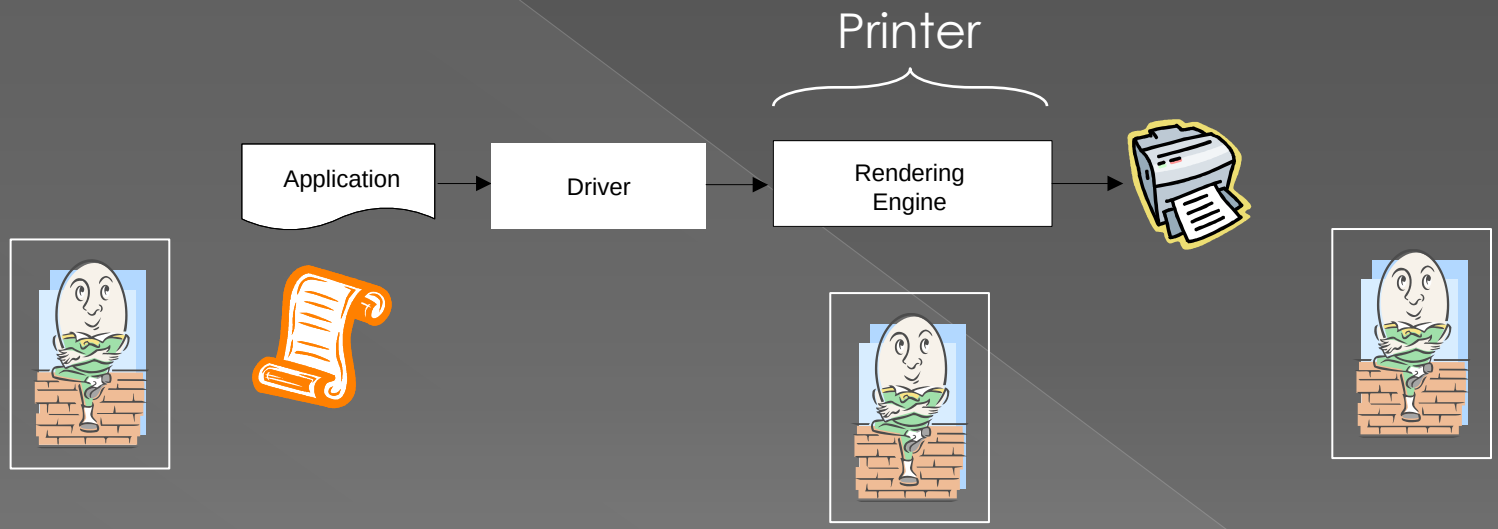
Host Based Rendering



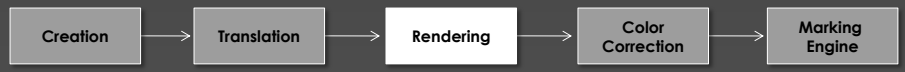
- Print job is sent to device as a single raster object (or multiple strips)
- Can take advantage of processor on the host (PC)
- Can result in larger print job file sizes for simple documents
- Example of such PDL - PCLm



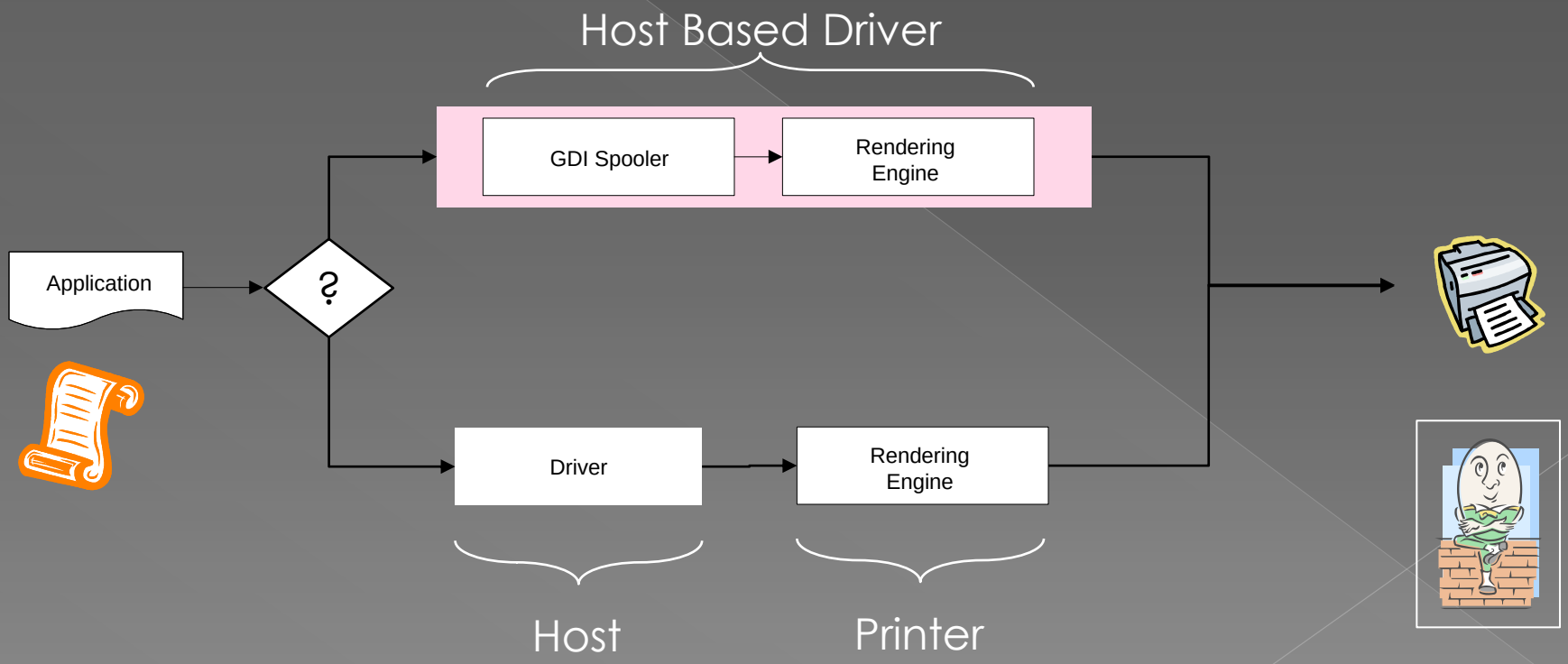
Device Based Rendering



- Print jobs are sent in their native PDL
- Embedded Firmware renders the page
- Color management happens on the device
- Example of such PDLs - PCL 6, PS



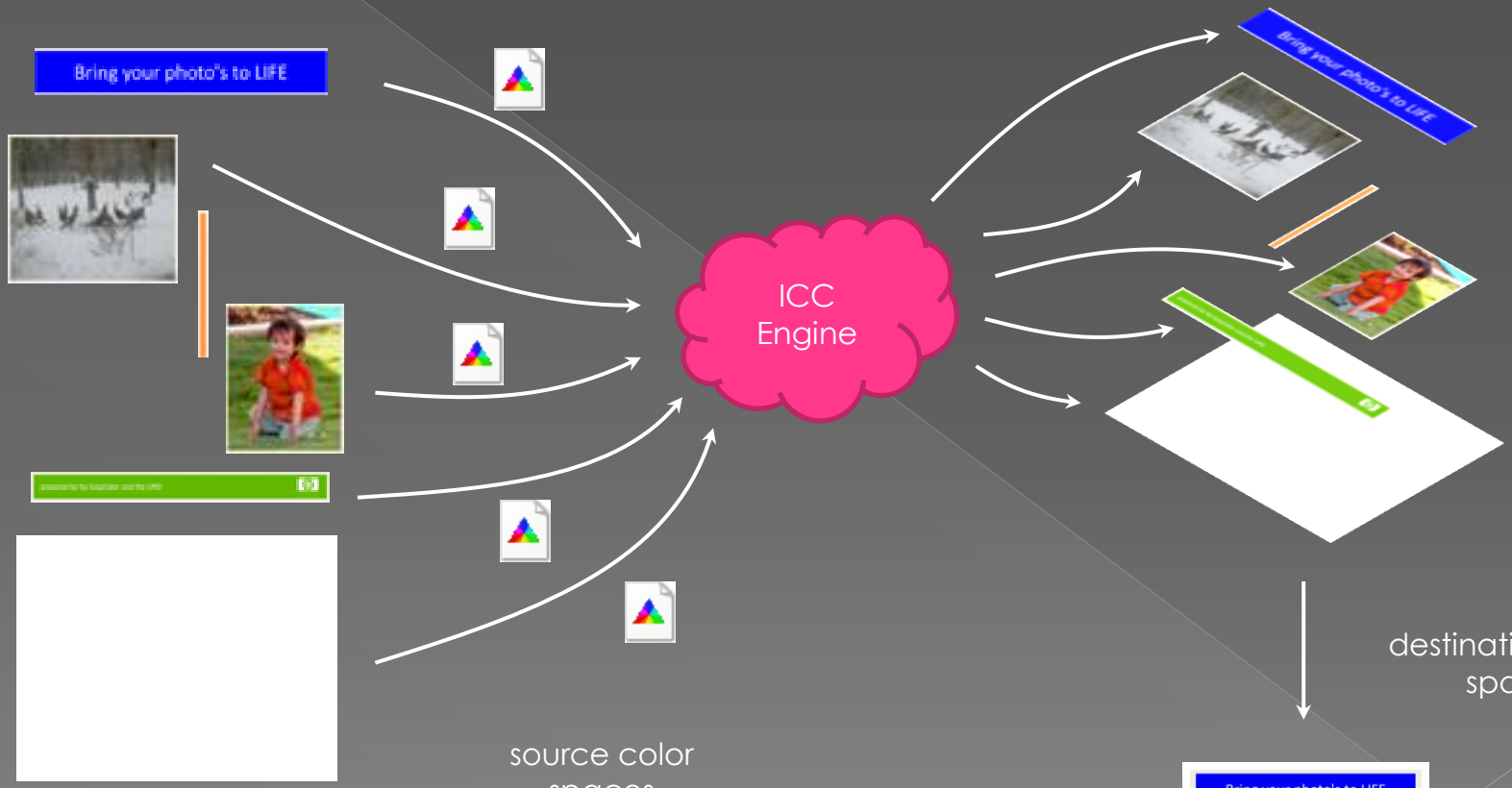
- Hybrid Rendering



Color Management

- Color Management has been prevalent for a number of years.
- There are multiple philosophies on how to “best” manage color – part engineering, part artistic preference
- Only a small number of applications support true ICC color management

Creation → Translation → Rendering → Color Correction → Marking Engine



source color spaces

sRGB, Adobe RGB, etc

destination color space

- Colors are transformed from the source space to the rendering space
- Rendering engines can use CIELab, XYZ, sRGB, colorimetric RGB or Device CMYK
- Color Conversion workflows are built to map the color transforms together

- Color Conversion Workflow

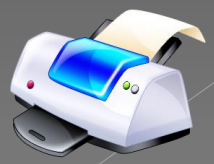
Device Color Model

Color Appearance Model

Gamut Mapping

Color Appearance Model

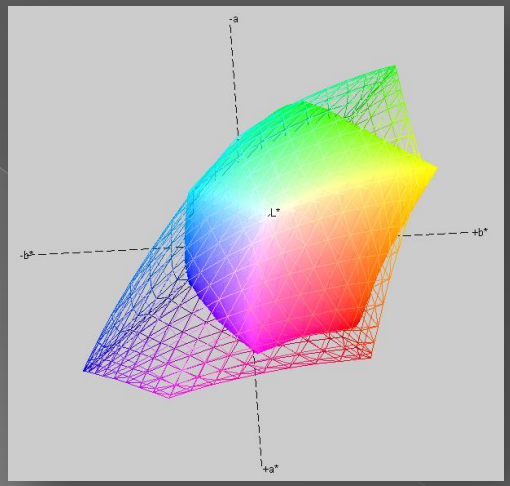
Device Color Model



Connection Space

CIELab, XYZ, sRGB, colorimetric RGB

- How does one map colors between devices?
  - First one must build colorimetric models of the source and destination devices
    - CMYK Devices
      - SWOP
      - DIC
      - EuroScale
    - RGB Devices
      - sRGB
      - Adobe RGB



  - The range of colors the device can create is called the "**Color Gamut**"
  - Then one must map all colors from the source gamut to the destination gamut