Large-Scale Single Pass Inkjet Printing: A Focus on Variable Data Software & High-Speed Datapath Electronics

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Contents

- **Introduction to GIS**
- **Single pass inkjet system evolution**
- **Single pass drivers**
- **Variable data**
  - Partial or fully variable applications
  - Challenges for RIP & workflow manufacturers
  - Content creation
- **Typical system architectures**
  - Getting data to the printheads – “feeding the beast”
- **Advanced printing techniques & configurations**
  - Options possible with GIS technology
- **Impact of variable data on production pipeline**
  - Upstream and downstream from print station

Global Inkjet Systems

- **Founded in 2006 – privately held**
- **Based in Cambridge, UK**
- **Leading developer of software and electronics for industrial inkjet printheads**
- **Wide industrial printhead capability**
  - Dimatix, Konica Minolta, Kyocera, Xaar etc.
- **Portfolio of products**
  - Uniti
  - Puriti
- **Global coverage**
  - GIS products are running on single pass and scanning systems in Asia, Europe, Africa & the Americas
- **Proven in production over several years**
  - Systems in field driving over 100 printheads

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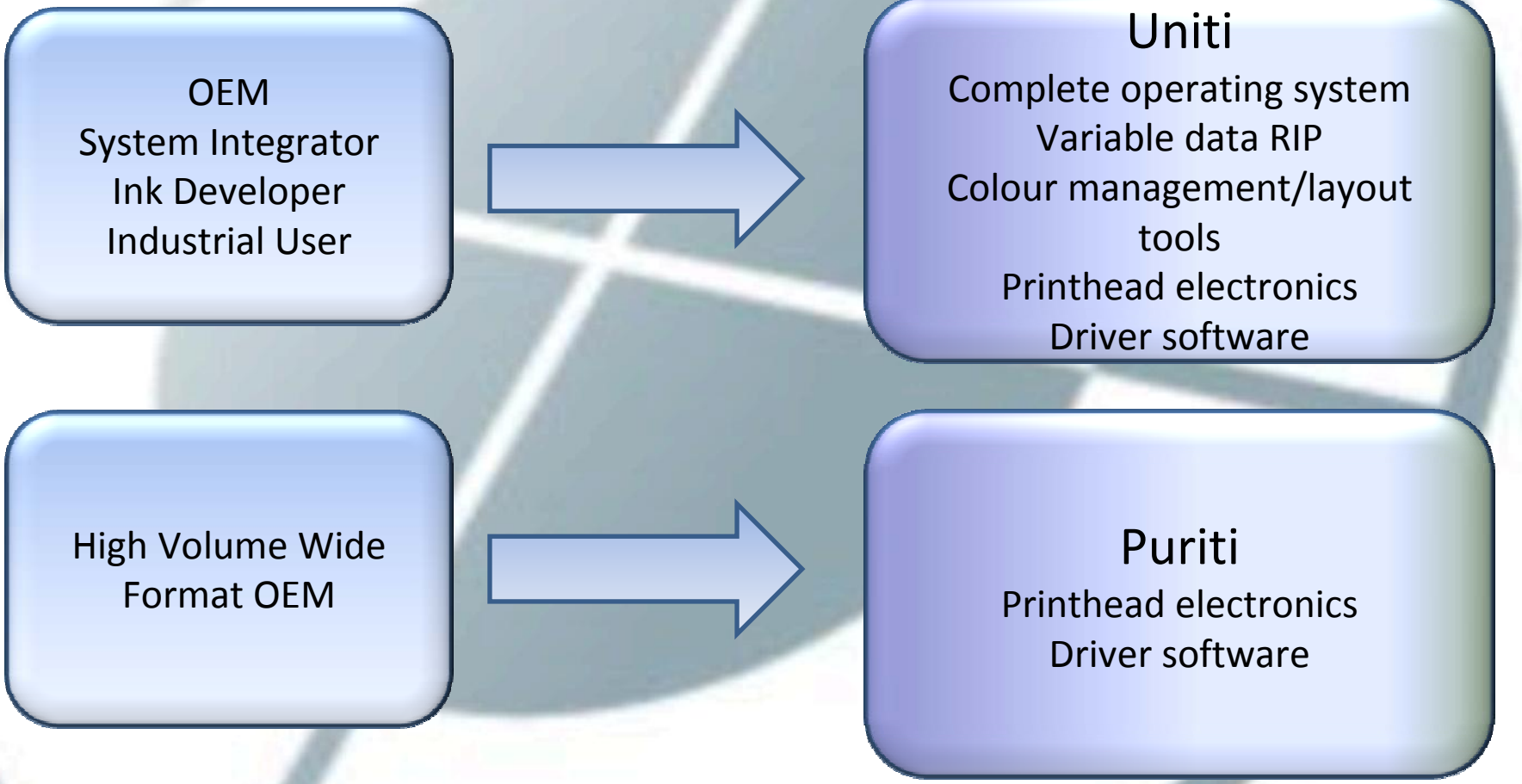
GIS Product Portfolio



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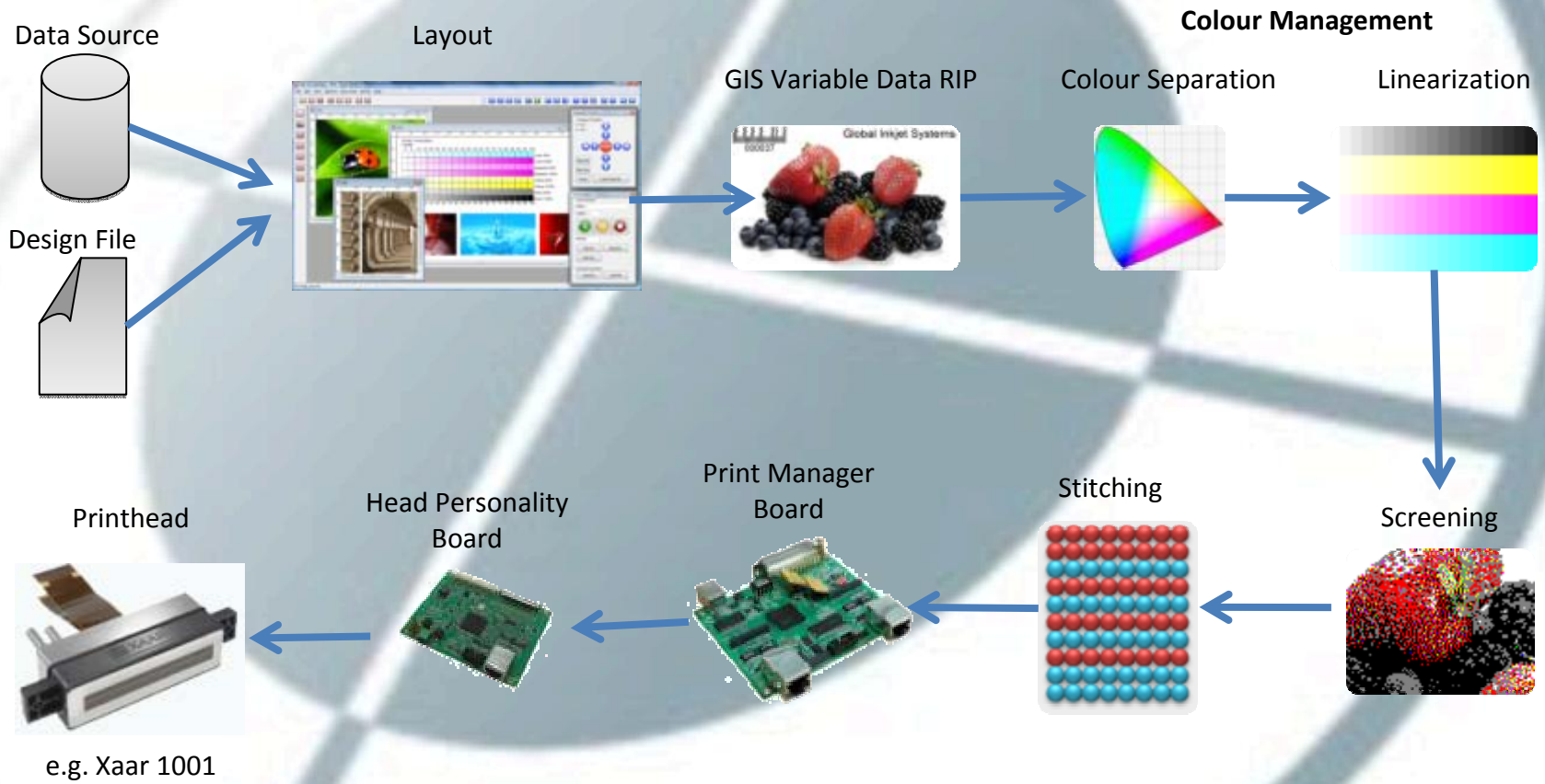
GIS Uniti



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GIS Puriti

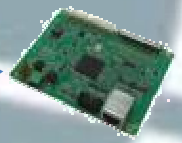
OEM 's datapath
3rd party RIP,
content creation,
colour management,
multipass strategies

API

Windows
DLL

Print Manager
Board

Head Personality
Board



Printhead

e.g. Xaar 1001

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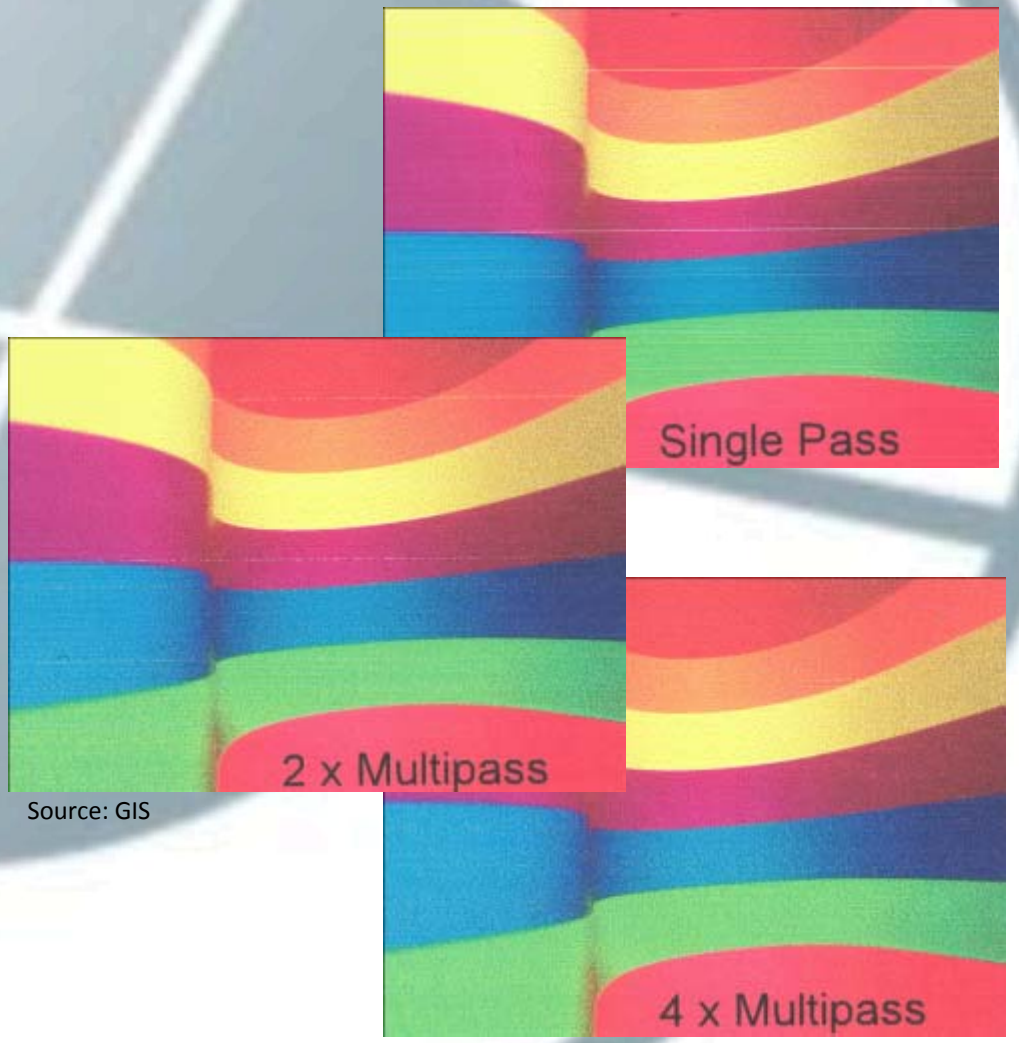
Scanning vs. Single Pass

- **Scanning**
  - Safe and reliable
  - Errors recoverable
  - Lower productivity
- **Single pass**
  - No room for error
  - Defects highly visible
  - High productivity



Source: GIS

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Single Pass System Evolution

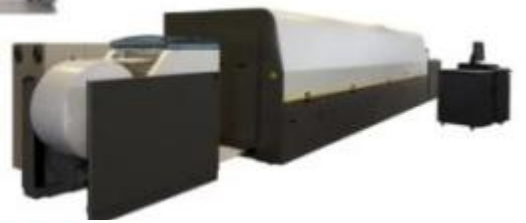
Fujifilm Jetpress 720
28” x 20” wide
180 sheets/min

Inca FastJet demo
52cm wide
200x300dpi
1.6m/sec

Nilpeter/FFEI Caslon
310-420mm wide
greyscale

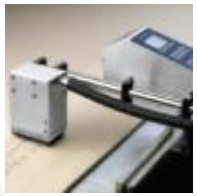
Ferro Kerajet
35cm wide
180dpi

Kodak Prosper
2 up wide 200m/min
175lpi



Kerajet K700/720
1m -1.26m wide

Mono
Low res
Variable data



Dotrix Dot Factory
High res/greyscale
Up to 63cm wide (now)

Miyakoshi MJP600
50cm wide
120 heads

Jetrion, CSAT, Durst, Atlantic Zeiser, IIJ, PPSI, Domino.....

Long established single pass systems | **DRUPA 2000** | **DRUPA 2004** | **DRUPA 2008/Label Expo 2009/ IPEX 2010/ Tecnargilla2010**

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Single Pass – Commercial Drivers

- **Opens up new applications not possible or viable with scanning systems**
- **Higher volume throughput - matched to production requirements**
- **Capable of running in-line with analogue presses**
  - Modular approach
  - Incorporate advantages of analogue technologies with digital – e.g. flexo pre-coat/varnish stations; post-print finishing/processing

Edale/Agfa - Dotrix

Nilpeter/FFEI - Caslon

Omet/Beijing Founder - X-Jet

PPSI - DICE

Atlantic Zeiser - Gamma/Omega series

Industrial Inkjet – Colourprint series

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Single Pass – Commercial Drivers

- **Single system vs. multiple smaller systems**
  - Potentially fewer operators
- **Inkjet perceived as more reliable now**
  - Moved from prototypes to full commercialization
  - Market has benefited from the single pass pioneers
- **Printheads – larger; higher speed; built-in alignment features; recirculating ink; long life & reliability**

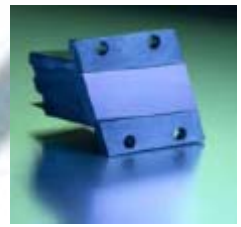
Xaar 1001

Kyocera KJ4

HP-SPT

Panasonic modules

Fujifilm Samba



T-Tec CF1

Dimatix Q-Class

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Single Pass - Applications

Examples of output systems

Screen Truepress

Short run cut sheet

Impika I-Print

Transpromo

Books

Examples of printed output

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Single Pass - Applications

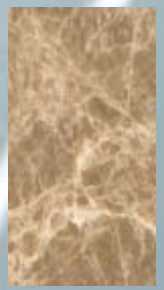
Sun FastJet

Corrugated - sheets

ITW Trans Tech InDecs

Product decoration

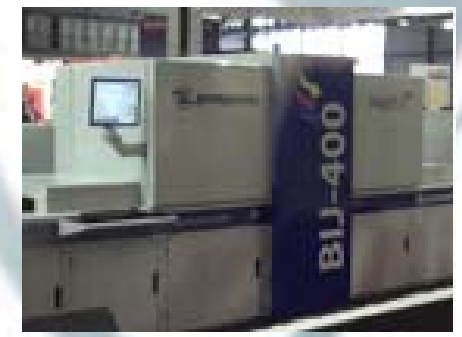
Kerajet K700



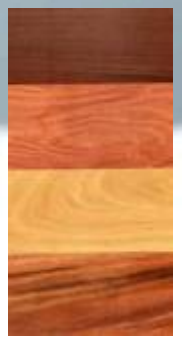
Tiles

Domino N600

Labels



Barberan BIJ 400



Boards

Agfa Dotrix

Flexible packaging

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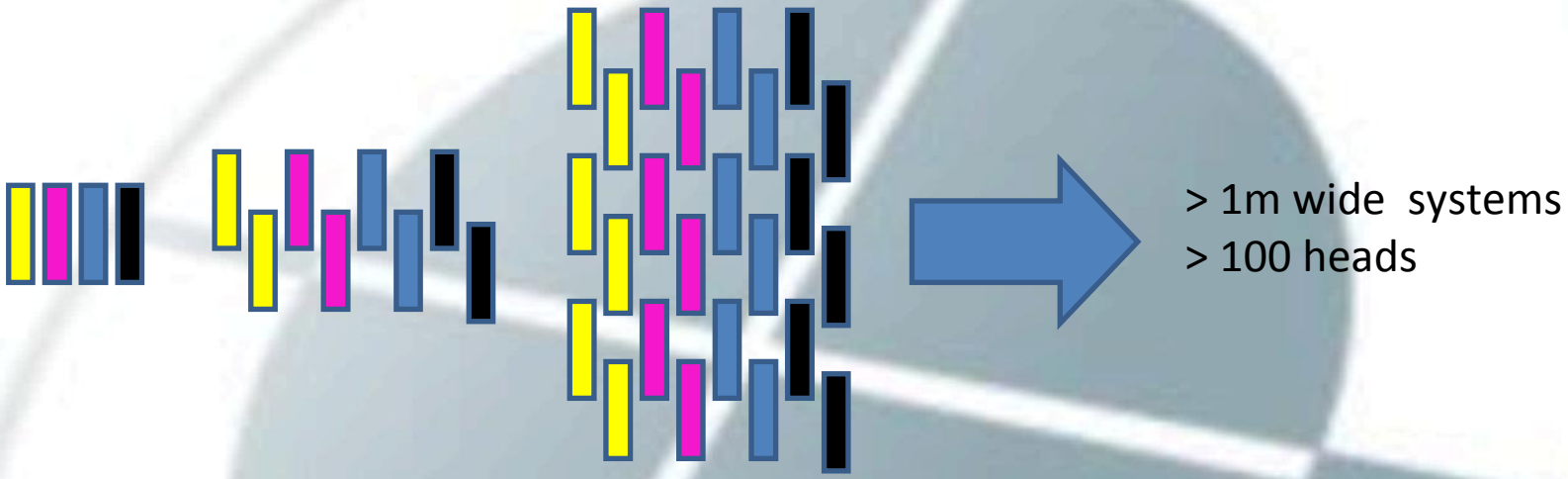
Printheads and Nozzles



System	# Heads	Total Nozzles*	Print Width	Printheads
FUJIFILM Jetpress 720	52 (CMYK) + BA	106,496	520mm (20.4”)	Samba 14 modules per print bar
Océ JetStream (per engine)	40 (CMYK)	106,240	515mm (20.3”)	Kyocera KJ4
System Ceramics Rotodigit-NG	44 to 66 (4 - 6 colour)	22,528 (4 colour)	712mm	Dimatix Sapphire
Cretaprint Cretaprinter	48 to 128 (3 - 8 colour)	64,064 (4 colour)	1.12m	Xaar 1001

* Does not take into account nozzle redundancy

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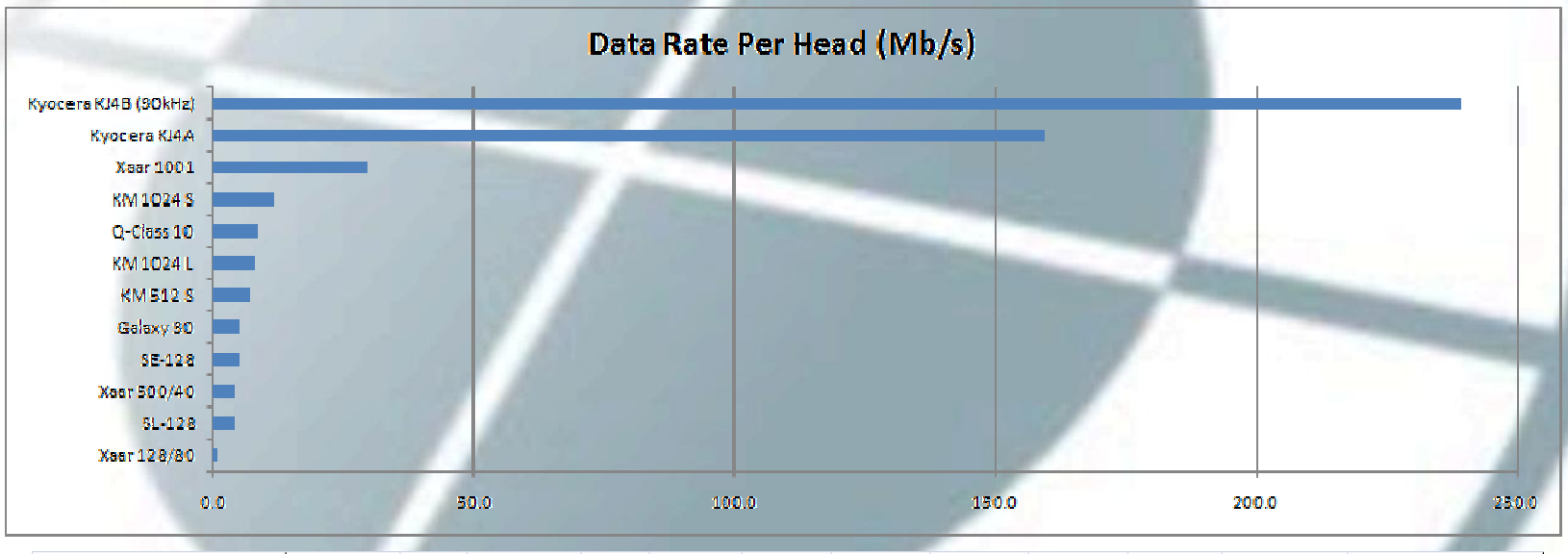
Industrial Inkjet Printhead Data Rates

- Printhead data rates have increased over 100 times over the last 15 years
- Colour/Resolution/Speed/Variable Data/ # of Heads



Features	Xaar 128/80	SL-128	Xaar 500/40	SE-128	Galaxy 30	KM 512 S	KM 1024 L	Q-Class 10	KM 1024 S	Xaar 1001	Kyocera KJ4A	Kyocera KJ4B (30kHz)
Nozzles	128	128	500	128	256	512	1024	256	1024	1000	2656	2656
Grey Levels (non-zero)	1	1	1	1	1	3	1	3	7	7	4	4
Bits per nozzle	1	1	1	1	1	2	1	2	3	4	3	3
Sub-drop freq (kHz)	5	30	8	40	20	20	7.6	50	26	50	20	30
Native Resolution (dpi)	185	50	180	50	100	360	360	100	360	360	600	600
Head Height (mm)	17.4	64.5	70.4	64.5	64.8	36.1	72.2	64.8	72.2	70.5	108.2	108.2
Data Rate Per Nozzle (kb/s)	5.0	30.0	8.2	40.0	20.0	13.3	7.6	33.3	11.1	29.3	60.0	90.0
Data Rate Per Head (Mb/s)	0.6	3.8	4.1	5.1	5.1	6.8	7.8	8.5	11.4	29.3	159.4	239.0

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Increasing Demands on Print Data

- The demands for print data have increased steadily over last 15 years
- Application Drivers / Quality Improvements
  - **Monochrome vs. Colour** : Process colour requires at least 4 times the amount of data of monochrome
  - **Resolution and Greyscale**: Increasing resolution and moving to greyscale all require more data per square mm
  - **Static vs. Variable Data**
    - **Static**: All print data can be downloaded to print electronics before printing
    - **Partially Variable**: Similar to static data but a small section is downloaded on each print
    - **Fully Variable**: New print data needs to be downloaded every time at the speed it is consumed by the printheads

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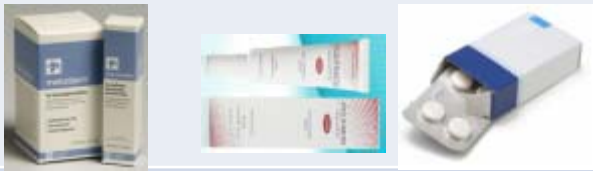
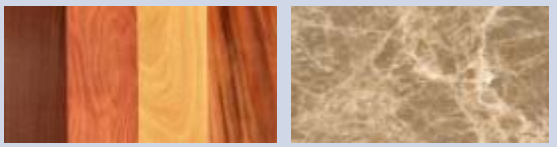
Variable Data Applications

Application Example	Requirements	Example
Tracking	**Data Path** Partially variable **RIP** Real-time **Text/Barcode** Fully variable **Images** Pre-cached	
Late Stage Product Customisation	**Data Path** Partially variable **RIP** Offline **Text/Barcode** Static/fully variable **Images** Pre-cached/fully variable	
Number Plate Printing	**Data Path** Fully variable **RIP** Real-time **Text/Barcode** Fully variable **Images** Pre-cached	
ID Card/Passport Printing	**Data Path** Fully variable **RIP** Real-time **Text/Barcode** Fully variable **Images** Fully variable	
Natural Material Printing	**Data Path** Fully variable **RIP** Offline **Text/Barcode** N/A **Images** Pre-cached	

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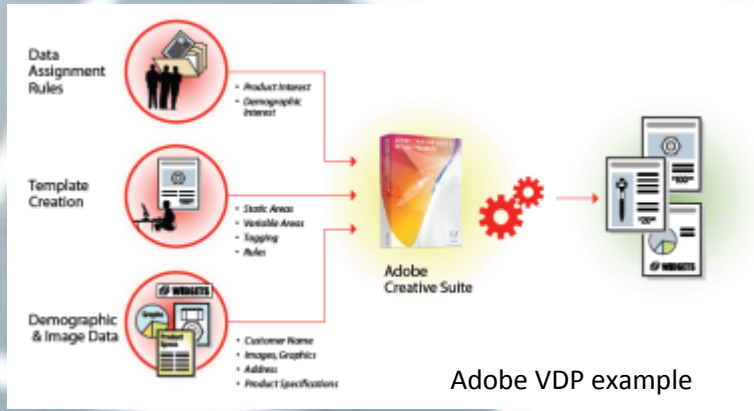
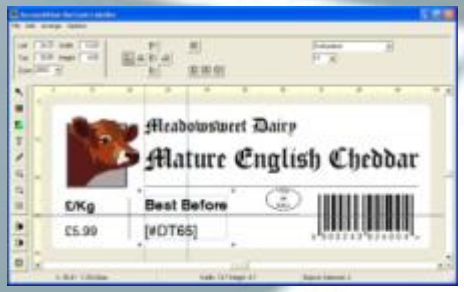
Content Creation and Management

- **Existing technologies**
  - Adobe PDF, JDF and VDP
    - Workflow management
  - Custom Application Tools
    - Label Design Software
    - CD Design Software
    - GIS Layout tool etc
- **Is "Adobe Inside" right for all?**
  - Appears to be the trend
  - All but niche players could adopt PDF/JDF and move away from TIF/BMP etc.



Adobe VDP example



Label & CD design Software examples

GIS Layout tool

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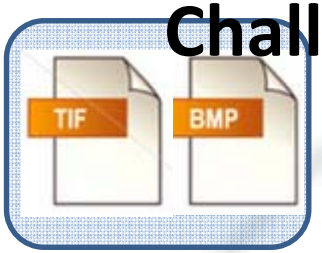
Challenges for RIP and Workflow Manufacturers

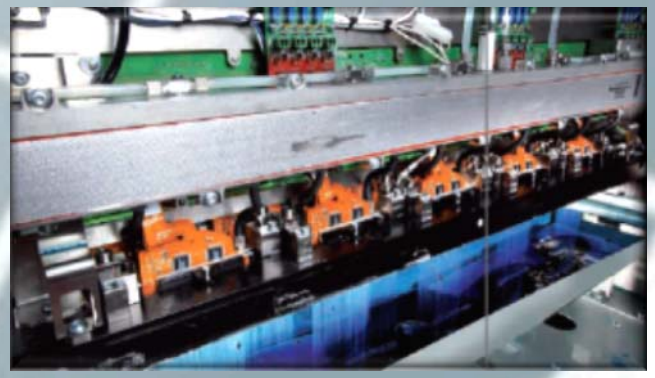


Job 11712

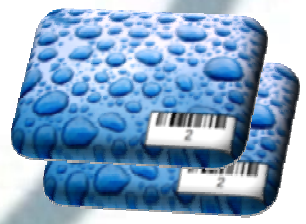
Job 11713

Job 11714

Job 11715



Single pass inkjet press



Graphics Designers	Jobs	Partially Variable Print Engine	Partially Variable Output

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Challenges for RIP and Workflow Manufacturers

Job 11712

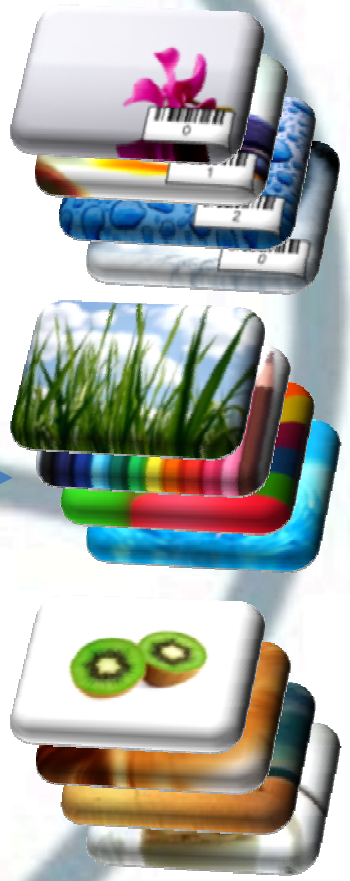
Job 11713

Job 11714

Job 11715

Fully variable print applications require vast amounts of data and artwork

Single pass inkjet press



Graphics Designers	Jobs	Fully Variable Print Engine	Fully Variable Output

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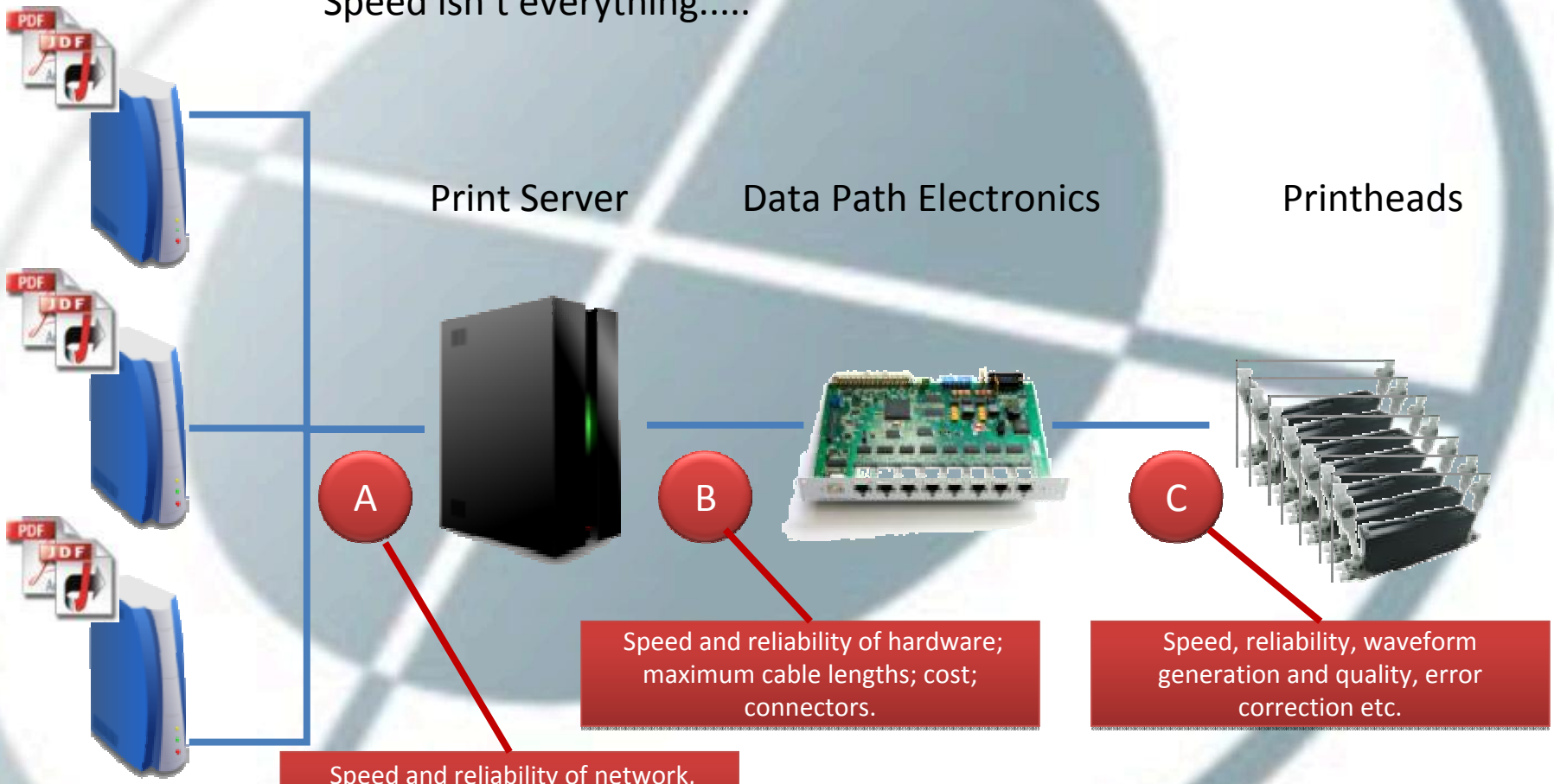
Getting Data to the Printheads

Speed isn't everything.....



...reliability, cost etc. also factors

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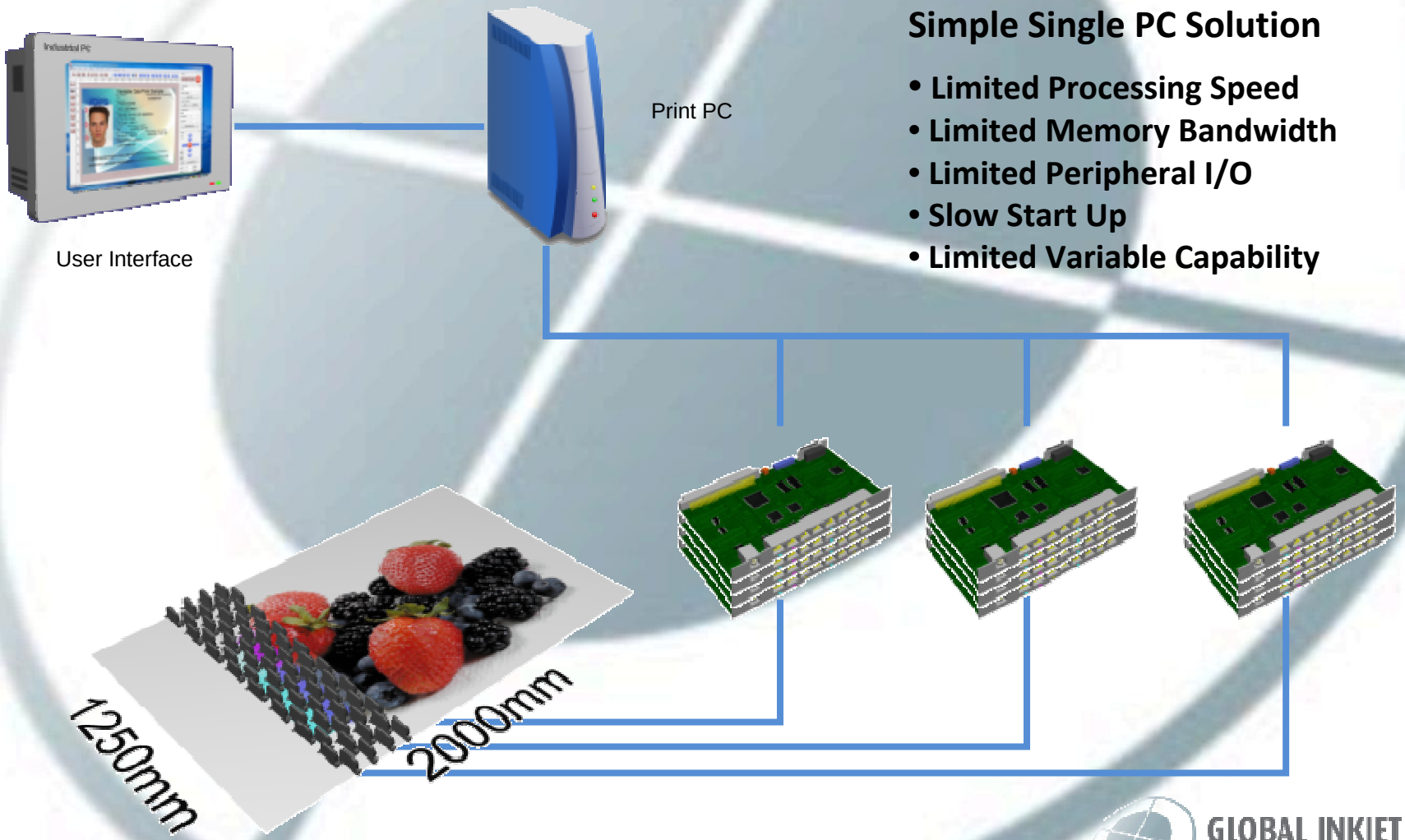
Large Single Pass System
Single PC Architecture Example



Simple Single PC Solution

- Limited Processing Speed
- Limited Memory Bandwidth
- Limited Peripheral I/O
- Slow Start Up
- Limited Variable Capability

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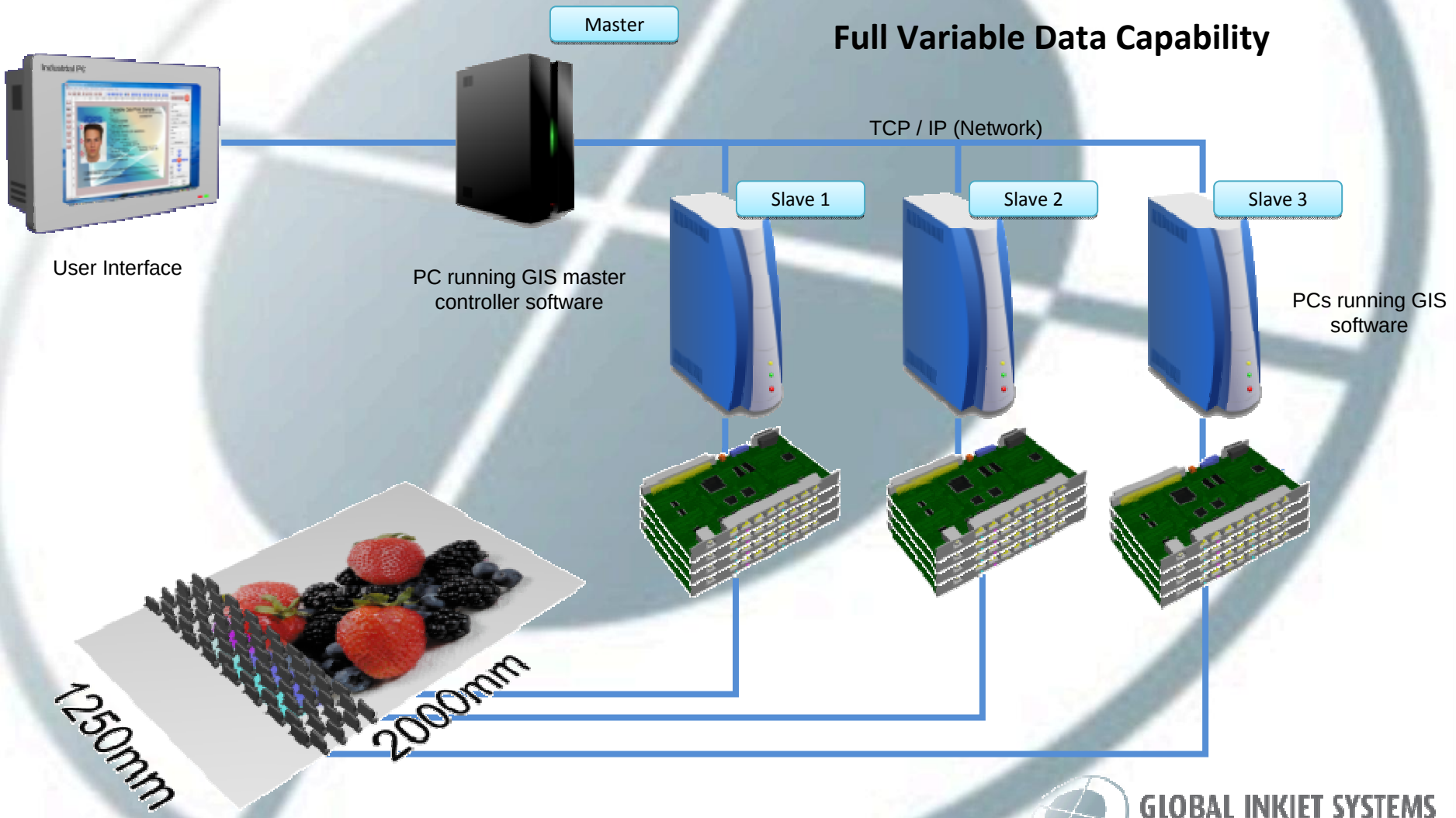
Large Single Pass System
Multi-PC Architecture Example



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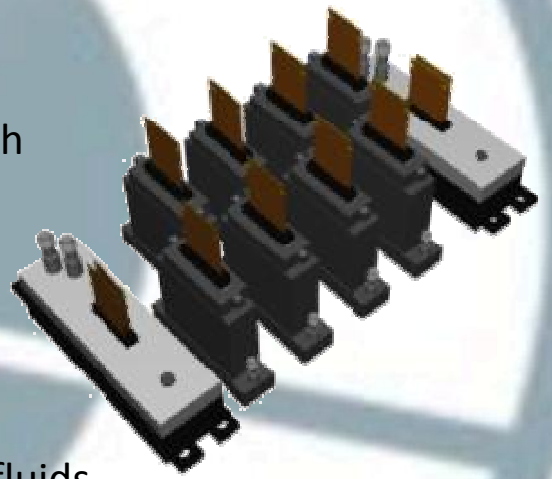
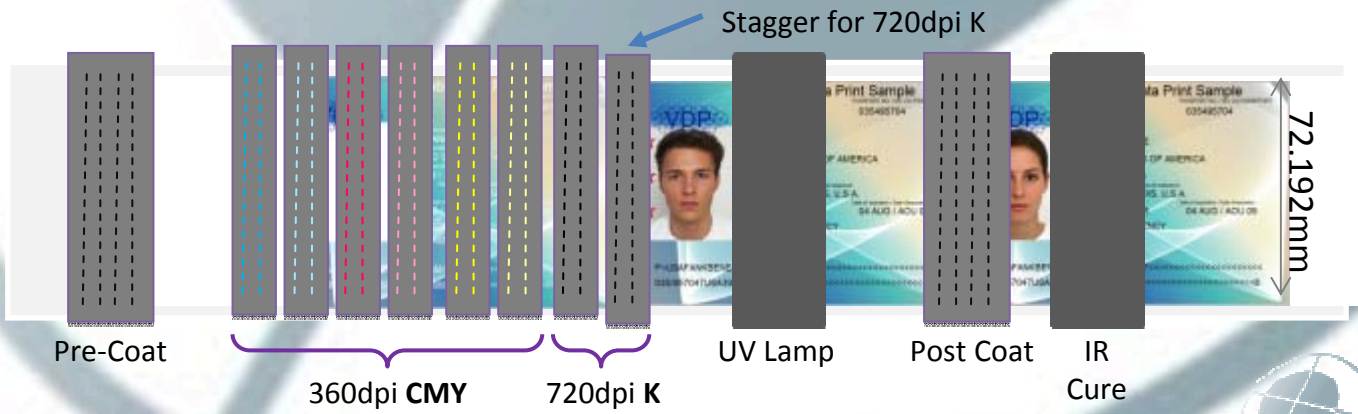
Advanced System Configurations

- **Further complexity**

- **Mixed technology printheads**
  - One technology of printhead for precoat or post-varnish
    - Large drop volume
  - Second technology of printhead for image
    - Small/greyscale drops



- **Mixed printhead resolutions**
  - Single printhead technology – running bars or colours/fluids of printheads at different resolutions
  - E.g. Precoat or varnish in binary mode; image in greyscale



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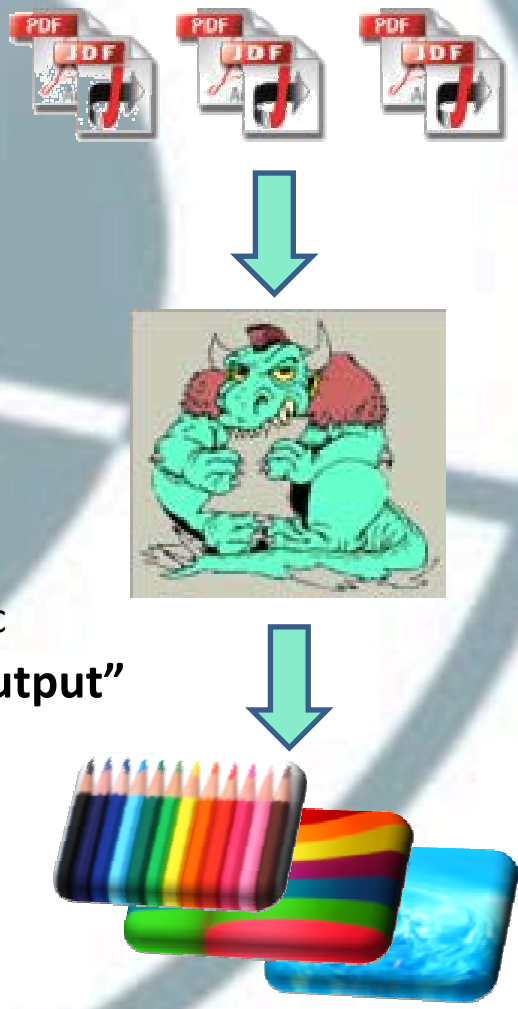
Impact of Variable Data on Production Pipeline

- **Upstream from print station - “feeding the beast”**
  - Variable data management
  - Job change management
  - More complex workflow
  - More content designers
  - Must be in production 24/7
  - Cost model and benefits
    - Is the demand really there?
  - Customer education
    - Capabilities of variable data printing – training etc
- **Downstream from print station - “processing the output”**
  - Flexible interleaved production runs
    - Short and long runs
  - Post-print processing
  - Customer education on capabilities
  - Consumer education



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Summary

- **Single pass systems growing in width/numbers of printheads/speed**
  - 100's printheads; > 1m wide
- **More applications demanding fully variable data**
  - Where will variable really make money?
- **Will the future become dominated by "Adobe Inside"?**
- **Much should become clearer by Drupa 2012**

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Thank You – Any Questions?

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PS. Look out for our new web site – coming soon!

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