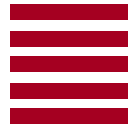


The Technology Partnership

**Europe's leader in
digital printing technology services**

**The home of Meteor
- printhead driver electronics and data path**





TTP Background

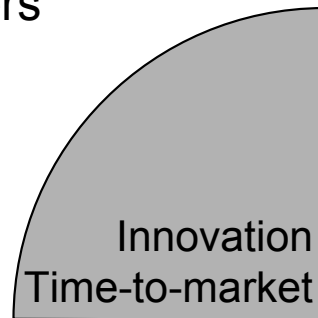
- Founded in 1987, TTP has grown to become Europe's leading independent technology and product development company.
- Near Cambridge (UK) TTP employs a staff of over 200 engineers and scientists. Many hundreds more work in technology businesses incubated and spun off by TTP.
- TTP services the following industries:
 - Printing (30%)
 - Communications (20%)
 - Consumer products (20%)
 - Medical and healthcare (20%)
 - Industrial and automotive (10%)



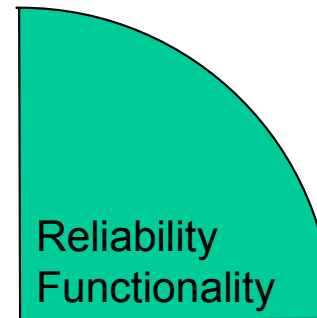


TTP and Inkjet

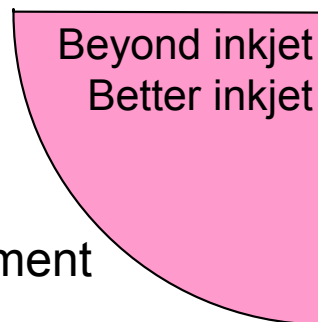
- Development services to design new printers or improve existing products.



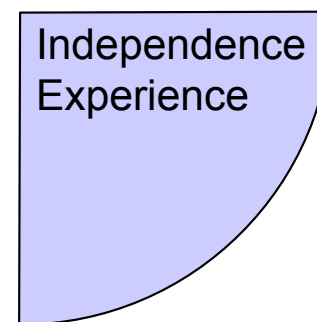
- Inkjet component design and supply



- Novel print technology development



- Consulting and bespoke system integration



tonejet

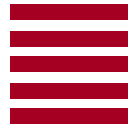
Vista



TTP case study: inkjet printer for postage franking

- Neopost IJ25
- TTP activity:
 - Printhead and manufacturer selection
 - System design and project planning
 - Detail design for mechanics, electronics, and print engine firmware
 - Prototype assembly and testing
 - Production transfer
 - Production support



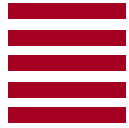


TTP case study : cost reduction of an inkjet printer

- Stork AX4 / Du Pont Cromalin

- TTP Activity
 - Initial analysis of cost reduction opportunity
 - Detailed study into cost reduction options from new architecture, detail design changes, and suppliers
 - Assistance in implementation of design changes
 - Redesign of sub-systems





TTP case studies: inkjet system integration

■ Printed Electronics Development

- Used for testing a wide range of functional inks, resolutions and curing methods
- Suitable for full-size (18"x24") PCB format



■ Inkjet Ink Development

- Used for testing UV-cured inks
- 2 colours; 2 variable-power UV lamps; Spectra and Xaar printhead modules
- Wet-on-wet or wet-on dry printing





TTP case studies: design of inkjet components

- Header tanks, ink supply controllers (e.g. Xaar's ink supply peripherals)
- Proprietary data path systems (e.g. Xaar's "XPCI")
- "Meteor" - a universal software and electronics platform for all printhead types





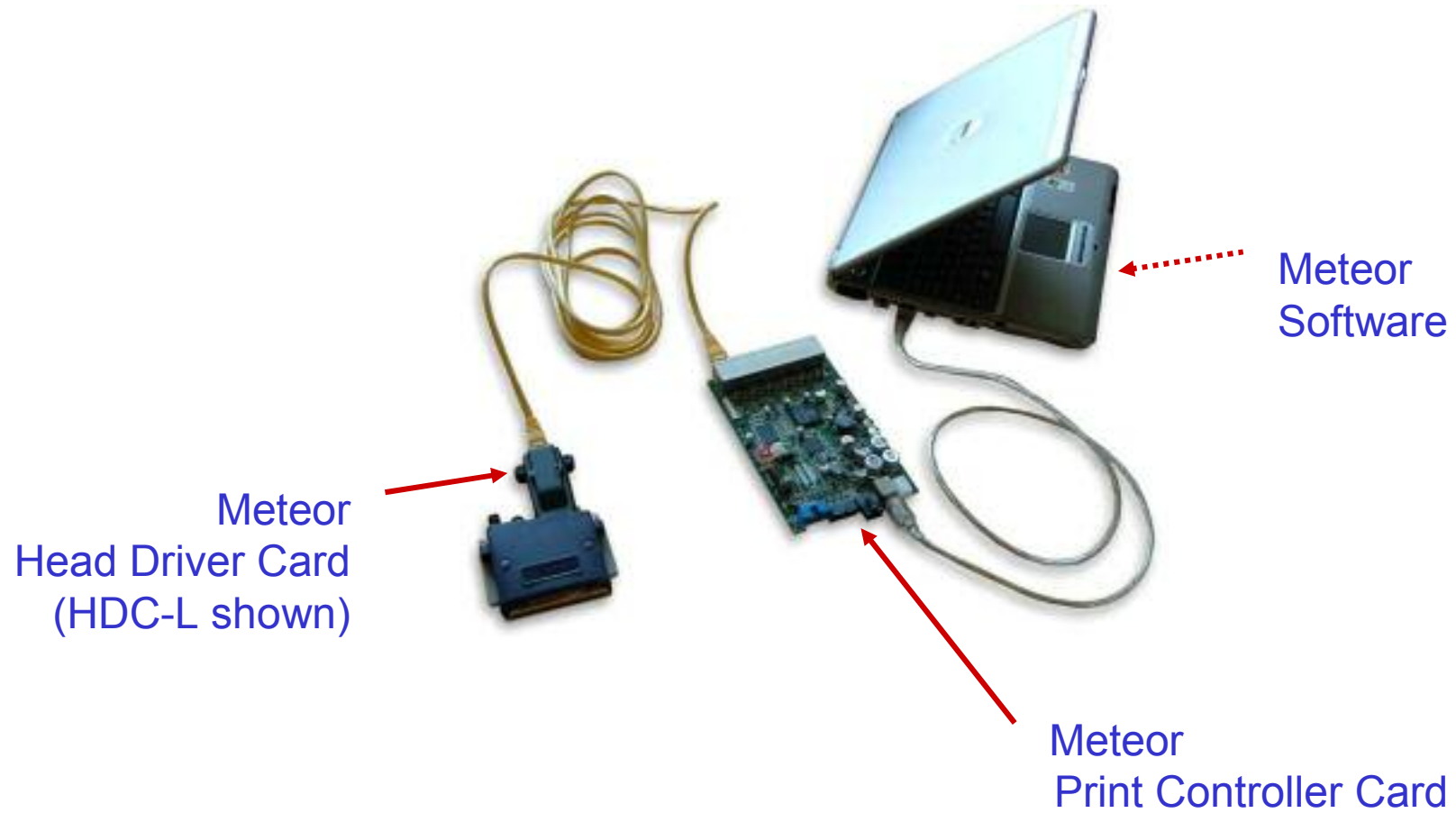
Meteor Universal Print Controller

- Suitable for any printhead type and for any industrial inkjet printer
 - single pass and scanning systems
 - from 1 to 100+ printheads per system
 - binary printheads and greyscale printheads





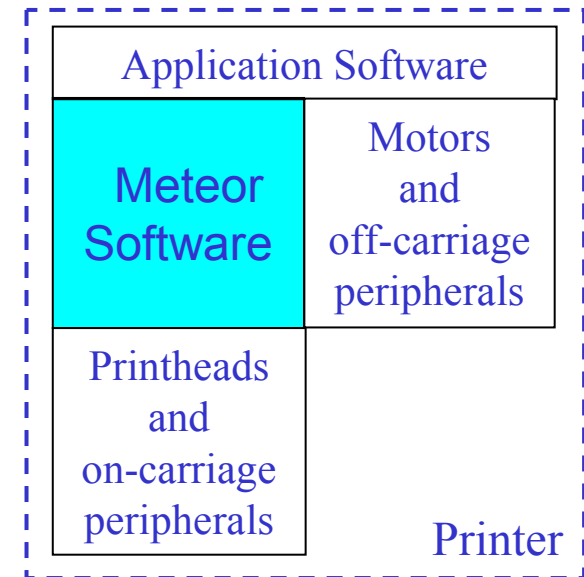
Meteor Components





Meteor Software

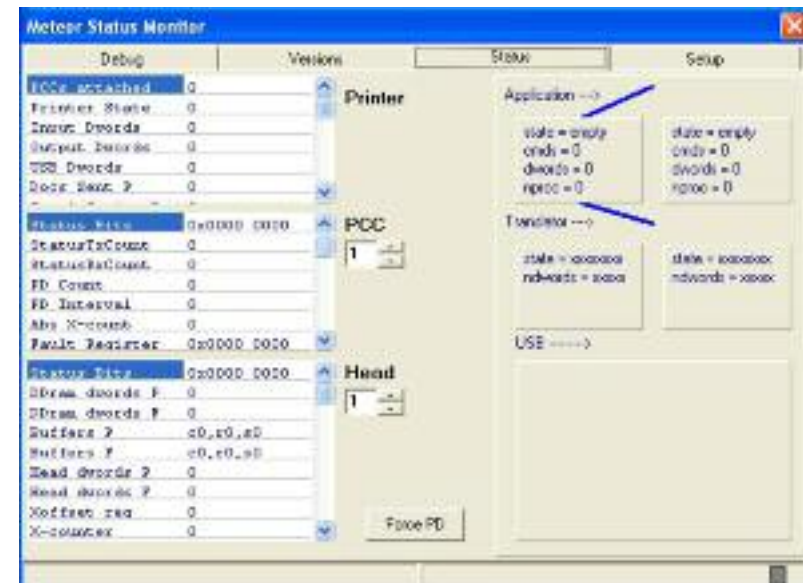
- Controls the configuration of printheads and controls peripheral I/O
- Splits print data into streams of data for each printhead
- Buffers print data
- Synchronises large arrays of printheads
- Handles repeated fixed images and variable images and overlays of variable data onto fixed background images
- Handles encoder signals and home/product detect signals
- Tested to extremely high data rates (for very large printers and print systems)





Meteor Software (continued)

- Microsoft Windows® DLL
- Clearly-defined API
- Demo application source code
- Support by TTP software development engineers





Meteor Print Controller Card

- The Print Controller Card (PCC) is a USB2.0 data path module designed to be used with any type of printhead
- Each PCC has 6 outputs, each configurable for driving a printhead or a group of small printheads
- The PCC is Eurocard in size (160mm x 100mm) and can be used alone or in standard Eurocard racks





Meteor Print Controller Card (continued)

- The PCCs can be placed up to 25m from a PC and up to 10m from printheads using standard USB cables, USB hubs and Ethernet cables
- Each PCC has 8MBytes of memory to store fixed data and/or buffer variable print data for each printhead
- Each PCC has user-configurable I/O
- One PCC in each system is the 'master' handling the encoder and product detect signals and synchronising the other PCCs





Meteor Head Driver Card

- All brands and types of printhead are made compatible by the use of an appropriate Meteor Head Driver Card (HDC)
- Each HDC receives all its power and data from an Ethernet cable attached to one of six outputs on a PCC
- Each HDC contains all printhead-specific electronics necessary
- Each HDC also has user-configurable I/O for control of peripherals (sensors, header tanks, UV lamps, heaters etc)
- The size and cost of each HDC depends on the printhead type it supports
- Different printhead HDC variants are being developed and supplied as customer orders are received by TTP



Meteor Head Driver Card example: HDC-S

- The HDC-S supports:
 - Fuji Dimatix Spectra Galaxy
 - Fuji Dimatix Spectra Nova
 - 2 x Fuji Dimatix Spectra S-class: SL-128, SM-128, SE-128
- Two thermistor inputs for monitoring jetting assembly temperatures
- Ethernet cabling is used
 - >10m long
 - Low cost standard cable
 - Flexible (tight bend radius)
- Unallocated I/O available for control of peripherals

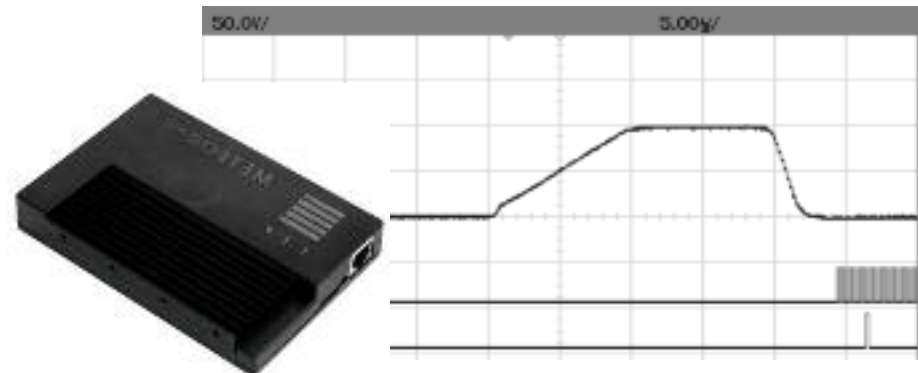




Meteor Head Driver Card example: HDC-S (continued)

- The HDC-S provides data for binary firing at up to 40kHz on all printhead types
- The HDC-S creates a digitally-defined pulse shape for each 64-nozzle piezo crystal within each printhead. This enables:
 - Calibration of manufacturing tolerances between piezo crystals and between printheads
 - Optimisation of drop formation for different inks and conditions

- Entered mass production: Q2 07
Hundreds sold





Meteor Head Driver Card example: HDC-L

- The HDC-L supports:

- Xaar Leopard / OM318
- Toshiba Tec CA3, CA4, CE2*



- Unlimited access to printhead capabilities:

- Greyscale 7-drop, 15-drop, or as configured
- 4.8kHz, 6.2kHz or as configured





Meteor Head Driver Card example: HDC-L (continued)

- Ethernet cabling
 - >10m long
 - Low cost standard cable
 - Flexible (tight bend radius)
- Unallocated I/O for peripheral control
- Entered mass production: Q1 07
Hundreds sold



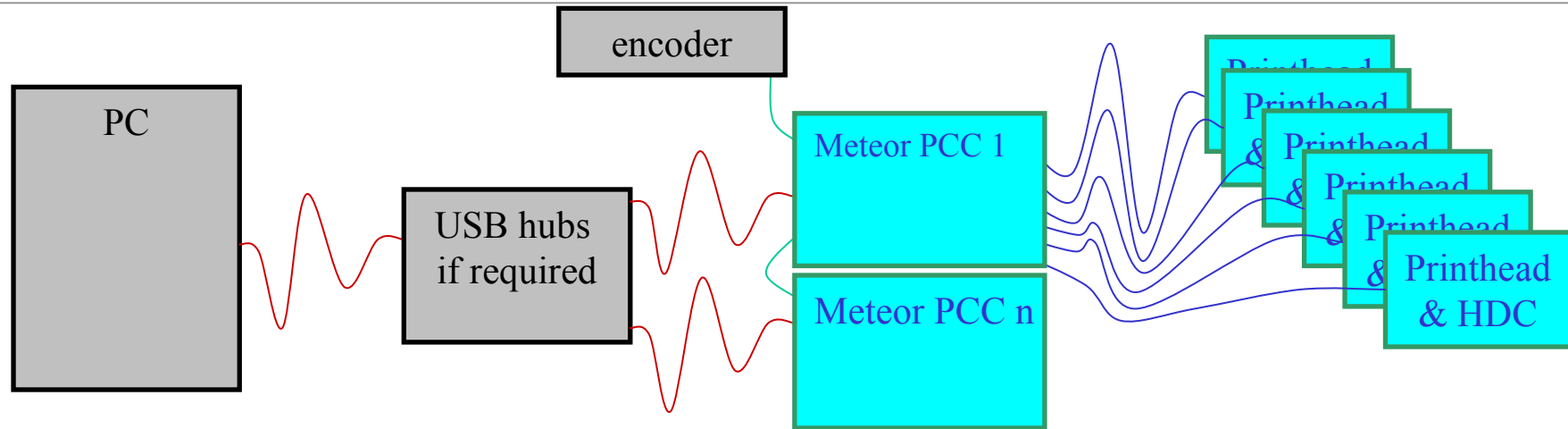


Meteor Head Driver Cards * new for 2008 *

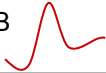

- any head driver card/license available upon application
- several in development for 2008 including Xaar 1001 and VersaDrop™ Dimatix head types
- look out for press releases



Meteor system configuration



- n Meteor PCCs support 6n printheads or 6n groups of small printheads / jetting assemblies
- peripheral pumps, motors and sensors can be controlled via I/O available on each Meteor PCC and HDC

Cable type	Signal type	Max length
USB 	USB2	5x5m (82')
Ethernet Cat 5 	LVDS	>10m (>30')



Meteor data rates

Meteor buffers 8* MegaBytes of image data per head (*increasing in 2008)
thus peak data rates are easily achieved.

Meteor sustained data rate availability:

- 50 MBytes/sec sustained rate to an array of PCCs using USB hubs
- >60 MBytes/sec sustained rate when using multiple USB host controllers

Typical printer requirement:

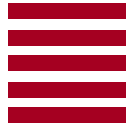
- 15 MBytes/sec sustained data rate for 2000 sfph, 600 dpi, 4 colour



Meteor commercial offering

- Meteor components are available from TTP:
 - Integration support and software license
 - PCCs
 - HDCs for your printhead types
 - Evaluation kits including printhead supplier components

- TTP development services for OEMs inclusive of Meteor technology license
 - Digital shaping, multi-pulse drive circuits for Dimatix / Ricoh etc



Summary



TTP is:

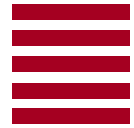
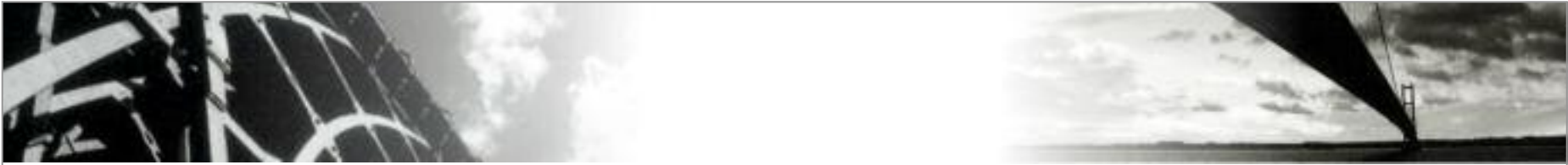
- 300-strong technology services group based in Cambridge, UK
- 20-year experience of contract R&D working across many industries
- Engineering services available across all types of inkjet product development from small to large



Meteor is:

- A commercially-available universal printhead control system for all your printer / print system needs





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