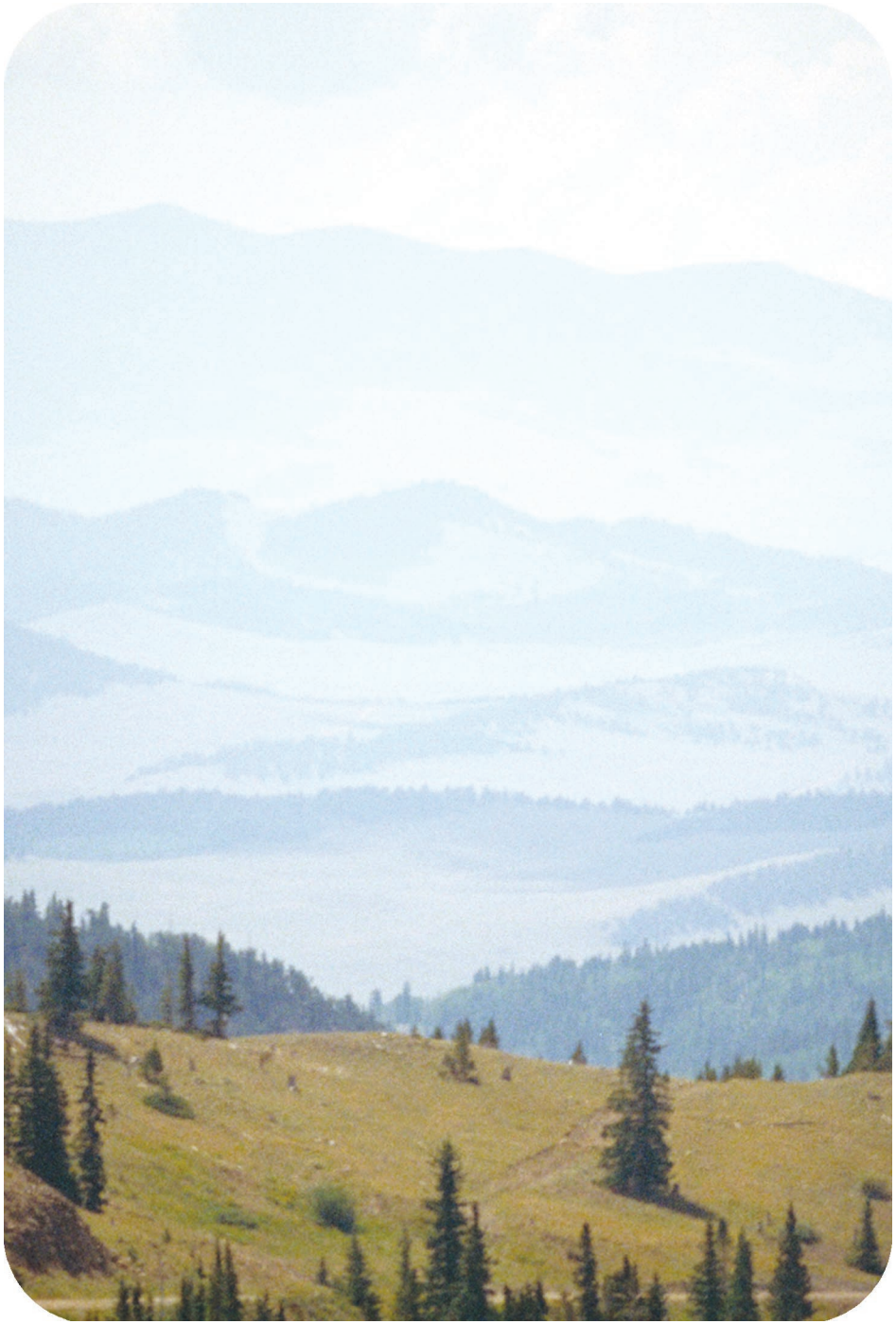

InterWorks 2001
HP Technical Conference

May 6-9, 2001

HP-UX Workstation Console Extension

Bob Niland
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Fort Collins CO 80528-9599

Audience

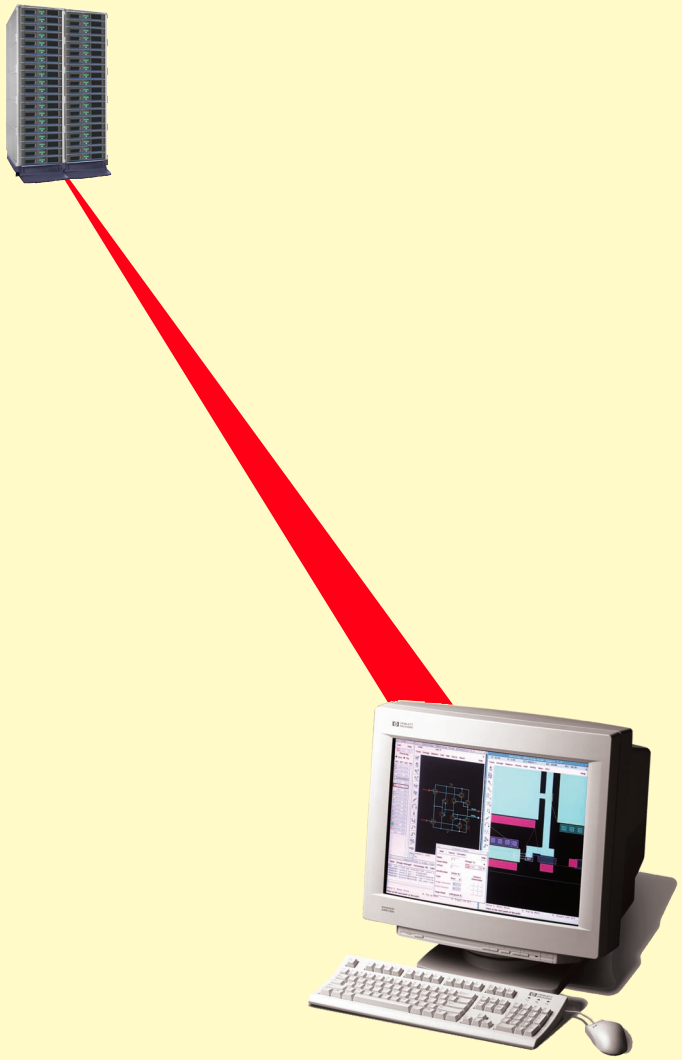
Systems analysts, planners, administrators willing to learn about the technical issues involved with extending graphics video, keyboards, mice and related ports.

Benefits of Console Extension

- Physical security of processor and storage devices
- Free-up floor space at desired console location
- Keep thermal load/noise of clusters away from people spaces
- Manage multiple systems from anywhere

Contents

bob_niland@hp.com
TCD Fort Collins



Problem Statement

hp Unix workstation console cable lengths:

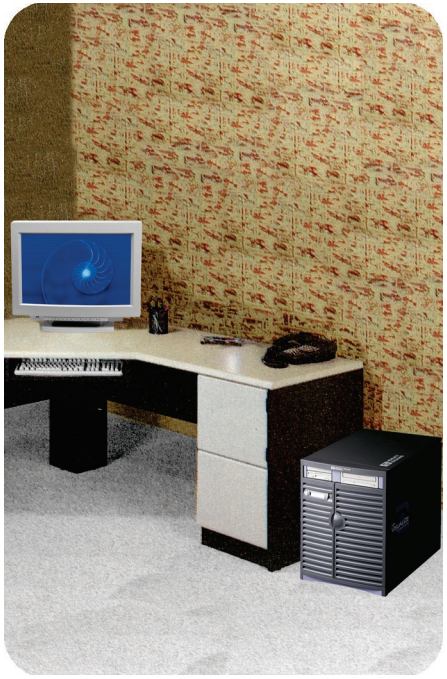
- Keyboard & mouse cables: 2.9m (9 feet)
- Monitor cable: 1.8m (6 feet)

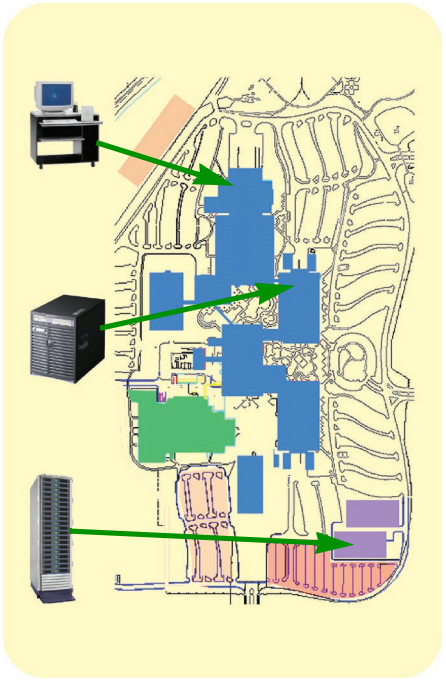
This is sometimes too short.

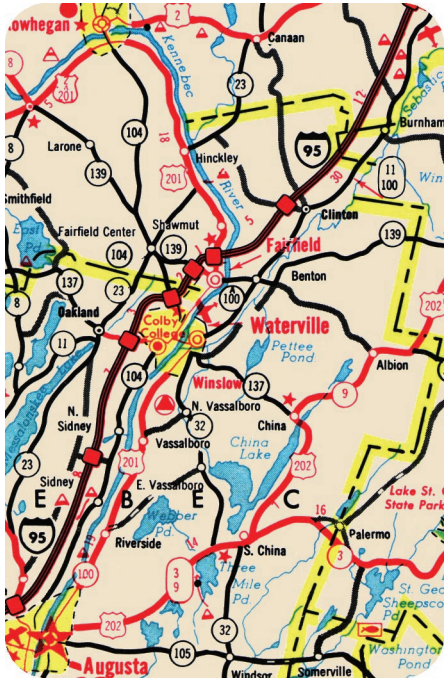
The solution starts with…

How do you use your console?

- Administration only:
  Low-performance, low-res GUI, or perhaps merely text-only mode.
  What about boot-time interaction?
- Application:
  Full graphics performance and capability
- Mission Critical:
  Minimal extraneous technology between user and Unix processor







Topology Scenarios

Cubicle

- Distance: 3m to 6m
- Passive or active repeaters
- Dedicated cables

Ranch/Back-Room

- Distance: 6m to 100m
- Active repeaters
- Preference for facility-standard cables

Campus

- Distance: 100m to 3km
- Active repeaters
- Preference for facility std. cables

Geographic

- Distance: unlimited
- Active repeaters, translated signals
- Common carrier infrastructure (although dark fiber is possible)

Graphics

Text

Pixels vs. Words?

Do you really need an extended directly-attached graphical console?

If you only need extended access for admin and/or low-performance applications…

- Core HP-UX administration tools run in terminal mode.
- A serial port can be used as boot, install, update and trouble-shooting console, connected to either:
  - A classical terminal, or
  - To a reverse terminal server, such as the **hp secure web console** or **central web console**

A normally-running system can be administered, and graphical applications executed, via remote Xwindows.

Don't invest in graphics console extension unless you really need it.

analog

digital

Graphics (Video)

Keyboard & Mouse

PS/2

USB

HP-HIL

Graphics Console Extension is 2 (and ¾) Separate Issues

1. Video extension

a. Digital graphics video
   The emerging challenge

b. Analog graphics video
   The mainstream connection

2. Keyboard/Mouse extension

a. USB 1.1 - The contemporary challenge

b. PS/2* - The heritage (and fall-back) connection

c. HP-HIL - The legacy connection

2½. What connectors are present?

2¾. Using audio, graphic stereo sync?

*. Personal System/2: PS/2 is a trademark of International Business Machines, Inc.

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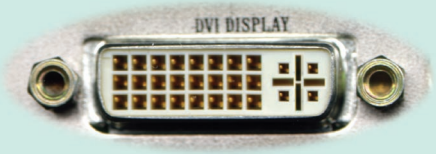
TCD Fort Collins

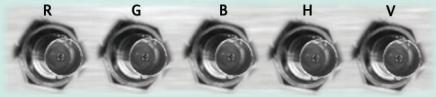
Analog Video Requirements

HD15 (aka Dsub15 or VGA)

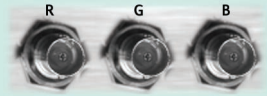


DVI-I (in analog mode)

EVC



RGBhv BNC



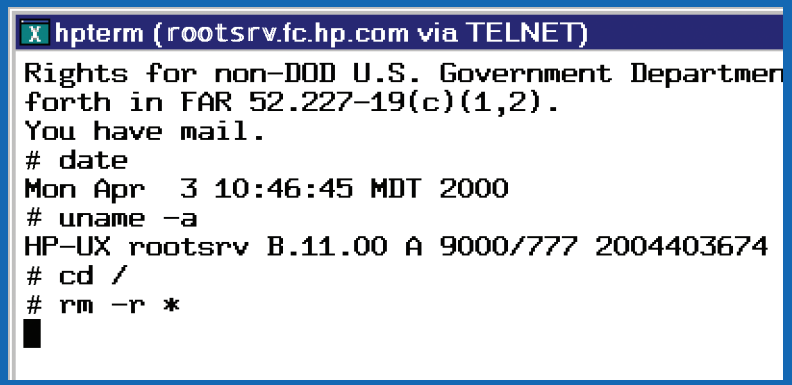
RGB BNC

Output: 3 to 6 lines:

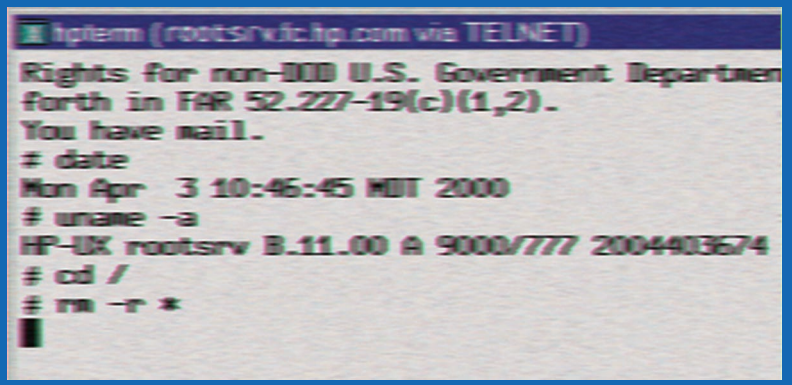
- 3 Distinct color signals (R, G, B):
  - Bandwidth: 40 to well over 400 MHz (VGA@60 Hz to 1920x1200@85 Hz)
  - Level: 0.7V p-p (1.0V w/SoG)
  - Impedance: 75Ω
- 2 discrete sync (contemporary):
  - Separate horizontal and vertical signals
  - 5V TTL (2 kΩ)
  - Pulse rates:
    H: 28.8 kHz to 102 kHz
    V: 60 to 85 Hz
  - DPMS requires additional control over sync
- Sync-on-green (SoG: legacy)
  - Composited onto the green analog signal
- 1 (opt.) sync for stereo graphic displays

Input: 0 or 3 lines:

- EDID: DDC monitor info read-back
  - 5Vdc, Data, Clock TTL (2 kΩ)



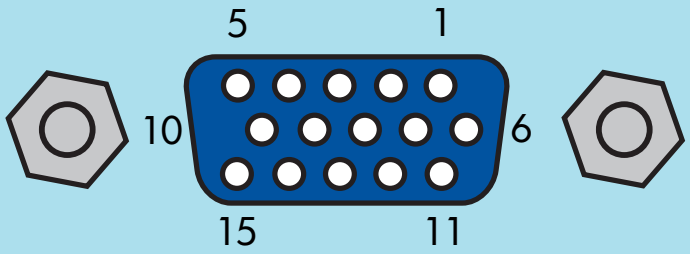
VS.



Analog Video Signal Challenges

- Getting all the signals there…
  …and back (EDID/DDC)
- Preserving and/or regenerating all required sync signals
- Avoiding or compensating for frequency response roll-off
- Avoiding skew (time and phase shift)
- Avoiding noise, including:
  - Ground-loop/common-mode
  - Cross-talk
  - Reflections
  - External interference
- Avoiding or compensating for attenuation and wandering ground reference

Host Connector Clues
Analog Video
HD15

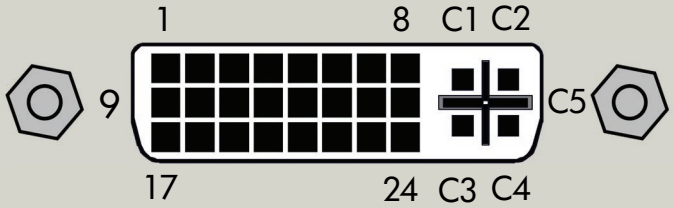


HD15 Pin-Outs

Pin	Signal	Direction	Type
1	Red	Out	Analog
2	Green or Green+Sync	Out	Analog
3	Blue	Out	Analog
4	N.C.		
5	Ground, DDC	N/A	Ground
6	Ground, Red	N/A	Return
7	Ground, Green	N/A	Return
8	Ground, Blue	N/A	Return
9	+5 Vdc, DDC	Out	DDC pwr.
10	Sync Return	N/A	Return
11	N.C. (absent on legacy)		
12	SDA, Data	Duplex	
13	Sync, Horizontal	Out	TTL
14	Sync, Vertical	Out	TTL
15	SCL, Data Clock	Out	

15-pin D-subminiature (aka "VGA"):

- Video image signalling: Predictable
  - Always RGB analog output
- Video sync: Separate H&V likely
  - Recent/new outputs have separate H&V. If you can select a "VESA" setting for the graphics, it's using separate H&V.
  - Some ports/cards still also support sync-on-green.
  - Legacy ports/cards may be sync-on-green only.
- EDID/DDC: Uncertain
  - Even if present in monitor and card/port, DDC may be unimplemented by graphics driver.
- Video image resolution/rate: Uncertain
  - Typically 1024x768 or 1280x1024@75Hz on HP-UX workstations, but could be anything from 640x480 through 1920x1200.
- What is the other end of the cable?
  - If RGB-BNC, you are using sync-on-green
  - If RGBhv-BNC, you might still be SoG



DVI-I Pin-Outs

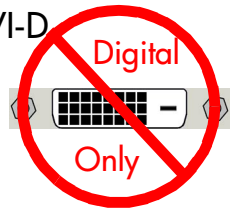
Pin	Signal	Direction	Type
1	T.M.D.S. Data2-	Out	TMDS
2	T.M.D.S. Data2+	Out	TMDS
3	T.M.D.S. Data2/4 Shield	N/A	Ground
4	T.M.D.S. Data4-	Out	TMDS
5	T.M.D.S. Data4+	Out	TMDS
6	DDC Clock		
7	DDC Data	In	
8	Analog Vertical Sync	Out	TTL
9	T.M.D.S. Data1-	Out	TMDS
10	T.M.D.S. Data1+	Out	TMDS
11	T.M.D.S. Data1/3 Shield	N/A	Ground
12	T.M.D.S. Data3-	Out	TMDS
13	T.M.D.S. Data3+	Out	TMDS
14	+5 Vdc power	Out	
15	Ground, Hsync, Vsync, +5V	N/A	Ground
16	Hot Plug Detect	In	DC
17	T.M.D.S. Data0-	Out	TMDS
18	T.M.D.S. Data0+	Out	TMDS
19	T.M.D.S. Data0/5 Shield	N/A	Ground
20	T.M.D.S. Data5-	Out	TMDS
21	T.M.D.S. Data5+	Out	TMDS
22	T.M.D.S. Clock Shield	N/A	Ground
23	T.M.D.S. Clock+	Out	
24	T.M.D.S. Clock-	Out	
C1	Analog Red	Out	Analog
C2	Analog Green	Out	Analog
C3	Analog Blue	Out	Analog
C4	Analog Horizontal Sync	Out	TTL
C5	Analog Ground	N/A	Ground

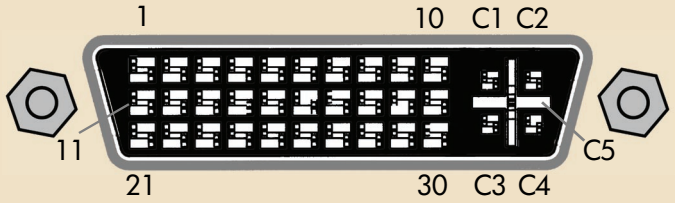
Host Connector Clues
Analog Video
DVI-I

Digital Visual Interface - "Integrated" (new 24+5-pin connector):

- Video image signalling: User discretion
  - Your choice of digital or analog (with DVI-I, not DVI-D*). This slide assumes analog is chosen.
- Video sync: Predictable
  - VESA separate H&V sync required.
  - Sync-on-green proscribed.
- DDC: Predictable
  - VESA EDID (DDC2B) support required. (EDID: Extended Display Identification Data. DDC: Display Data Channel)
- Video image resolution/rate: User discretion
  - VGA (640x480@60Hz) through HDTV and QXGA (2038x1536@85Hz) are defined

*DVI-D





EVC Pin-Outs

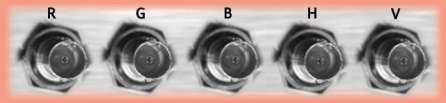
Pin	Signal	Direction	Type
1	Analog Audio Output, Right	Out	Analog
2	Analog Audio Output, Left	Out	Analog
3	Audio Output, Common Return	N/A	Ground
4	Sync Return	N/A	Ground
5	Horizontal Sync	Out	TTL
6	Vertical Sync	Out	TTL
7	RESERVED 1	N/A	N/A
8	RESERVED 2	N/A	N/A
9	IEEE-1394 pair A, data-	Duplex	Digital
10	IEEE-1394 pair A, data+	Duplex	Digital
11	Charging Power+	In	
12	Charging Power-	In	
13	Video Input, Y or composite	In	Analog
14	Video Input, Return	N/A	Ground
15	Video Input, C	In	Analog
16	USB Data+	Duplex	Digital
17	USB Data-	Duplex	Digital
18	USB/1394 Common Shield	N/A	Ground
19	IEEE-1394 Vg	Out	DC
20	IEEE-1394 Vp	Out	DC
21	Analog Audio Input, Left	In	Analog
22	Analog Audio Input, Right	In	Analog
23	Audio Input, Common Return	N/A	Ground
24	Stereo Sync	Out	TTL
25	DDC Return	In	
26	DDC Data (SDA)		
27	DDC Clock (SCL)		
28	+5Vdc	Out	DC
29	IEEE-1394, pair B, clock+	Out	Digital
30	IEEE-1394, pair B, clock-	Out	Digital
C1	Red	Out	Analog
C2	Green	Out	Analog
C3	Pixel Clock	Out	Digital
C4	Blue	Out	Analog
C5	Video/Pixel Clock Return	N/A	Ground

Host Connector Clues
Analog Video
EVC

VESA Enhanced Video Connector, 35-pin D-subminiature:

- Video image signalling: Predictable
  - Always RGB analog output. Although pins were reserved for digital video, they were never implemented.
- Video sync: Probable
  - H&V likely
  - SoG optional
- DDC: Uncertain (theoretically required)
  - Even if present in monitor and card/port, DDC may be unimplemented by graphics driver.
- Video image resolution/rate: Uncertain
  - Typically 1024x768 or 1280x1024@75Hz on HP-UX workstations, but could be anything from 640x480 through 1600x1200.

Host Connector Clues
Analog Video
RGB(hv) BNC



BNC Pin-Outs

Pin	Signal	Direction	Type
R	Red	Out	Analog
G	Green or Green+Sync	Out	Analog
B	Blue	Out	Analog
H	Sync, Horizontal	Out	TTL
V	Sync, Vertical	Out	TTL

5-connector BNC:

- Video image signalling: Predictable
  - Always RGB analog output
- RGBhv video sync: Probably both
  - Sync-on-green likely present.
- RGB video sync: Sync-on-green only
- EDID/DDC: Absent
- Video image resolution/rate: Uncertain
  - Typically 1024x768 or 1280x1024 on HP-UX workstations.
  - Resolution and rate may be fixed (not multi-sync) at both ends.
  - Vertical rate may be 60, 70 or 75 Hz.
- Be sure to check the monitor connection. It may only be sync-on-green capable.

Analog Video Extension Solutions

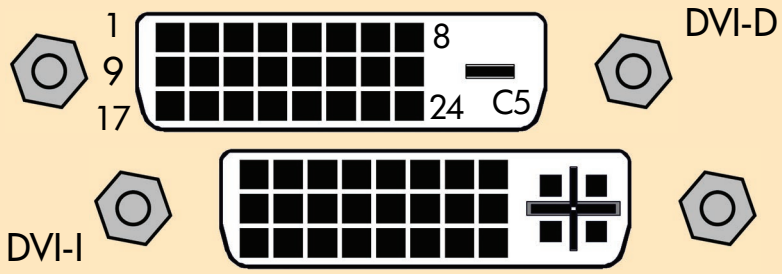
HD15 extension

Long HD15-RGBhv-HD15 cable
(NTI custom fabricated)

VGA transceiver pair

Fiber Optic transceiver pair
(Lightwave PC Fiberlynx)

- 2m to 5m - passive extension via long cables usually provides acceptable results. Replacing entire cable is preferable to using an HD15 extension like that shown here.
- 5m to 60m:
  - Passive extension with high-quality low-capacitance 75Ω cables may provide acceptable results
  - Active extension usually provides acceptable results
- 10m to 300m - active extenders:
  - Distribution amplifiers (one box at head end)
  - Transceivers (one box at each end, typically with Cat5 in between. May be analog or digital on the Cat5)
- 100m to 3km - fiber optic extenders are about the only option if full graphics performance is required.
- Beyond 3km - seriously consider KVM via IP.



DVI-D and DVI-I (digital) Pin-Outs

Pin	Signal	Direction	Type	Note
1	T.M.D.S. Data2-	Out	TMDS	
2	T.M.D.S. Data2+	Out	TMDS	
3	T.M.D.S. Data2/4 Shield	N/A	Return	
4	T.M.D.S. Data4-	Out	TMDS	Link2
5	T.M.D.S. Data4+	Out	TMDS	Link2
6	DDC Clock			
7	DDC Data	In		
8	Analog Vertical Sync	Out	TTL	
9	T.M.D.S. Data1-	Out	TMDS	
10	T.M.D.S. Data1+	Out	TMDS	
11	T.M.D.S. Data1/3 Shield	N/A	Return	
12	T.M.D.S. Data3-	Out	TMDS	Link2
13	T.M.D.S. Data3+	Out	TMDS	Link2
14	+5 Vdc power	Out		
15	Ground, Hsync, Vsync, +5V	N/A	Ground	
16	Hot Plug Detect	In	DC	
17	T.M.D.S. Data0-	Out	TMDS	
18	T.M.D.S. Data0+	Out	TMDS	
19	T.M.D.S. Data0/5 Shield	N/A	Return	
20	T.M.D.S. Data5-	Out	TMDS	Link2
21	T.M.D.S. Data5+	Out	TMDS	Link2
22	T.M.D.S. Clock Shield	N/A	Return	
23	T.M.D.S. Clock+	Out		
24	T.M.D.S. Clock-	Out		
C5	Video/Pixel Clock Return	N/A	Return	

Host Connector Cues
Digital Video
DVI-D (and DVI-I)

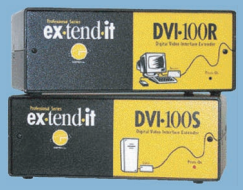
Digital Visual Interface (new 24+1-pin connector):

- DVI-D (-"Digital") is digital-only
  DVI-I is both (digital assumed for this page)
- Video image signalling: TMDS digital
  - 6 differential data lines (3 for each link, nominally R,G,B)
  - 3.3V Transition-Minimized Differential Signalling - encodes 8 data bits as 10 DC-balanced TMDS bits
  - Clock rates to 165 MHz (x2 if dual-link)
- Video sync: TMDS Clock
  - another differential pair
- DDC: required
  - Plus "hot plug" line
- Video image resolution/rate: User discretion
  - VGA (640x480@60Hz) through HDTV and QXGA (2038x1536@85Hz) are defined

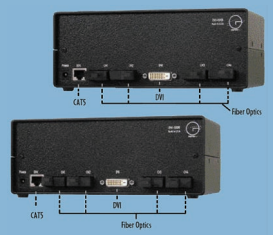
dvi digital visual interface

hp invent

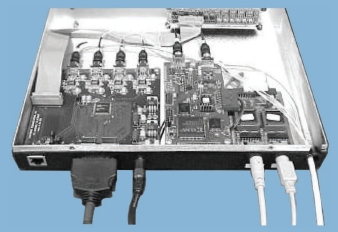
Digital Video Extension Solutions



Gefen DVI-100



Lightwave VirtualPanel



- 2m to 3m - passive extension beyond 3m, via long cables, often provides unacceptable results. The TMDS signalling, although much more robust than analog, was not designed with extension in mind.
- 3m to 330m - fiber optic extenders are an option if full performance is required.

  Shown at left are two known DVI extenders currently available, neither tested yet by **hp**. Two additional suppliers announced product plans during drafting of this presentation.

  Note that 4 to 6 fiber cables, plus or minus one Cat5 are required for these extenders.
- Over 330m - no known solutions at this time, other than reverting to analog over fiber, which is something to consider, particularly if the ultimate display is analog.

Keyboard/Mouse Requirements: PS/2

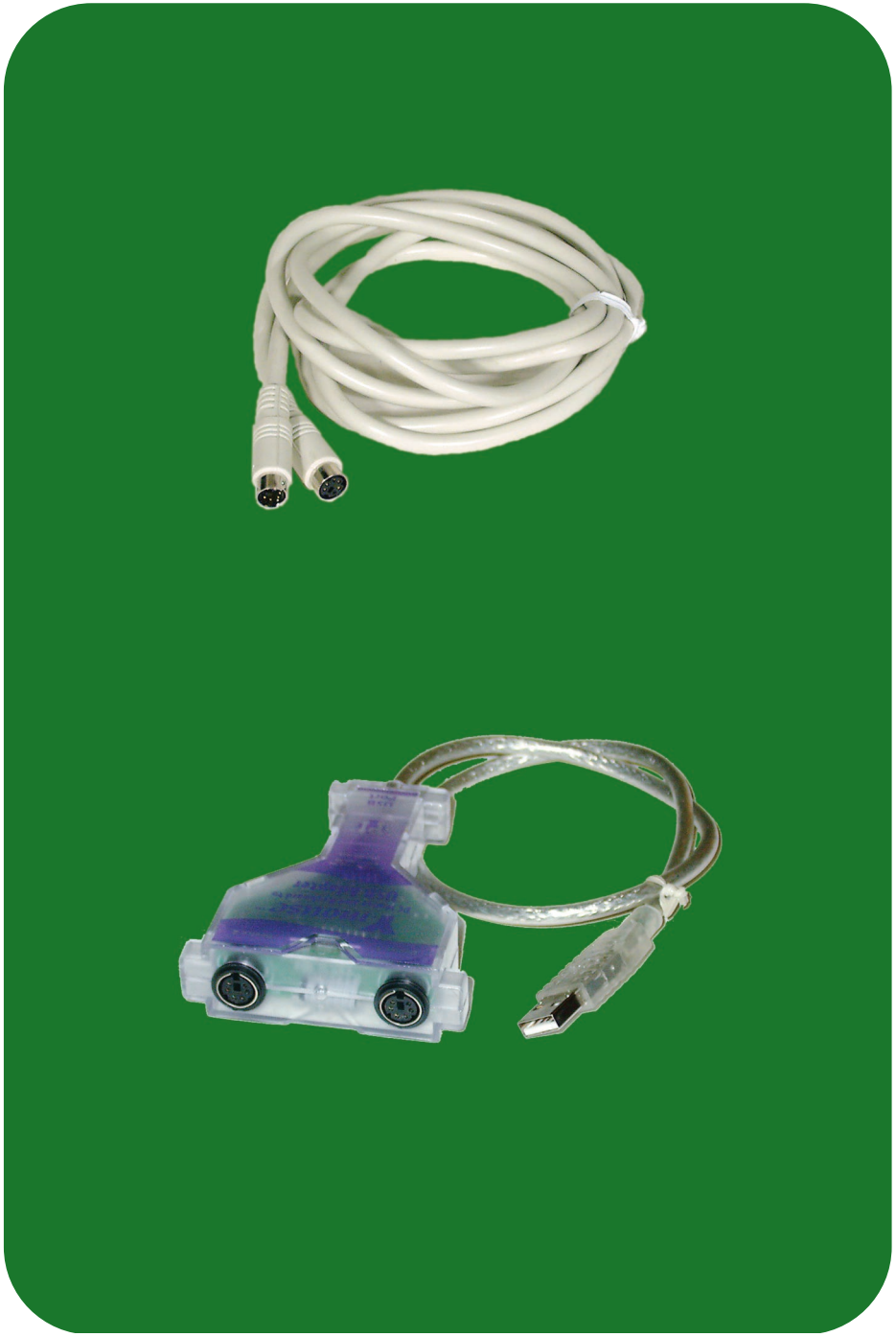
Keyboard

Mouse

PS/2 Receptacle Pin-Outs

Pin	Signal	Description
1	Data	To/from device
2	N/C, nominally	Don't rely on N/C
3	Signal Ground	
4	+5Vdc	Power to device
5	Clock	Sync to device
6	N/C, nominally	Don't rely on N/C

- Two dedicated (not interchangeable) ports
- Three scanset modes on keyboards
  - HP-UX uses scanset mode 3
  - Windows uses modes 1 and 2.
  - Linux uses mode 1
- Two major mouse protocols (MS & Logitech)
- Two slow (10…33 KHz) single-ended signals: 1 duplex data line, and 1 clock line
- +5Vdc power can be supplied at remote
- Ensure N/C pins really are N/C:
  - Host: some PA-RISC SPUs provide HP-HIL on these pins (via internal jumper)
  - Extender: make sure the pins aren't used
  - Device: some recent dual-mode devices put USB data lines on these pins
- PA-RISC systems with native PS/2 (or HIL+PS/2) are sensitive to noise on the PS/2 ports. Passive extension is discouraged beyond 5m.



Keyboard/Mouse Solutions PS/2

- 3m to 5m - passive extension via long cables usually provides acceptable results.
- 5m to 100m - requires active extension (usually over Cat5). See the KVM extenders.
- 5m to 3km - active extension, usually over fiber optic cable
- Beyond 3km: KVM-via-IP. See page 31.

Tip: USB systems can be converted to PS/2 with an external adaptor, at which point PS/2 extension criteria apply.
Shown: P.I. Engineering USB “Y-Mouse”.

USB Style A Device Plug

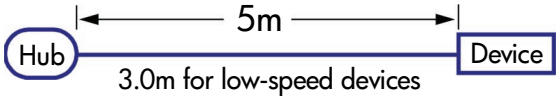
USB Plug Pin-Outs

Pin	Signal	Description
1	+Vcc	5 Vdc @ 100 or 500mA
2	-Data	Half-duplex
3	+Data	Half-duplex
4	Ground	Power to devices

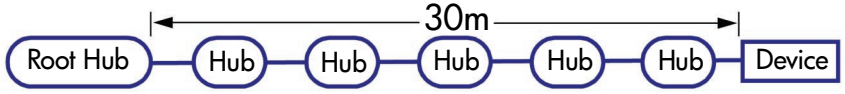
USB 1.1 Requirements

- One differential bi-directional signal pair. Max: 12 Mbps/sec., Typ: 700 Kbytes/sec.
- +5 Vdc power to devices. Can be regenerated by extender. Devices may supply own.
- One ground. Shielded cable required.

USB spec. strictly limited segments to 5m (3m for low-speed devices).



Segments can be cascaded 5 deep to 30m



30m seems short, until you ask: Excluding the USB cables, just how “long” can a hub be?

USB 2.0 may have new extension challenges, but is not an issue for keyboard and mouse, which are apt to remain USB 1.1 low-speed devices, even on a USB 2.0 port or hub.

USB Repeater

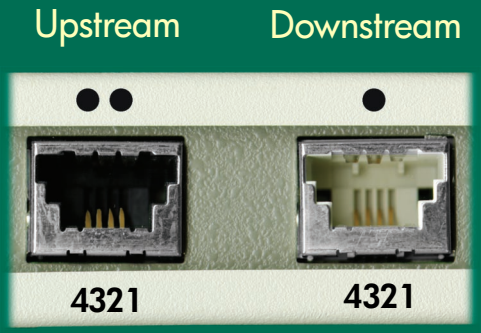
USB Hub

USB Solutions

- Non-solution (and not shown): passive extension A-to-A plug to receptacle cables - do not use these!
- 0-5m: Replace short detachable device cable with 5.0m A-to-B plug-to-plug cable.
- 5…30m quasi-solution: active repeater cables violate the spec by failing to report their (modest) power consumption. If you have 25mA to spare, they usually work.
- 5…30m: Cascade hubs at 5m each, to 30m.

Extension beyond 30m was originally "out-plan" in the USB spec. They overlooked clever Canadian engineers…

- 30…105m: Icron *USB Ranger* extenders increase segment length to 105m, and meet the USB spec. Cannot be cascaded.
- Over 105m: Convert to PS/2, and use PS/2 extender.



HP-HIL Pin-Outs

Pin	Signal	Description
1	Signal Ground	
2	Data Downstream	2.4…4.5V High
3	Data Upstream	
4	+12Vdc	Power to devices

HIL Requirements

- AMP SDL modular connectors.
- Two simplex data lines, downstream to the devices, and upstream to the host (no device-to-device). 100 KHz bit rate, 6.5Kbytes/sec. max theoretical data rate (15 bit frames).
- Seven (7) devices max. Devices could have zero addresses (extenders) or multiple addresses (dial box).
- One power line - locally regulated to +5Vdc by devices. 1.0A available from host. No provision for self (locally) powered devices.
- Shielded cable required in addition to signal ground.
- Maximum of 3.0m between devices using standard HIL cables.
- More than 3.0m requires signal conversion.

HIL Solutions

46081A
HP-HIL/Audio Extension, 2.4m

Not Shown: 2.4m HIL cable

46082
HIL/Audio Extension transceivers. Included 15 or 30m RGB cable.

Not Shown:
15 or 30m DB15 interlink cable

All discontinued, but might be found in the after-market:

- 46080/81A 2.4m extender. Note:
  - Separate audio circuit is not tied to HIL.
- Most devices were daisy-chained, and acted as repeaters, at 2.4m per segment (3.0m if you can find such cables).
- 46082A (15m) and 46082B (30m) remote extenders also existed - and included RGB BNC passive cables. Note:
  - No H or V-sync cables. Sync-on-green assumed.
  - No HD15 connectors or adaptors.

The author has personally tested cascaded 46082A+46082B to 45m. Just acceptable.

Passive HIL extension cables are unreliable, and the HIL protocol was not designed to detect, much less correct such any errors that occur (and they do).

Audio Requirements

Speaker/Phone Audio Pin-Outs

Pin	Signal	Description
Tip	Right channel	8 to 40Ω typ. impedance, 250mW to several watts
Ring	Left channel	
Sleeve	Ground	

Line-Out Audio Pin-Outs

Pin	Signal	Description
Tip	Right channel	0-2V, 10 KΩ
Ring	Left channel	
Sleeve	Ground	

Mic-In Audio Pin-Outs

Pin	Signal	Description
Tip	Microphone audio	0-100 mV, 10 KΩ
Ring	1.5 Vdc	Phantom power for electret microphones
Sleeve	Ground	

3.5mm ports.

- Speaker-out is easy to extend, as it's relatively insensitive to noise and voltage drop over long passive lines.
- Line-out is less robust. Simple conversion to differential ("balanced") enables longer passive lines.
- Mic-in is downright fragile, and really needs a pre-amp at any remote mic-in jack. Note also, if you are using an electret mic, that not all HP mic ports have phantom power - does the extender?

A significant caveat is that not all KVM extenders (and almost no KVM switches) have any provision for handling audio.

Audio Solutions

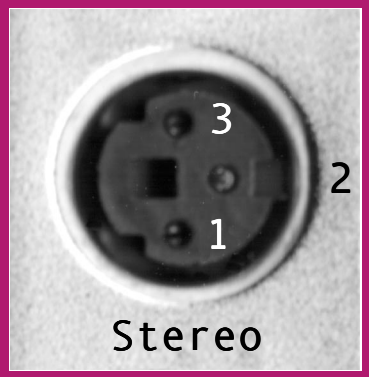
Speaker and Headphone ports can easily drive tens of meters of even unshielded passive cable with no obvious signal degradation.

For longer runs, consider using 75Ω PA (public-address) standards (in-line transformers), and keep safety in mind between buildings. Lightning strikes to your ears are loud.

If you need to extend “line” (in or out), convert line to low impedance (“LoZ”) using commonly available in-line transformers at each end.

Microphone input is not as simple - you probably need to place a pre-amp at the remote end, and run LoZ to the Line-In port.

Stereo Sync Requirements



Stereo Sync Receptacle Pin-Outs

DIN Pin	EVC Pin	Signal	Description
1	28	+5 Vdc	300mA to 1.0A Is device 12V?
2	25	Sync Return	
3	24	Stereo Sync 	TTL or 5V CMOS High = Left Low = Right Edge occurs within 100µSec of leading edge of vertical sync.

Stereo sync is used for stereo display. Separate left-eye and right-eye images are sent as alternate frames to the video display.

Usually, the signal drives an infrared (IR) emitter at the display, which in turn directs the shutters on the viewers.

The DIN-style connector port shown is only the most recent of numerous used historically.

Stereo sync is also defined as pin 24 on the EVC connector, but isn't necessarily implemented on all EVC graphics ports.

+5Vdc device drive is also a recent standard.

Ensure you understand your port and devices (IR emitter, viewers, etc.). Reference information is available at: http://www.stereographics.com

Stereo sync standards are stabilizing just in time to get ignored by the DVI standard ☹.

Stereo Sync Solutions

Lightwave
VDE-200 Audio

The major extension challenge is not the stereo-sync signal. Stereo graphics video implies doubling the vertical refresh rate on video, typically to 120Hz (vs. 60 to 85 normally).

- First - can your display do that?
- Then - can your video extender do that?

The sync signal itself is extendable using simple technology similar to PS/2 extension. Note, however that the stereo sync mini-DIN is not compatible with PS/2 mini-DIN.

Clearly, the sync signal must arrive at the display during vertical interval of remote image. If your video extender buffers, or digitizes, then regenerates analog, the video frames may lag the stereo sync. This will quickly cause literal headaches.

Alternative for IR implementations:
generate the IR locally, and
use an IR repeater.

DB9S 9-pin Cable Connector

Serial (Cable) Pin-Outs

9-Pin	25-Pin	SPU port Signal (EIA designator)	Description
1	08	DCD (CF)	Data Carrier Detect (from device)
2	03	RxD (BB)	Received Data (from device)
3	02	TXD (BA)	Transmitted Data (from SPU)
4	20	DTR (CD)	Data Terminal Ready (SPU asserts)
5	07	GND (AB)	Signal Ground
6	06	DSR (CC)	Data Set Ready (device asserts)
7	04	RTS (CA)	Request To Send (SPU asserts)
8	05	CTS (CB)	Clear To Send (device asserts)
9	22	RI (CE)	Ring Indicator (device asserts)
SHLD	01	(AA)	Safety/EMC Ground

Serial Requirements

- Two or more simplex single-ended signals, space=0, mark=5 to 15 Vdc
- Pull-up resistors not always present
- Minimum of 2 lines (TxD, RxD) plus ground for console
- Official EIA cable spec is 50ft

This is for PA-RISC HP-UX only, although Linux can have serial console after boot.

- SPU uses serial console if graphics or keyboard not found. You can force serial console regardless.
- Console port defaults to 9600bps, 8-bits, no parity bit, 1 start, 1 stop, no flow control.
- Admin may enable in-band Xon/Xoff or HP Enq/Ack, or hardware DTR/CTS flow control after boot.

Running serial over LAN raises security issues.

Serial Console over IP

typical single-port LAN adaptor

Export console as HTML web page via LAN

Serial port to system serial console port

Serial Solutions

EIA aside, with care, passive runs of 1000’ or more cable are reliable at 9600 bps.

Classical serial extension solutions abound (e.g. leased-line modems, reverse terminal servers), but check into recent innovations.

Some KVM extenders include serial (and LPT) ports, and might be inexpensive enough to use just for serial.

Most modems can be configured to run in “leased line” (no dial-tone) configuration over even longer copper runs. fiber repeaters used to be common, and may yet exist.

But you may be able to avoid pulling cable entirely with a secure reverse terminal server. Extend to multiple web browsers anywhere.

bob_niland@hp.com
TCD Fort Collins

General Solutions
Short Distances

- Deal with each port separately.
- Don't stretch DVI (digital) beyond 3m.
- If an inexpensive experiment, see if passive, or low-cost active extension provides acceptable results. If extension almost-but-doesn't-quite-do-it, test complete cable replacement.
- Don't spend more to buy extension cables if you can simply replace the original cables with longer ones for the same price. Continuous cables generally provide more reliable results than joined cables.
- Going for high-grade professional (passive) cables may be cheaper than active (electronic) extenders.

Medium-range KVM Extender

Cybex LongView shown

Console Ports:
- UVGA
- PS/2 (both)
- Audio (phones & mic)
- Serial

Includes custom head-end cable assembly

Solutions - Backroom

Numerous KVM extenders are on the market. Most are analog video, PS/2 keyboard and mouse, with transmit/receiver units interconnected with dedicated Cat5 cable.

TCD itself uses the Cybex (now Avocent) LongView, shown on this slide, at distances up to 250 feet. We adapt our USB hosts to PS/2 with the P.I.Engineering USB Y-Mouse.

It is worth noting that at our site, it costs as much to install the Cat5 as to purchase the LongViews themselves. This is probably typical.

Comment from our cluster admin: "It's hard to diagnose failures." Although the Cybex products haven't failed, other components have, and none of them except the host computers have any fault indicators.

Extension failures imply a need for KVM access at the head end…

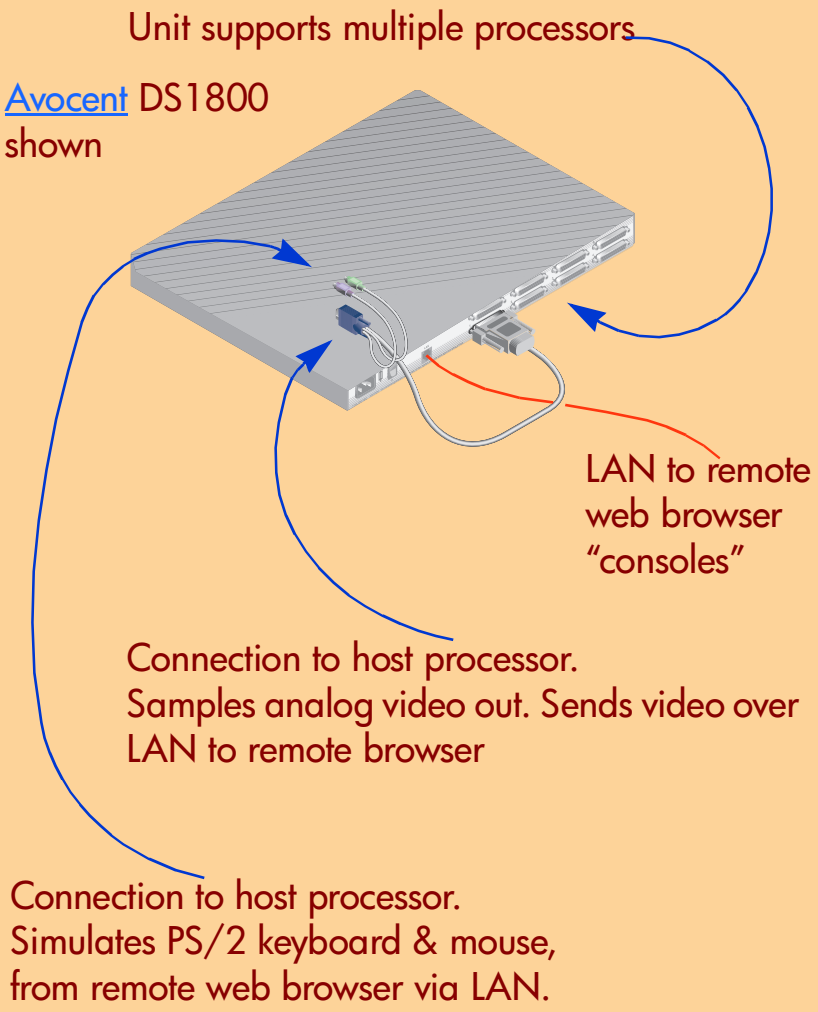
Solutions - Campus

Distances are often too long for coaxial or twisted-pair cable. Metal cables are often both unwise and unsafe to use between separated buildings, due to ground-loops and lightning.

- If dedicated cable is to be pulled, fiber optics is probably required.
- That's expensive, so be sure to re-visit serial console over your existing LAN.
- If the graphics performance requirement is modest, KVM over IP (next slide) may also be less expensive than provisioning new fiber.

Don't forget the need for infrequent in-person head-end admin. A graphics video splitter/ distribution amp, KVM switch or easy access to the SPU back panel for a "crash cart" is essential.

KVM via IP



Solutions - Unlimited

Traditional: Serial over LAN:

- Single-port solutions such as the **hp secure web console**.
- Multi-port (cluster) solutions such as the **hp central web console** and reverse terminal servers generally.

Emerging: KVM via IP:

Connected head-end systems have their entire screen displayed as a window, in browsers anywhere on the network, but, this requires you to (often literally) dial-in your preferred mix of:

- Reduced resolution
- Reduced frame rate
- Reduced data (compression)
- Reduced traffic - not all the head-end systems active simultaneously.

Don't forget to have a web browser (crash cart) in the machine room.

Extendonomics 101

Your costs include:

- Adaptors (at both ends), unless ports & devices match extender connectors
- "Transmitter" - converts signals for extension
- Cable(s): video, keyboard/mouse, audio
- Outlets, junction boxes, conduit
- Pulling the cable, often US$1.00 per foot
- "Receiver"- deconvert to device standards

Tip:

- Don't invest in extender video resolution higher than your useful display resolution
- What is your horizontal pixel count? Where "Visible" is the visible diagonal screen size in inches:

$$Hpels = \frac{\sqrt{Visible_{in}^{2}/1.56}}{(DotPitch_{mm})}$$

Avoid Sticker Shock

Per-Seat Cost Range:
under US$50.00 to
over $5000.00

Console Extension Product Suppliers

ADDER
www.addertec.com

GEFEN Inc.
www.gefen.com

MINICOM Advanced Systems Ltd.
www.minicom.com

ATEN
www.aten.com.tw

hp invent
www.hp.com

NTI NETWORK TECHNOLOGIES INC
www.nti1.com

Avocent
www.avocent.com

icron
www.icron.com

N BASE XYPLEX
www.nbase-xyplex.com

BELKIN
www.belkin.com

IHSE GmbH
www.ihse.de

Raritan
www.raritan.com

COMPUCABLE
www.compucable.com

LANTRONIX
www.lantronix.com

ROSE ELECTRONICS
www.rosel.com

ConnectPRO
www.connectpro.com

Lightwave Communications Console Management Solutions
www.lightwavecom.com

StarTech.com
www.startech.com

Resources

The manufacturers listed to the left offer KVM and/or serial console extension products. Other than **hp**-branded products, none of the suppliers and products mentioned in this presentation are officially supported by **hp**. Most products have not been tested by **hp**.

Background information on the emerging DVI specification is available from:
Digital Display Working Group: www.ddwg.org
and Silicon Image.: www.siliconimage.com

Where to find this presentation:

A specific URL had not been assigned at time of submission to InterWorks. Details will be available at the live presentation, or browse to:
www.hp.com/go/technical
and use search to seek “console extension”.

Questions?

hp invent