

Galvanically isolated EGSE Building Blocks

**Paul Walker
4Links**

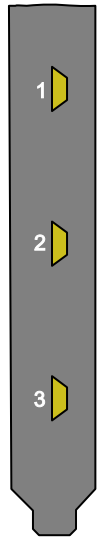
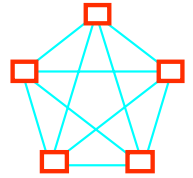
Demo: Start at 400 Mbits/s See how fast it will go



```
Command Prompt - java -cp .;Waveform.jar Waveform speedlimit-error
C:\demo>speedlimit 150 7
A150 Link 7 at 10.0 Mb/s
[0.061318176s] Parity error in Run state
ERROR - packet ends with EEP (EOP expected)
ERROR - packet is wrong length (1000 bytes expected, 944 bytes)
A150 Link 7 at 400.0 Mb/s
Received 125000000B in 10.796s = 92.6 Mb/s, Total of 125.000
A150 Link 7 at 401.0 Mb/s
Received 125000000B in 10.725s = 93.2 Mb/s, Total of 125.000
A150 Link 7 at 402.0 Mb/s
Received 125000000B in 10.725s = 93.2 Mb/s, Total of 125.000
A150 Link 7 at 403.0 Mb/s
Received 125000000B in 10.715s = 93.3 Mb/s, Total of 125.000
A150 Link 7 at 404.0 Mb/s
Received 125000000B in 10.735s = 93.2 Mb/s, Total of 125.000
A150 Link 7 at 405.0 Mb/s
Received 125000000B in 10.725s = 93.2 Mb/s, Total of 125.000
A150 Link 7 at 406.0 Mb/s
Received 125000000B in 10.726s = 93.2 Mb/s, Total of 125.000
A150 Link 7 at 407.0 Mb/s
Received 125000000B in 10.796s = 92.6 Mb/s, Total of 125.000
A150 Link 7 at 408.0 Mb/s
Received 125000000B in 11.136s = 89.8 Mb/s, Total of 125.000
A150 Link 7 at 409.0 Mb/s
Received 125000000B in 10.825s = 92.4 Mb/s, Total of 125.000
```

(error left over from previous run)

Digression: SpaceWire-PCI Upgrade 4Links



- SpaceWire-PCI upgrade to SMCS-SpW
- New SMCS on customer's existing board
- Simple, clean, no cuts, no wires
- Proven to work with 4Links test programs
- Interoperable with 4Links test equipment
- Drivers provided complete with source

Galvanically isolated EGSE Building Block

4Links 

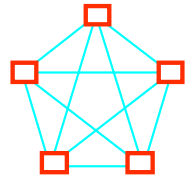


- Galvanically isolated Power
- Galvanically isolated Ethernet
- Galvanically isolated expansion
- Internal 0V isolated from chassis/cable shields
- Common mode output voltage is set to track common mode input voltage

Galvanically isolated EGSE Building Blocks

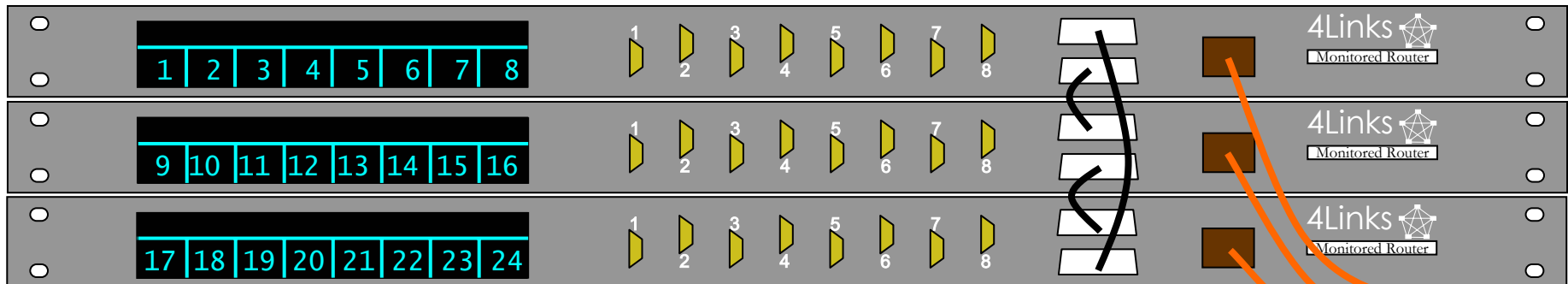
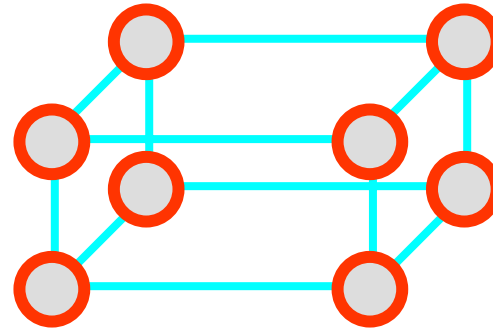
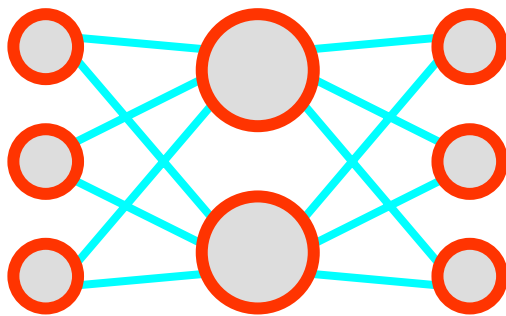
**What jobs do you want
SpaceWire EGSE to do?**

4Links Simulate & evaluate



SpaceWire nodes & networks

Simulate separate nodes and/or routing switches up to as many SpaceWire ports as are available.



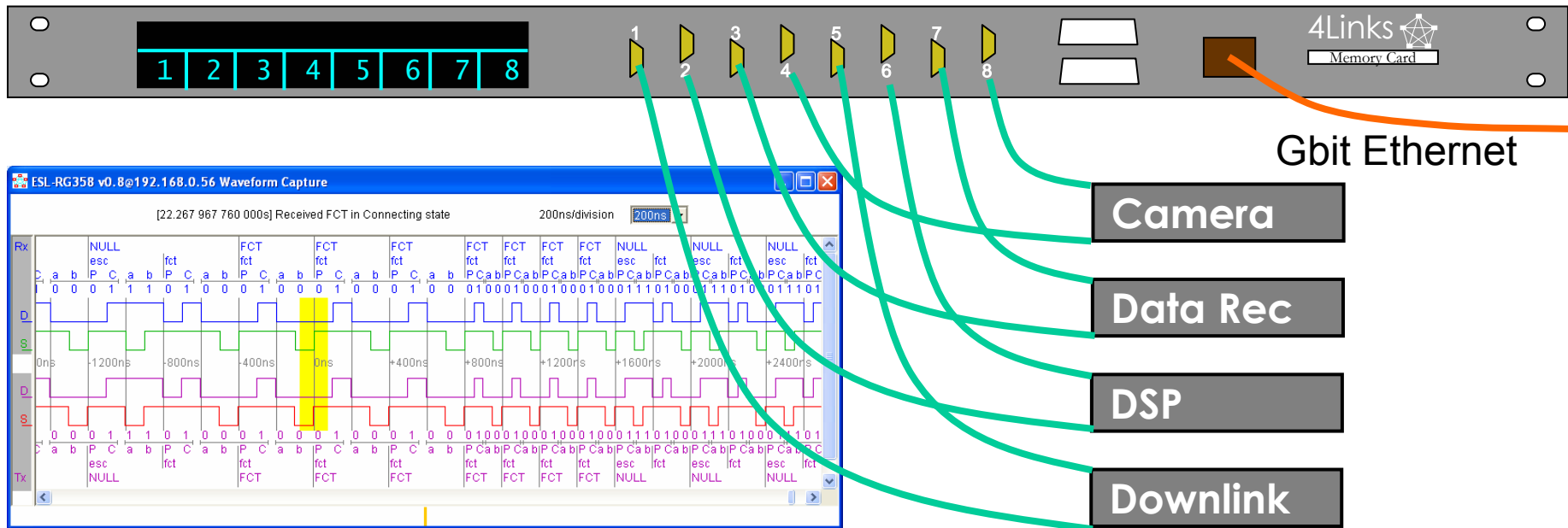
4Links

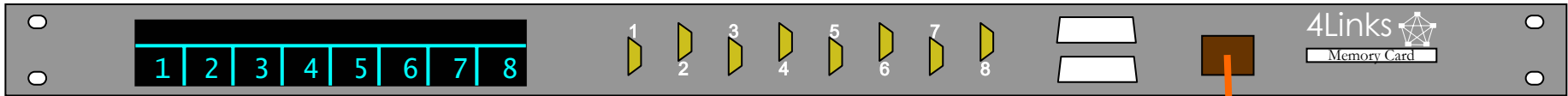
Develop & debug

SpaceWire chips, boards & instruments

Ease of use & test coverage to detect bugs quickly

Point-of-failure diagnostics to fix bugs & meet schedule





Remote trial integration

of **SpaceWire** systems
& networks via IP Tunnel

No computer needed at either end

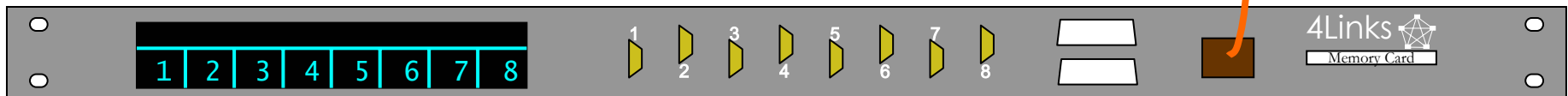
Real-time via Gbit Ethernet

BUT beware latency, buffering

Gbit Ethernet

**LAN /
WAN /
Internet**

Gbit Ethernet



4Links

Validate & integrate

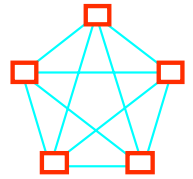
SpaceWire flight systems & networks

Full galvanic isolation protects flight equipment,
Scalable EGSE tests, validates, the whole network

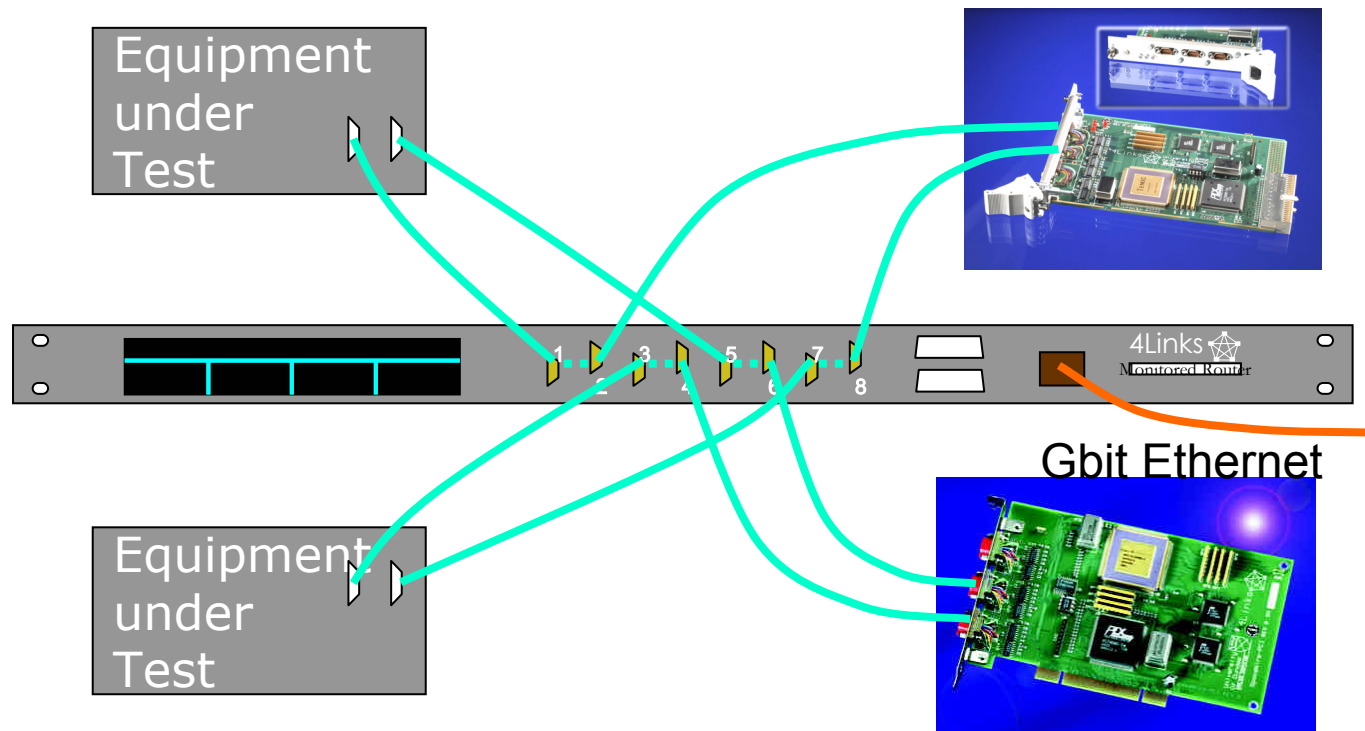


4Links

Monitor & characterize



SpaceWire flight subsystems & systems,
Tag, record, replay. Measure operating margins.
Time tags synchronized to external (eg GPS) clock



Demo: Started at 400 Mbits/s how fast did it go?



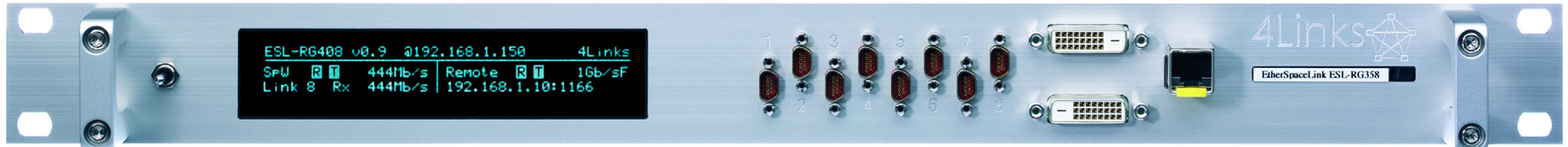
```
Command Prompt - java -cp .;Waveform.jar Waveform speedlimit-error
A150 Link 7 at 468.0 Mb/s
Received 125000000B in 10.815s = 92.5 Mb/s, Total of 125.000
A150 Link 7 at 469.0 Mb/s
Received 125000000B in 10.826s = 92.4 Mb/s, Total of 125.000
A150 Link 7 at 470.0 Mb/s
Received 125000000B in 10.826s = 92.4 Mb/s, Total of 125.000
A150 Link 7 at 471.0 Mb/s
Received 125000000B in 10.806s = 92.5 Mb/s, Total of 125.000
A150 Link 7 at 472.0 Mb/s
Received 125000000B in 10.826s = 92.4 Mb/s, Total of 125.000
A150 Link 7 at 473.0 Mb/s
Received 125000000B in 10.826s = 92.4 Mb/s, Total of 125.000
A150 Link 7 at 474.0 Mb/s
Received 125000000B in 10.815s = 92.5 Mb/s, Total of 125.000
A150 Link 7 at 475.0 Mb/s
ERROR - packet ends with EEP (EOP expected)
ERROR - packet is wrong length (1000 bytes expected, 944 byt
[0.392335744s] Parity error in Run state
Created waveform file speedlimit-error

Last good speed = 474

C:\demo>java -cp .;Waveform.jar Waveform speedlimit-error
```

Galvanically isolated EGSE Building Blocks

4Links



- 8 SpaceWire ports, each up to 400Mbits/s with good margins
- 10/100/1000BaseT, optical fibre Gbit Ethernet, TCP, UDP
- 1U 19" rack mount, 22 to 72 Volt power bus
- Stackable with scalable expansion to many ports (20Gbits/s)
- Function defined by plug-in memory card, so the same hardware can fulfil many different functions
- Memory card also enables field upgrades
- 6 levels of safety protection for equipment under test
- Galvanic isolation between SpaceWire ports and all other connections