IEEE 1355

Why yet another high-speed serial interface standard?

Paul Walker, 4Links, www.4Links.co.uk
IEEE 1355 port is like a UART

<table>
<thead>
<tr>
<th>UART/RS232</th>
<th>IEEE 1355</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asynchronous</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>Serial</td>
<td>Serial</td>
</tr>
<tr>
<td>Autobaud</td>
<td>Autobaud</td>
</tr>
<tr>
<td>Point-to-point</td>
<td>Point-to-point</td>
</tr>
<tr>
<td>Simple</td>
<td>Simple: Users say (much) easier to use than RS232</td>
</tr>
</tbody>
</table>
Like UART but faster, more reliable, less logic

<table>
<thead>
<tr>
<th>UART/RS232</th>
<th>IEEE 1355</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Flow-control with escapes or extra wires</td>
<td>• Flow-control built-in, never loses data</td>
</tr>
<tr>
<td>• Packet protocol(s) with escapes</td>
<td>• Simple packet protocol built in</td>
</tr>
<tr>
<td>• Fastest ~ 10 Mbaud</td>
<td>• to 200 Mbaud for DS, to 2GBaud for HS</td>
</tr>
<tr>
<td>• UART core in Xilinx: 1.5 MBaud 350 CLBs</td>
<td>• 1355 DS core in Xilinx: 140 Mbaud 100 CLBs</td>
</tr>
</tbody>
</table>

100 times UART performance in 1/3 logic

IEEE 1355 at IEE Electronics and Communications Open Forum, 1 July 1999, Paul Walker, 4Links
Ports connect into networks: Plenty to choose from!

- **USB**: Bus, bottleneck, single point failure
- **1394**: Bus, bottleneck, single point failure

(Buses are obsolete: new networks are switched, scalable and fault-tolerant)

- **Ethernet**: Designed as bus, now switched
- **ATM**: Designed for switched global network
- **1355**: Designed for switched chip-chip network
1355’s flexible packet protocol

<table>
<thead>
<tr>
<th>EOP</th>
<th>188 byte MPEG frame</th>
<th>Hdr</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOP</td>
<td>53 byte ATM cell</td>
<td>Hdr</td>
</tr>
<tr>
<td>EOP</td>
<td>48 byte</td>
<td>ATM Hdr</td>
</tr>
<tr>
<td>EOP</td>
<td>Data</td>
<td>Address</td>
</tr>
<tr>
<td>EOP</td>
<td>1.5 kbyte IP packet</td>
<td>Hdr</td>
</tr>
<tr>
<td>EOP</td>
<td>4 kbyte disc sector</td>
<td>Hdr</td>
</tr>
</tbody>
</table>

1355 network can carry multiple encapsulated protocols on same network

IEEE 1355 at IEE Electronics and Communications Open Forum, 1 July 1999, Paul Walker, 4Links
1355’s bandwidth scales

Source: Microprocessors and Microsystems, 30 March 1998, Performance/Cost Analyses for Common Network Topologies
Mark Firth, Andrew Jones and Carol Wright
PACT, Park Row, Bristol BS1 5UB

IEEE 1355 at IEE Electronics and Communications Open Forum, 1 July 1999, Paul Walker, 4Links
Network router/server

No single point of failure,

Network can share many different types of traffic
HS-link PCI routing switch

Courtesy Parsytec

IEEE 1355 at IEE Electronics and Communications Open Forum, 1 July 1999, Paul Walker, 4Links
Rosetta Spacecraft to use 1355

http://www.estec.esa.nl/spdwww/rosetta/pics/rosetta.jpg
Image-processing DSP for Space

http://www.omimo.be/companies/dasa_006.gif

IEEE 1355 at IIEE Electronics and Communications Open Forum, 1 July 1999, Paul Walker, 4Links
Virtuoso VSP on 21020 DSP

- Virtuoso Host Server
- Virtuoso / VSP + Ext.
- DSP Libraries

I/O

- To other boards
- All links : 1355 DS

Host

Multi-Threaded Virtuoso Host Server

From Deep Space to Deep Sea
What’s wrong with IEEE 1355?

- Transputer links demonstrated convergence of computers and communications in 1985
- Abandoned by companies who started it
- Used in niche markets such as Space
- Not quite enough products yet

- No one has heard of it
What’s right with IEEE 1355?

• **Low-cost:** Port uses fewer gates than RS232, Switches use fewer gates than USB Hubs
• **Scalable** to Terabits/s total network throughput
• **Reliable,** resilient, no single points of failure
• **Flexible:** ATM, IP, MPEG... on same network

No other network has this combination

You need this combination

That’s why the 1355 standard

IEEE 1355 at IEE Electronics and Communications Open Forum, 1 July 1999, Paul Walker, 4Links
What’s right with IEEE 1355?

• You have heard of it now

www.1355.org
4Links
for links
www.4Links.co.uk