
S800Base-T Auto-Negotiation

Kevin Brown

December 2003

Relevant Ethernet Standards

- **802.3**

- Clause 28 – Basic Auto-Negotiation
- Annex 28A – Selector Field Definitions
- Annex 28B – 802.3 Selector Base Page Definition
 - Also Priority Resolution
- Annex 28C – Next Page Message Code Field definitions
 - 1000Base-T Next Pages
 - 1xMC(=8) + 2xUP
- Annex 28D – Description of Extensions to Clause 28 and associated annexes
 - Clause 40 Extensions
- Clause 40.5
- Annex 40C – Add-on interface for additional Next Pages

Possible Approaches

- **Bits in 802.3 Base Page**
 - Only 1 bit left
- **1394 Selector Field**
 - Harder to do 1394 to Ethernet interoperability
 - Existing auto-negotiating devices will ignore these pages
- **Add Organizationally Unique Identifier (MC=5)**
 - Several defined for 1394
- **Add to Gigabit Ethernet Next Page (MC=8)**
 - 6 bits leftover in 1st Unformatted Page
- **Generic Next Page mechanism (MC=9)**
 - Same way Gigabit Ethernet was done

Prior Technical Proposal

- **Use the Next Page Mechanism in Auto-Negotiation**
 - MC = 9
 - UP = 1 or 2 pages
- **Potential issues with 802.3**
 - The key issue is that the Base Page still says “802.3”, but the end result is sending 1394 packets, not 802.3 packets
 - Concern this may affect 802.3 management, if a node is identified as 802.3 via its Base Page Selector field, but not capable of 802.3 functions

Use of Selector Field

- **Selector Field is part of Base Page**
- **1394c could request assignment of new Selector Field Value**
- **802.3 AutoNegotiation does not allow more than one Selector Field to be advertised at one time**
 - A device advertising 1394c would never link with a legacy 802.3 device
 - A device advertising 802.3 would never link with a device advertising 1394c
- **This could be worked around by alternating the values of the Selector Field**
 - Need a protocol to prevent continual mismatch
 - This could extend autoneg time from a few seconds to many seconds
 - Clearly perceptible to the end user
 - Unlike current link times for legacy 802.3 devices

Use of OUI

- **OUI's allow for unique capabilities**
 - Encoded in a Next Page Message Code 5
 - Several 1394 alternatives exists
- **Two “1394” OUI are currently assigned:**
 - 00-50-29 hex assigned to “1394 Printer Working Group”
 - 00-A0-2D hex assigned to “1394 Trade Association”
 - A new OUI could be requested

Use of OUI

- Technique #1:

- Add OUI to standard 1000BASE-T 802.3 advertisement
- If 1394 OUI is matched by both ends, immediately link in 1394c mode
 - Base Page Selector Field is still 802.3
 - May be an issue

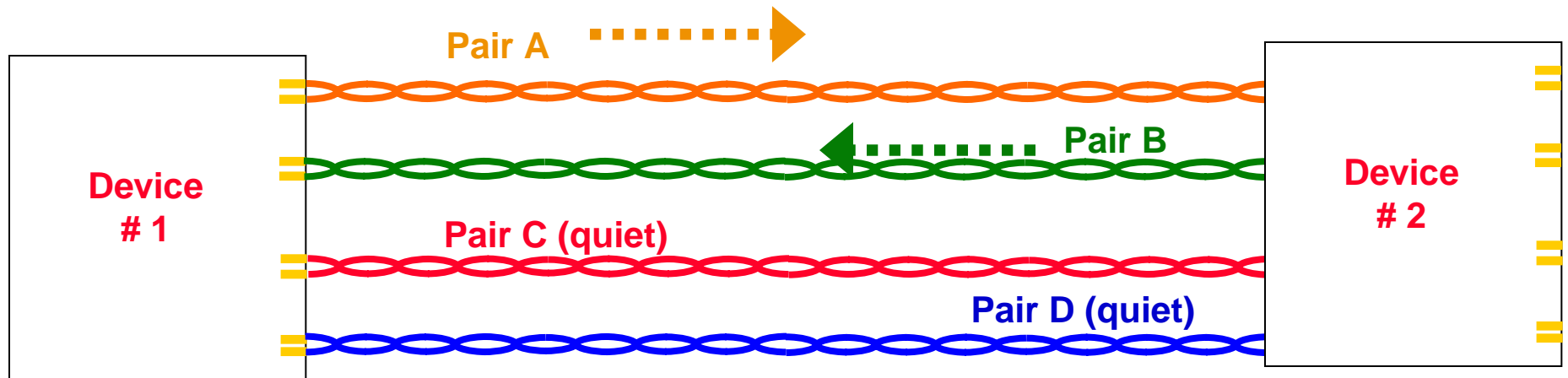
- Technique #2:

- Add OUI to standard 1000BASE-T 802.3 advertisement
- If 1394 OUI is matched by both ends, then both ends drop link, and re-start with 1394 advertised in the Base Page Selector Field
 - Avoids issues with 802.3
 - Extends AutoNegotiation time by several seconds, which is perceptible to the end user, may cause some confusion

New Proposal: Parallel Negotiation

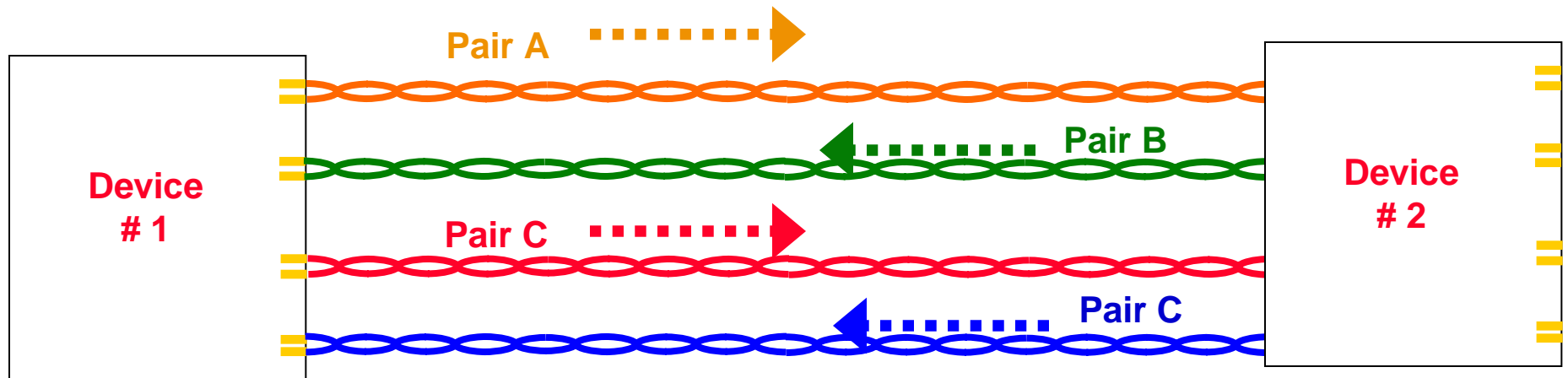
- **1394c request assignment of new Selector Field Value**
- **802.3 AutoNegotiation does not allow more than one Selector Field to be advertised at one time**
- **802.3 AutoNegotiation is specified on wire pairs A & B**
 - The state of pairs C & D is undefined in 802.3 AutoNeg
- **Run 1394c negotiation on pairs C & D**

802.3 Clause 28 AutoNegotiation



- AutoNegotiation on Pairs A & B can establish 802.3 capabilities
- Pairs C & D are silent (no signals)

New Algorithm for Protocol Handshake



- AutoNegotiation on Pairs A & B can establish 802.3 capabilities
- Pairs C & D are used in parallel to signal other capabilities

New Proposal: Parallel Negotiation

- **Run 1394c negotiation on pairs C & D**
 - Use unique 1394 Selector Field in Base Page
 - Set 10/100 values to zero (no capability)
 - No possible confusion with any legacy device on pairs C & D
 - No interaction with any 802.3 AutoNegotiation
- **A device with only 1394c capability will only run negotiation on pairs C & D**
- **A device with both 802.3 and 1394c capability will run two negotiations in parallel on both pairs of pairs**
 - If Link Partner does not respond on pairs C & D, then 802.3 negotiation will link successfully
 - If Link Partner also has 1394c advertised on pairs C & D, then 1394c will override results of 802.3 negotiation
 - Both ends can see capabilities for both 802.3 and 1394c, and store for use by management

Summary

- **Use of a new 1394c Selector Fields seems the cleanest way to proceed**
- **A new Selector Field value could be used with the existing 802.3 autoneg, but advertising both 802.3 and 1394c capabilities would require alternating between the two**
- **Indicating 1394c capabilities on pairs C & D allows both 802.3 and 1394c to be advertised simultaneously, without touching 802.3 autoneg**