S800Base-T Auto-Negotiation

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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 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 1934c 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