+---+
| 8802-3/802.3 REVISION REQUEST |
+-------------------+===========================+---------------------+

DATE: 28th June, 2000
NAME: Bob Noseworthy
COMPANY/AFFILIATION: UNH InterOperability Lab
ADDRESS: Univ of New Hampshire
Durham, NH
PHONE: (603) 862-4342
FAX: (603) 862-0898
E-MAIL: ren@iol.unh.edu

REQUESTED REVISION:
STANDARD: IEEE Std 802.3-1998
CLAUSE NUMBER: 28.3.1, 28.3.4 and Figure 28-16
CLAUSE TITLE: State diagram variables and State diagrams

PROPOSED REVISION TEXT:

In Figure 28-16:

Place ability_match=true * ((toggle_rx^ability_match_word[12])=1) as the exit condition from the NEXT PAGE WAIT state to the ACKNOWLEDGE_DETECT state, replacing rx_link_code_word[12].

the definition for ability_match_word is added to section 28.3.1:

""
ability_match_word[16:1]
A 16 bit array that contains the last Link Code Word that caused ability_match=true. For each element in the array:

Values: Zero; Data bit is logical zero.
One; Data bit is logical one.
""

RATIONALE FOR REVISION:

The exit condition of ability_match in the NEXT PAGE WAIT state is prone to a race condition that can cause next page exchange to consistently fail. Example: station A and station B are negotiating.

refer to ASCII art and text below:

```
A - COMPLETE ACKNOWLEDGE ...........| NP WAIT
A - FLP(n-1)w/ACK ..................| FLP(n)w/ACK

B - COMPLETE ACK ... | NP WAIT ......|ACK DETECT
B - FLP(n-1)w/ACK... | FLP(n)w/o ACK.|FLP(n)w/ACK
```

Station A is in the COMPLETE ACKNOWLEDGE state transmitting page (n-1) and Station B is in the NEXT PAGE WAIT state transmitting page (n). After receiving 3 FLPs of page (n-1) from station A, station B sets ability_match=TRUE. Station A then transitions to the NEXT PAGE WAIT state and starts transmitting page (n), station B receives the first 12 bits of station A's new FLP with toggle_rx^link_code_word[12]=1 and returns to the ACKNOWLEDGE DETECT state. This in and of itself represents a violation of the acknowledgement protocol as station B will now be indicating acknowledgement of station A's new page (n) even though only 12 bits of it has been received. However, as the standard is currently defined, this behavior is acceptable, as there is no requirement for ability_match to be set to FALSE upon the initial/partial receipt of a new FLP.

While this issue as discussed so far may simply weaken the robustness of the arbitration system, a more significant failure occurs when

station A is consistently slower than station B in entering NEXT PAGE WAIT (slower by at least three FLPs transmitted by station B. In most devices, this results in the first FLP(n) transmitted by station A to have its ACK bit set. After 3 such FLPs, station B sets acknowledge_match=TRUE for FLP(n), however, as ability_match was set for FLP(n-1), station B detects a consistency_match=FALSE and enters transmit disable. Thus, a next page exchange, and thus auto-negotiation, can never complete between stations A and B. However, both stations are compliant.

Similar scenarios exist where the outcome is still the inability for aneg to complete.

IMPACT ON EXISTING NETWORKS:

The standard defines incorrect behavior and _every_ existing PHY manufacturer is well aware of the issues and in all(?) cases works the way they "should" and not the way the standard says they "shall".

This remedy is beleived to be best suited for existing and future clause 28 devices, as no attempt is made to redefine/clarify how the ability_match function is set and/or cleared.

Please attach supporting material, if any

Submit to:- Geoffrey O. Thompson, Chair IEEE 802.3
Nortel Networks, Inc. M/S SC5-02
4401 Great America Parkway
P. O. Box 58185
Santa Clara, CA 95052-8185 USA
Phone: +1 408 495 1339 FAX: 988 5525
E-Mail: gthompso@nortelnetworks.com

For official 802.3 use

REV REQ NUMBER: 1039
DATE RECEIVED: 28th June, 2000
~~EDITORIAL~~/TECHNICAL
ACCEPTED/~~DENIED~~
BALLOT REQ'D YES/~~NO~~
COMMENTS: Published IEEE Std 802.3-2002

For information about this Revision Request see -
http://www.ieee802.org/3/maint/requests/revision_history.html#REQ1039