```
+------------------------------------------------------------------------+
|                          REVISION REQUEST                              |
+------------------------============================--------------------+
DATE: 2023-10-10
NAME: Bob Noseworthy
COMPANY/AFFILIATION:  UNH-IOL
E-MAIL: ren@iol.unh.edu

REQUESTED REVISION:
  STANDARD: IEEE 802.3
  CLAUSE NUMBER: 97.4.2.4
  CLAUSE TITLE: PHY Control function
PROPOSED REVISION TEXT:

Clarification of two interpretations of the infofield_complete reseting,
identifying one as a recommended behavior, while allowing the alternate
interpretation.

Change 3rd paragraph, last sentence of 97.4.2.4
From:
  Each InfoField shall be transmitted at least 256 times to ensure
  detection at link partner.

To:
  InfoField shall be transmitted at least 256 times to ensure
  detection at link partner.  It is recommended that InfoField should
  be transmitted at least 256 times with each change to octets 7 to 10.
  Thus each encoding shown in Table 97-7 or Table 97-8 should be sent
  256 times.  Only when loc_rcvr_status has been indicated in at least
  256 InfoFields sould infofield_complete be set TRUE.
  Any change in PMA_state shall result in infofield_complete being set
  to FALSE, and at least 256 InfoField transmissions shall occur with the
  new PMA_state value before infofield_complete is set TRUE.

If the above is deemed acceptable, a similar change may be performed for
149.4.2.4, changing the 3rd paragraph, last sentence
From:

  Infofield shall be transmitted at least 256 times with each change to
  octets 7 to 10.

To:

  InfoField shall be transmitted at least 256 times with each change to
  octets 7 to 10. Thus each encoding shown in Table 149-10 or Table
  149-11 shall be sent 256 times.
  Only when loc_rcvr_status has been indicated in at least
  256 InfoFields shall infofield_complete be set TRUE.
  Any change in octets 7 to 10 shall result in infofield_complete being
  set to FALSE, and at least 256 InfoField transmissions shall occur
  with the new PMA_state value before infofield_complete is set TRUE.


Note, in both cases, the proposed remedy addresses the explicit setting
of infofield_complete as used in the state diagrams of Figure 97-26 and
Figure 149-32, the only places where this state variable is used.
```

Finally, cleanup of the PICS item PMF12 should occur:

change PICS PMF12 Feature text from:
  Each unique InfoField
to:
  InfoField shall be transmitted at least 256 times with each change to
PMA_state.

change PICS PMF12 Value/Comment from:
  Transmitted at least 256 times
to:
  InfoField should be transmitted at least 256 times with each change to
octets 7 to 10.

RATIONALE FOR REVISION:

Resolving ambiguities around the interpretation of when
infofield_complete occurs. Specifically, when should it be set back to
false?

97.4.4.1 defines infofield_complete as:

This variable indicates that a complete set of InfoField messages has
been sent (see 97.4.2.4).
 false: a complete set of InfoField messages has not been sent
 true: a complete set of InfoField messages has been sent

97.4.2.4 states, at the end of the third paragraph:

Each InfoField shall be transmitted at least 256 times to ensure
detection at link partner.

PICS item PMF12 incorrectly states that: "Each unique InfoField" must be
"Transmitted at least 256 times." But each InfoField contains the PFC24
counter that must increment by 15 with each PHY Frame. Hence PMF12 is
impossible to be truly "unique"

Referring to 97.4.2.4, the intention is "likely" referring to the two
types of InfoField formats (Training and Countdown) shown in Figure 97-20
and 97-21, however this then suggests that "infofield_complete" is only
reset to false when PMA_state changes from 00 to 01 (eg: upon
transitioning to COUNTDOWN).
But what about the encoding of loc_rcvr_status in the transmitted
infoField? If loc_rcvr_status changes for a device (presumably 0 to 1
being the only case of interest), then should infofield_complete be
reset?

In MGbase-T1 (Clause 149), this issue was rectified with the PICS item
PCF3, as defined in 149.4.2.4
 "Infofield shall be transmitted at least 256 times with each change to
octets 7 to 10"
Note the definition of infofield_complete remains slightly poor, as
149.4.4.1 simply states the same text as 97.4.4.1, with the only change
being a pointer to 149.4.2.4 instead of 97.4.2.4. As 149.4.2.4 DOES
state the Infofield shall be transmitted at least 256 times with each

change to octets 7 to 10, this strongly implies that infofield_complete
should return to FALSE when these changes occur. The Clause 149 behavior
is utilized as the suggested remedy, while allowing for alternate, but
non-recommended, behaviors.
Namely, Clause 97 implementations have been observed that only set
infofield_complete to FALSE when PMA_state changes. As a result, the
suggested remedy allows for this, while recommending behavior that is
inline with Clause 149 behavior.

Possible race-condition:
If infofield_complete does reset when loc_rcvr_status becomes OK, what is
expected to occur at the exit condition from the TRAINING state as shown
in Figure 97-26. Specifically the only exit from this state is based on
the following:

  loc_rcvr_status = OK *
  rem_rcvr_status = OK *
  minwait_timer_done *
  infofield_complete

Consider the case where rem_rcvr_status = OK and minwait_timer_done. In
that case, when loc_rcvr_status = OK, infofield_complete is already TRUE
for the case where PMA_state = 00 and loc_rcvr_status = NOT_OK.

Strict interpretation of IEEE 802.3 state machines suggests that the
"race condition" mentioned above would not occur, as instantaneous
updating of both loc_rcvr_status and infofield_complete are expected, and
thus even though the exit conditions are evaluated continuously, the
change of infofield_complete to FALSE should occur simultaneously with
the change of loc_rcvr_status = OK.
Note, this "race condition" issue exists in Figure 149-32 as well.
As it is believed that the strict interpretation of the state diagrams,
per 97.1.5 and 149.1.6, which both point to 21.5, which in turn points to
1.2.   Note that 21.5.1 states that the state machine:
  "continuously evaluates its exit conditions until one is satisfied,
   at which point control passes through a transition arrow to the next
   block"
While 21.5.3 defines State Transitions, eg: "Boolean expressions" are
"valid transition qualifiers", no section explicitly defines behaviors
when multiple variables in the boolean expression update simultaneously
Nonetheless, the commenters belief is that the strict interpretation
allows for these local variables to simultaneously change and thus the
setting of loc_rcvr_status to OK would simultaneously set
infofield_complete to FALSE, thus preventing either Figure 97-26 or
Figure 149-32 from existing the TRAINING state.

This said, the likelihood of practical implementation having delays
impacting their behavior should be taken into account such that the
externally observed behavior complies with the strict interpretation
outlined above. As such, no explicit change to either Figure is proposed
as a suggested remedy, though the "race condition" issue is highlighted
for due consideration by the IEEE 802.3 Maintenance Committee. The
proposed text change to 97.4.2.4 provides a suggested remedy for the race
condition without a state diagram change.

Note, this text has been previously reviewed by additional parties who
have been encouraged to participate directly in the IEEE 802 Maintenance
meetings and process.

IMPACT ON EXISTING NETWORKS:

No additional impact. The ambiguity described results in PHY Control
transitions from TRAINING to COUNTDOWN that may occur faster or slower
than anticipated by the alternate interpretation.
The changes described clarify recommended behaviors while allowing the
two possible interpretations described above.

```
+-------------------------------------------------------------------+
|Please attach supporting material, if any                          |
|Submit to:-   David Law, Chair IEEE 802.3                          |
|and copy:-    Adam Healey, Vice-Chair IEEE 802.3                   |
|                                                                   |
|At:-          E-Mail: stds-802-3-maint-req@ieee.org                |
|                                                                   |
|               +------------ For official use ------------+        |
|               |  REV REQ NUMBER: 1421                    |        |
|               |  DATE RECEIVED: 11 October 2023          |        |
|               |  EDITORIAL/TECHNICAL                     |        |
|               |  ACCEPTED/DENIED                         |        |
|               |  BALLOT REQ'D    YES/NO                  |        |
|               |  COMMENTS:                               |        |
+------------+-------------------------------------------+----------+
| For information about this Revision Request see -                 |
|http://www.ieee802.org/3/maint/requests/revision_history.html#REQ1421 |
+-------------------------------------------------------------------+
```