Getting Stuck in UPDATE in the 1000BASE-T PHY Control State Machine

Presenter: James A. McIntosh

Vitesse Semiconductor Corp.

UPDATE State Introduction

- As you know, in D1.1, a handshake with the remote link partner via rem_lpi_mode (a scrambled version of loc_lpi_mode) was added during UPDATE to prevent either side from transitioning to WAIT_QUIET (thus tx_mode<=SEND_Z) before the other side was ready
- This handshake also allows a faster path back to SEND_IDLE_OR_DATA if the remote link partner removes its rem_lpi_req before transitioning to UPDATE.

Figure 40-15b – PHY Control State Diagram, part b

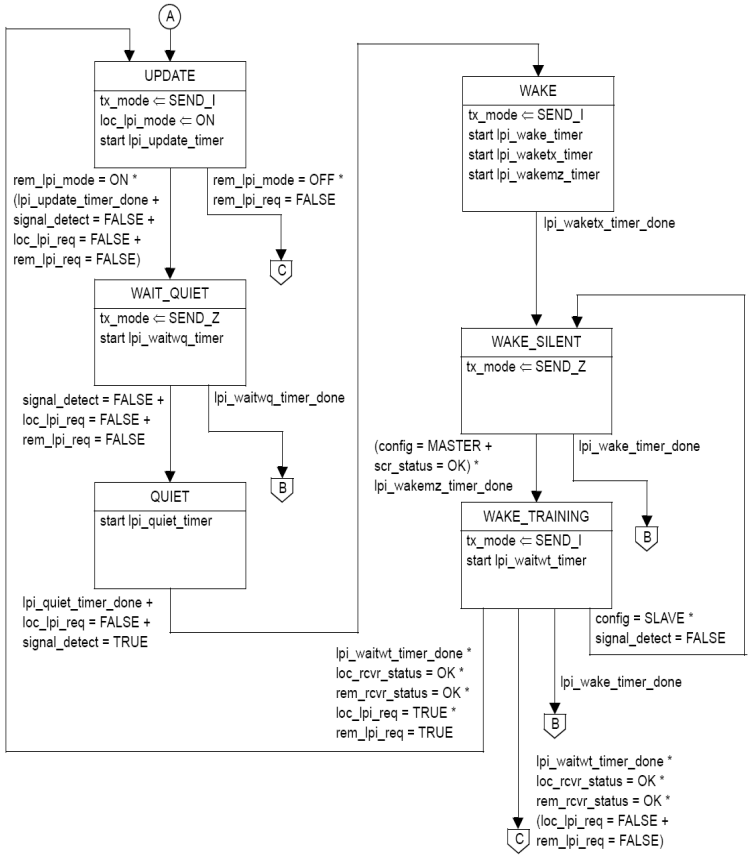

Figure 40–15b—PHY Control state diagram, part b (optional)

UPDATE State Corner Cases

- We have discovered two corner cases while rem_lpi_mode=OFF that could leave us stuck in UPDATE.
  - signal_detect=FALSE
  - lpi_update_timer_done

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Case 1: rem_lpi_mode=OFF & signal_detect=FALSE

- What happens when we are in the UPDATE state, rem_lpi_mode=OFF, and we observe signal_detect=FALSE?
  - This will not happen *normally*. In normal cases, at some point the link partner will transition to UPDATE and we will observe rem_lpi_mode=ON before it can transition to WAIT_QUIET (thus, tx_mode<=SEND_Z and we observe signal_detect=FALSE).
- What if the cable is unplugged at just the wrong time?
  - If, for example, the cable is unplugged and we observe signal_detect=FALSE before we observe rem_lpi_mode=ON, we will be stuck in the UPDATE state *forever*.
- Perhaps we should add a <B> transition (to SLAVE SILENT) if rem_lpi_mode=OFF & signal_detect=FALSE to handle this error condition.

Case 2: rem_lpi_mode=OFF & lpi_update_timer_done

- What happens when we are in the UPDATE state, rem_lpi_mode=OFF, and the lpi_update_timer expires?
  - If rem_lpi_mode never goes to ON, we *should* see rem_lpi_req go to FALSE before the lpi_update_timer expires.
  - Otherwise, the remote link partner *should* see our lpi_req and go to UPDATE, therefore setting rem_lpi_mode to ON.
- However, if the lpi_update_timer expires while rem_lpi_mode=OFF, there is probably a problem with the link partner and we could, again, be stuck in the UPDATE state.
- Perhaps we should add a <B> transition (to SLAVE SILENT) if rem_lpi_mode=OFF & lpi_update_timer_done to handle this error condition.

Proposed changes to Figure 40-15b

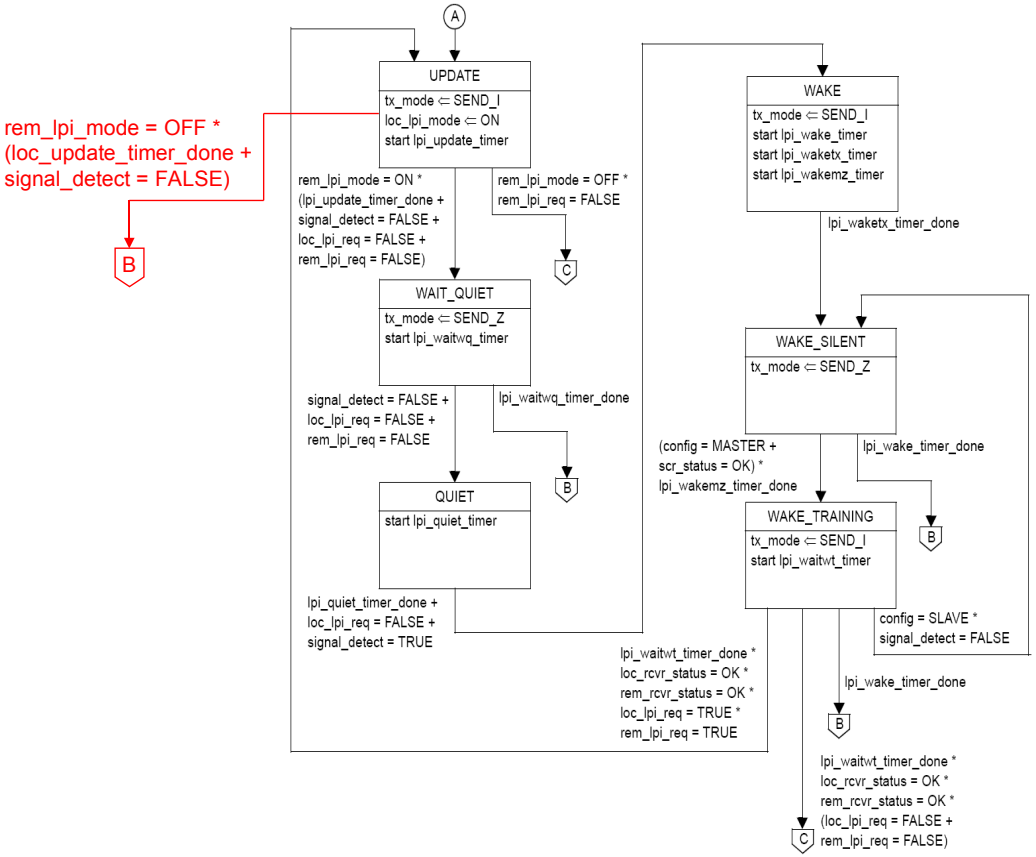

Figure 40–15b—PHY Control state diagram, part b (optional)

Questions?