

## 78. Energy Efficient Ethernet (EEE)

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## 78.4 Data Link Layer Capabilities

### 78.4.0.1 Variables

#### LocTxSystemFW

Boolean variable that indicates the state of FW\_enable that the local transmit system can support. This value is updated by the EEE DLL FW Tx state diagram. This variable maps into the aLldpXdot3LocTxFw attribute.

#### RemTxSystemFWEcho

Boolean variable that indicates the state of transmit FW\_enable echoed back by the remote system. This value maps from the aLldpXdot3RemTxFwEcho attribute.

#### LocRxSystemFW

Boolean variable that indicates the state of FW\_enable that the local receive system requests from the remote system. This value is updated by the EEE DLL FW Rx state diagram. This variable maps into the aLldpXdot3LocRxFw attribute.

#### RemRxSystemFWEcho

Boolean variable that indicates the state of receive FW\_enable echoed back by the remote system. This value maps from the aLldpXdot3RemRxFwEcho attribute.

#### RemTxSystemFW

Boolean variable that indicates the FW\_enable that the remote transmit system requests from the local system. This value maps from the aLldpXdot3RemTxFw attribute.

#### LocTxSystemFWEcho

Boolean variable that indicates the remote system's transmit FW\_enable that was used by the local system to decide the FW\_enable that it wants to request from the remote system. This value maps into the aLldpXdot3LocTxFwEcho attribute.

#### RemRxSystemFW

Boolean variable that indicates the FW\_enable that the remote receive system requests from the local system. This value maps from the aLldpXdot3RemRxFw attribute.

#### LocRxSystemFWEcho

Boolean variable that indicates the remote system's receive FW\_enable that was used by the local system to decide the FW\_enable that it can support. This value maps into the aLldpXdot3LocRxFwEcho attribute.

#### LocResolvedTxSystemFW

Boolean that indicates the current FW\_enable supported by the local system.

#### LocResolvedRxSystemFW

Boolean that indicates the current FW\_enable supported by the remote system.

#### TempTxFW

Boolean used to store the value of FW\_enable.

#### TempRxFW

Boolean used to store the value of FW\_enable.

#### local\_system\_FW\_change

An implementation specific control variable that indicates that the local system wants to change either the Transmit FW\_enable or the Receive FW\_enable.

#### NEW\_TX\_FW

Boolean that indicates the value of transmit FW\_enable that the local system can support.

#### NEW\_RX\_FW

Boolean that indicates the value of receive FW\_enable that the local system wants the remote system to support.

A summary of cross-references between the EEE object class attributes and the transmit and receive control state diagrams, including the direction of the mapping, is provided in Table 78–3.

**Table 78–3—Attribute to state diagram variable cross-reference**

Entity	Object Class	Attribute	Mapping	State diagram variable
TX	oLldpXdot3LocSystems-Group	aLldpXdot3LocTxFw	⇐	LocTxSystemFW
		aLldpXdot3LocRxFwEcho	⇐	LocRxSystemFWEcho
	oLldpXdot3RemSystems-Group	aLldpXdot3RemRxFw	⇒	RemRxSystemFW
		aLldpXdot3RemTxFwEcho	⇒	RemTxSystemFWEcho
RX	oLldpXdot3LocSystems-Group	aLldpXdot3LocRxFw	⇐	LocRxSystemFW
		aLldpXdot3LocTxFwEcho	⇐	LocTxSystemFWEcho
	oLldpXdot3RemSystems-Group	aLldpXdot3RemTxFw	⇒	RemTxSystemFW
		aLldpXdot3RemRxFwEcho	⇐	RemRxSystemFWEcho

### 78.4.0.2 Functions

#### examine\_TxFW\_change

This function decides if the new value of FW\_enable that the local transmit system can support when there is an updated request from the remote system or if local system conditions require a change in the value of the presently supported FW\_enable.

#### examine\_RxFW\_change

This function decides if the new value of FW\_enable that the local receive system wants the remote system to support. This function is called when the remote system wants to change its presently allocated FW\_enable or if local system conditions require a change in the value of FW\_enable presently supported by the remote system.

### 78.4.0.3 State diagrams

The general state change procedure for transmitter Fast Wake is shown in Figure 78–5.

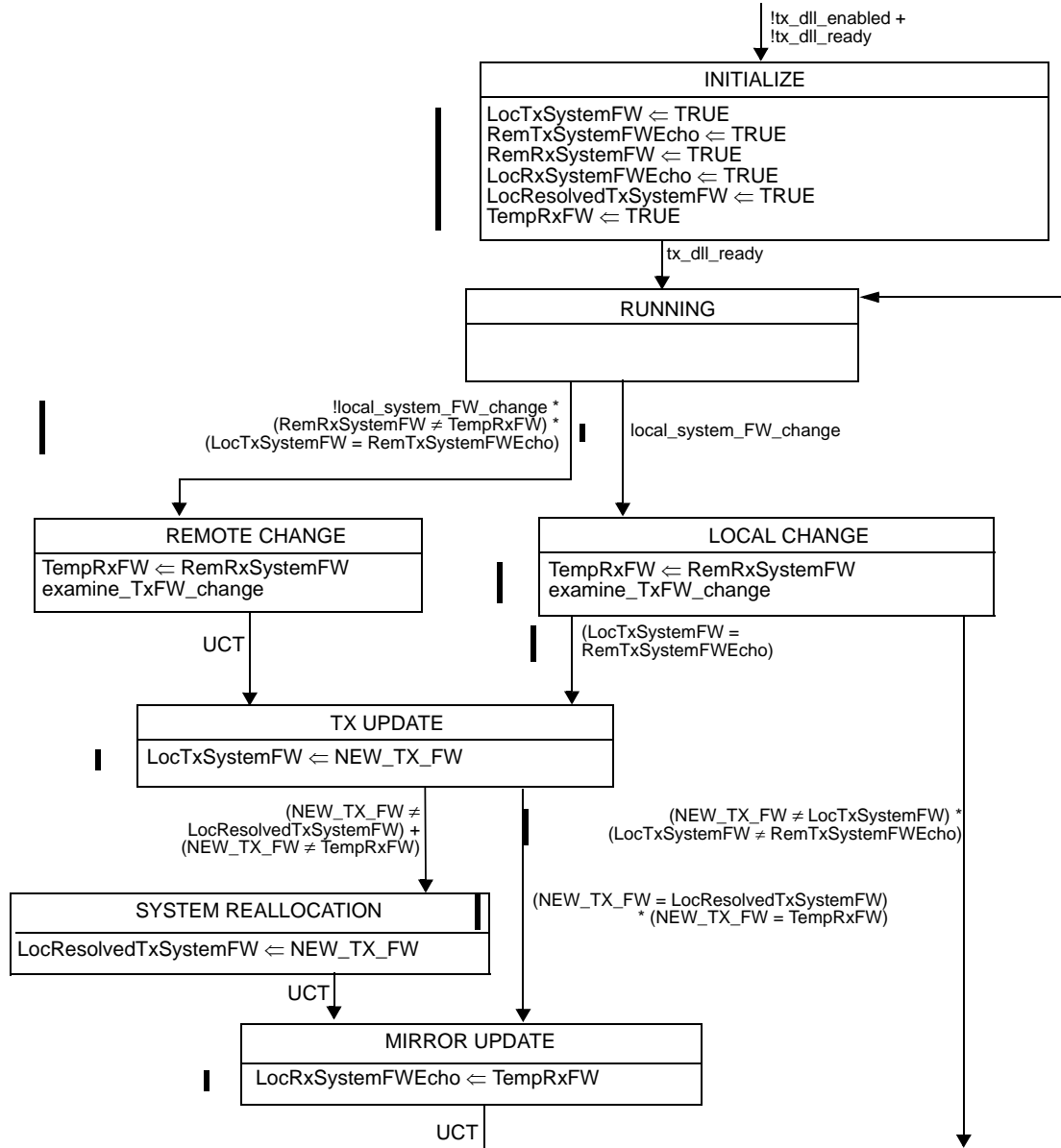


Figure 78–5—EEE DLL Transmitter FW State Diagram

The general state change procedure for receiver is shown in Figure 78–6.

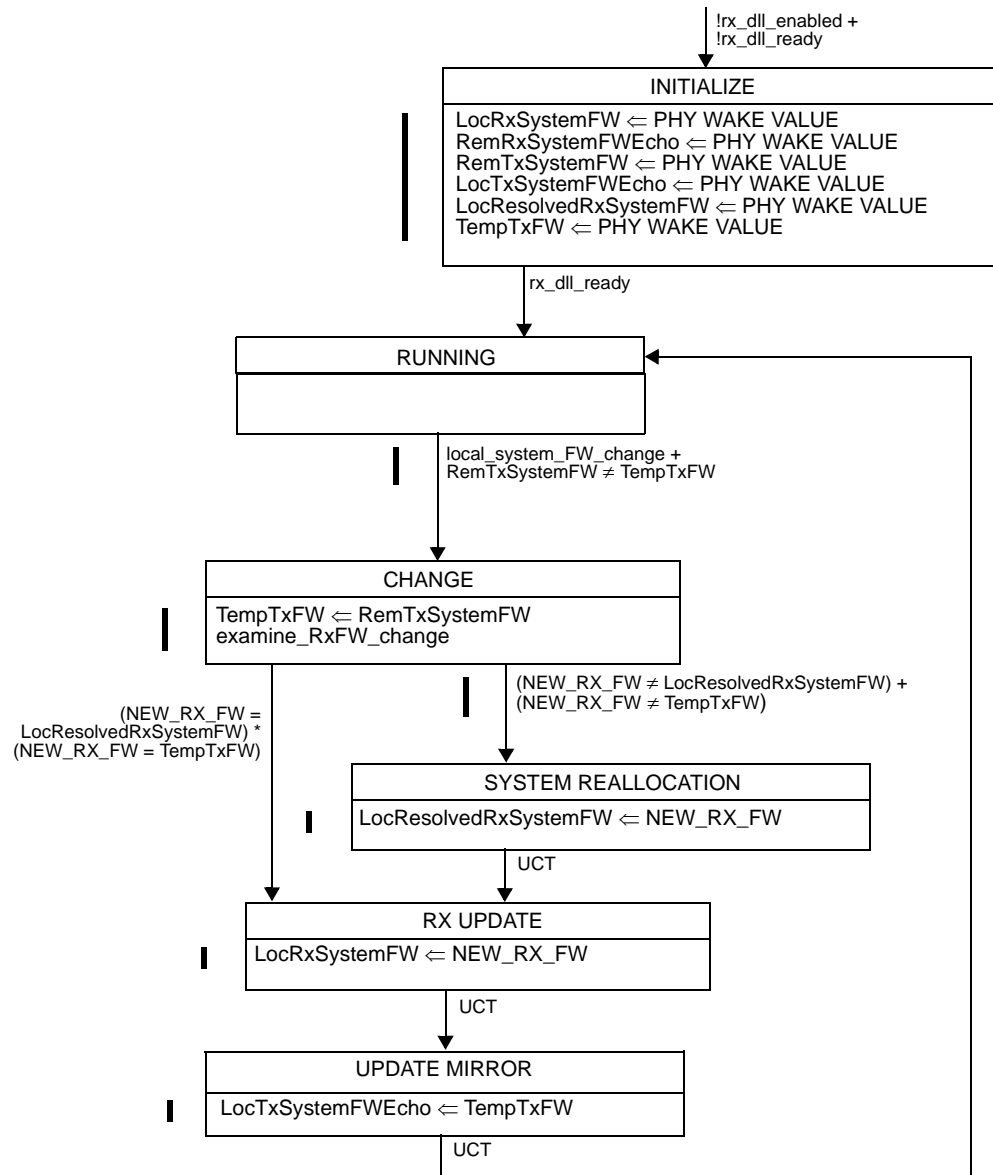


Figure 78–6—EEE DLL Receiver FW State Diagram

#### 78.4.1 State change procedure across a link

Additional procedure for FW exchange.

The default state of Fast\_Wake\_Enable is TRUE for all PHYs that support the function. This provides for EEE operation and functionality on initialization and prior to the exchange and processing of the TLVs.

The receiving link partner may request a change of Fast\_Wake\_enable through the aLldpXdot3LocRxFW (30.nnn) attribute in the LldpXdot3LocSystemsGroup managed object class (30.12.2). The request appears to the transmitting link partner as a change to the aLldpXdot3RemRxFW (30.nnn) attribute in the LldpXdot3RemSystemsGroup managed (30.12.3) object class. The transmitting link partner responds to its receiving partner's request through the aLldpXdot3LocTxFW (30.nnn) attribute in the LldpXdot3LocSystemsGroup managed object class (30.12.2). The transmitting link partner also copies the value of the aLldpXdot3RemRxFW (30.nnn) attribute in the LldpXdot3RemSystemsGroup managed (30.12.3) object class to the aLldpXdot3LocRxFWEcho (30.nnn) attribute in the LldpXdot3LocSystemsGroup managed object class (30.12.2).

The transmitting link partner may advertise a change of Fast\_Wake\_Enable through the aLldpXdot3LocTxFW (30.nnn) attribute in the LldpXdot3LocSystemsGroup managed object class (30.12.2). This appears to the receiving link partner as a change to the aLldpXdot3RemTxFW (30.nnn) attribute in the LldpXdot3RemSystemsGroup managed (30.12.3) object class. The receiving link partner responds to a transmitter's request through the aLldpXdot3LocRxFW (30.nnn) attribute in the LldpXdot3LocSystemsGroup managed object class (30.12.2). The receiving link partner also copies the value of the aLldpXdot3RemTxFW (30.nnn) attribute in the LldpXdot3RemSystemsGroup managed (30.12.3) object class to the aLldpXdot3LocTxFWEcho (30.nnn) attribute in the LldpXdot3LocSystemsGroup managed object class (30.12.2). This appears to the transmitting link partner as a change to the aLldpXdot3RemTxFWEcho (30.nnn) attribute in the LldpXdot3RemSystemsGroup managed (30.12.3).

The state diagrams in Figure 78–5 and Figure 78–6 describe the behavior above.

##### 78.4.1.1 Transmitting link partner's state change procedure across a link

A transmitting link partner is said to be in sync with the receiving link partner if the presently advertised value of Transmit Fast\_Wake\_Enable and the corresponding echoed value are equal.

During normal operation, the transmitting link partner is in the RUNNING state. If the transmitting link partner wants to initiate a change to the presently resolved value of Fast\_Wake\_Enable, the local\_system\_change is asserted and the transmitting link partner enters the LOCAL CHANGE state where NEW\_TX\_FW is computed. If the transmitting link partner is in sync with the receiving link partner, then it enters TX UPDATE state. Otherwise, it returns to the RUNNING state.

If the transmitting link partner sees a change in the Fast\_Wake\_Enable requested by the receiving link partner, it recognizes the request only if it is in sync with the transmitting link partner. The transmitting link partner examines the request by entering the REMOTE CHANGE state where a NEW TX FW is computed and it then enters the TX UPDATE state.

Upon entering the TX UPDATE state, the transmitter updates the advertised value of Transmit Fast\_Wake\_Enable with NEW\_TX\_FW. If the NEW\_TX\_FW is different to either the resolved Fast\_Wake\_Enable value or the value requested by the receiving link partner then it enters the SYSTEM REALLOCATION state where it updates the value of resolved Fast\_Wake\_Enable with NEW\_TX\_FW. The transmitting link partner enters the MIRROR UPDATE state either from the SYSTEM REALLOCATION state or directly from the TX UPDATE state. The UPDATE MIRROR state then updates the echo for the Receive Fast\_Wake\_Enable and returns to the RUNNING state.

#### 78.4.1.2 Receiving link partner's state change procedure across a link

A receiving link partner is said to be in sync with the transmitting link partner if the presently requested value of Receive Fast\_Wake\_Enable and the corresponding echoed value are equal.

During normal operation, the receiving link partner is in the RUNNING state. If the receiving link partner wants to request a change to the presently resolved value of Fast\_Wake\_Enable, the local\_system\_change is asserted. When local\_system\_change is asserted or when the receiving link partner sees a change in the Fast\_Wake\_Enable advertised by the transmitting link partner, it enters the CHANGE state where NEW\_RX\_FW is computed. If NEW\_RX\_FW is different to either the presently resolved value of Fast\_Wake\_Enable or the presently advertised value by the transmitting link partner, it enters the SYSTEM REALLOCATION state where it updates the resolved value of Fast\_Wake\_Enable to NEW\_RX\_FW. The receiving link partner ultimately enters the RX UPDATE state, either from the SYSTEM REALLOCATION state or directly from the CHANGE state.

In the RX UPDATE state, it updates the presently requested value to NEW\_RX\_FW, then it updates the echo for the Transmit Fast\_Wake\_Enable in the UPDATE MIRROR state and finally goes back to the RUNNING state.