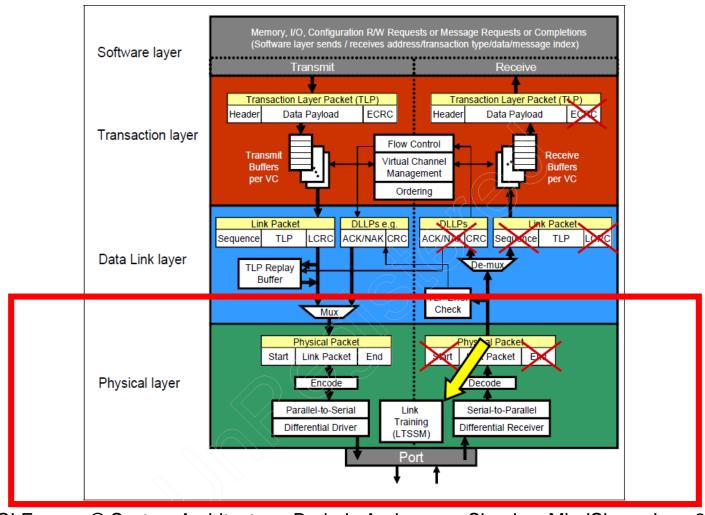
# PHY PCIE

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IE-0523 Circuitos Digitales II

# Diagrama de capas PCIE Figure 14-1: Link Training and Status State Machine Location



<sup>\*</sup> PCI Express® System Architecture; Budruk, Anderson y Shanley; MindShare, Inc.; 2008

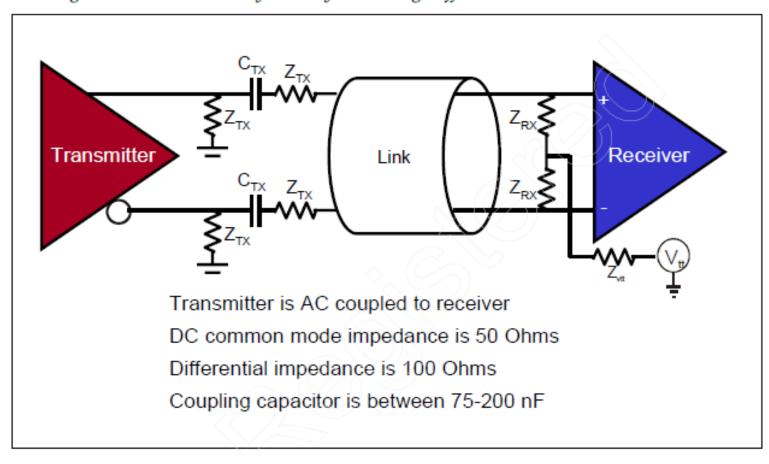
## Enlace de dos capas físicas

Physical Layer Physical Layer Rx Rx Logical Logical Electrical Electrical Link Rx+ T<sub>Rx+</sub>

Figure 11-2: Logical and Electrical Sub-Blocks of the Physical Layer

#### Capa física eléctrica

Figure 2-30: Electrical Physical Layer Showing Differential Transmitter and Receiver



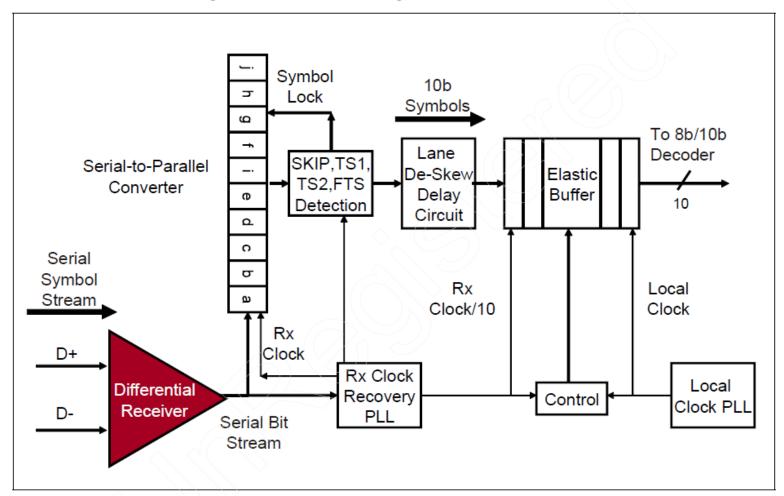
### Detalles de la capa física en TX y RX

From Data Link Layer To Data Link Layer Control Transmit Receive Throttle Řх Ťx Buffer Buffer IDLE/PAD START / END / IDLE / PAD Character Removal and Mux Packet Alignment Check D/K# D/K# Byte Un-StripingLane N (N=0,1,3,7,11,15,3 Byte Striping Lane N (N=0,1,3,7,11,15,31) Lane 0 De-Scrambler Lane 1, .., N-1 De-Scrambler Scrambler Scrambler Tx Local Error 8b/10b 8b/10b Decoder Detect Decoder Encoder Encoder Rx Local Tx Clk Serial-to-Parallel Serial-to-Parallel Parallel-to-Serial Parallel-to-Serial and Elastic Buffer and Elastic Buffer **∢**·····**≻** Lane 0 Lane 1, ..,N-1 Lane N Lane N Lane 0 Lane 1, .., N-1

Figure 11-3: Physical Layer Details

## Lógica RX

Figure 11-21: Receiver Logic's Front End Per Lane



# Microarquitectura del proyecto #1

Lógica de control y multiplexores para la transmisión (TX) y recepción (RX) de datos en el PHY.

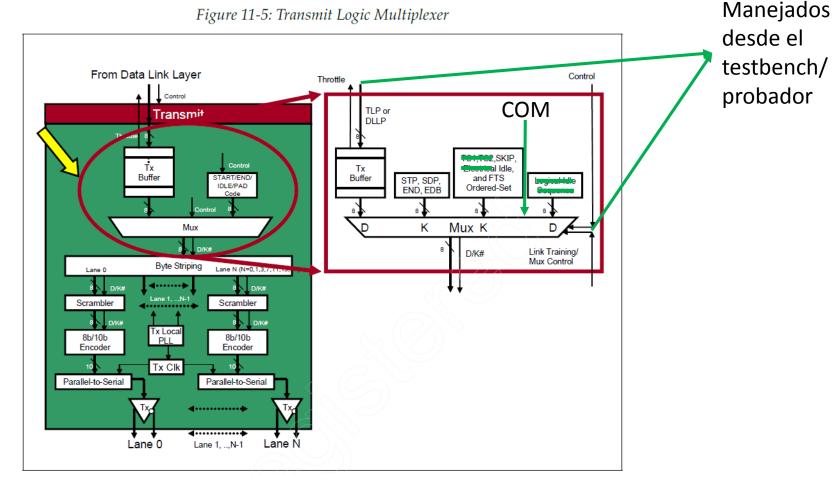
## Detalles del PHY para el proyecto #1

Figure 11-3: Physical Layer Details From Data Link Layer To Data Link Layer ↑ ↑ Control Transmit Receive IDLE/PAD START / END / IDLE / PAD Character Removal and Packet Alignment Check Mux D/K# D/K# Byte Un-StripingLane N (N=0,1,3,7,11,15,3 Lane 0 Byte Striping Lane N (N=0,1,3,7,11,15,31) Lane 0 De-Scrambler e-Scrambler Scrambler Scrambler 8b/10b 8b/10b 8b/10b 8b/10b Decoder Decoder Encoder Encoder Serial-to-Parallel Serial-to-Parallel Parallel-to-Serial Parallel-to-Serial and Elastic Buffer and Elastic Buffer **∢**·····**≻** Lane 0 Lane N Lane N Lane 0 Lane 1, .., N

#### Multiplexor de control

• Las entradas del mux se deben manejar desde una secuencia en el

probador.



#### Símbolos de control

Table 11-5: Control Character Encoding and Definition

Character Name	8b Name	10b (CRD-)	10b (CRD+)	Description
COM	K28.5 (BCh)	001111 1010	110000 0101	First character in any Ordered-Set. Detected by receiver and used to achieve symbol lock dur- ing TS1/TS2 Ordered-Set reception at receiver
PAD	K23.7 (F7h)	111010 1000	000101 0111	Packet Padding character
SKP	K28.0 (1Ch)	001111 0100	110000 1011	Used in SKIP Ordered- Set. This Ordered-Set is used for Clock Tolerance Compensation
STP	K27.7 (FBh)	110110 1000	001001 0111	Start of TLP character
SDP	K28.2 (5Ch)	001111 0101	110000 1010	Start of DLLP character
END	K29.7 (FDh)	101110 1000	010001 0111	End of Good Packet character
EDB	K30.7 (FEh)	011110 1000	100001 0111	Character used to mark the end of a 'nullified' TLP.

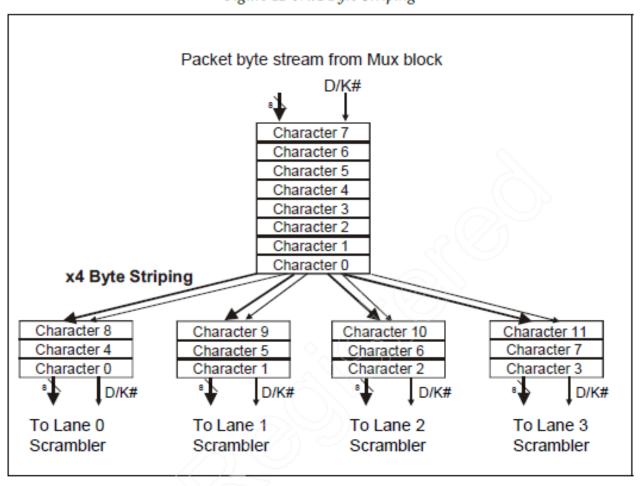
#### Símbolos de control

Table 11-5: Control Character Encoding and Definition

Character Name	8b Name	10b (CRD-)	10b (CRD+)	Description
FTS	K28.1 (3Ch)	001111 1001	110000 0110	Used in FTS Ordered-Set. This Ordered-Set used to exit from L0s low power state to L0
IDL	K28.3 (7Ch)	001111 0011	110000 1100	Used in Electrical Idle Ordered-Set. This Ordered-Set used to place Link in Electrical Idle state

#### De-mux de datos hacia 4 lanes

Figure 11-8: x4 Byte Striping



#### De-mux de datos hacia 4 lanes

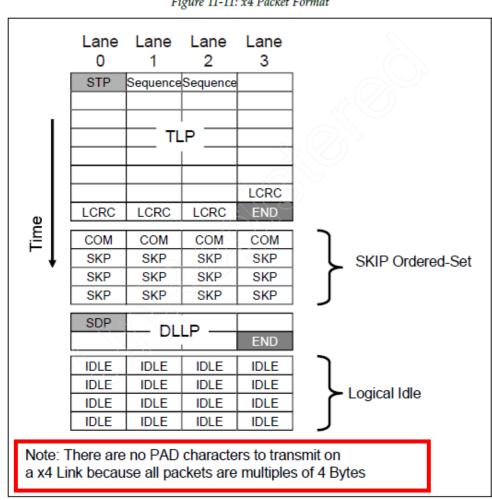


Figure 11-11: x4 Packet Format

#### Ejemplo de secuencia de prueba para 4 lanes

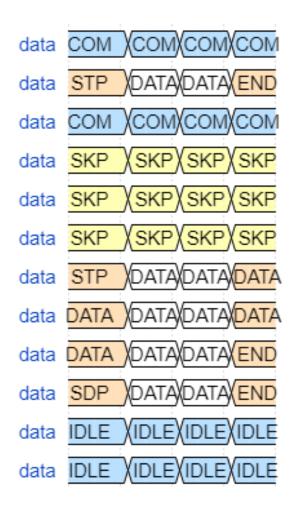


Figure 11-8: x4 Byte Striping Packet byte stream from Mux block Character 7 Character 6 Character 5 Character 4 Character 3 Character 2 Character 1 Character 0 x4 Byte Striping Character 8 Character 11 Character 9 Character 10 Character 4 Character 5 Character 6 Character 7 Character 0 Character 1 Character 2 Character 3 D/K# D/K# D/K# D/K# To Lane 0 To Lane 1 To Lane 2 To Lane 3 Scrambler Scrambler Scrambler Scrambler

