



Hierarchical Decoding of Parallel Serial Streams

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Levels of Decoding



- Bit locking
- Byte Alignment
- Clock Skew Management
- Lane Matching

Use separate control characters for each: K, S, M

At most one KM at each IPG

If longer IPG needed then insert S(s): KS..SM

Insert 3 S in IPG every 4,000 cycles or better: KSSSM

Packet bytes after every M simplifies lane matching

Comparison



all lanes: dddddKRRRddddddddKAKRdddddd

all lanes: dddddKRRRddddddddKAKdddddd

(lanes lined up & packet is after last K or R after A)

clock skew (R) adjustment not needed at each IPG

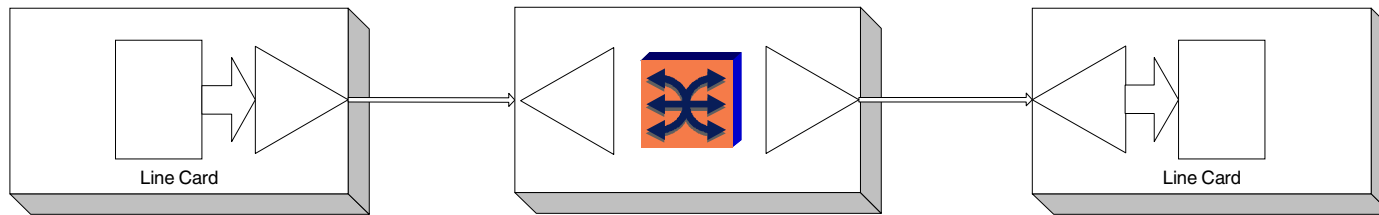
lane A: dddddKMddddddddKSSSMdddddd

lane B: dddddKMddddddddKSSSMdddddd

(lanes not lined up & packet is after M)

New scheme allows for clock skew per lane and lane matching.

Example



clock domain A KSSS	clock domain B KSS	clock domain C KS	clock domain D K
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KSSSM

KSSM

KSM

KM

The Journey of 10GE Data Packets



Tx ASIC Output

0	1	2	3
d	T	P	P
K	K	K	K
M	M	M	M
S	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	T	P
K	K	K	K
S	S	S	S
S	S	S	S
S	S	S	S
M	M	M	M
S	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	T	P
K	K	K	K
M	M	M	M
S	d	d	d

Tx SERDES FIFO

0	1	2	3
d	T	P	P
K	K	K	K
M	M	M	M
S	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	T	P
K	K	K	K
S	S	S	S
S	S	S	S
S	M	S	S
M	d	S	M
S	d	M	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	K	d	P
K	M	T	K
M	d	K	M
S		M	d
		d	

Towards Rx SERDES

	1		
0	T		3
d	K	2	P
K	M	P	K
M	d	K	M
S	d	M	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	K	d	P
K	S	T	K
S	S	K	S
S	M	S	S
S	d	S	S
M	d	S	M
S	d	S	d
d	d	M	d
d	d	d	d
d	d	d	d
d	K	d	d
d	M	d	P
K	d	d	K
M		T	M
S		K	d
		M	
		d	

Rx SERDES FIFO

	1		
0	T		3
d	K	2	P
K	M	P	K
M	d	K	M
S	d	M	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	K	d	P
K	S	T	K
S	M	K	S
S	d	S	S
S	d	S	S
M	d	S	M
S	d	S	d
d	d	S	d
d	d	M	d
d	K	d	d
d	M	d	d
d	d	d	P
K		d	K
M		d	M
S		T	d
		K	
		M	
		d	

Rx SERDES Output

0	1	2	3
d	T	P	P
K	K	K	K
M	M	M	M
S	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	T	P
K	K	K	K
S	S	S	S
S	S	S	S
S	S	S	S
S	S	S	S
S	S	S	S
S	S	S	S
M	M	M	M
S	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	d	d
d	d	T	P
K	K	K	K
M	M	M	M
S	d	d	d