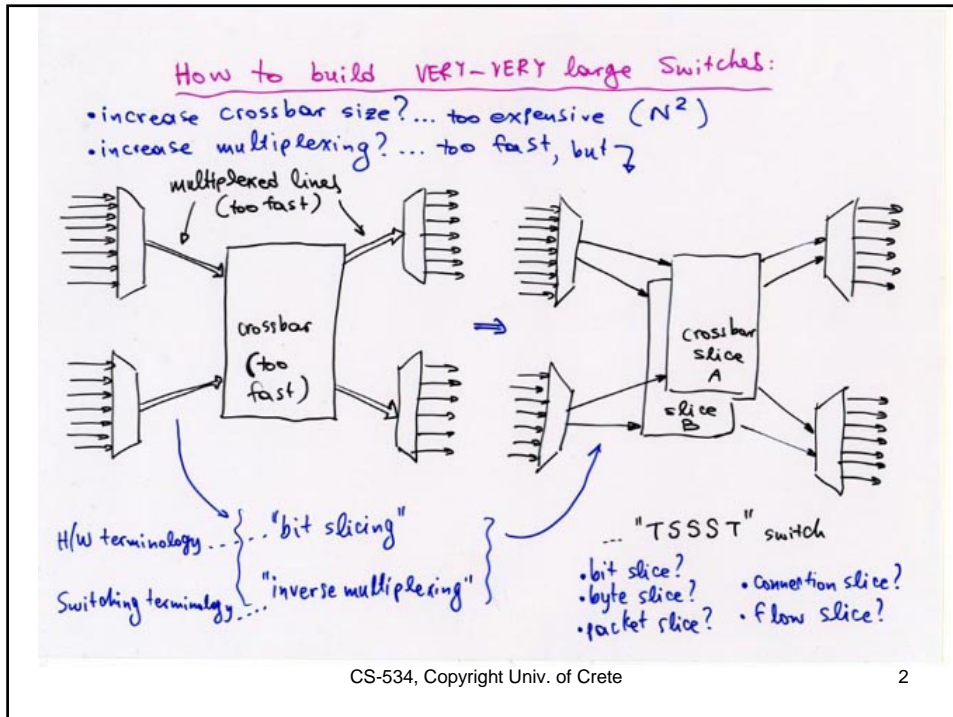


5.1 Byte-Slicing, Inverse Multiplexing

- How to increase the throughput of a Link?
 - wide link #1 – bit-slicing, byte-slicing:
each packet passes through all wires – time switching
 - wide link #2 – packet (flow) slicing, Inverse Multiplexing:
each packet passes through some (of the) wire(s) – space switching
- Duality of Time Switching and Space Switching
 - TSI changes the position of information in time, on one (wide) link
 - Crossbar changes the position in space, among a set of wires/links
 - TST switching is dual of 3-stage fabrics made of smaller crossbars

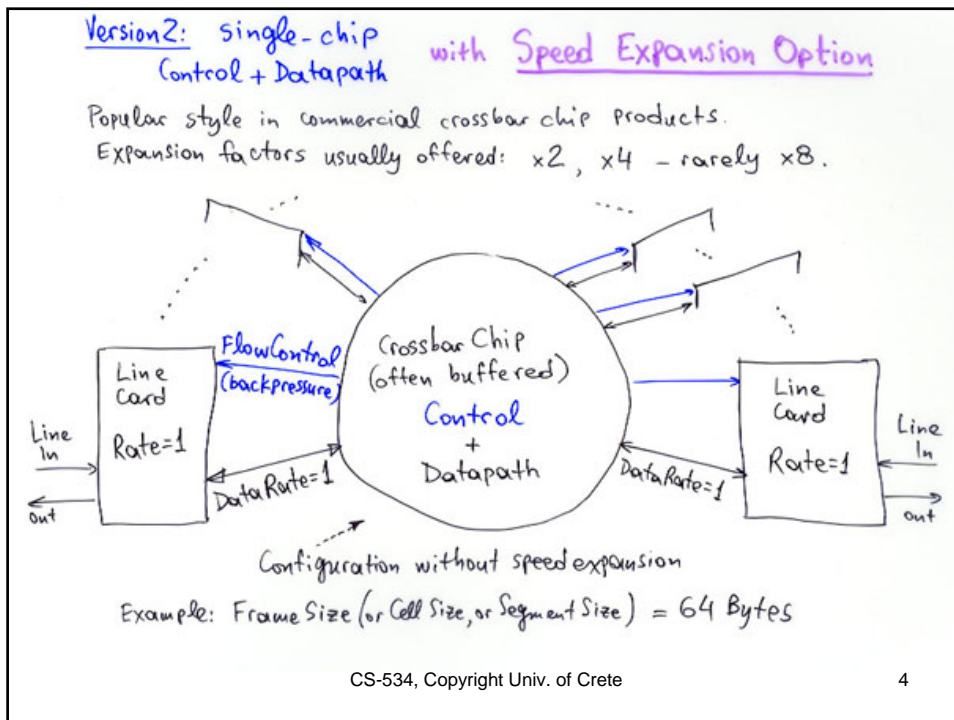
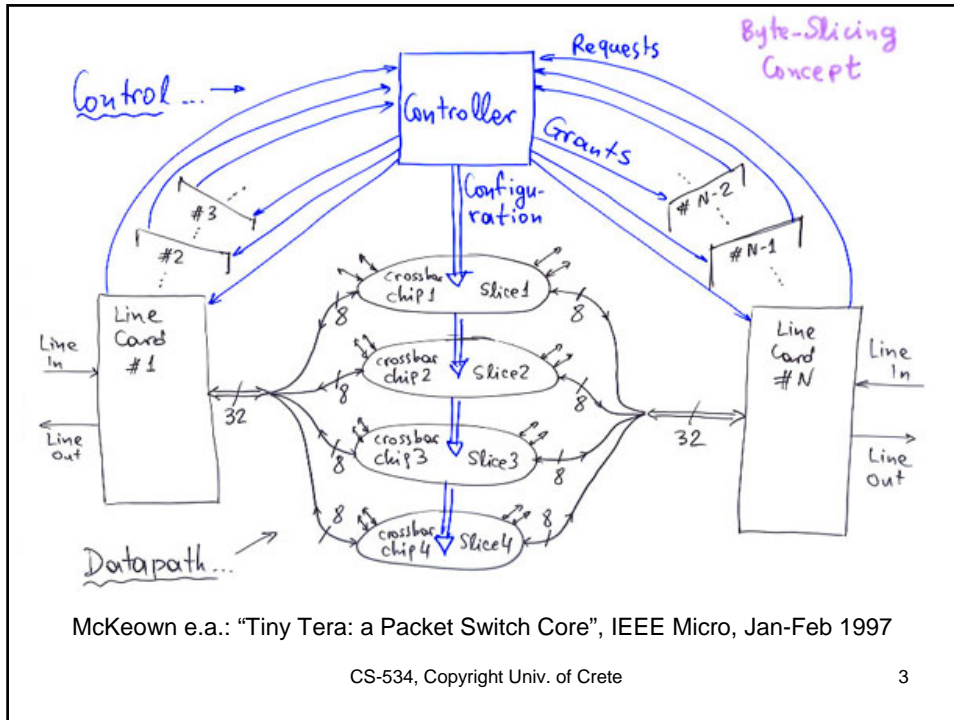
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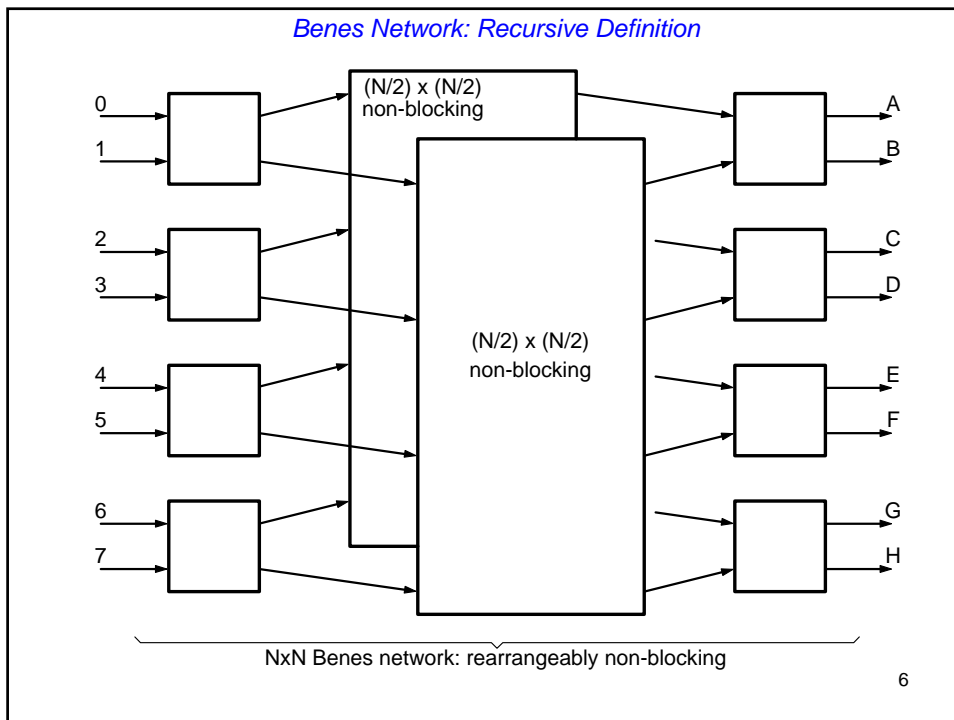
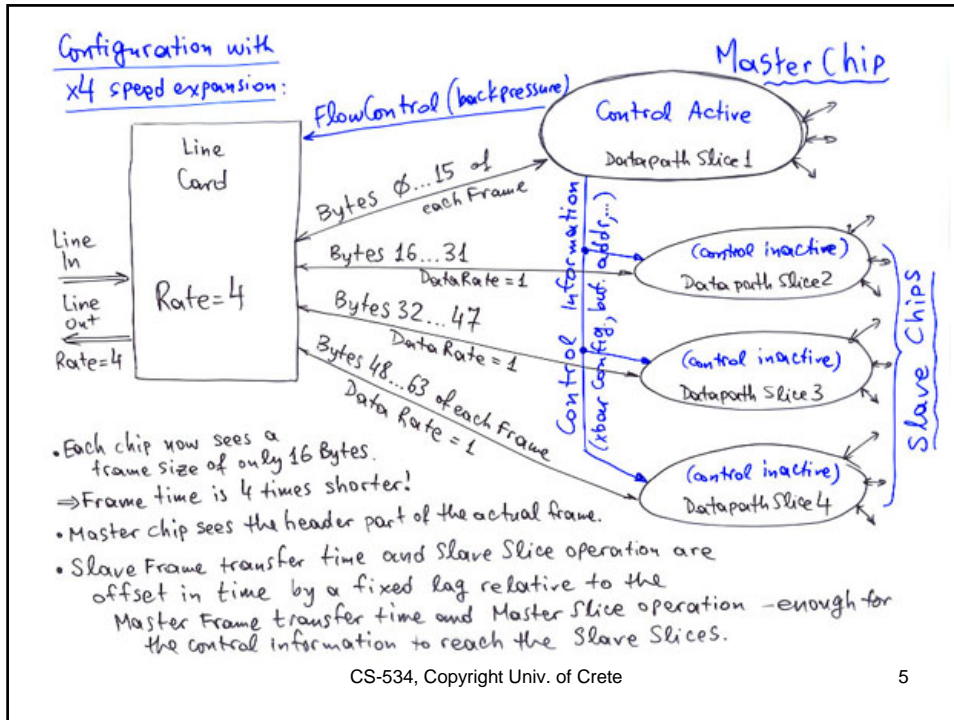
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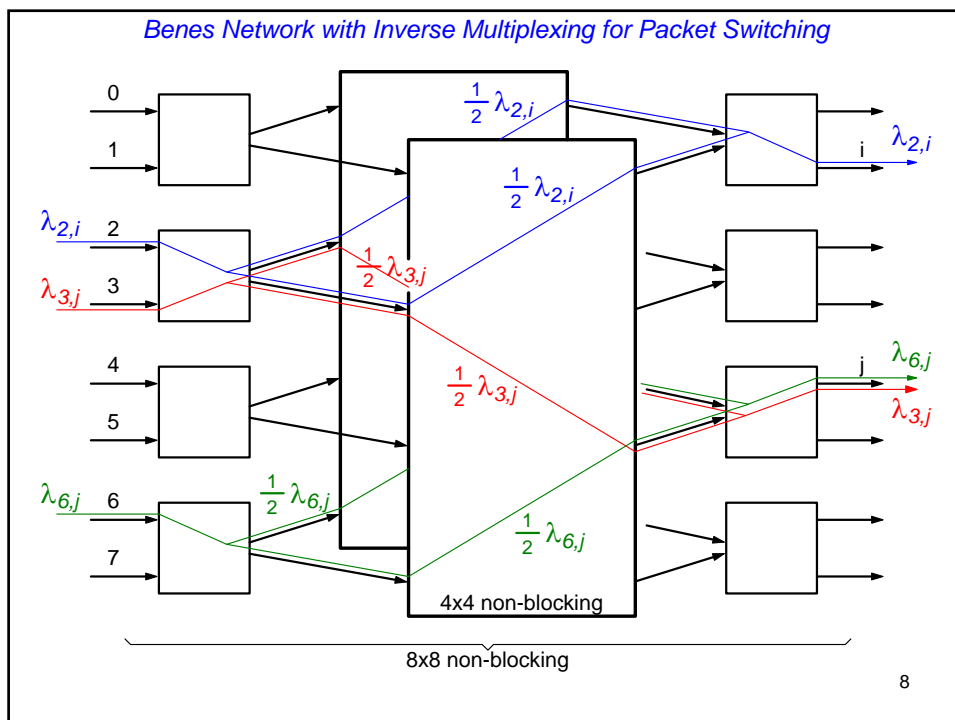
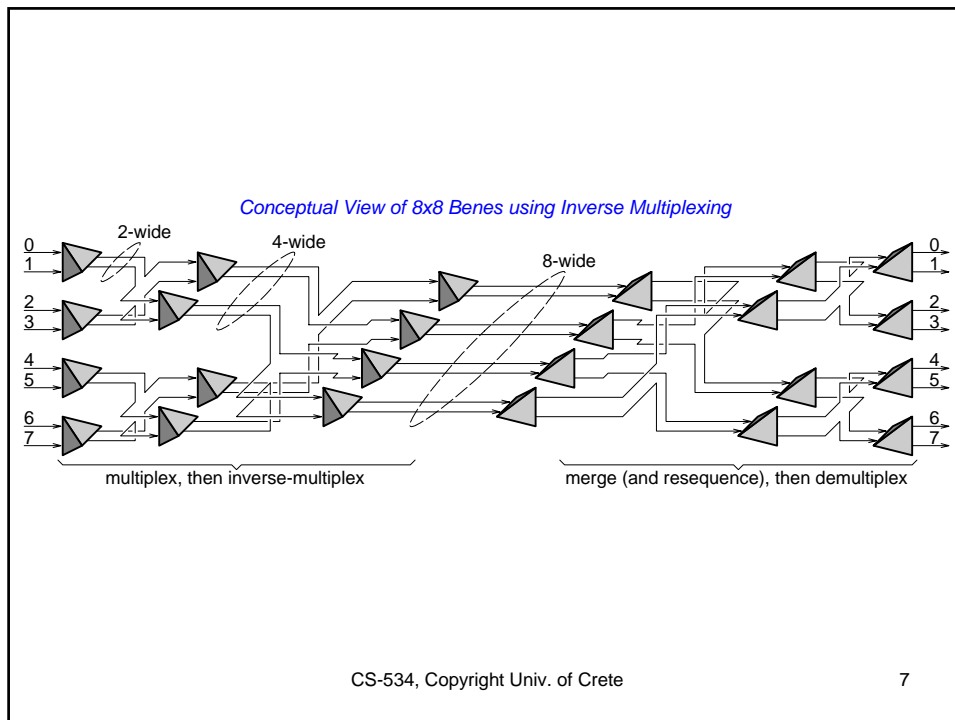


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2







Inverse Multiplexing Implementations

- **Per-Flow Splitting: poor man's approximation**
 - path selection based on hash function of flow ID
 - all packets of a given flow through same path in-order delivery
 - poor load balancing when small number of flows
- **Per-Packet Splitting: full solution**
 - distribute individual packets evenly among the multiple paths
 - potentially out-of-order delivery even for packets of a same flow
 - ⇒ most applications require a resequencer
 - must ensure even distribution at outputs too –not just at inputs
 - ⇒ distribute evenly per flow –flows defined as input-output pairs
 - some architectures perform “adaptive routing”...