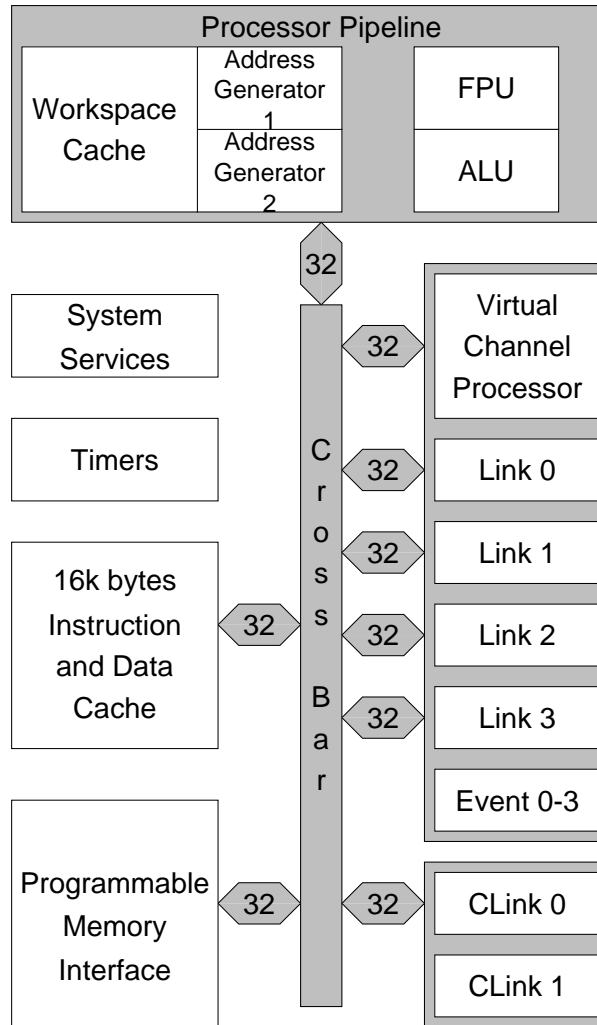
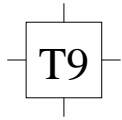


T9000 Transputer



15001



T9000

- **Superscalar Pipeline Processor**

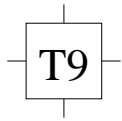
A novel pipeline architecture groups up to eight instructions which will progress together through the five stage pipeline. The pipeline is designed to complement the simple three register stack which is inherited (along with the instruction set) from earlier transputers.

- **Advanced Memory System**

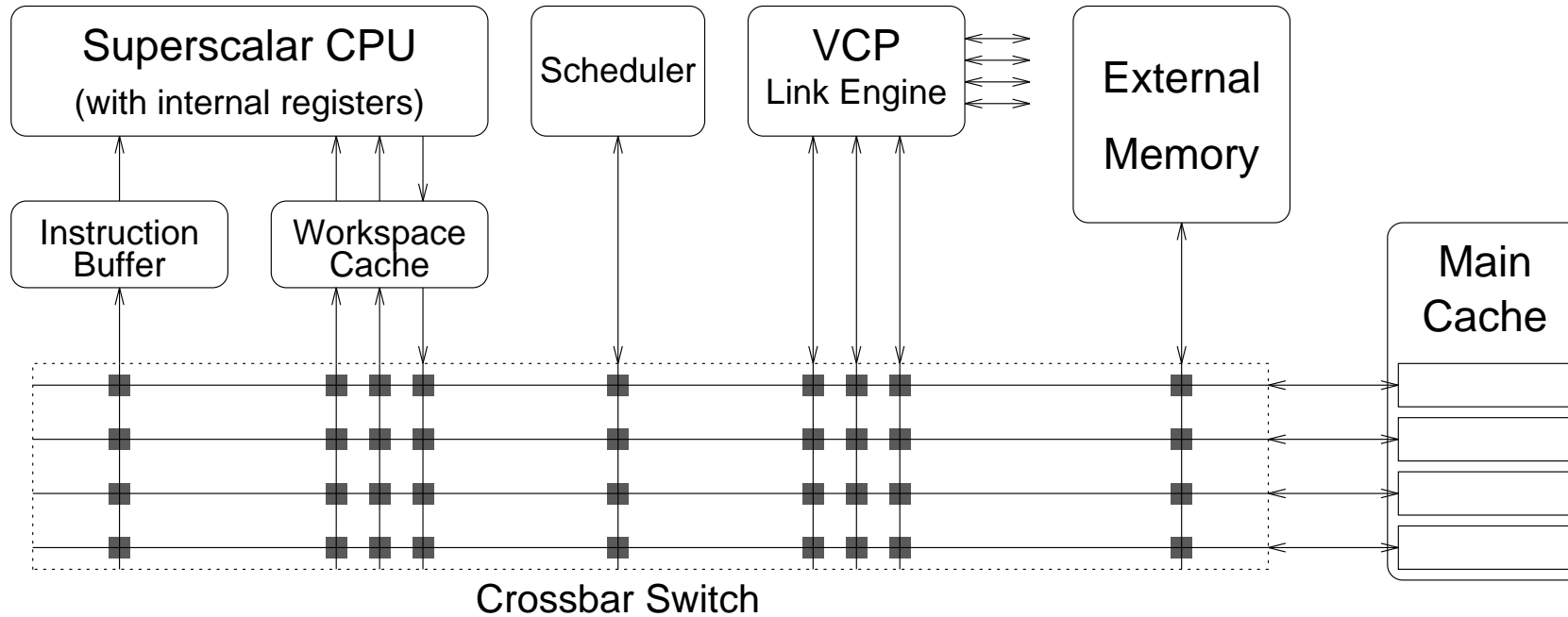
- 32 byte Instruction Buffer
- 32 word multi-port Workspace Cache
- 4 bank x 4 kbyte Secondary Cache

- **Advanced Interconnect**

- Faster (100 MBaud) links with improved clock recovery
- Support for packet routing via direct and indirect networks

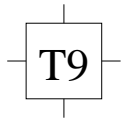


T9000 - Memory Hierarchy



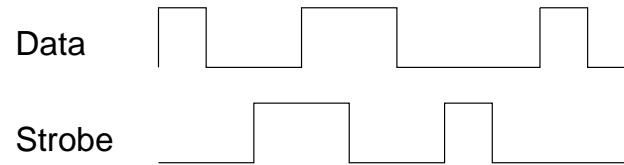
- Crossbar Switch and Arbitrator

- Replaces internal bus
- Allows concurrent access to different cache memory banks.



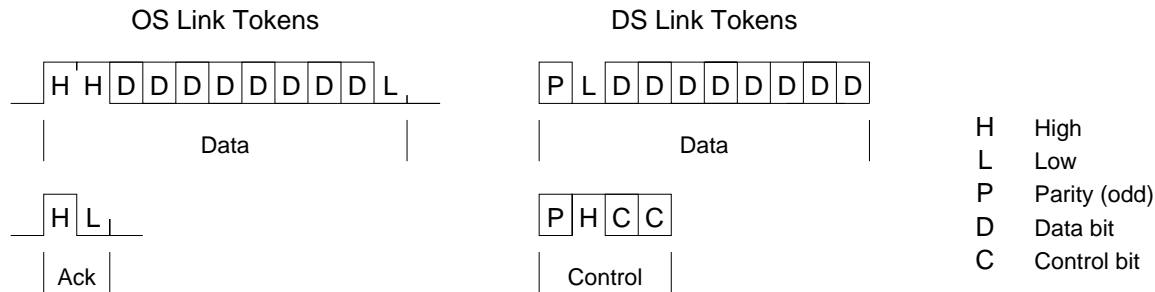
T9000 - Data Strobe (DS) Links

Strobe line

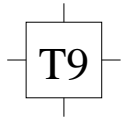


- Strobe changes every time data doesn't.
 - Easier clock recovery.

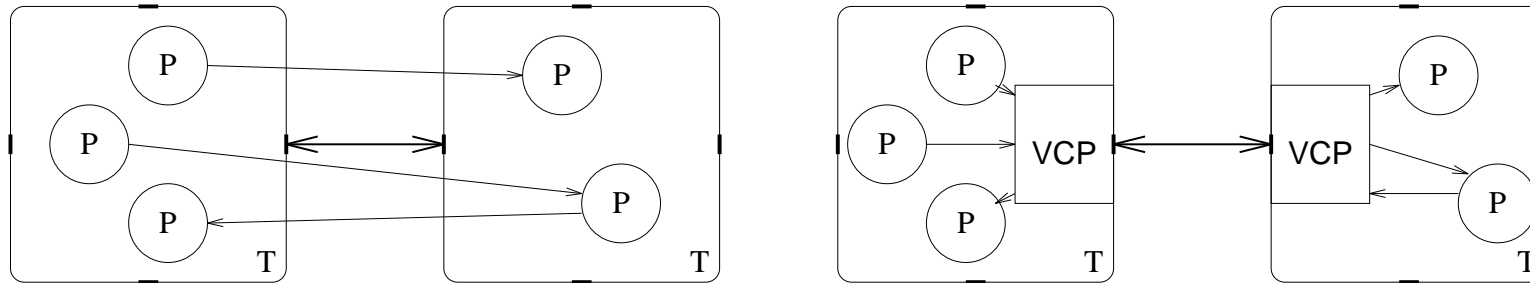
Tokens



- Old oversampled (OS) links support Data tokens and Ack tokens.
- DS links support Data tokens and 4 different Control tokens.

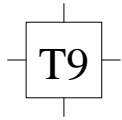


T9000 - Virtual Channel Processor



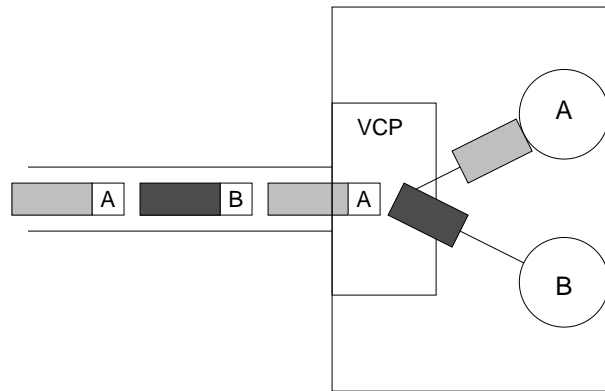
- Support for *Virtual Channels*:

- Divide messages into 32 byte packets.
- - Packets are given a header to indicate the *virtual channel*.
- - Packets are terminated with either an *end of packet* or an *end of message* control token.



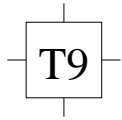
T9000 - Virtual Channel Processor

- Interleave packets from different *virtual channels* down a single physical link.



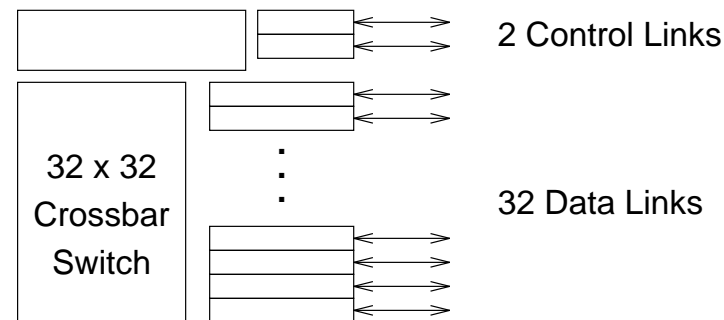
- Each data packet is acknowledged by a zero length packet carrying the same header.¹

¹This packet acknowledge is quite separate from the data token acknowledge. Every data token is acknowledged by a flow control token.

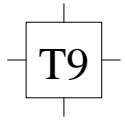


C104 - Packet Routing Switch

The T9000's Virtual Channel Processor does not perform message forwarding, for this INMOS have provided the C104 packet routing switch.

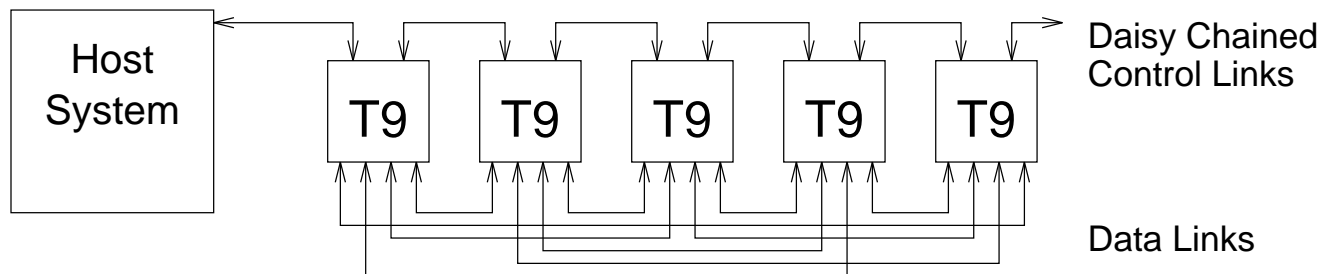


- 32 DS data links to 32x32 Crossbar switch.
- Wormhole Packet Routing is used based on the packet address header.
- Where the required output link is busy the communication is blocked until the link is free.
- C104 is configured via the Control Link daisy chain - Routing strategy is programmable.



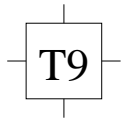
T9000 Direct Networks

- Up to 5 T9000s can be used in a fully connected network - using Control Links for booting.



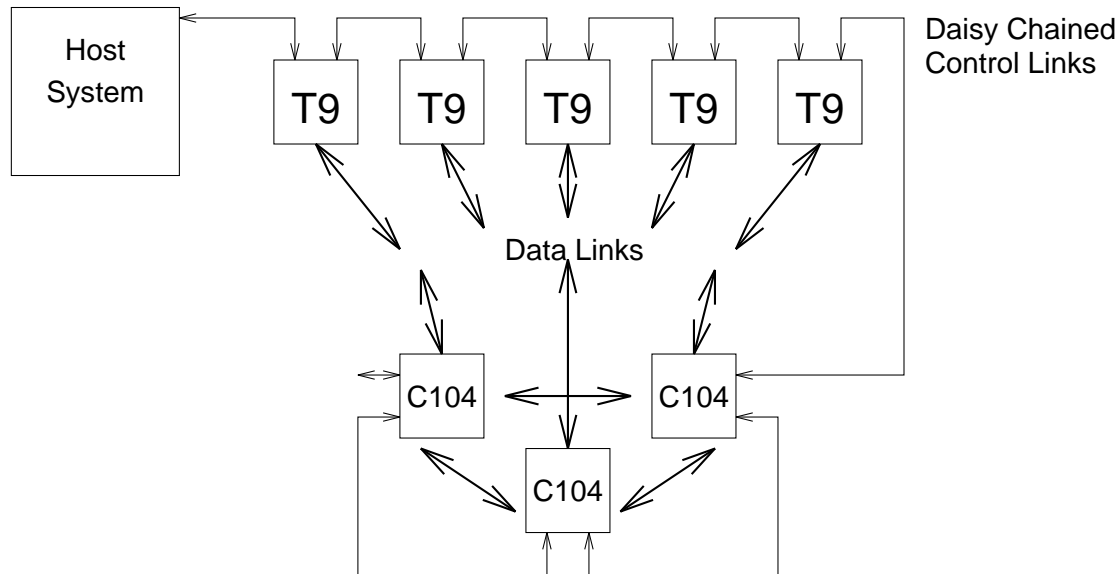
As with the T800, any direct network which requires node valencies of up to 4 can be assembled using T9000 components².

²e.g. 2D grid



T9000/C104 Networks

- Alternatively links can be connected via one or a number of C104s to provide a wide variety of indirect networks³.



Note that only one C104 is required in order to provide an indirect network with a diameter of 2 for 32 T9000s - although 4 C104s would do the job rather better.

³e.g. fat tree