

2000 Paper 8 Question 4

Comparative Architectures

Outline the design of a simple dynamic branch prediction cache which would provide a high degree of accuracy for branches that exhibit a strong bias in one or other direction (for example, loop-closing branches). [5 marks]

Give an example of a simple code sequence containing branches that would be mispredicted by your design, and describe how it would behave. [5 marks]

By storing a record of a branch's recent behaviour it is possible to devise prediction caches which are able to predict accurately branches whose behaviour follows some short regular pattern.

Revise your prediction cache design to make use of a four-bit "local history" for each entry. [5 marks]

How would this predictor perform with a branch exhibiting the following repeating sequences?

(T = taken, N = not-taken)

(a) NTTNNTTNNTTN...

(b) NTTNNTNNTNNT...

(c) TTTTTTTNTTTT...

[5 marks]