Summary
Multiscalar Processors

Venkatesan Packirisamy
January 31, 2005

1 To be completed before class

What are the problems solved by this paper? (50 words)

Current superscalar processors use hardware speculation and other techniques to extract ILP in a program. It can issue multiple instructions from the same program in the same cycle. But the parallelism that can be extracted by this method is very limited. The main reasons are:

- branch prediction accuracy limits ILP (There are 1 branch in every 5 instructions)
- complexity of issue logic to issue n instructions is $n^2$.
- to extract more parallelism we need a very large window of instructions to know which are ready to issue. Because of this the superscalar approach is not scalable.

What are the approaches attempted by this paper? (50 words)

The paper tries to cross these limits and extract more parallelism in the program using a novel technique. They try to get more parallelism by extracting thread level parallelism (TLP). The multiscalar processor contains many processing elements, each of which can fetch and execute instructions independently. A sequencer walks over the Control Flow Graph (CFG) and assigns tasks to these processing elements. The tasks execute in parallel (speculatively) while maintaining sequential semantics. In effect multiscalar splits the complexity of the superscalar processor and distributes across the processing element. Due to this the processor can extract parallelism from a very large window of instructions and the processor is also not as complex as the superscalar processor.

What are the main conclusions of this paper? (50 words)

The multiscalar processor has various advantages to the existing paradigms of computer architecture. The multiscalar approach can give very good speedup over a superscalar processor which uses the same amount of hardware. Apart from performance, the multiscalar processor is comparatively less complex (eg. issue logic). The paper discusses various performance bottlenecks which indicates that further speedup is possible by using more advanced hardware and compiler approaches.

2 To be completed after class

Did this paper address an important issue? Explain. (100 words)

Are the proposed approaches valid? Describe its strength and weakness. (100 words)
Do the results support the conclusions? Explain. (100 words)

Describe the potential future works? (100 words)