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Lecture 11 - Coherence
Essential requirements?

• Must be single-writer / multiple-reader or stricter

• One owner -> centralization point

• Must be an ordering on requests to each piece of data -> coherence property; ordering across pieces of data -> consistency
How to build directories?

• Requirements
  • Do you need full sharing capabilities?

• Toolkit:
  • Hierarchy
  • Hashing (to avoid high contention on directory)
  • Optimize for the common case
A world w/o coherence

- A few pieces of data in some applications would be ok
- Software-coherence fence (SCF)
  - Coherent modifications to shared data require an SCF:
    - Write-> SCF -> Readers
    - Readers -> SCF -> Reader -> Write
- SCF: CLFUSH or IPI/CLFLUSH
Questions

- Does IBM machine support SC or TSO?
- How to scale directory?
- How to scale snoop based systems?
- Snoop not used much, really???
- How to optimize storage requirements of directories?
- Can we use these ideas for distributed systems?
- Can we relax strict coherence requirements?
- How have things evolved from what is described?
- Are there any decentralized solutions?
- How to build a scalable interconnect?
- Is the complexity of all these transient states worth it?
- How much time is spent in each of the MESI states?
- Why not a central switch?