Fault Tolerance

- Checkpointing can also be used for fault tolerance
- Makes programs robust against software or hardware faults
  - Becoming more common as process size becomes smaller and chips become more dense
- Can use disk checkpoints for this, but they’re slow
- Charm++ can also PUP to memory
Double In-Memory Checkpointing with Automatic Restart

- Can checkpoint data in a buddy processor’s memory, in addition to local checkpoint
- System auto detects when node crashes using heartbeat mechanism
- Failed process restarted on a working core, retrieves checkpoint from buddy
- Every other processor uses local checkpoint
Using Double In-Memory Checkpointing with Automatic Restart

• Build Charm++ with syncft option on a net-based machine layer
• At synchronization point, call from main chare:

```cpp
CkStartMemCheckpoint(CkCallback& cb);
```

• Callback cb called when checkpoint or restart is complete
• To test, invoke CkDieNow() to mimic failure