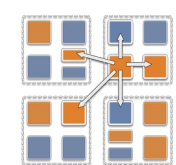# Fault Tolerance

- 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

PPL
UIUC
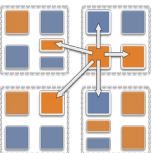
Using Double In-Memory Checkpointing with Automatic Restart

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

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

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