



CoreGRID Industrial Conference

Applying decentralized algorithms in peer-to-peer networks

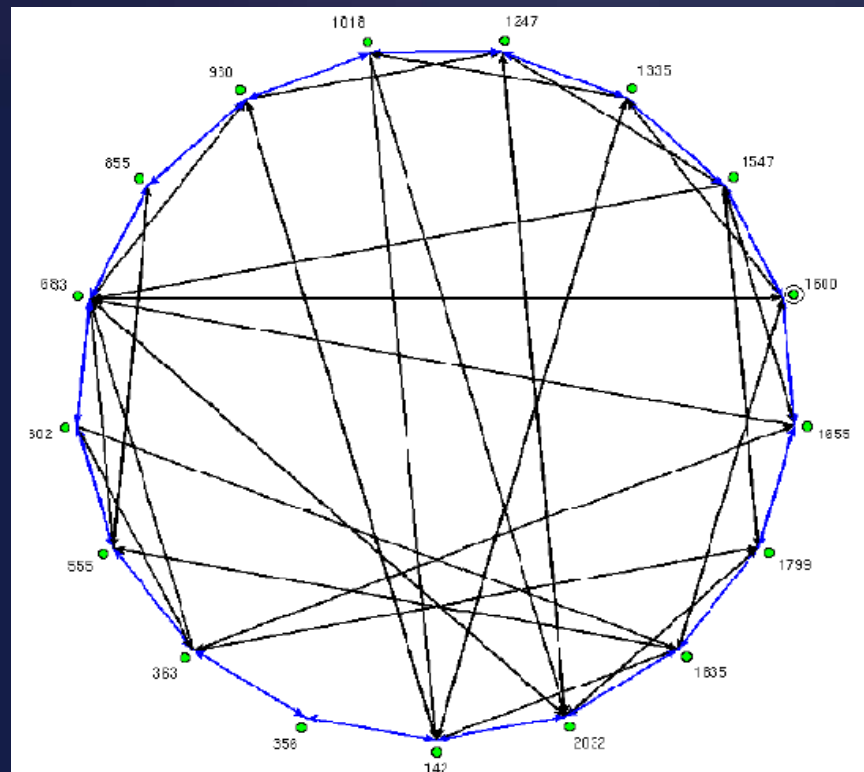
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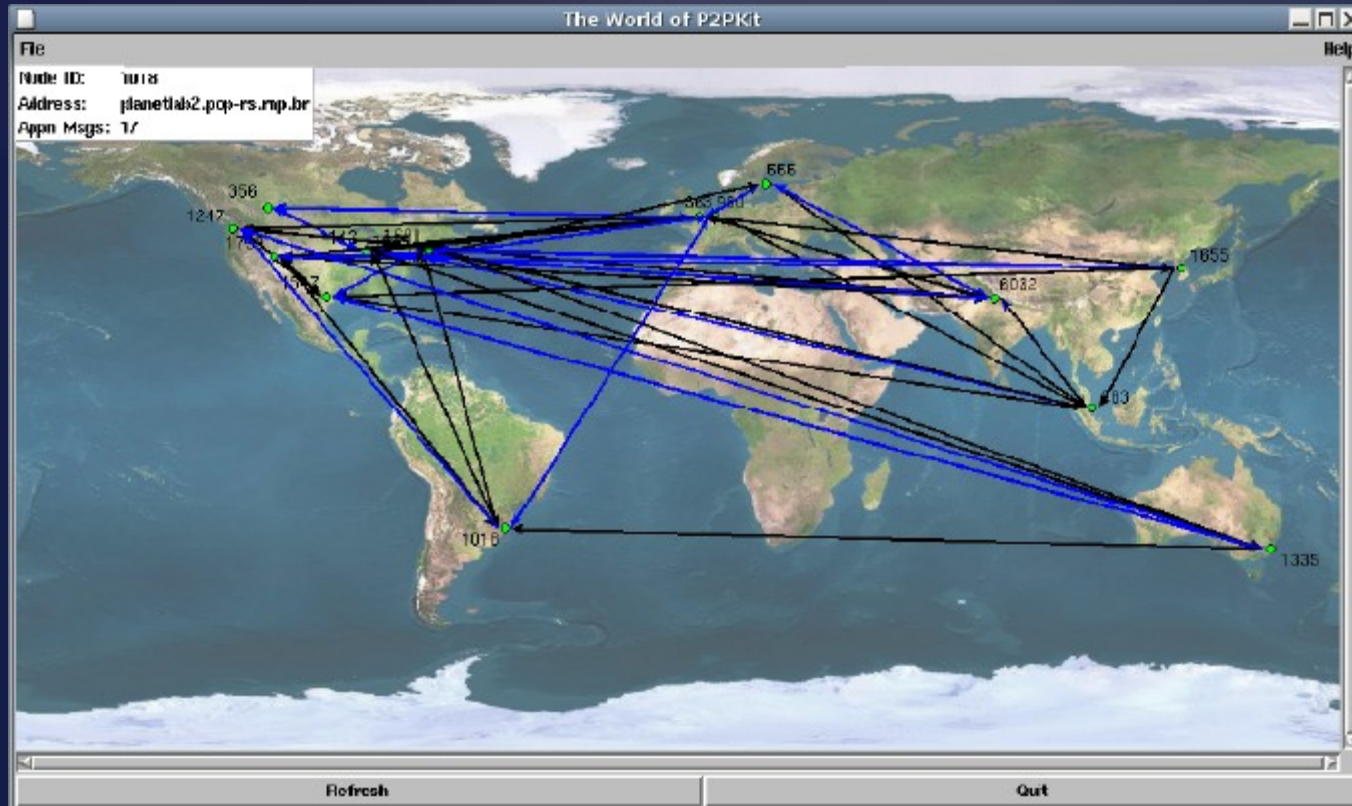
Peer-to-peer networks

- **Self-organizing structured overlay network**
- **Scalable and fully decentralized network based on DHTs, successors, predecessors and finger tables**
- **All synchronization and management is done with decentralized algorithms**
- **Examples: Chord, DKS, P2PS/P2PKit**
- **Base for self-organizing Grid services**

P2PS/P2PKit



P2PS/P2PKit in PlanetLab



Atomic Join/Leave of Peers

- Decentralized algorithm based on a locking mechanism
 - First get the lock of the joining/leaving peer
 - Then get the lock of the successor
 - Update successors and predecessors.
- Safety: Deadlock free (Dining Philosophers)
- Liveness: No *livelocks*, no *starvation*, based on lock forwarding
- Algorithm of Ali Ghodsi, SICS/KTH.

Demo Part I

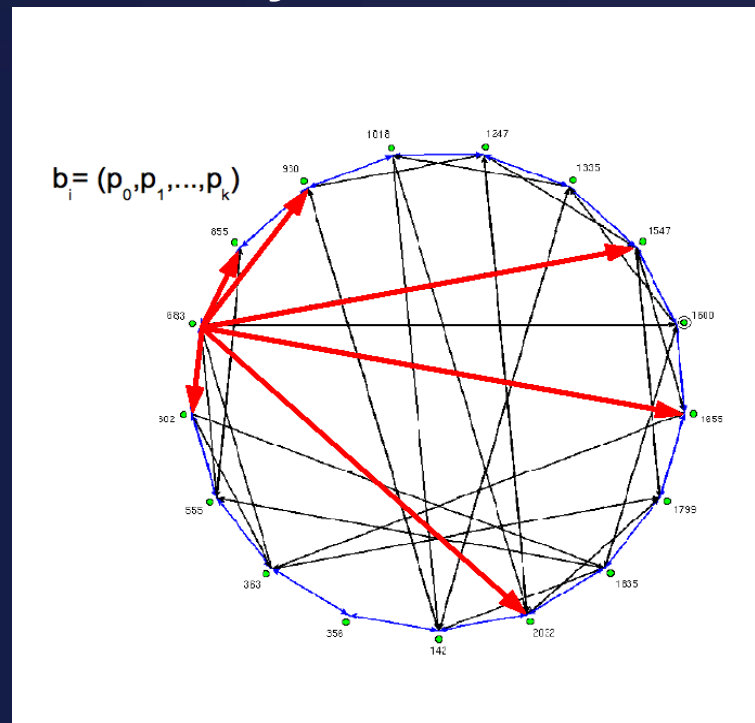


Belief Propagation

- Algorithm to compute marginal probabilities
- Application from mathematics and physics research area
- Used for local estimation without global knowledge
- Every node estimates its belief and propagates it to its neighbours
- New belief is estimated based on neighbours' beliefs until the iteration converge to a solution
- Every belief can be seen as a summary of neighbour's beliefs. It always converge in trees.
- Example: Sudoku solvers, k -partitioning

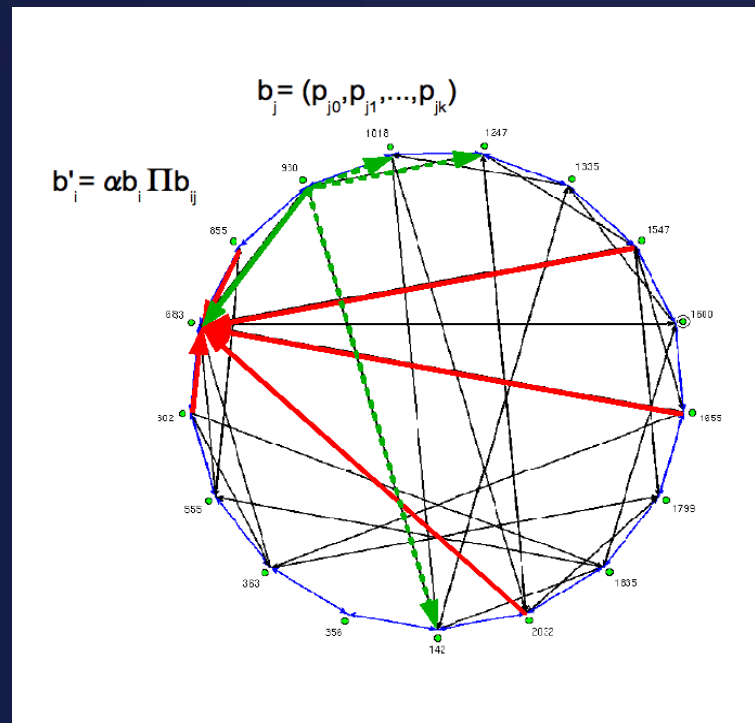
Load-balanced k -partitioning

- Partition the network into k sets for data retrieving
- Every peer knows a subset of the network (its fingertable)
- Based on work of Danny Bickson *et al.*, HUJI.



Load-balanced k -partitioning

- Peer i receives the belief of its neighbours
- Not as a reply message, but because every peer propagates its own belief



Demo Part II



THANK YOU

