If a global partition were to happen it could mean the end of most blockchains. Geographical replication ensures that one blockchain continues to work in regions that are not split by the partition. This work proposes a protocol to update regions as nodes join, move or leave the system.

Nodes are the unit of the distributed system. Each one will draw a level from a lottery and compute their bunch and cluster. Then nodes create regions that cover their own cluster. Each region participates in regions that it created and that nodes in its cluster create. Distances are estimated using Round Trip Time (RTT). It is guaranteed by design that any two nodes in the system participate within a region with a radius of a small multiple of their RTT.

Time is split into epochs. At the beginning of each epoch, the system is updated and the regions are redrawn. Nodes in the system at a given epoch are the authority that can accept nodes for the next epoch and run consensus. It is required that if there are \( N \) nodes in the system there are less than \( f \) malicious nodes, where \( f \) is given by \( 3f + 1 = N \). The protocol described below offers a solution for the update of the system.

A control plane in time and space for locality-preserving blockchains

Control Plane Protocol

**Time**

**Registration for Epoch 1**

**Epoch 1**

- Measures Ping
- Draws Level
- Node asks to join
- Node receives list of participants
- Consensus on participants
- Threshold signature

**second Solution: New Epoch Locarno Lottery**

**Control Flow**

**Epoch 1**

- Region creation
- Pairwise distances computed
- Registration for Epoch 2 begins
- Region creation
- Pairwise distances computed
- Registration for Epoch 3 begins
- Region creation
- Pairwise distances computed
- Registration for Epoch 4 begins
- Region creation
- Pairwise distances computed
- Registration for Epoch 5 begins