Controlling the cost of reliability in peer-to-peer overlays

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Problem

u The self-organizing ability of p2p networks has a cost

- Probing to detect failures
- More probing => faster failure discovery => greater reliability

u Reliability also depends on the environment

- Fixed probing rate: More node failures => less reliability

u What is the cost of maintaining the overlay under realistic conditions, and how can we reduce it?

Solution

1. Understand the relationship between probing rate, environmental conditions, and reliability

2. Control maintenance cost by
   - Self-tuning: observe and adapt to the environment
     - Enables probing rate that is "just right"
   - Identify and deal with rare failures
     - Enables configurations with lower maintenance cost

Pastry: probing cost

- u Pastry is a scalable, self-organizing p2p network
  - Nodes are mapped to 128-bit id space
  - Keys are assigned to nodes, and messages routed using keys
  -      overlays hops to route
- u Routing state
  - Routing table: $O(\log_{16} N)$ entries
  - Leaf set: $\dfrac{L}{2}$ closest node-ids on either side

- u Periodic probing cost: ⎯⎯⎯⎯⎯⎯⎯⎯

```
ERROR: rangecheck
OFFENDING COMMAND: .buildcmap

STACK:

-dictionary-
/WinCharSetFFFF-V2TT621301FBt
/CMap
-dictionary-
/WinCharSetFFFF-V2TT621301FBt
```