Naming

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cs598pbg Sept 23 2010

Announcements

- Presentations are not on the assigned reading
  - We all read it; no need to see a detailed talk on it
  - Pick from the optional reading, or email me to suggest another paper
- Paper reviews are not paper summaries
  - Keep your review to two short criticisms / comments which demonstrate that you read the paper

Layered Naming Arch.

"All problems in computer science can be solved by another level of indirection."

– Butler Lampson

so...

What two problems is this paper solving?

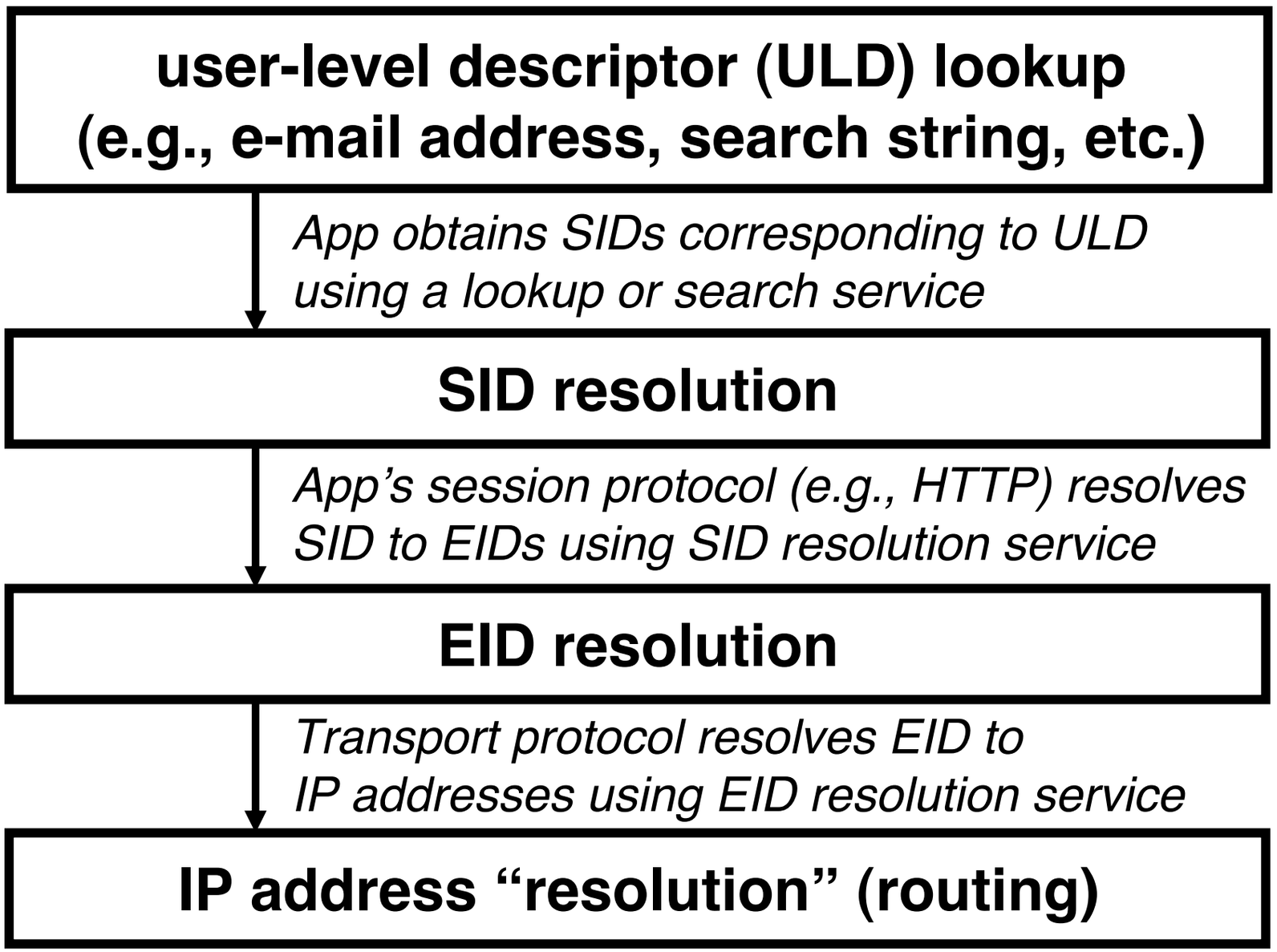
One: Services tied to hosts

- Today: application trying to access a service binds to an IP address
  - Ties service to particular end-host
  - When is this inconvenient?
- This coupling is unnecessary: application cares only about identifying the service it wants
- Solution: Name maps to service identifier (SID), independent of machine hosting service

Two: Hosts tied to location

- Today: transport layer trying to reach a host binds to an IP address
  - Ties connection to physical location of end-host, and even to one interface to access that host
    - When is this inconvenient
- This coupling is unnecessary: transport layer cares only about identifying the host to send to
- Solution: SID maps to endpoint identifier (EID), independent of host's location in network

Architecture picture



What's in a name?

- Goal: persistence
- So, name shouldn't encode unnecessary information
  - e.g., organizational affiliation might change

~ Shakespeare Approves ~

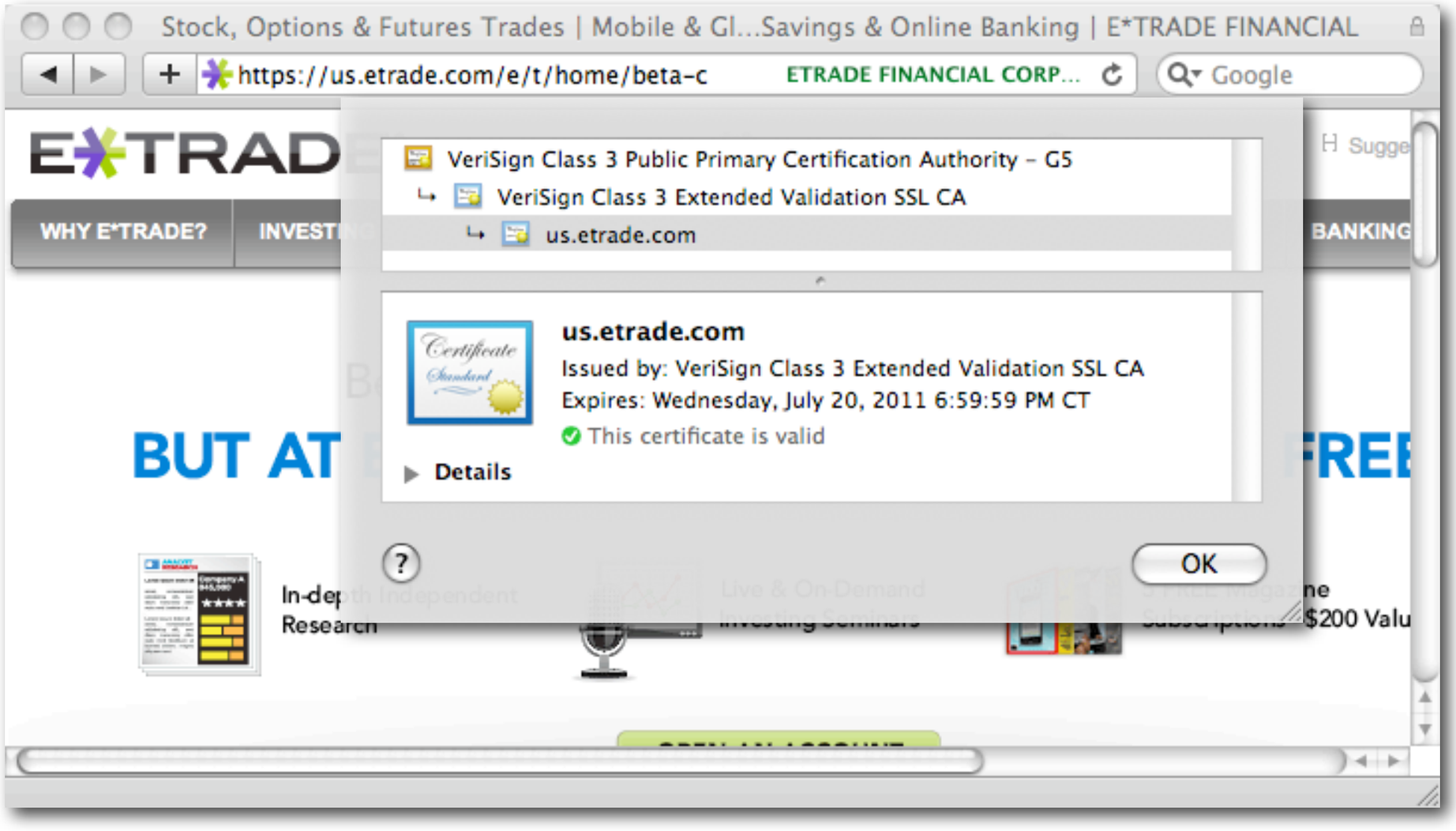
"What's in a name? That which we call a rose
By any other name would smell as sweet."

– Juliet

- Solution: flat names: just a string of bits

Self-certifiable flat names

- If name is a public key or secure hash of a public key, source can verify identity of remote party
  - Alice gives Bob a link to SID x
  - Bob contacts x, begins conversing with party P
  - Bob challenges P: "*prove you have private key associated with public key x*"
  - If successful, Bob knows P is party Alice meant to contact (assuming private key not compromised)
- DNS solution: P sends public key x; trusted 3rd party certifies binding between x and high-level name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Details
OK

Resolving flat names

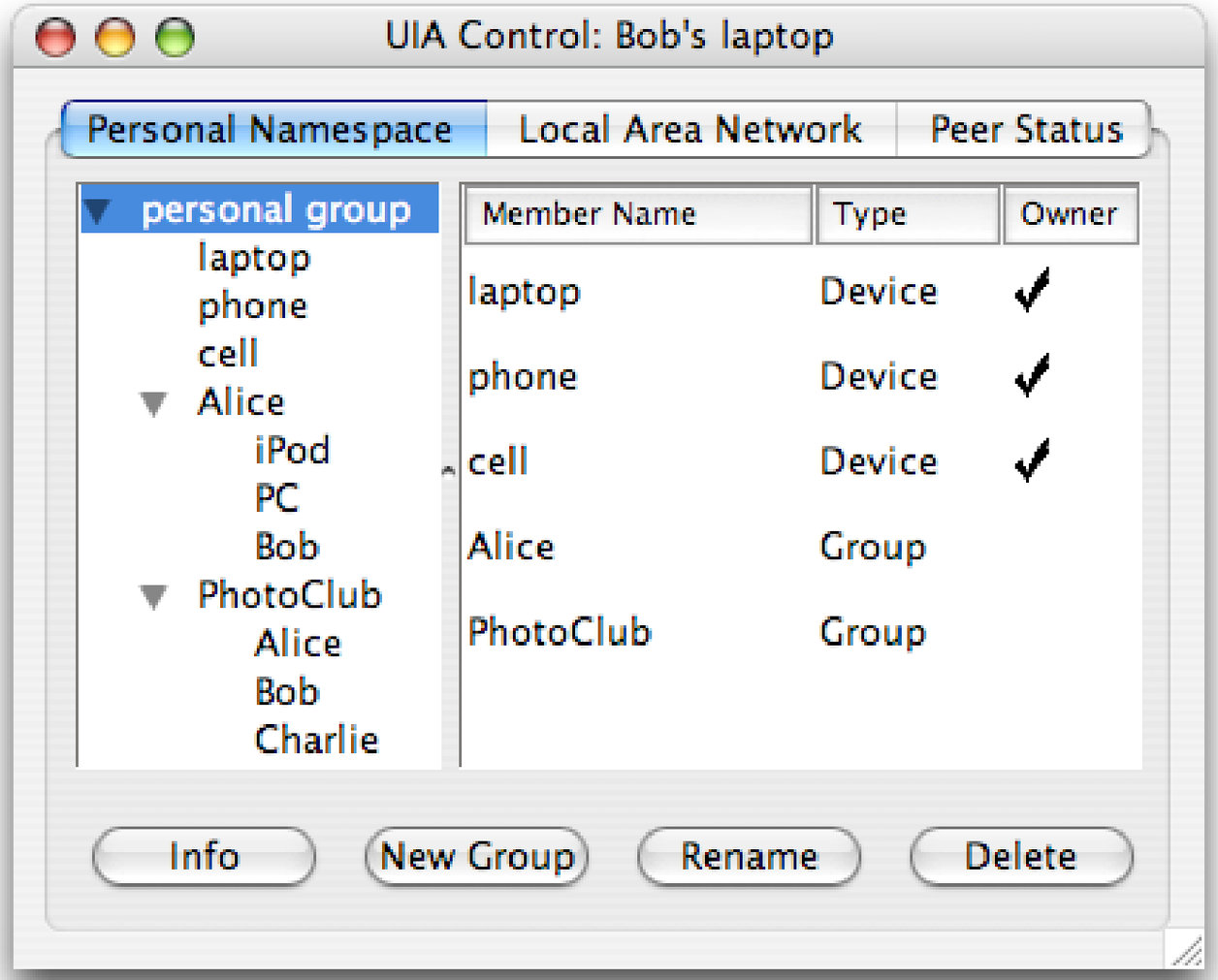
- Challenge: scalability
  - flat means not hierarchical
  - hierarchy is what helps DNS scale
- One solution: distributed hash tables
  - Distributes hash table functionality (e.g., SID to EID mapping) across arbitrarily large
  - We'll see how DHTs work on Nov 2

Implications of decoupling

- Human-readable user-level descriptor (ULD) decoupled from service ID (SID)
- One implication: can accommodate many ULD resolution services
- A possible extreme case: everyone is their own ULD resolution service
  - i.e., ULDs have local meaning only

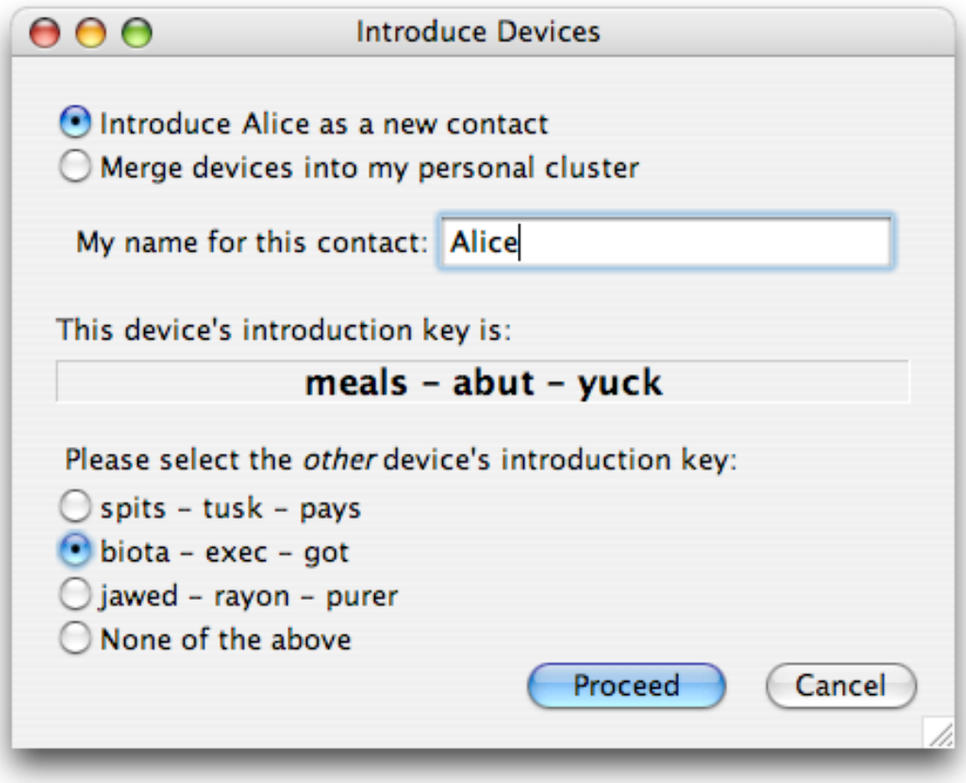
Personal names [Ford '06]

- Each person uses names that have meaning to them
- One name may map to different objects depending on who is resolving the name
- One object may have many personal names associated with it

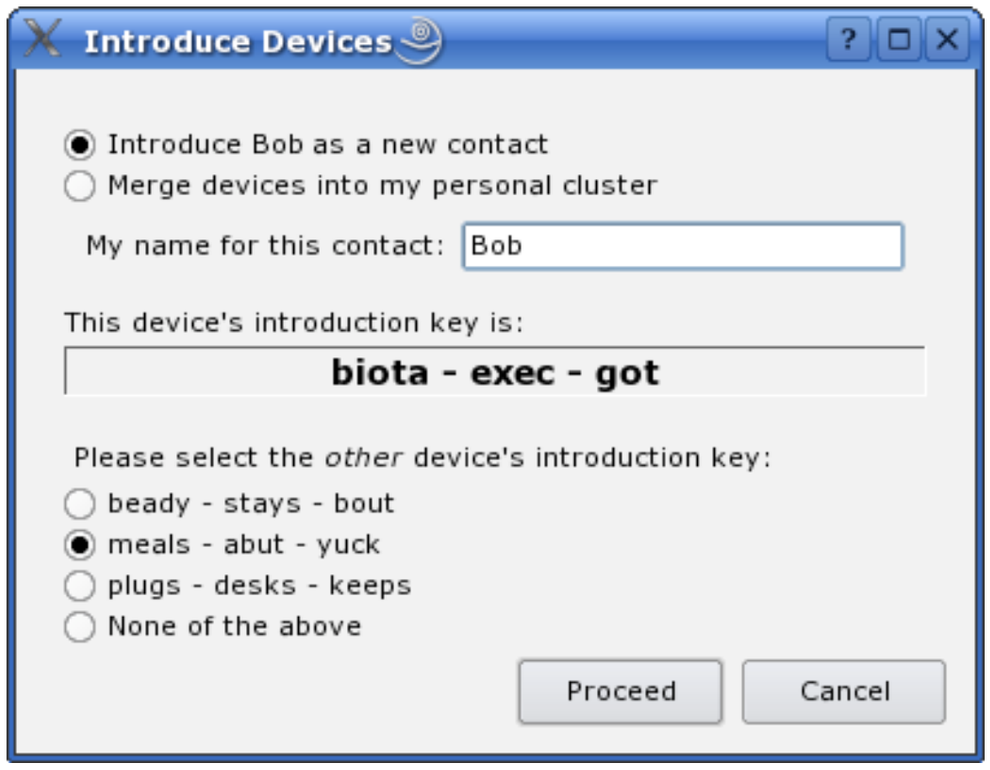


Creating personal names

Bob's Laptop



Alice's PC



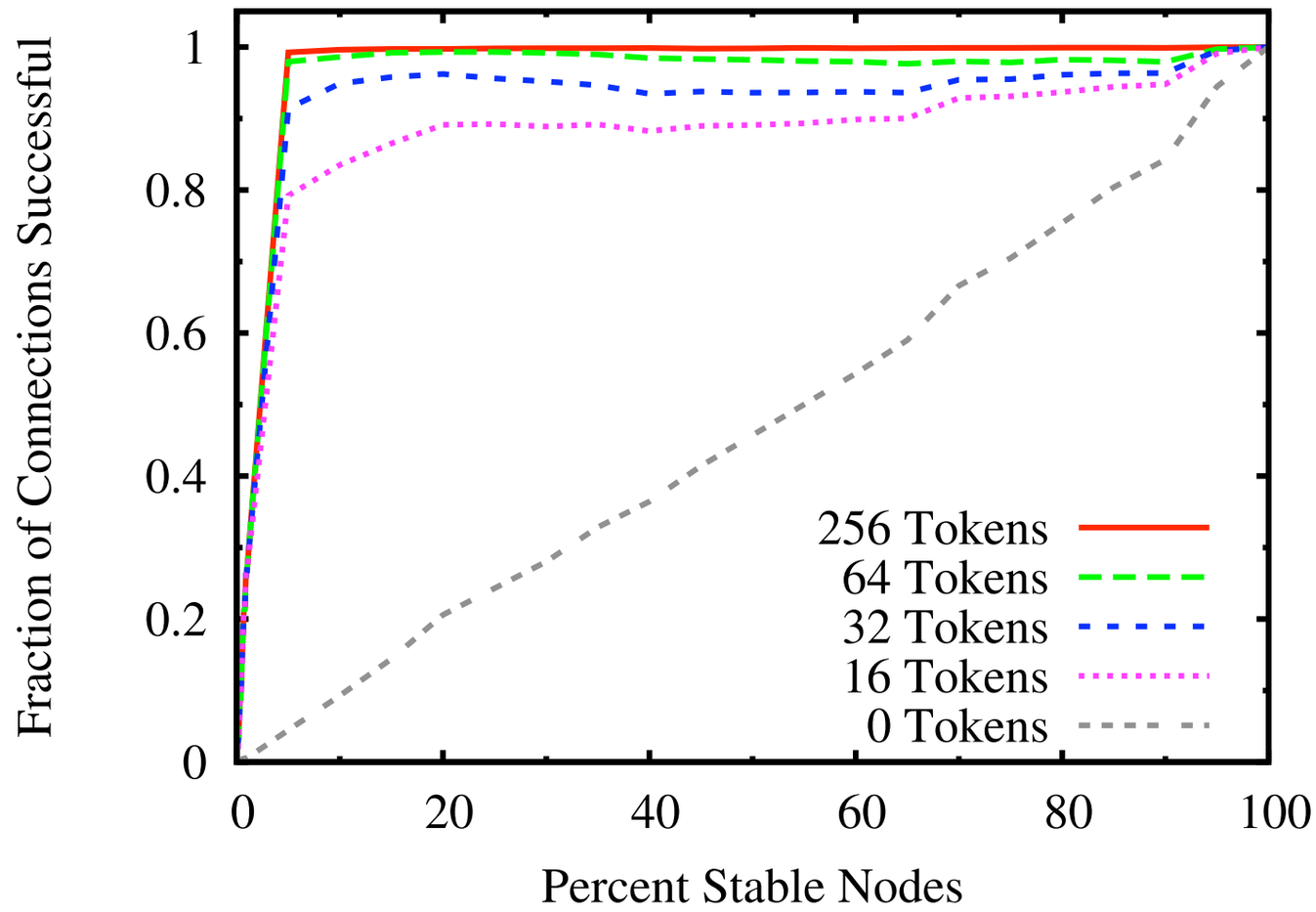
- Personal group: consistent names across devices
  - Challenge: must keep view of group consistent across sporadically-connected devices
  - Challenge: what happens if you lose your phone?

Connecting personal devices

- Want to refer to and connect to my phone, laptop, camera, from anywhere
  - Why is this not possible today?
- Solution:
  - Name bound to persistent self-certifying flat EID
  - Overlay network connects devices, preferring social links as neighbors in overlay
- Challenge:
  - Overlay network has no regular structure
  - How do we locate EIDs in the overlay?

Routing in the overlay

- One solution: token-based flooding



- Basic problem: routing on flat names. See October 5 discussion!

Take-away: 2 primitives

- Separation of identity and location
  - Conflated in current Internet
  - e.g., apps need itentity but must bind to location
- Self-certifying names
  - One use of flat names that is enabled by locator/identifier separation