A Global Name Service for a Highly Mobile Internetwork

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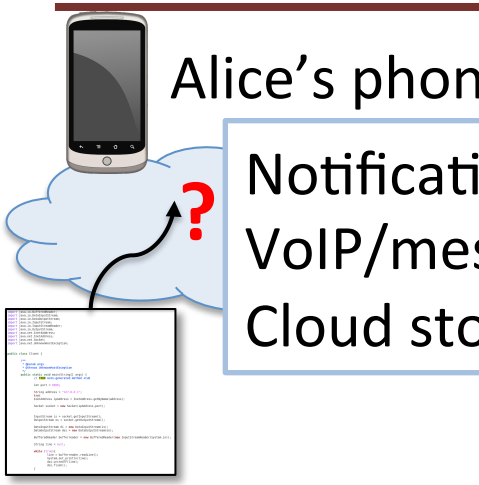
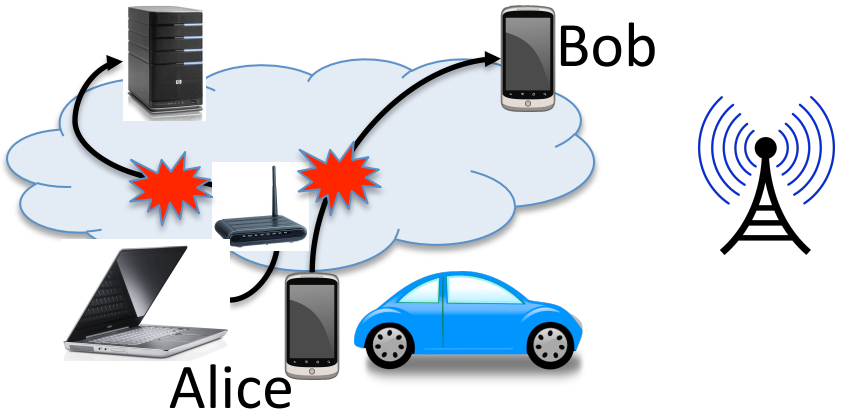
Mobile arrived, but Internet unmoved



Notification systems
VoIP/messaging
Cloud storage

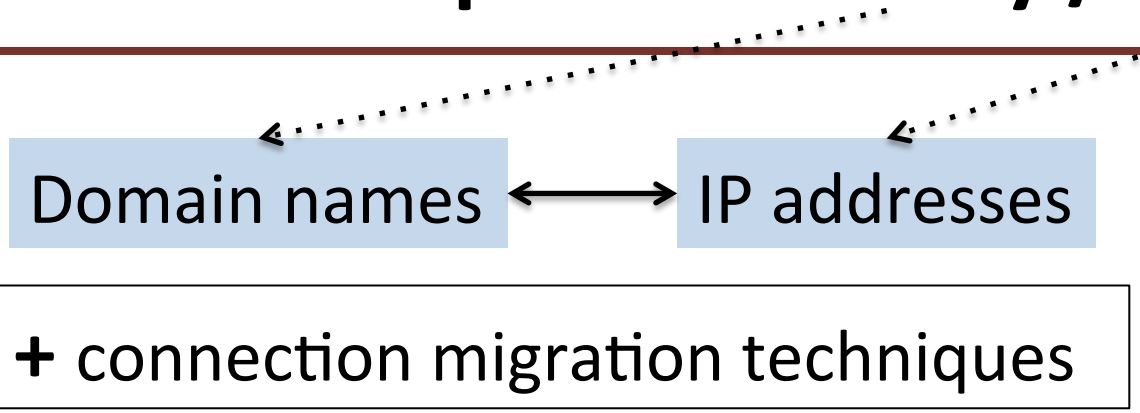


- Unidirectional communication initiation
- Redundant app-specific mobility support

- Ungraceful disruptions

Cleaner separation of location and identity commonly advocated wisdom

But DNS does separate identity / location



- Challenge: scaling to handle update cost of frequent mobility while returning up-to-date values
  - Example: 10B devices, 100 addresses/day ≈ 1M updates/sec
  - DNS update propagation can takes hours or days today!

How to force browsers/ISPs to look for my new DNS?

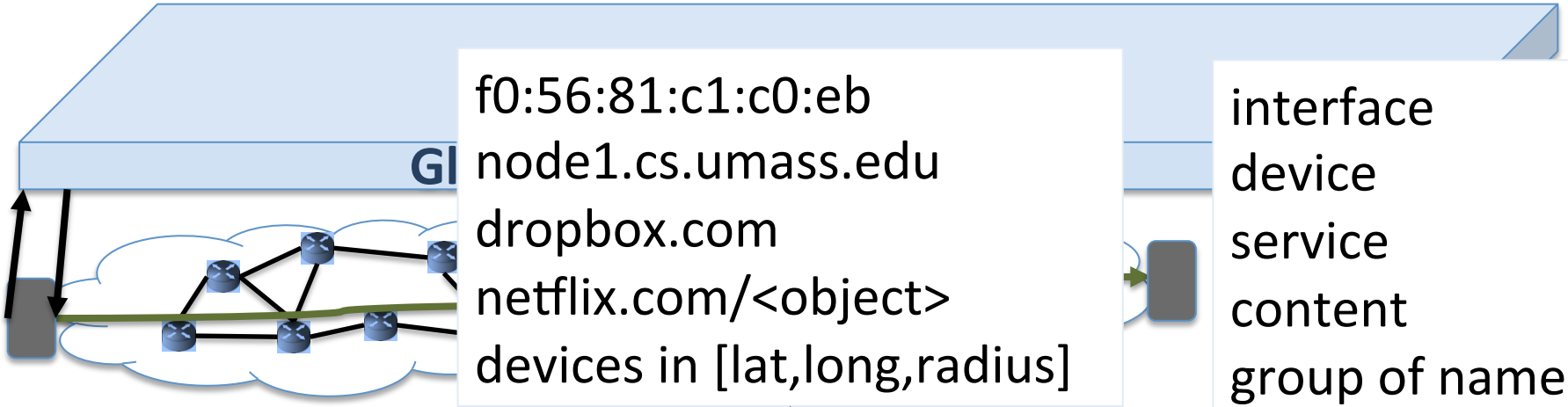
0

I have changed the DNS for my domain. what code (or header) should I use in my old server to tell the visitor's browser or ISP that it should check for my new DNS and the current content is old?

is the temp redirecting to a subdomain should help?

or you know a better way?

Scalable global name service (GNS)



Goal: A massively scalable, logically centralized GNS to enable secure, name-based communication with flexible endpoint principals with arbitrary (fixed) names despite high mobility.

Outline

- Poor intrinsic support for mobility today
- **Case for a next-generation GNS**
- Auspice GNS design
- Implementation and evaluation
- Related work, open issues, summary

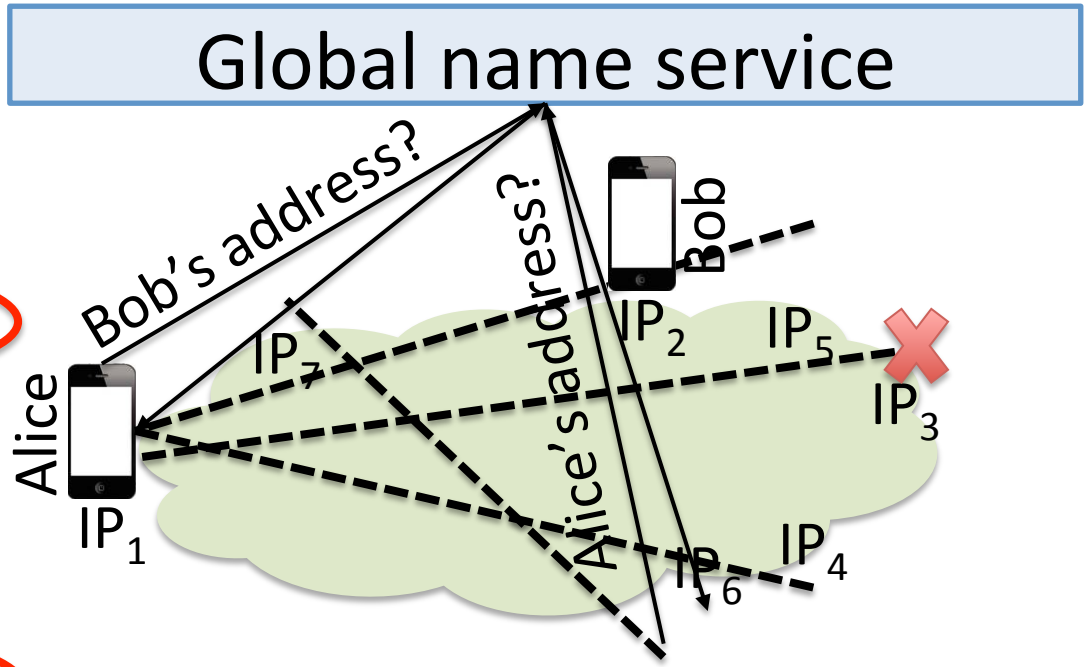
GNS critical to handle mobility

Pre-lookup mobility

Connect-time mobility

Individual mobility

Simultaneous mobility



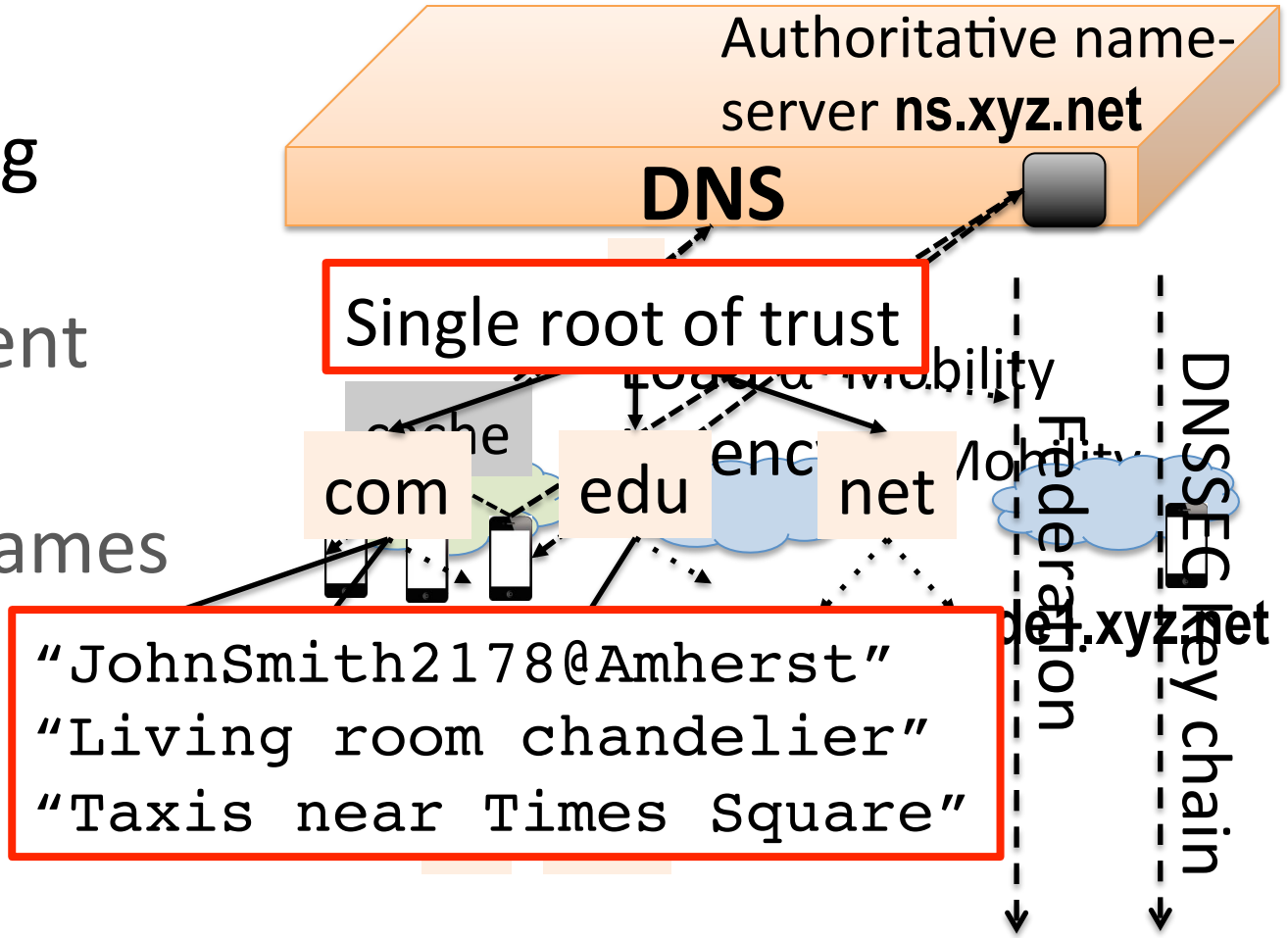
GNS critical or can significantly benefit mobility handling in any network architecture

DNS limitations

Passive caching

Static placement

Hierarchical names



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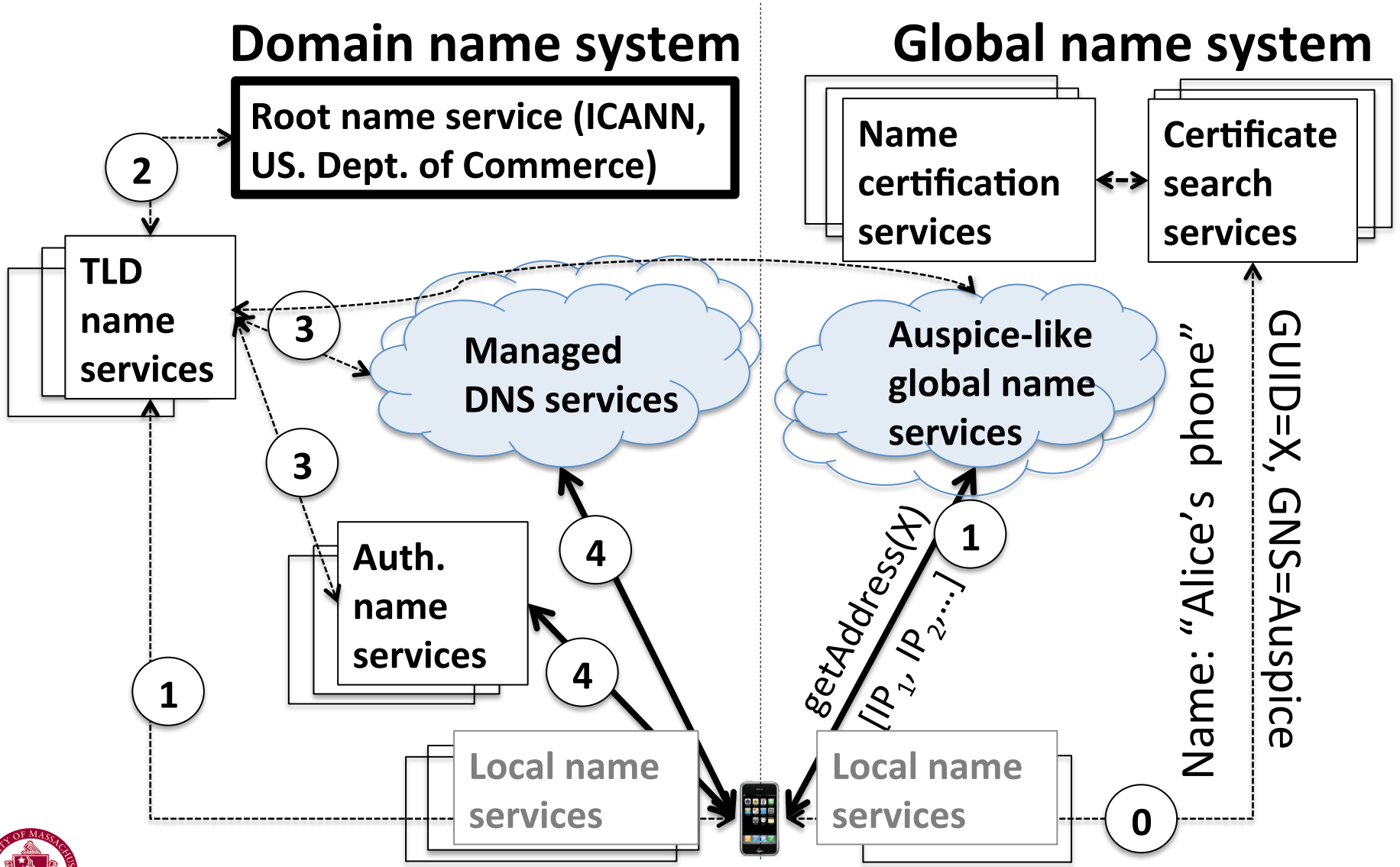
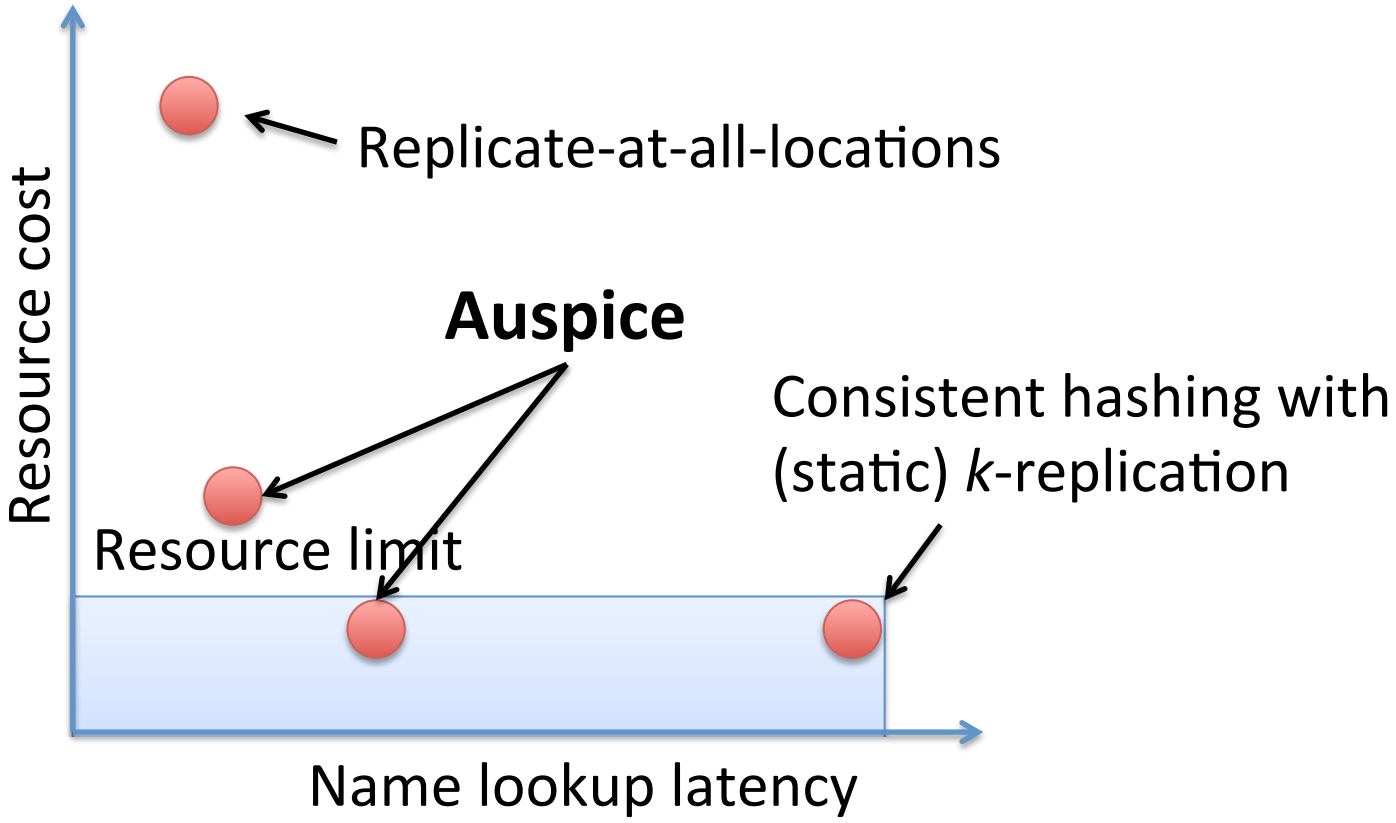
GNS: Decoupling certification and resolution



Active replication cost-benefit tradeoff

Update cost for name *i* α (#replicas$_i$) x (update_rate$_i$)

Lookup latency for name *i* ?

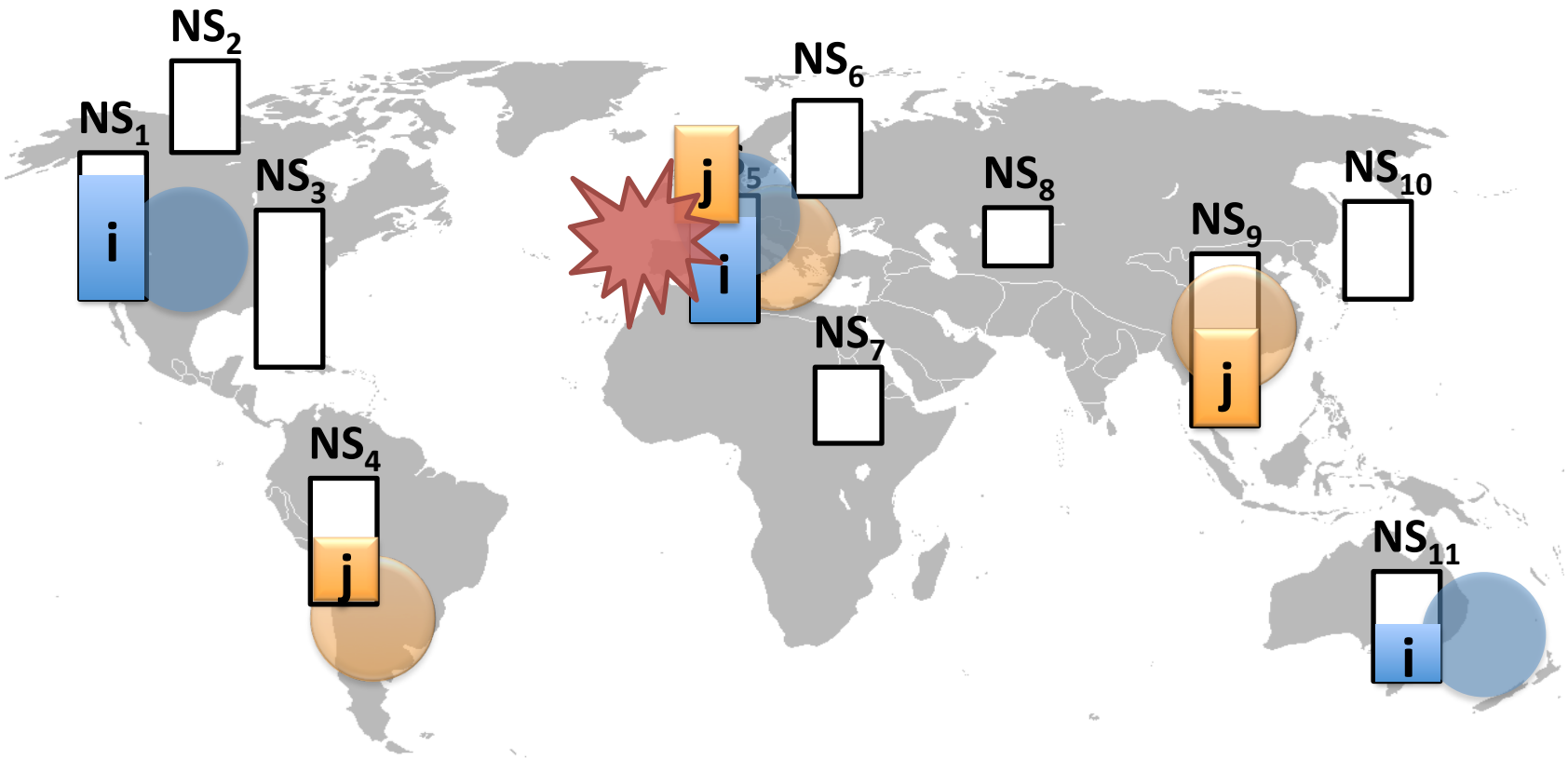


Demand-aware active replication

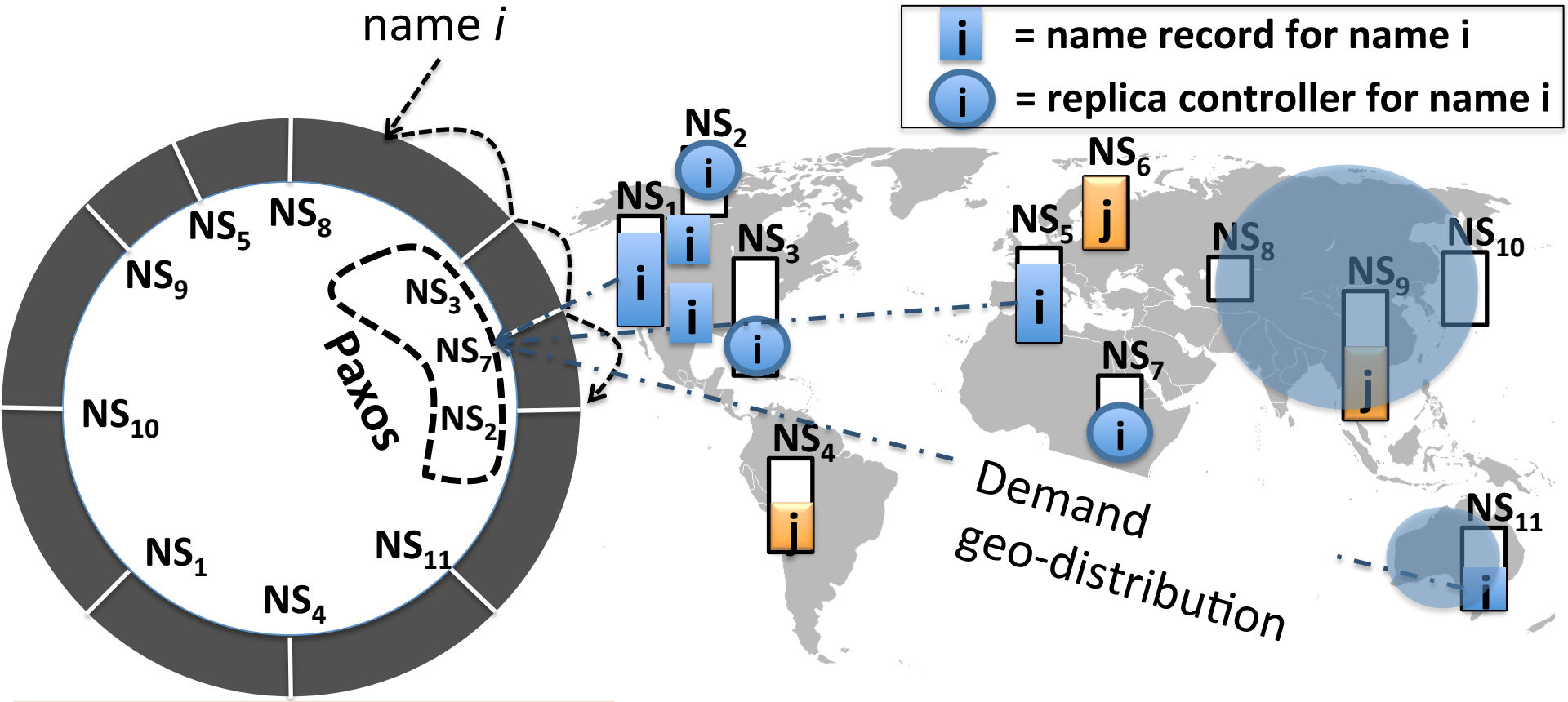
- #replicas of name *i* α (read_rate$_i$) / (update_rate$_i$)

Geolocality-aware

Load-aware



Placement reconfiguration engine



Consistent hashing based placement control plane

Planned demand-aware placement for data plane

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Implementation

- Geo-distributed key-value store

```
GUID: {
 {IPs: [123.45.67.89, 98.76.54.321]},
 {geoloc:[lat, long]},
 {TE_prefs: [“prefer WiFi”,…]},
 {ACL: {whitelist: […]}},
 …
}
```

- Name certification service

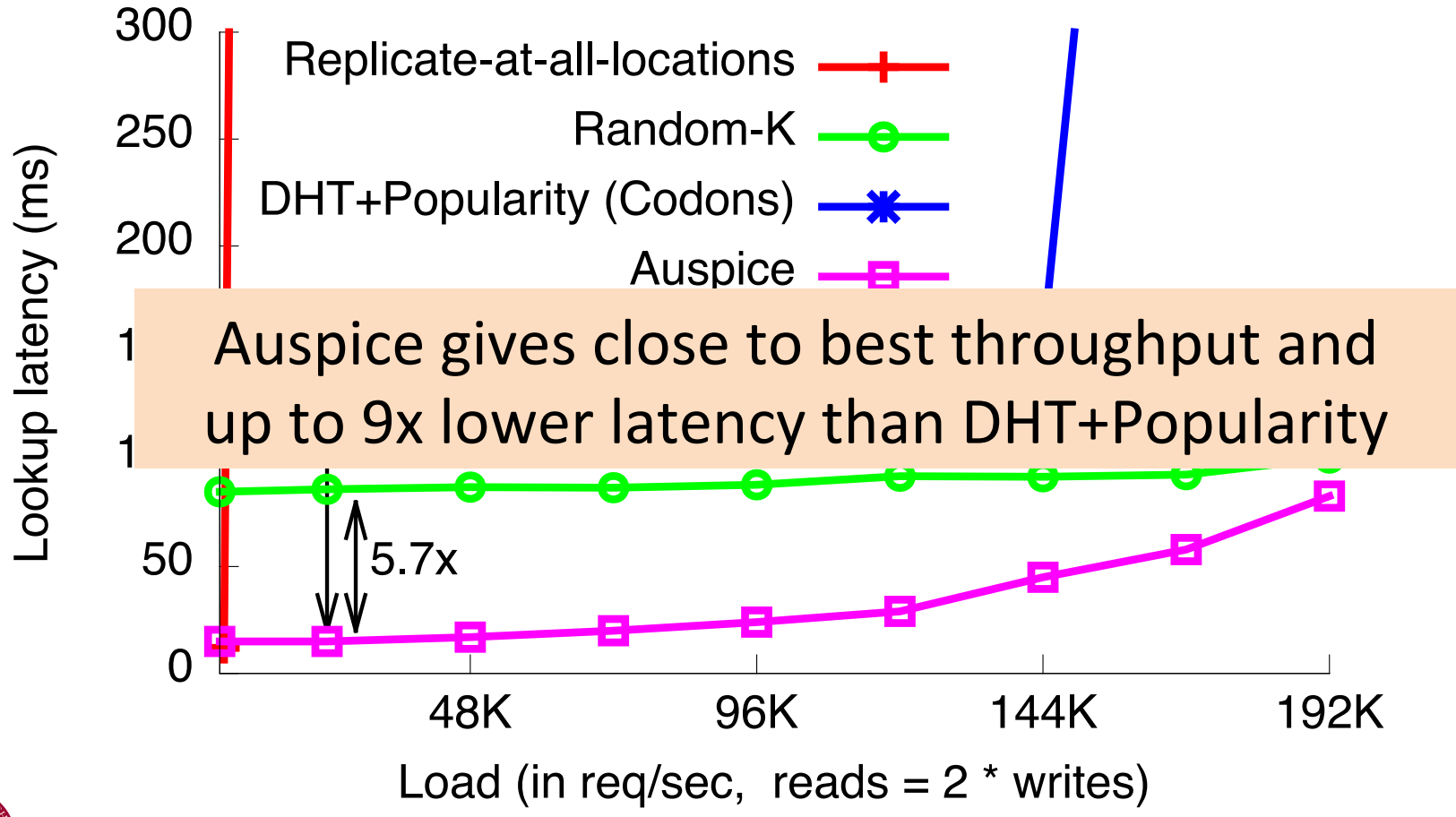
Human-readable name: abhigyan@cs.umass.edu:phone
GUID: 21EC2020-3AEA-4069-A2DD-08002B30309D

- **msocket** user-level socket library with Auspice integration

```
MSocket socket = new MSocket(abhigyan@cs.umass.edu:phone);
MServerSocket socket = new MServerSocket(8080);
```

Placement schemes comparison

Testbed: 16 server cluster emulating with 80 NS an 80 local NS
Workload: 90% mobile names (geolocality 0.75), 10% service names

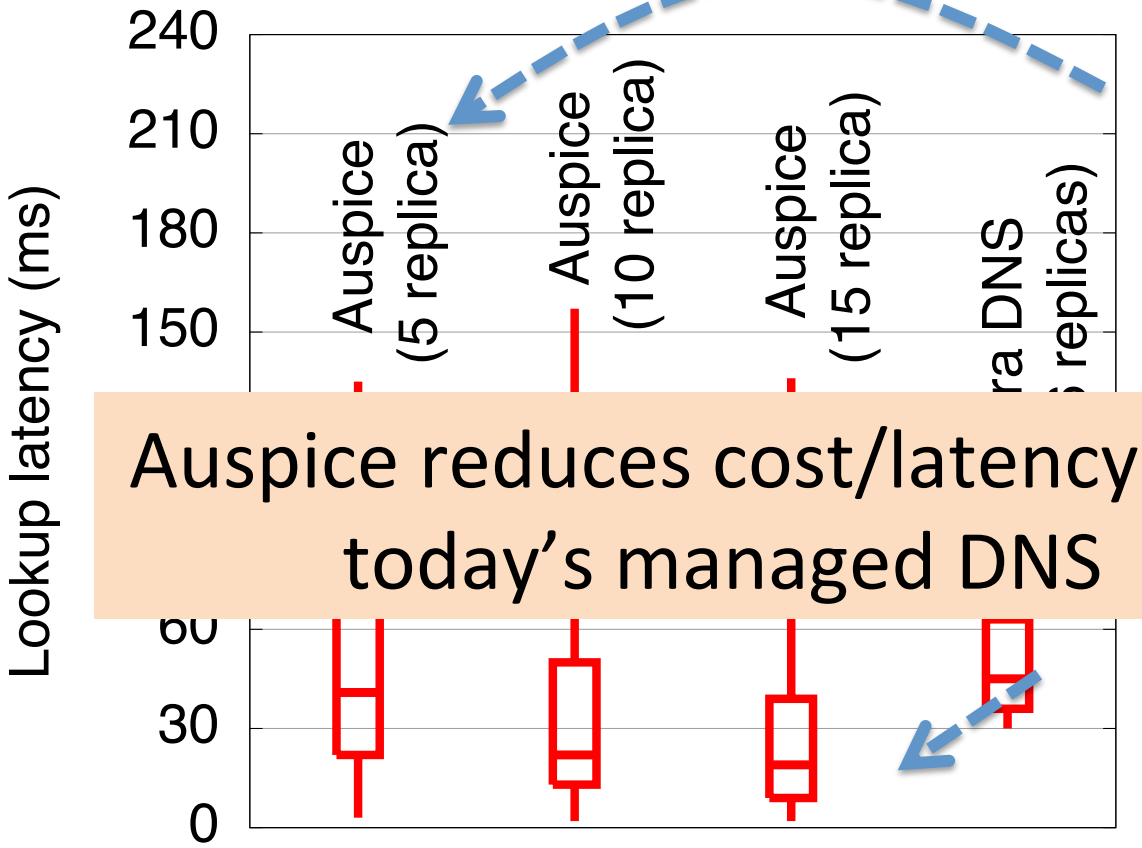


Auspice gives close to best throughput and up to 9x lower latency than DHT+Popularity

Managed DNS comparison

Ultra DNS (16 replicas) vs. Auspice 5/10/15 replicas out of 80 locations

One-third replication cost, similar latency



Auspice reduces cost/latency over today's managed DNS

60% less latency, similar cost

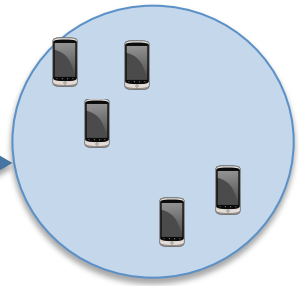
Related work

- Classical name services [Grapevine/ClearingHouse] used *static* replication
  - Context-based names like Lampson's "descriptive names"

"the XEROX system [Grapevine] was then … the most sophisticated name service in existence, but it was not clear that its heavy use of replication, light use of caching ... were appropriate"

```
msocket.bind([lat, long, radius])

msocket.send( msg )
```



Auspice GNS summary

Enables secure, name-based communication

- arbitrary name/location representation
- flexible endpoint principals
- handles all types of mobility

- Key differences from DNS for today's Internet
  - federation decoupling certification and resolution
  - active replication
  - demand-aware placement

Get your GUID at: **`http://gns.name`**