

# pWeb : A Personal Interface to the World Wide Web

Presented by

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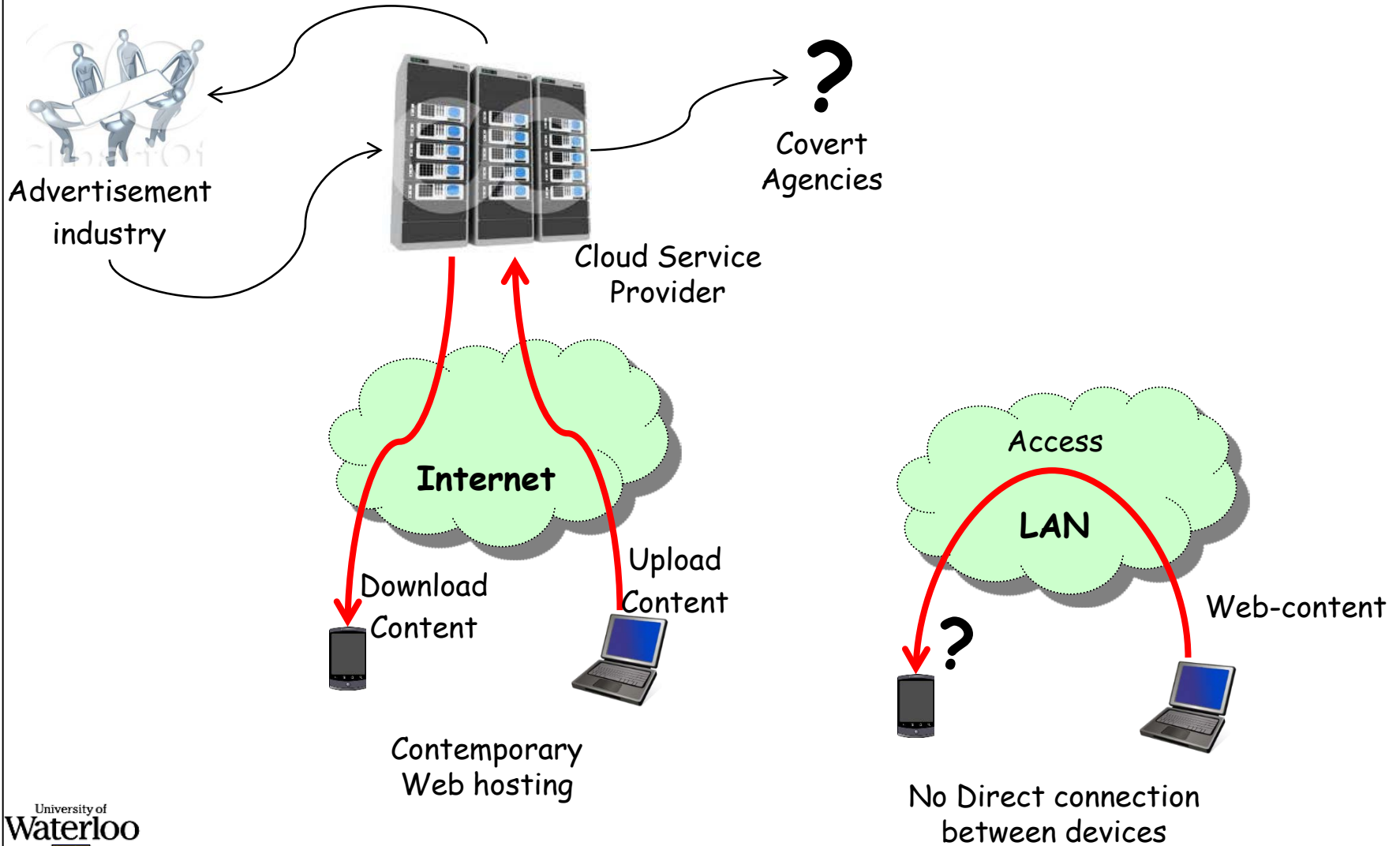
Joint work with Shihabur Rahman Chowdhury, Alexander Pokluda,  
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# Outline

- Motivation
- Technical challenges
- Architecture
- Evaluation
- Summary

# Motivation



# Motivation

- Censorship resistance
  - "Broadcast yourself" without censorship
- Access control
  - Define who can access what and when.
- Content Ownership
  - Add, delete, modify as / when you like
- Flexibility
  - Restriction on content/service type/format

Our goal is to free users from these limitations

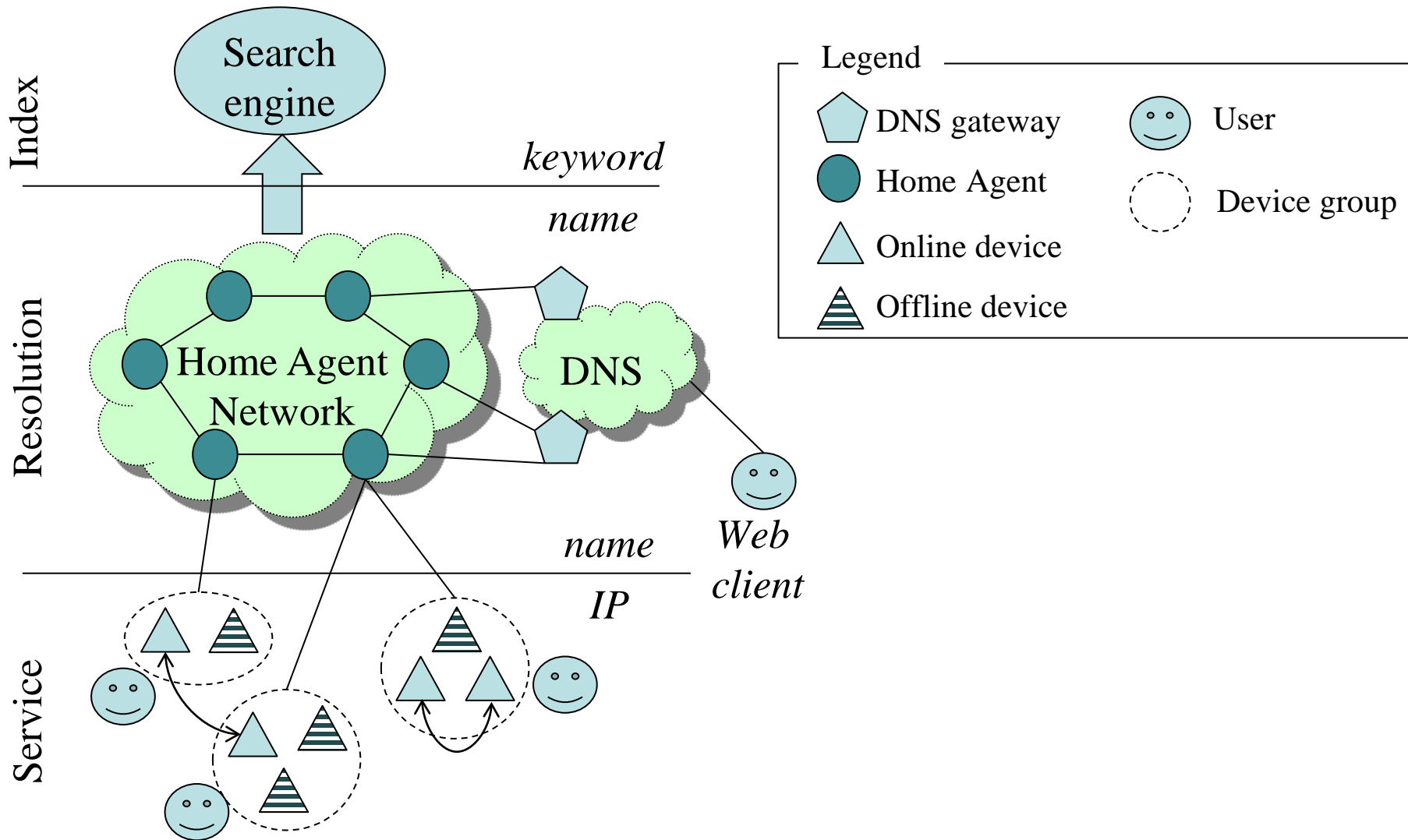
# Technical Challenges

- Naming:
  - User devices don't have global/unique names
  - Frequent IP change
- Availability:
  - User devices are not persistent as Internet hosts
  - How to ensure content availability
- Discovery:
  - How to find a device and its hosted contents?
- Dynamic content/service hosting:
  - How to generate & serve computationally expensive dynamic web content from low-end user devices?
- NAT:
  - Usually non-public IP and behind the NAT.

# Design Philosophy

- Compatibility with current Web technology.
- Naming:
  - Unique, persistent, DNS compatible names
  - Efficient, scalable name resolution infrastructure
- Availability:
  - Group by user and replicate
  - Cache popular contents at search/indexing servers
- Discovery:
  - Open interface for name/content crawlers
- Dynamic content/service hosting:
  - Light-weight http server w/ dynamic ip updater capability
- NAT:
  - use STUNT or URL forward

# pWeb Architecture

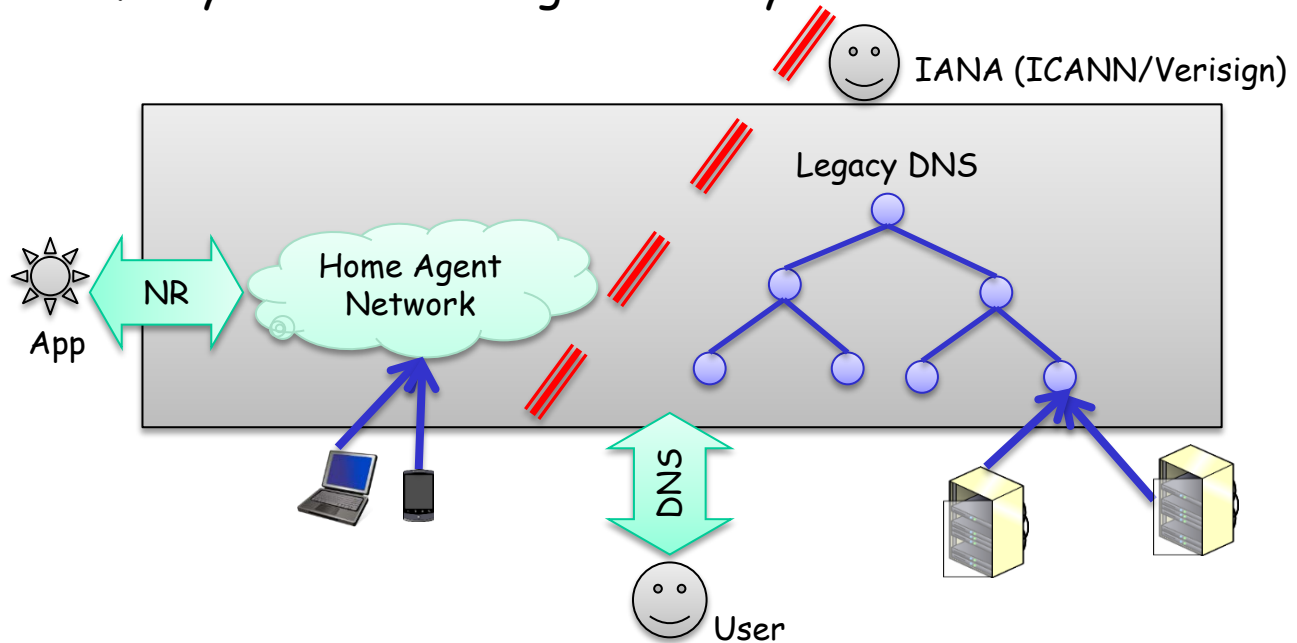


**Legend**

- DNS gateway
- Home Agent
- Online device
- Offline device
- User
- Device group

# pWeb Naming: Our Stand

- low latency, scalable, robust and independent naming system
- compatible with legacy DNS
- independent of any central naming authority



<http://device.user.home-agent.dns-suffix/content-path>

<http://nexus.bob.uw1.dht.pwebproject.net/public/vdo/sample1.flv>

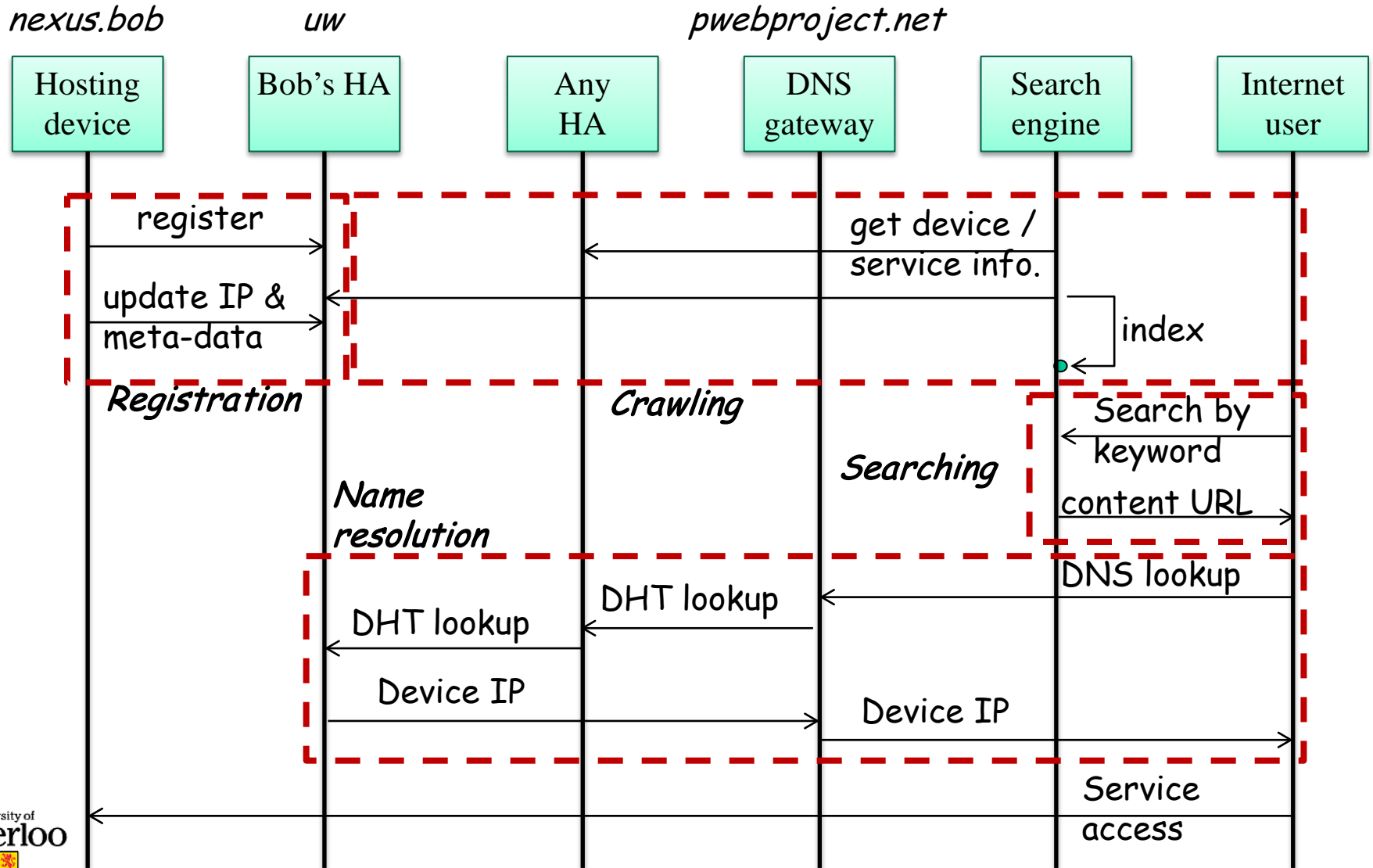
unique name within pWeb

for DNS compatibility

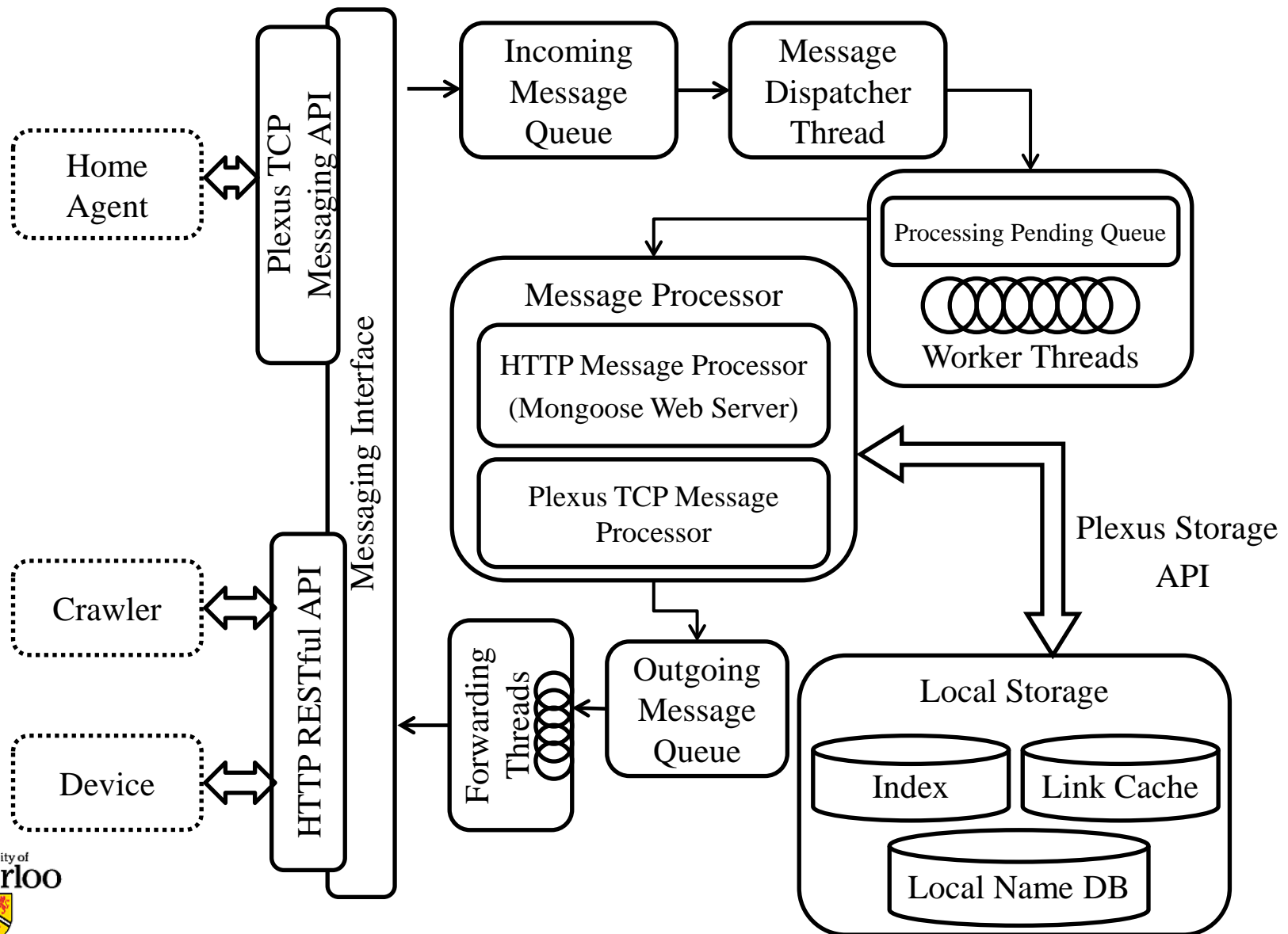




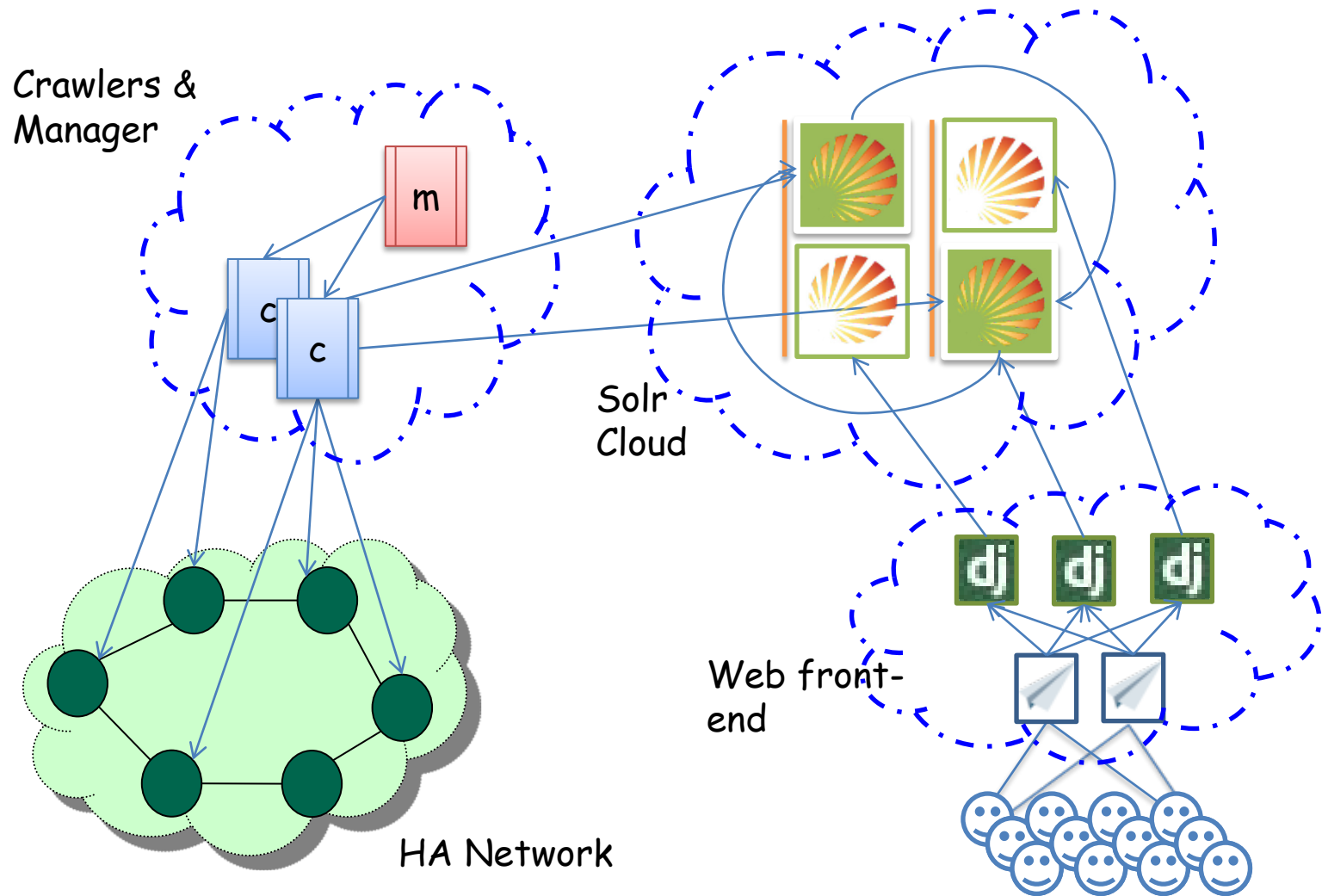
# Functional Overview



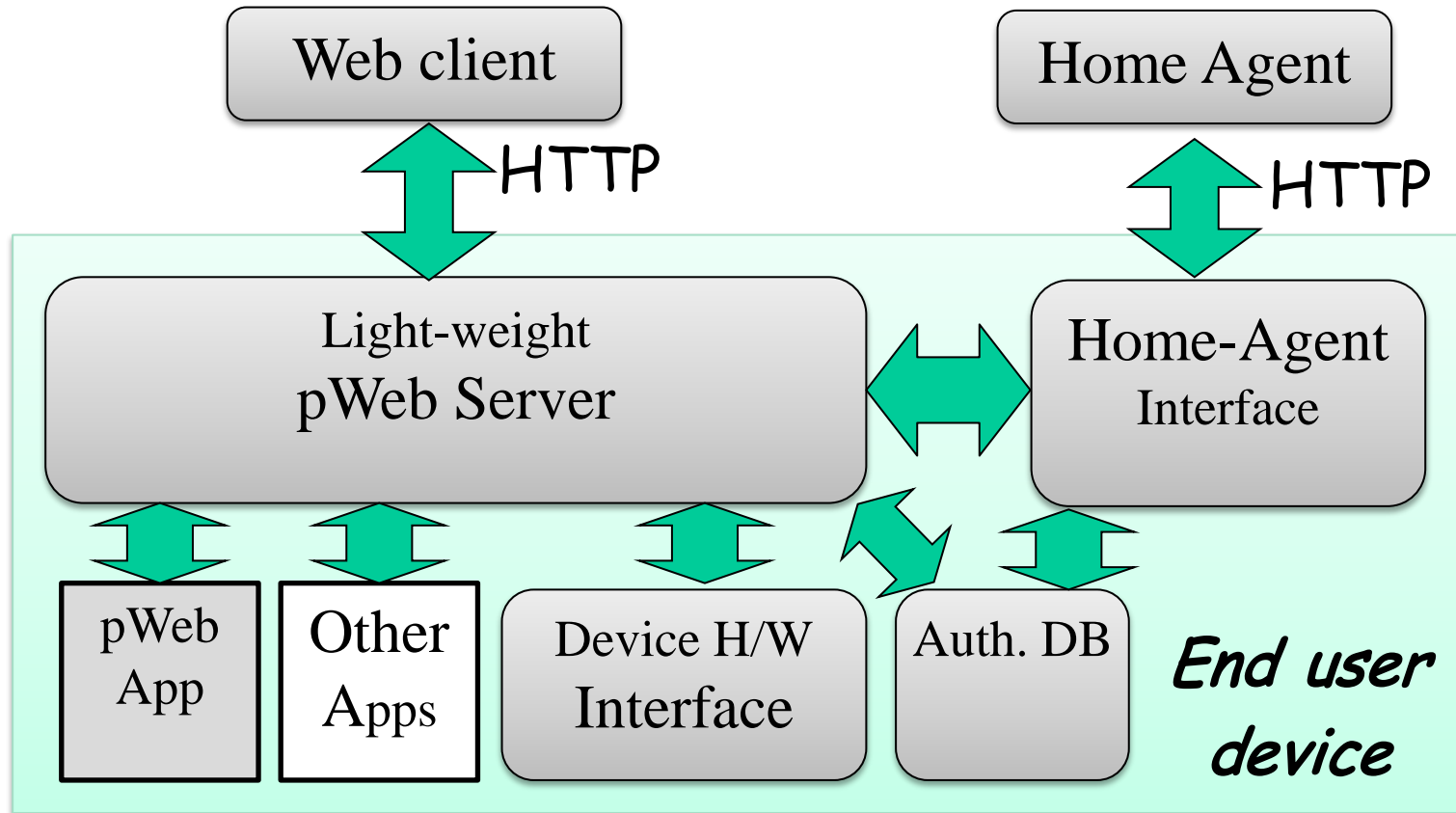
# Home Agent Architecture



# Crawler Architecture



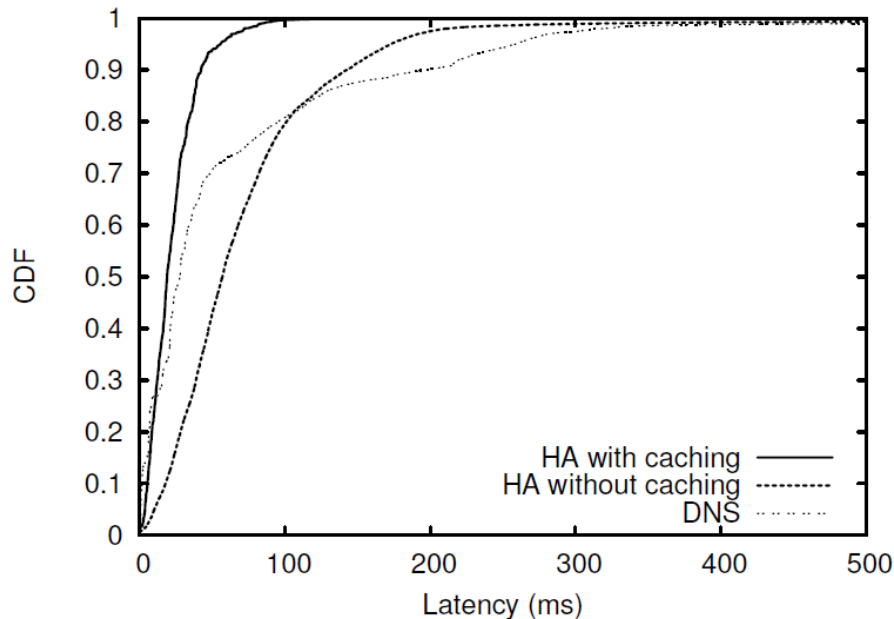
# Client Software



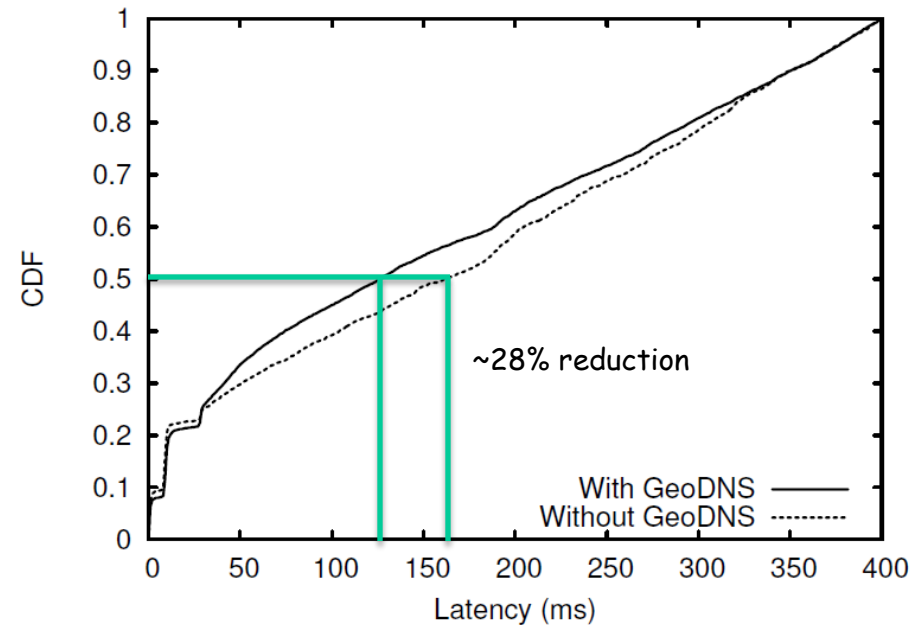
# Results



- Home Agent Network Performance
  - HA/DNS-GW in 25 PlanetLab Nodes
  - Clients (using Dig) in 30 PlanetLab Nodes
  - $2.5 \times 10^5$  unique names,  $5 \times 10^5$  queries in parallel
  - GeoAwareness : Maxmind GeoIP DB



**Name Lookup Efficiency**

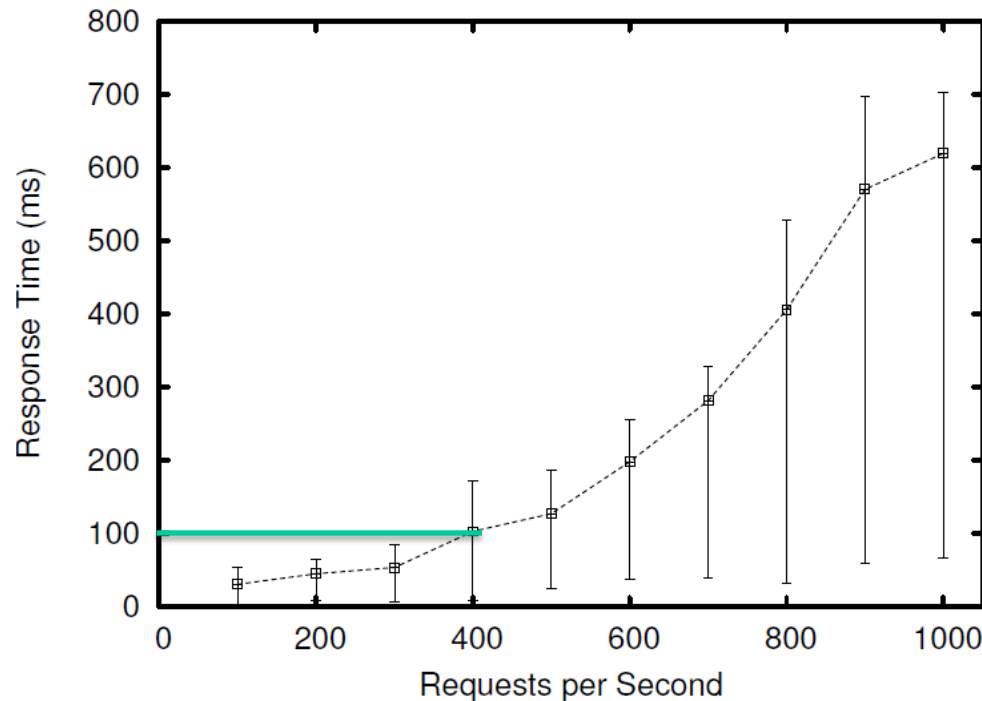


**Impact of GeoAwareness**



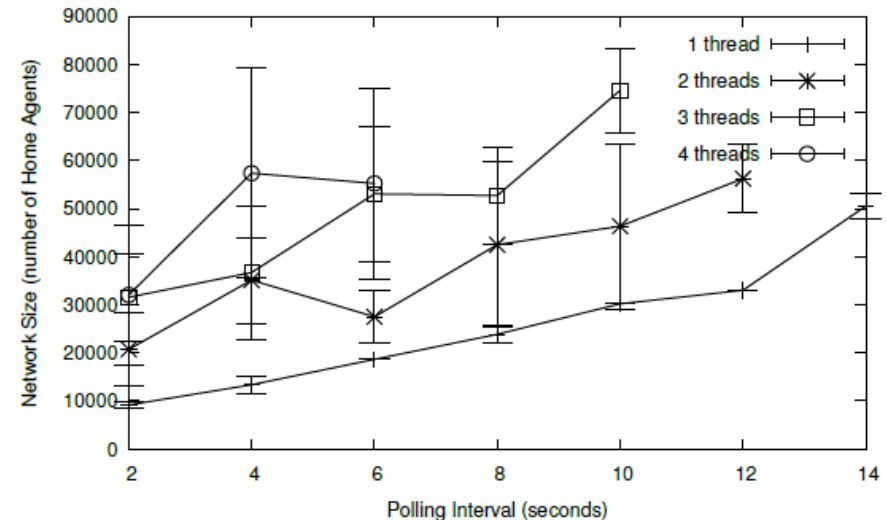
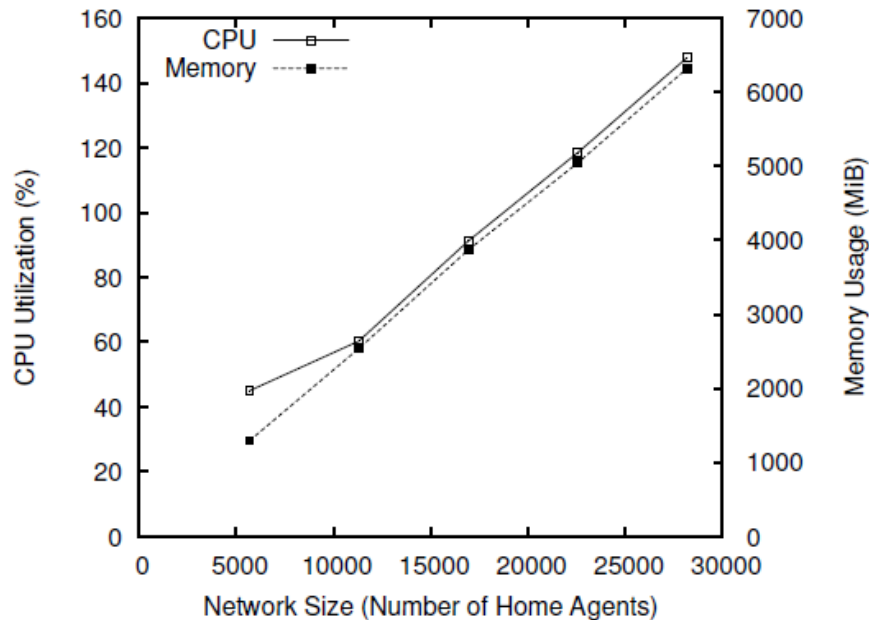
# Results

- Home Agent Scalability
  - One HA hammered by a micro-benchmarking tool
  - $\leq 100\text{ms}$  response time for up to 400 requests/sec
  - Mostly Due to raw file access. Better results with DB



# Results

- Performance of a single Crawler
  - Synthetic HA network
    - RTT from King Dataset
    - Geographic distribution from World Bank Open Data



Max. no. of HA a single crawler can handle—  
at which network size 2 HAs were not polled

# Summary

- pWeb characteristics
  - A hybrid architecture
  - Seamless integration with Web technology
  - Open platform for independent development
- Other applications:
  - Remote access for Configuration, NAS, IP camera, Sensors, etc.
  - Personal sync and backup solutions
  - VoIP by name: call **215-492-3971** vs call **cell.alice.uw**
  - Passive device: NFC tag/QRcode /Barcode for IoT
- Ongoing project at <http://pwebproject.net>



THANK YOU

QUESTIONS?

# Evaluation Scenario

- Home Agent Network
  - HA/DNS-GW in 25 PlanetLab Nodes
  - Clients (using Dig) in 30 PlanetLab Nodes
  - $2.5 \times 10^5$  unique names,  $5 \times 10^5$  queries in parallel
  - GeoAwareness : Maxmind GeoIP DB
- Home Agent
  - One HA with varying load
- Crawler
  - Synthetic HA network
    - RTT from King Dataset
    - Geographic distribution from World Bank Open Data

