

# Ensuring A Solid DNS Foundation For VoIP

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# Is Your Infrastructure Ready For Voice Over IP?

*“It is no longer a question of whether VoIP will wipe out traditional telephony, but a question how quickly it will do so.”*

*“VoIP, in short, is completely reshaping the telecoms landscape.”*

***Economist, September 15<sup>th</sup> 2005***

# Agenda

- Nominum
- Where does DNS fit in?
- Modeling DNS data flow
- Making DNS robust
- DNS Requirements

# Company Focus

- **Commercial–grade IP name and asset management**
  - DNS, DHCP, and IP management products
- **For medium to large deployments**
  - Telco, service providers, finance, retail, government, etc.
- **Product leadership**
  - Performance
  - Security
  - Management

# Sample Telco and Service Provider Customers



# Sample Enterprise and Government Customers



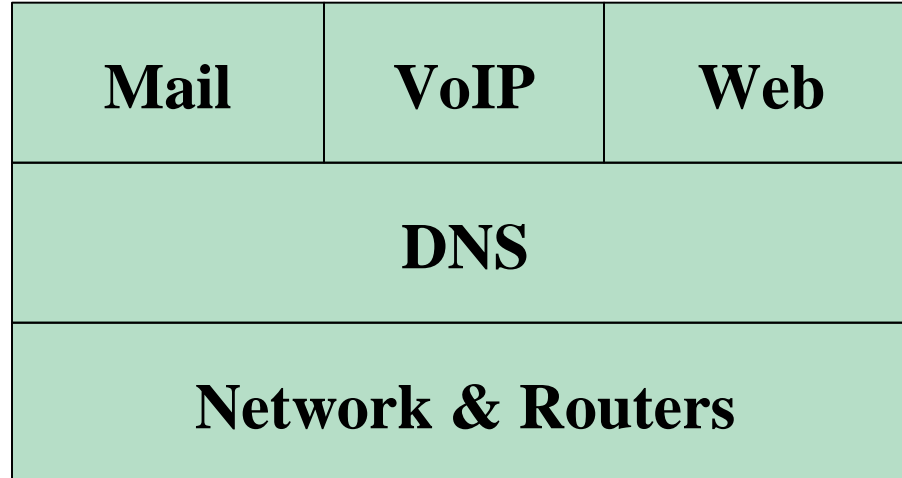
Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich



# Where does DNS fit in?

# What is DNS?

- Foundation for services
- Abstraction layer on top of addresses



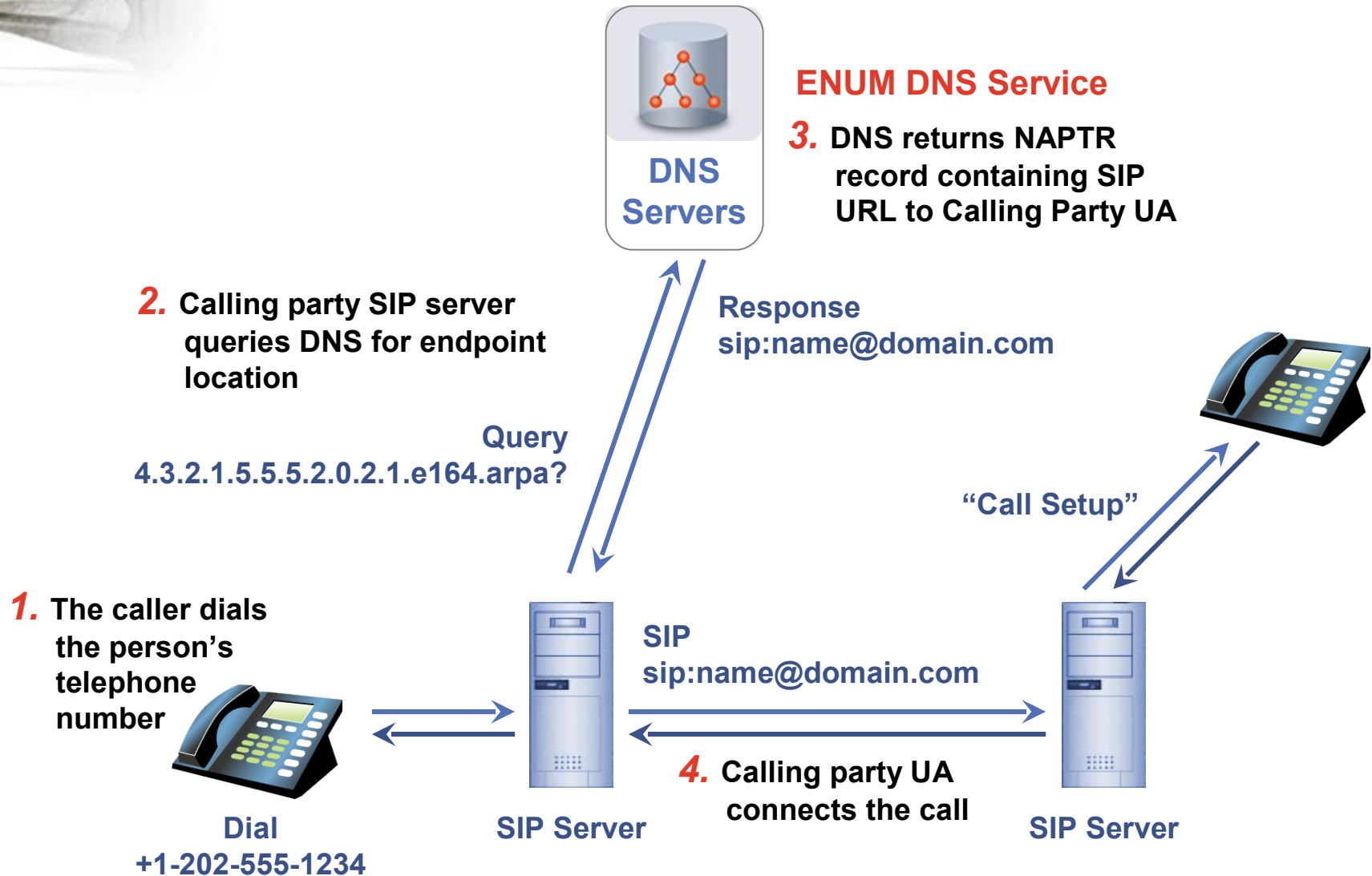


# DNS From The Perspective of the Subscriber

- If DNS does not work ‘the network is down’
  - No call possible
- A slow DNS is perceived as ‘a slow network’
  - Long call set up time
- Subscribers do not distinguish the network from DNS
  - DNS requirements for low latency and high availability

# Modeling DNS Data Flow

# Where Does DNS Appear?



# What is ENUM?

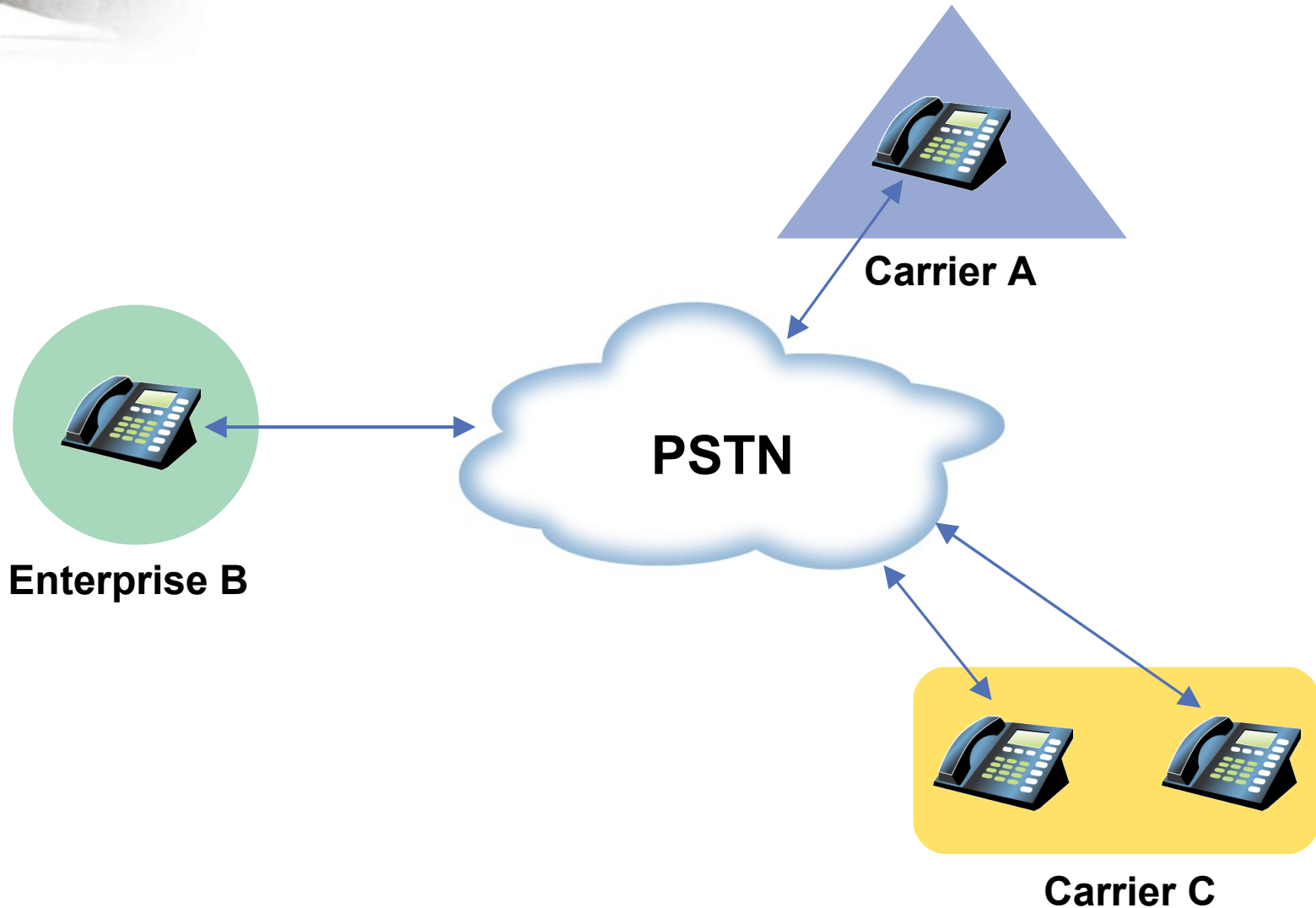
*The best hope for an open-standards-based approach to communications identifiers and signaling for the next decade:*

***Phone Numbers in the DNS  
(but not just phone numbers)***

# Why multiple ENUM types?

- Theory One:
  - The Internet wasn't relevant until there were multiple networks.
  - ENUM won't be relevant until we get a critical mass of VoIP implementations that use/need it.
- Theory Two:
  - Its just a matter of preserving ownership/control of something valuable, e.g.
    - Inside an enterprise
    - Between partners
    - Outsourcing while owning
    - Can Internet style ENUM triumph?

# The Situation: Islands of VoIP Connected through the PSTN



# Types of ENUM Deployments

## Public ENUM

*Publicly available,  
shared database*



## Carrier ENUM

*Database shared on the  
basis of bi- or multi-  
lateral agreements*

Interfaces with  
other CSPs

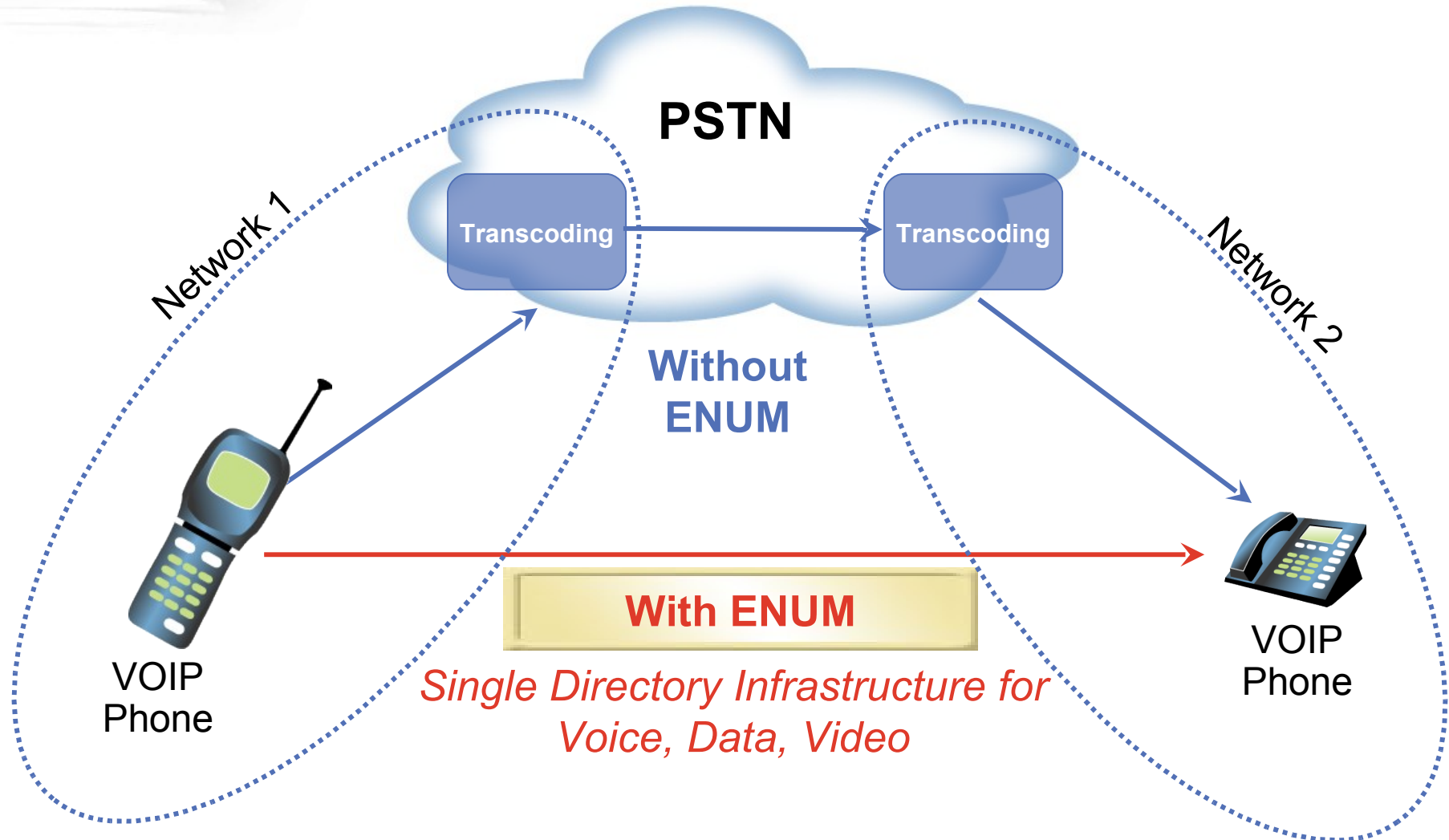


## Private ENUM

*Non-public database*

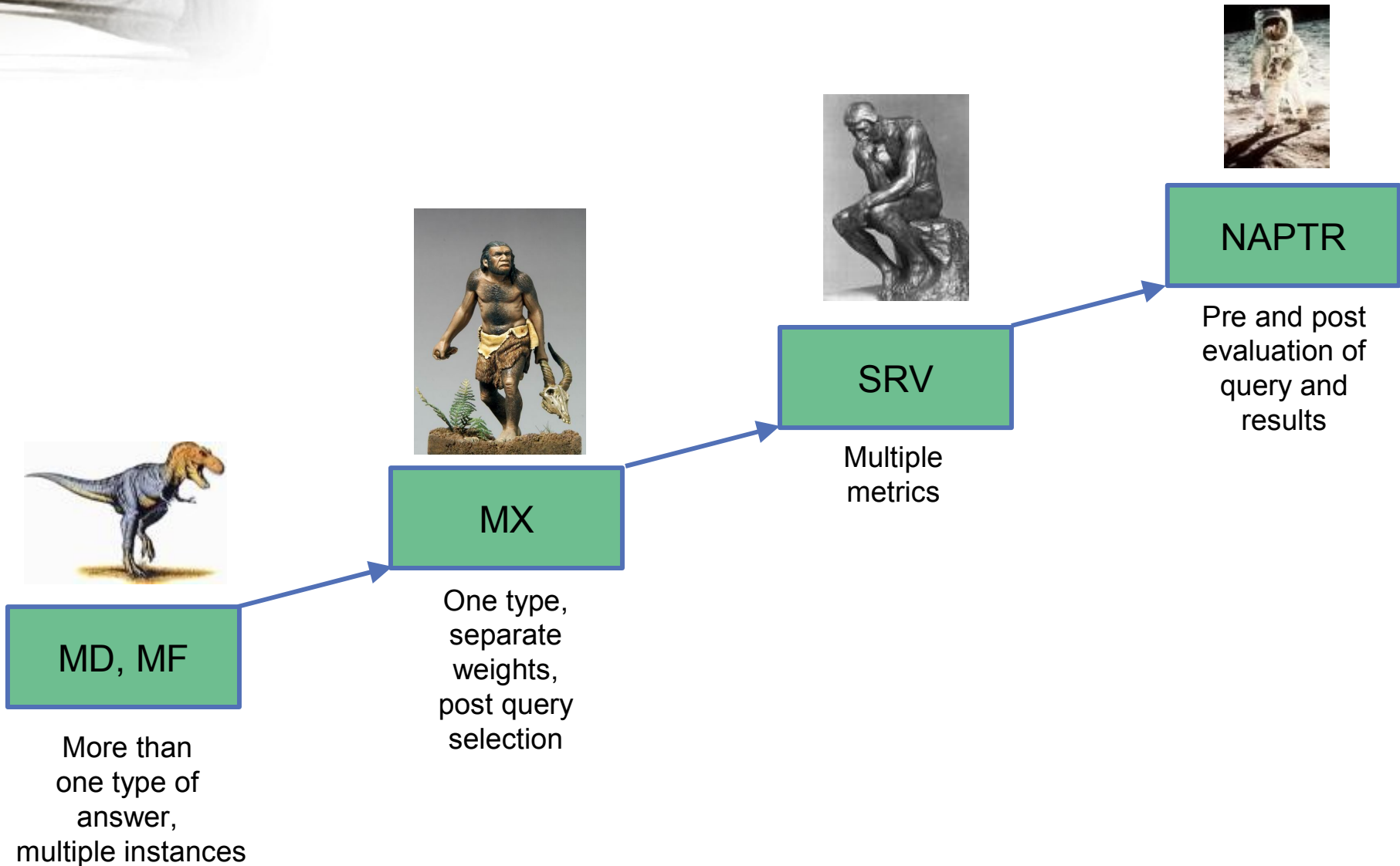


# Why ENUM? Efficient Communications

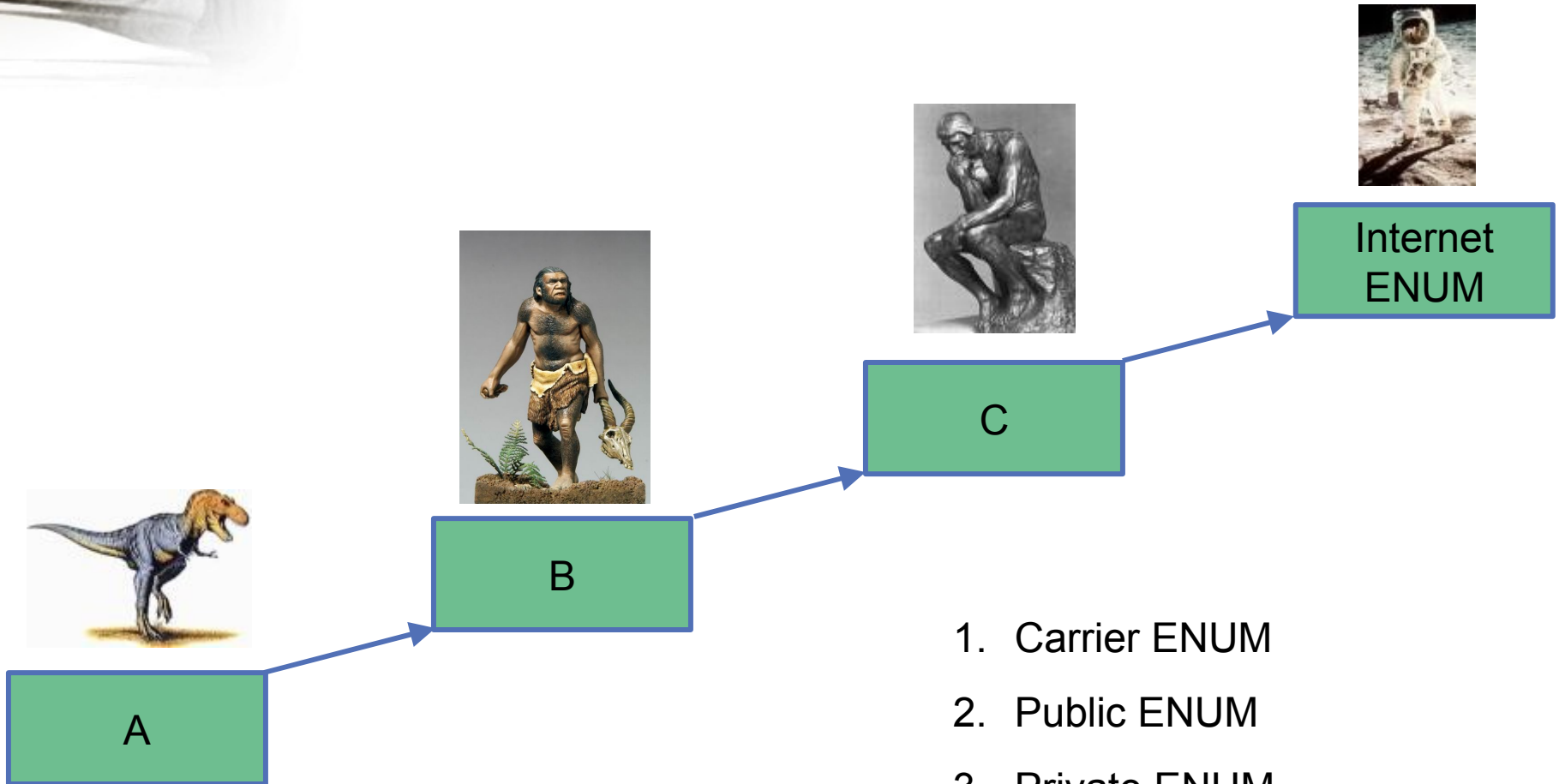




# Evolution of DNS data

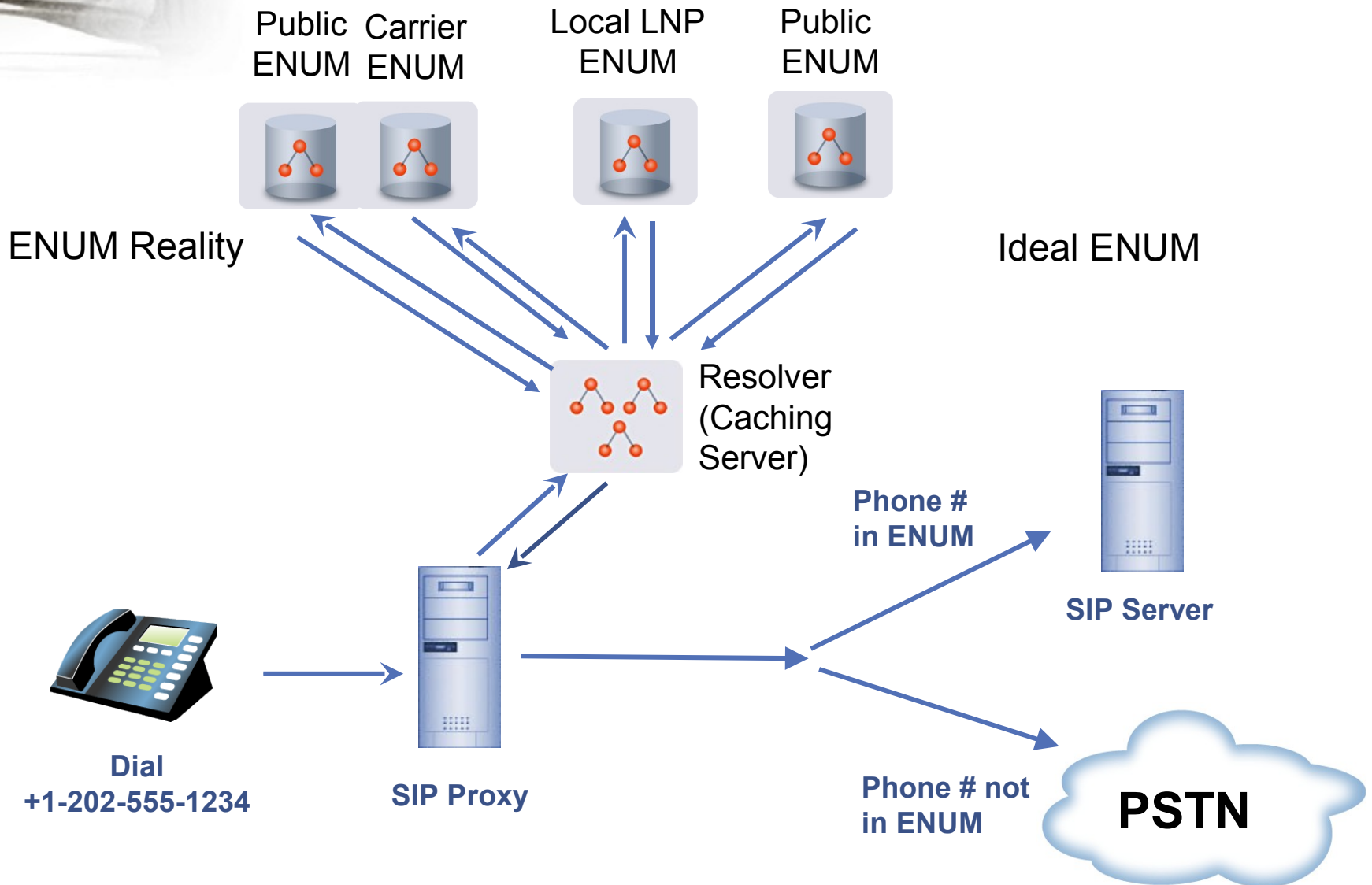


# Evolution of ENUM ?



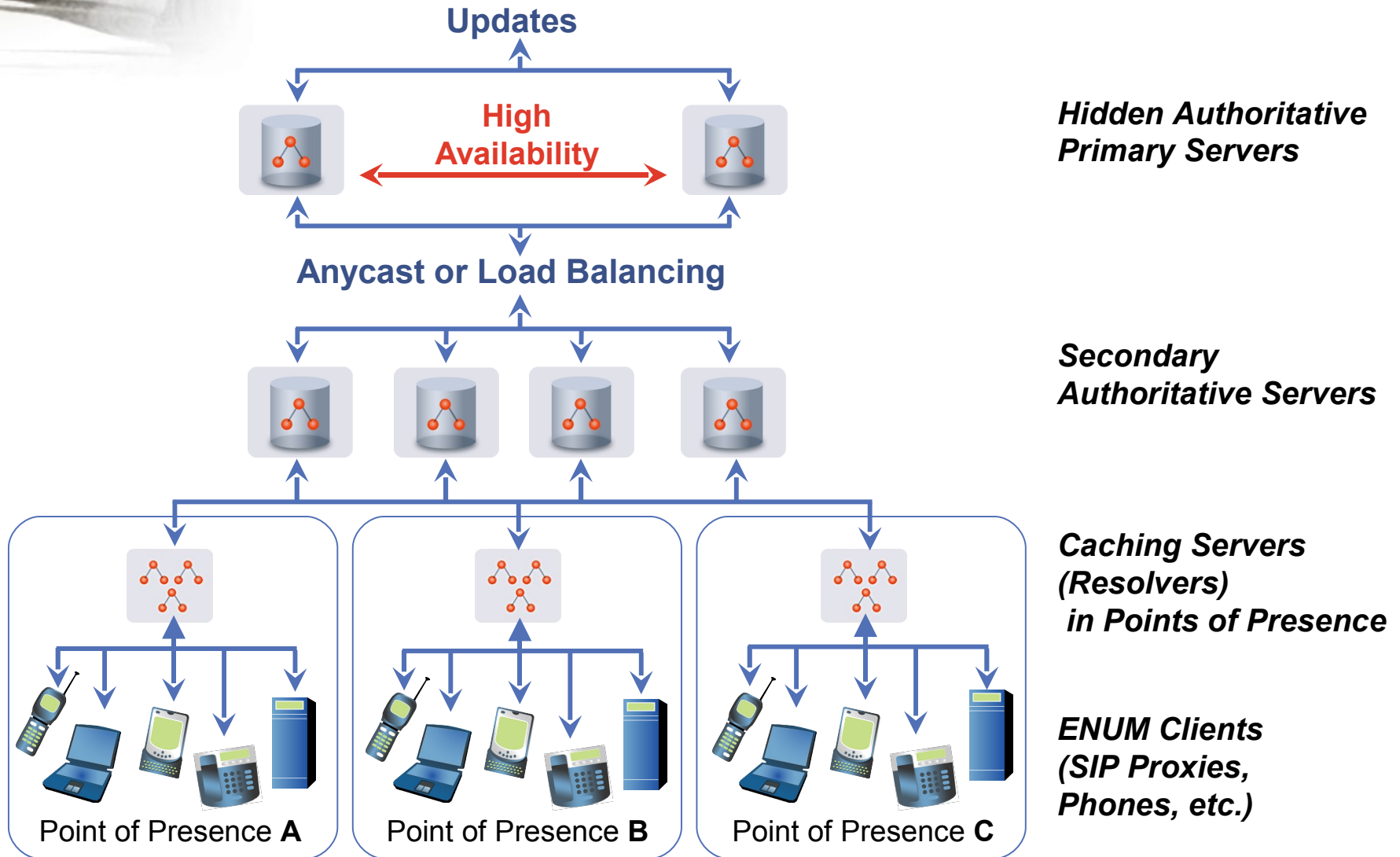
1. Carrier ENUM
2. Public ENUM
3. Private ENUM

# ENUM Lookups Resolution



# Making DNS Robust

# Simple High Availability Architecture



- Scalability
  - Each PoP one or more caching DNS servers
  - Slot in more authoritative servers if needed
- Performance
  - Caching name server as close as possible to the subscriber
- Availability
  - Not a single SPoF

# DNS Requirements

# Subscriber And Provider Requirements

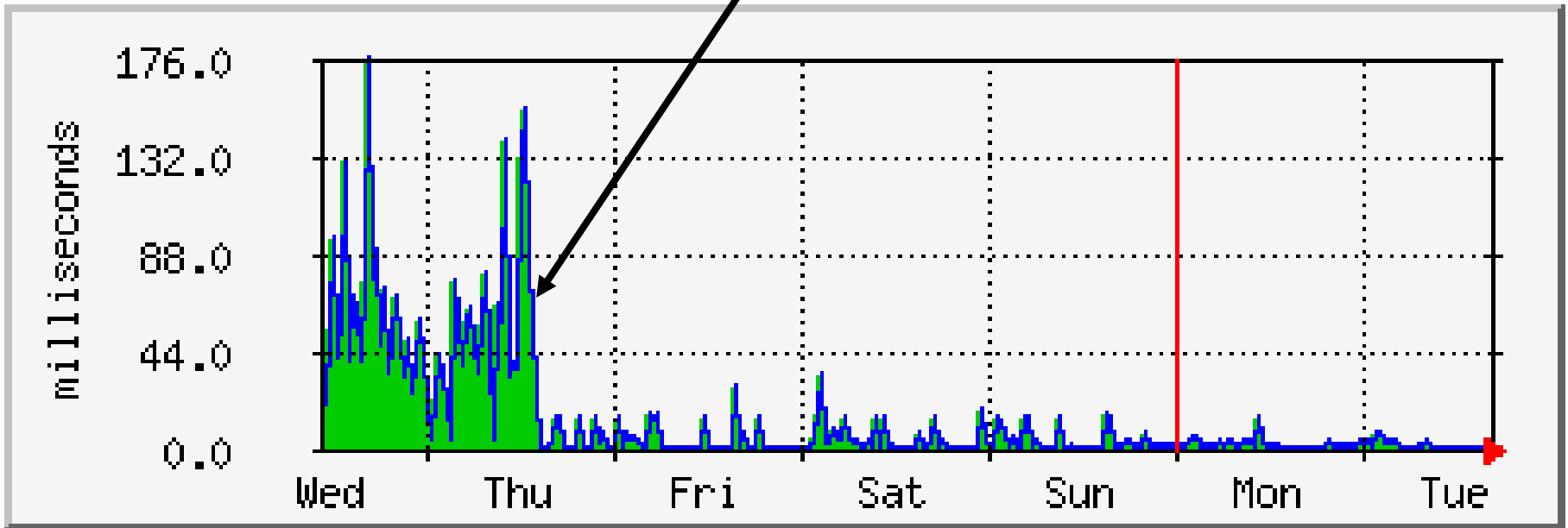
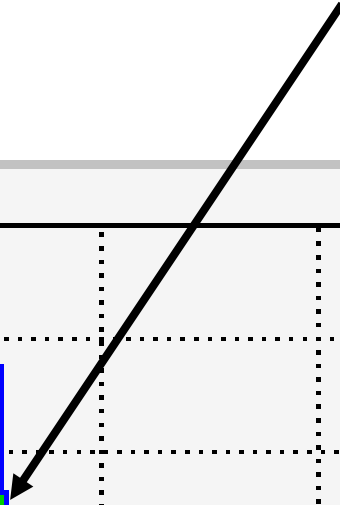
- Low latency
  - Fast call set up time
- High availability
  - POTS Dial tone expectations
- Large volumes of data
  - Millions of phone numbers
- High throughput
  - Process thousands of calls a second
  - Resistance against denial of service attacks
- Security
- Provisioning, provisioning, provisioning, provisioning and provisioning



# CNS Latency

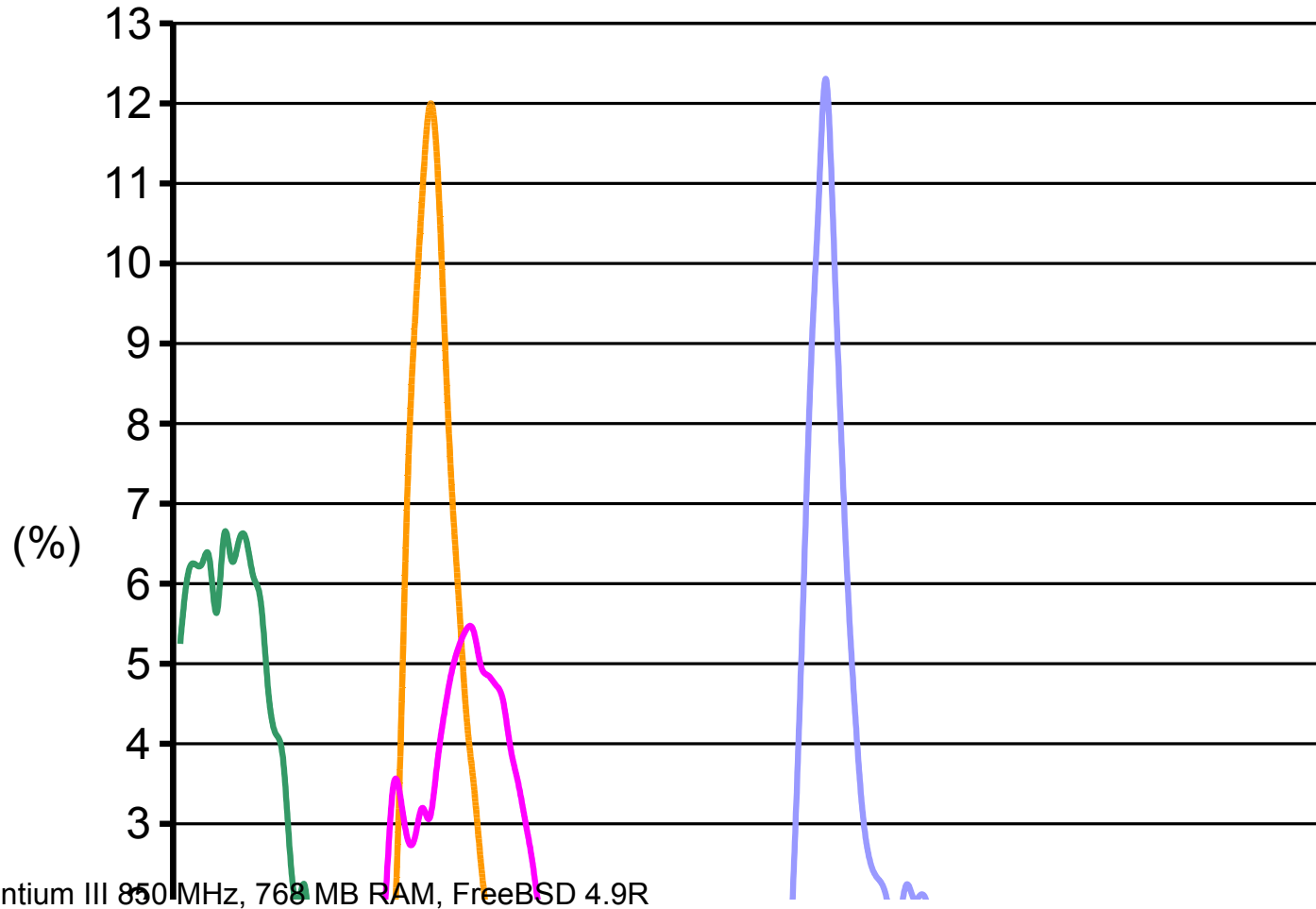


Replaced BIND 9.3.1 with CNS



Configuration: 1 GHz Pentium III, 512 GB of RAM, FreeBSD 4.10

# CNS Response Latency



Configuration: Pentium III 850 MHz, 768 MB RAM, FreeBSD 4.9R

# DNS Zone Architectures

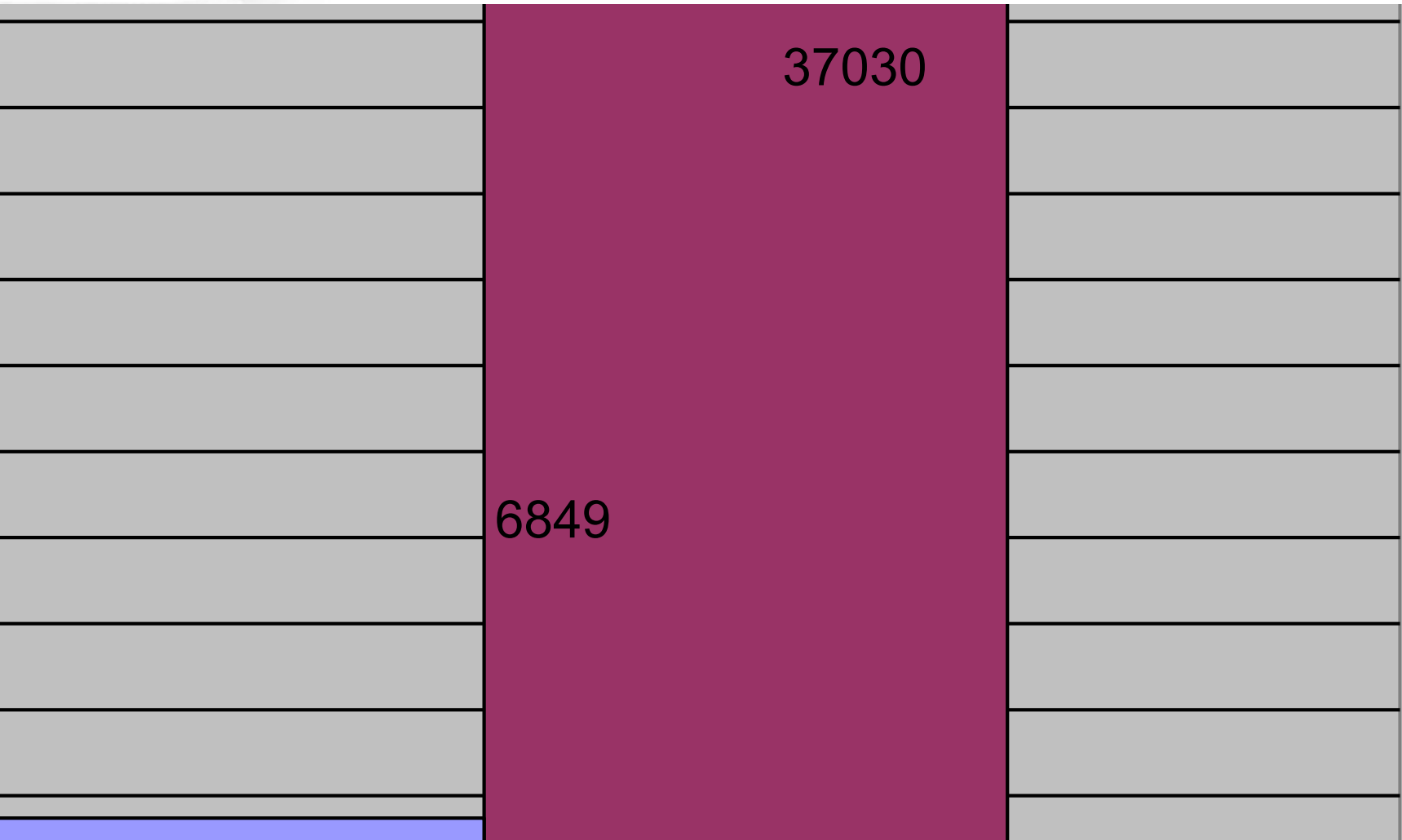
<i>Type</i>	<i>One Zone per Number</i>	<i>In the Middle</i>	<i>All Numbers in One Zone</i>
<b>Good For:</b>	<b>Public ENUM</b>	<b>Carrier ENUM</b>	<b>Private ENUM</b>
<b>Pros</b>	<ul style="list-style-type: none"><li>• Handles number portability</li><li>• Greatest flexibility for subscribers</li></ul>	<ul style="list-style-type: none"><li>• Reduces zone size and number of zones</li></ul>	<ul style="list-style-type: none"><li>• Relatively easily managed</li><li>• Doesn't require vast tracts of hardware</li></ul>
<b>Cons</b>	<ul style="list-style-type: none"><li>• Huge number of zones!</li></ul>	<ul style="list-style-type: none"><li>• Increases system complexity</li><li>• Requires cooperation</li></ul>	<ul style="list-style-type: none"><li>• Number portability is harder</li><li>• Very large zone</li></ul>

# Comparing BIND and Nominum ANS for ENUM

	BIND 9	Nominum ANS
Records in 3.5 Gigs RAM	28 MM	>200MM
Latency	2 seconds	0.003 seconds
Queries/Sec	57	33,000
CPU Utilization	99% each on two CPU's	12%

Configuration: 2 X AMD 1800+ CPU at 1.5GHz, 3.5 GB RAM, 100Mb Ethernet Interface  
Red Hat Enterprise 3.0 Server

# High Throughput



# Why Throughput Matters

- Accommodate growth number of subscribers
- Denial of Service (DoS) attack disables call routing - brings phone system down

# Provisioning, Provisioning, Provisioning And Provisioning

- Millions of phone numbers
- On the fly moves adds and changes
  - No service down time for changes
- APIs
  - Integrate DNS servers in your processes
- Dynamic DNS
  - Secured through TSIG or GSS-TSIG

# Historical Parallel

## Semiconductors

1947 Transistor

1958 Integrated Circuit

1965 Moore's Law

## DNS

1983 Domain Names,  
RRs

1993 Dynamic update,  
DHCP integration

2005 ?



# How have DNS systems changed?

## 1983

- Where do I get the code for DNS to compile and install?

## 2005

- I need a system that can do moves, adds, and changes without restarting
- I need to manage 100 servers as a unit
- I need to manage 20 system administrators
- I need integrated DNS and DHCP

# Conclusions

- DNS is a prerequisite for VoIP
- Latency and high availability matter to the subscriber
- High throughput, store large volumes, security and provisioning facilities matter to the provider
- Nominum implementation is ready to serve you today

**Thank you**