IPv6 Made Easy

Making the Transition to IPv6 with IPAM

April 11th, 2012

Discussion Highlights

- What is DDI?
- How does DDI relate to IPv6?
- IPv6 Network Modeling
- IPv6 Address Assignment
- IPv6 DNS
- BlueCat Overview
- Questions

What is DDI?

What is DDI?

DNS, DHCP, IP Address Management

It's about the management of your name and address infrastructure

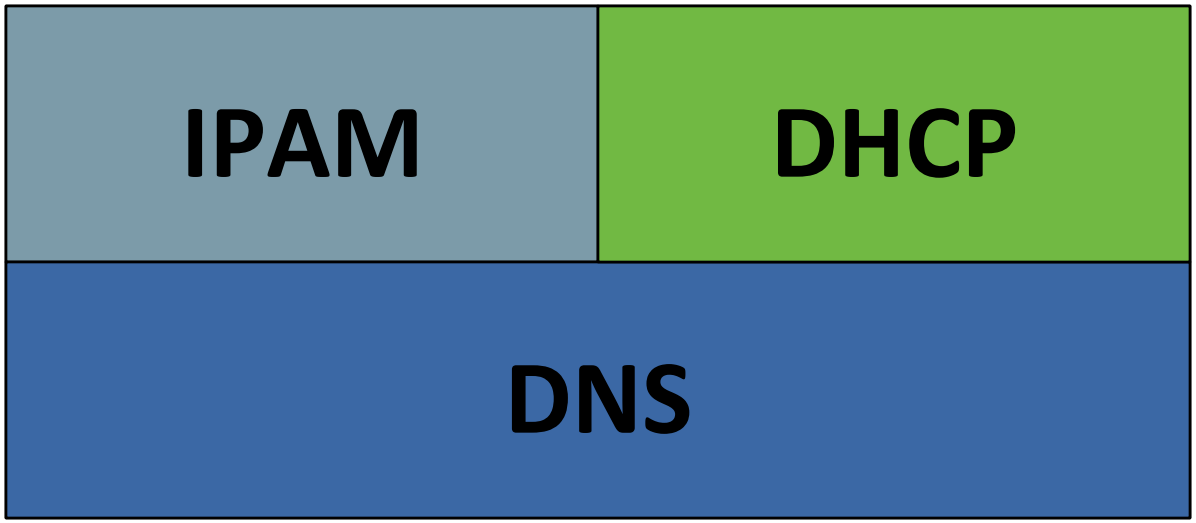
- DHCP provides management of dynamic IP addresses
- DNS maps names to addresses
- IP Address Management ties the two together, and provides management of network structure

Why DNS, DHCP and IPAM?

DDI products help manage the **name** and **address** space of an organization.

Addresses

Names



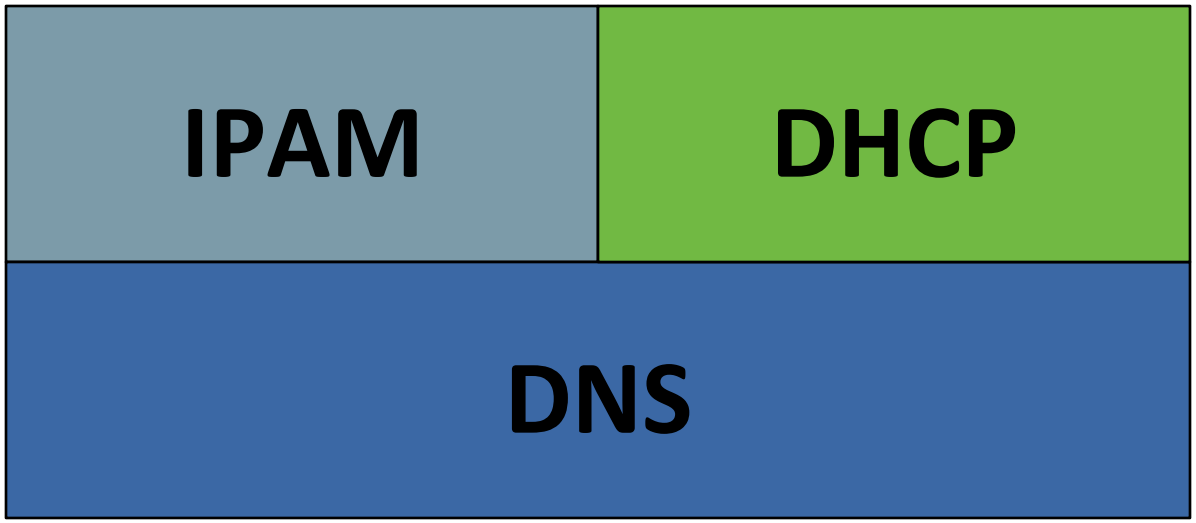
Dynamic Hosts

Dynamic hosts typically account for the largest type of assigned IP address.

Dynamic Host

client.example.com

172.16.200.100



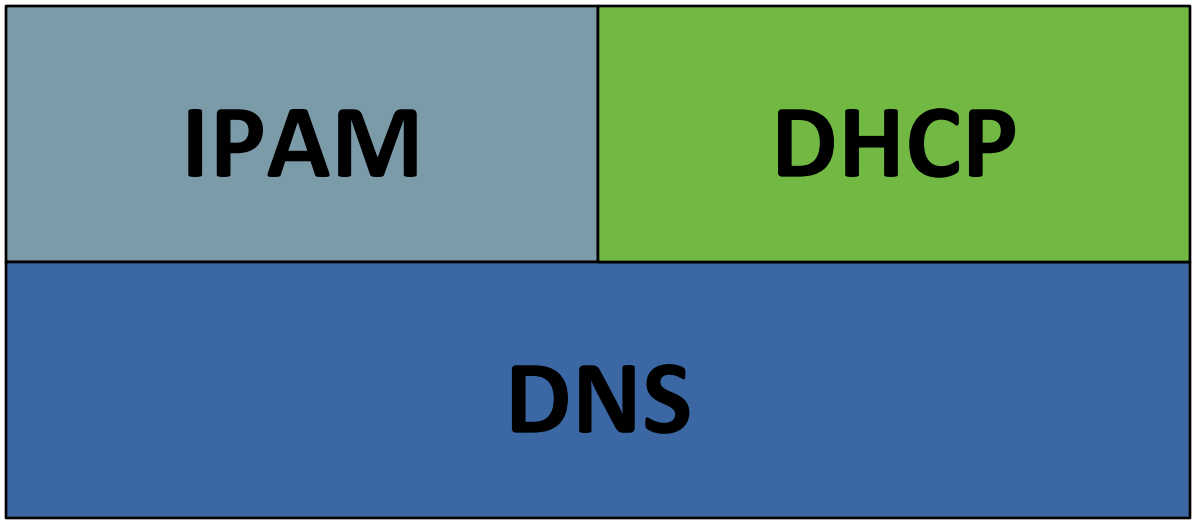
Static Hosts

Static hosts typically represent vital assets or older hosts that are not dynamic.

Static Host

www.example.com

38.99.150.71

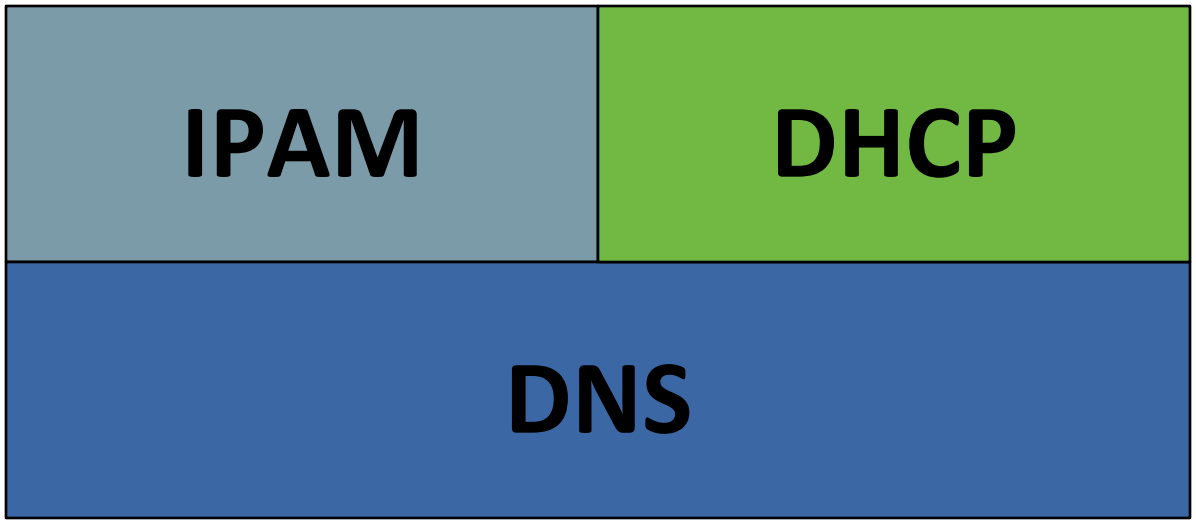


Network information

Other information includes network assignments and size of network.

Network

172.17.0.0/16



How Does DDI Relate to IPv6?

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- DNS
  - Allocating and tracking IPv6 hosts
  - Tracking dual-stack hosts through DNS
- DHCP
  - Allocating and tracking IPv6 addresses
  - Assigning IPv6 options and client settings
- IPAM
  - Allocating and tracking IPv6 networks and addresses
  - Discovering IPv6 addresses in use
  - Tracking and managing dual-stack hosts

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IT'S CRITICAL TO IPv6!

Implementing IPv6 for DDI

IPv6 Roadmap with DDI

BLUECAT NETWORKS

Discover

Where am I starting from?

- Document existing IPv4 network and equipment
- Understand existing (if any) IPv6 capabilities

Plan

Where/when do I want to go?

- Determine what IPv6 capabilities are going to be used
- Understand what equipment may need to be updated

Model

How do I want to travel?

- Model IPv6 space to determine optimal design
- Understand devices to be updated and how

Map

What route should I take?

- Map existing IPv4 space to proposed IPv6 space
- Document updates to existing devices
- Document which devices will need to be added/replaced

Implement

Taking the trip

- Deploy IPv6 capable DNS and DHCP
- Deploy IPv6 capable network equipment

Where Are We Today?

Gartner recommends enterprises should:

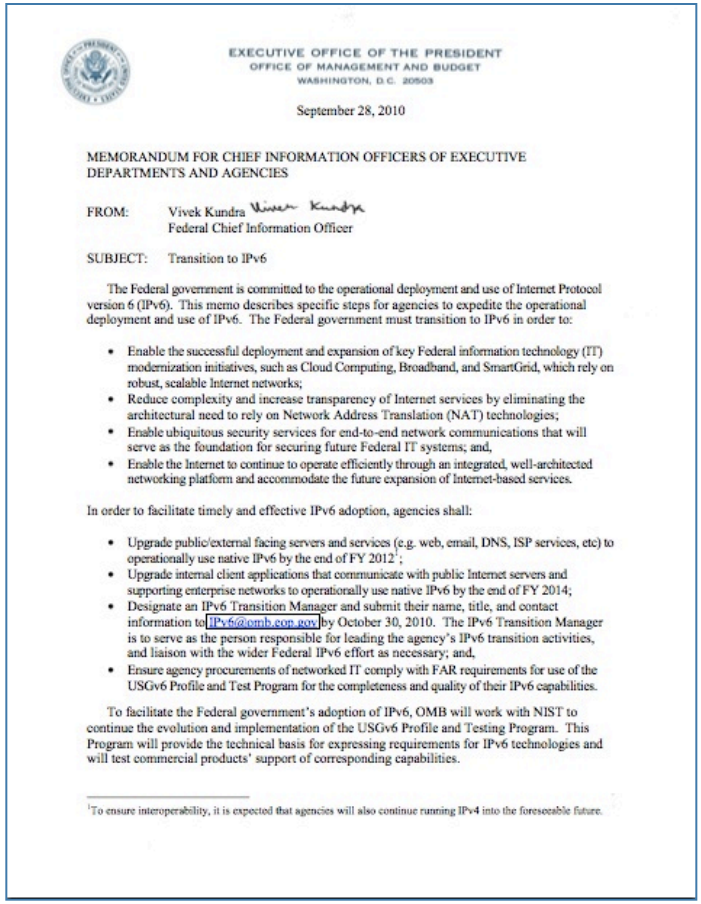
- Conduct an inventory of IPv4 addresses and utilization
- Assess your current IPv6 readiness
- Develop an IPv6 road map focused on communicating with external IPv6 endpoints

Internet Protocol Version 6: It's Time for (Limited) Action – Dec, 2010

Successful IPv6 implementations require DDI

What About Federal?

OMB issued an IPv6 memo on Sept. 28th, 2010



EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

September 28, 2010

MEMORANDUM FOR CHIEF INFORMATION OFFICERS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: Vivek Kundra
Federal Chief Information Officer

SUBJECT: Transition to IPv6

The Federal government is committed to the operational deployment and use of Internet Protocol version 6 (IPv6). This memo describes specific steps for agencies to expedite the operational deployment and use of IPv6. The Federal government must transition to IPv6 in order to:

- Enable the successful deployment and expansion of key Federal information technology (IT) modernization initiatives, such as Cloud Computing, Broadband, and SmartGrid, which rely on robust, scalable Internet networks;
- Reduce complexity and increase transparency of Internet services by eliminating the architectural need to rely on Network Address Translation (NAT) technologies;
- Enable ubiquitous security services for end-to-end network communications that will serve as the foundation for securing future Federal IT systems; and,
- Enable the Internet to continue to operate efficiently through an integrated, well-architected networking platform and accommodate the future expansion of Internet-based services.

In order to facilitate timely and effective IPv6 adoption, agencies shall:

- Upgrade public/external facing servers and services (e.g. web, email, DNS, ISP services, etc) to operationally use native IPv6 by the end of FY 2012[1];
- Upgrade internal client applications that communicate with public Internet servers and supporting enterprise networks to operationally use native IPv6 by the end of FY 2014;
- Designate an IPv6 Transition Manager and submit their name, title, and contact information to IPv6@omb.eop.gov by October 30, 2010. The IPv6 Transition Manager is to serve as the person responsible for leading the agency's IPv6 transition activities, and liaison with the wider Federal IPv6 effort as necessary; and,
- Ensure agency procurements of networked IT comply with FAR requirements for use of the USGv6 Profile and Test Program for the completeness and quality of their IPv6 capabilities.

To facilitate the Federal government's adoption of IPv6, OMB will work with NIST to continue the evolution and implementation of the USGv6 Profile and Testing Program. This Program will provide the technical basis for expressing requirements for IPv6 technologies and will test commercial products' support of corresponding capabilities.

[1]To ensure interoperability, it is expected that agencies will also continue running IPv4 into the foreseeable future.

What Does the Mandate Say?

- Upgrade public/external facing servers and services (e.g. web, email, DNS, ISP services, etc) to operationally use native IPv6 by the end of FY 2012

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- Ensure agency procurements of networked IT comply with FAR requirements for use of the USGv6 Profile and Test Program for the completeness and quality of their IPv6 capabilities.

Where Should You Be?

Discover

Where am I starting from?

- [illegible]
- [illegible]

Recommended by Gartner

Plan

Where/when do I want to go?

- [illegible]
- [illegible]

Recommended by Gartner

Model

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Taking the trip

- Deploy IPv6 capable DNS and DHCP
- Deploy IPv6 capable network equipment

IPv6 Networks

IPv6 Networks

Tracking v4 began with spreadsheets

- Simple address boundaries (Class A, B, C)
- Static IP addresses

Spreadsheets won't work for IPv6

- Address boundaries are much more difficult
- Dynamic assignment of addresses
- IPv6 addresses are longer and more difficult to remember

IP Network Game

What's the next network of equal size?

172.16.0.0/13

172.24.0.0/13

IP Network Game

What's the next network of equal size?

2001:0DB8:1BDC:8000::/50

2001:0DB8:1BDC:C000::/50

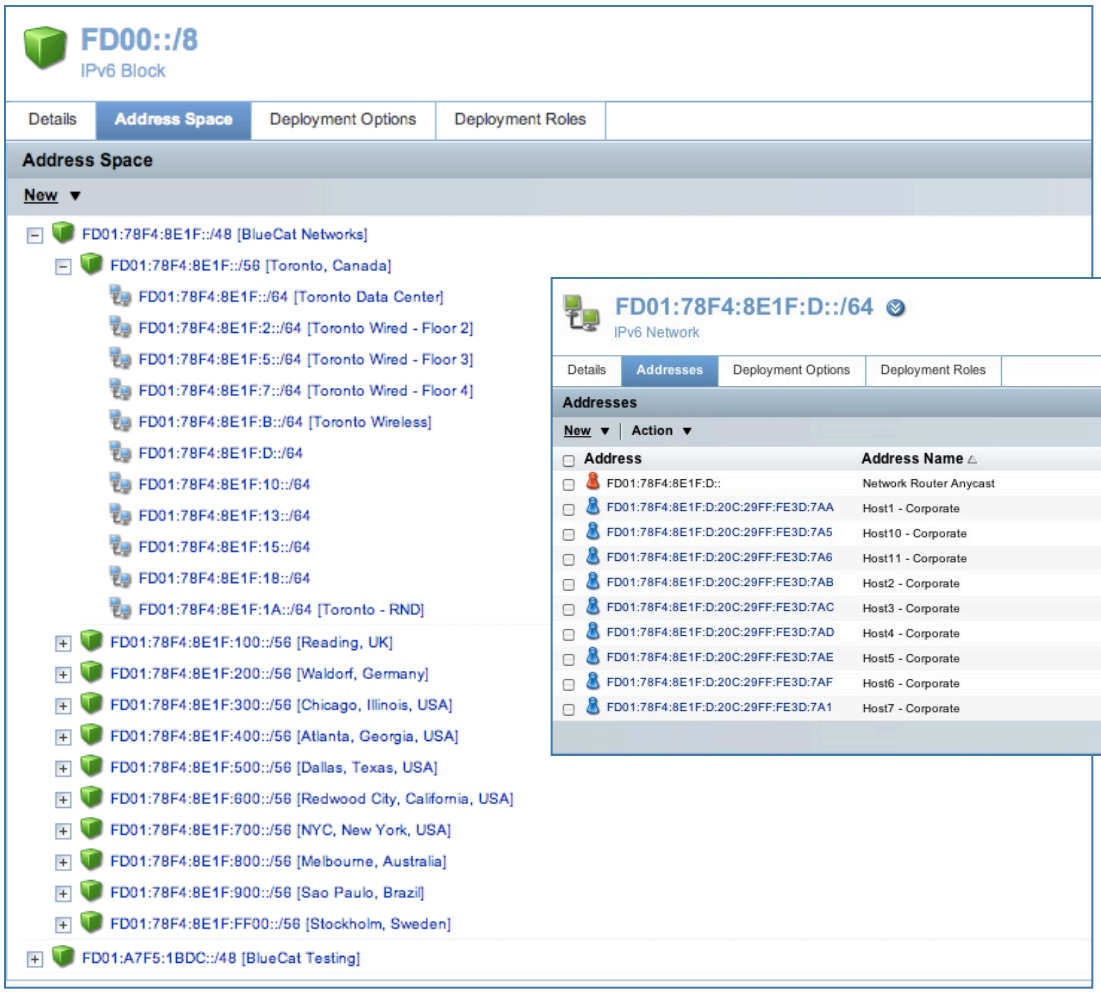
IPv6 Network Plans Need DDI

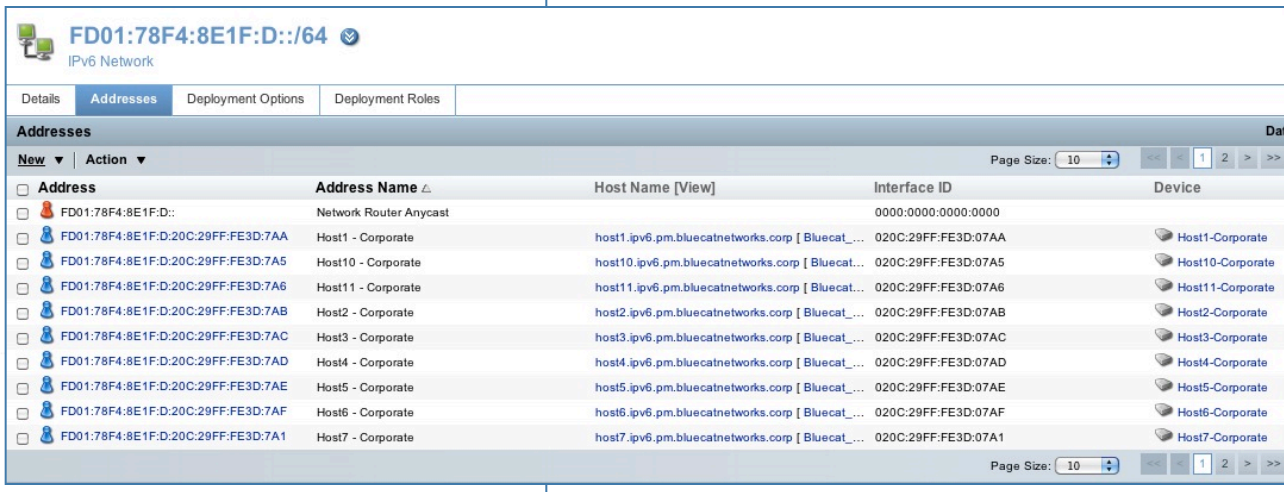
Without DDI, organizations will struggle to:

- Track IPv6 Networks
- Manage IPv6 Network Boundaries
- Track dynamic IPv6 assignments (SLAAC and DHCP)
- Represent their IPv6 network in business logic

DDI Simplifies IPAM for IPv6

BlueCat IPAM





How to Allocate IPv6 Space?

With IPv6 you have a chance to plan properly

- Allows you a fresh start to begin planning
- Chance to re-organize network infrastructure

Map your business logic to IPv6 infrastructure

- Location
- Department
- Service Type

Allocation Example

2001:0DB8::/32 – Assigned IPv6 Space

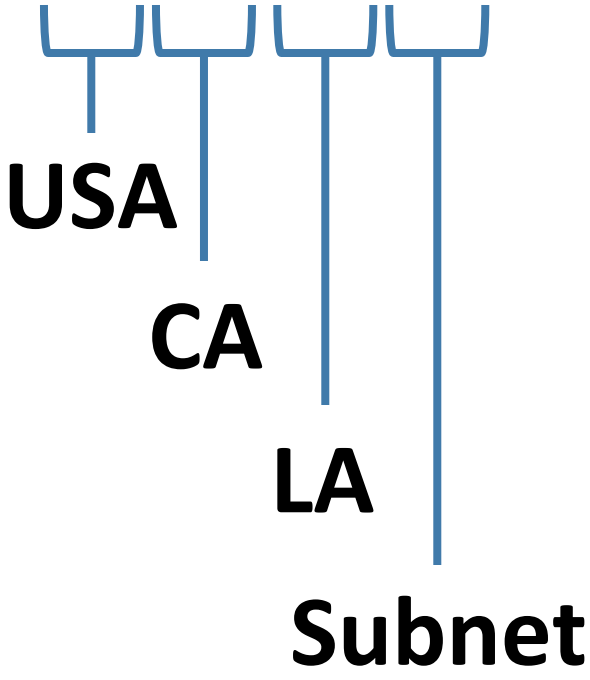
- /40 – Assigned per Country
  - /48 – Assigned per State
    - /56 – Assigned per City
      - /64 Assigned per Subnet

At each level you have 256 blocks available

Dissecting the IPv6 Address

Use IPv6 allocation to understand IP address

2001:0DB8:**001A:0F14**:BC:F78:9045:C102



Should I Model Using IPv4?

Map each existing v4 network to a new v6?

- Would be wasteful of IPv6 space
- Introduces management headaches – too many networks to manage and maintain

IPv6 networks are NOT limited by broadcast

- Allows for larger flat networks to be created

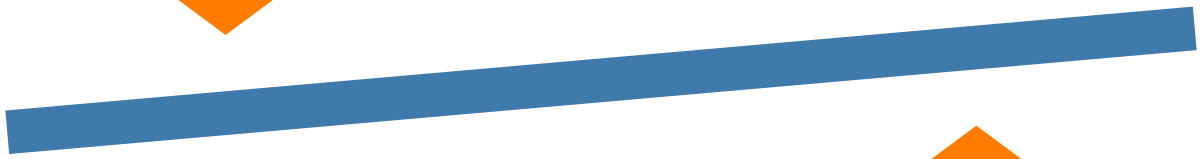
Map multiple IPv4 networks to new IPv6 network

- Facilitates grouping based on business logic
- Reduces number of networks to maintain

Striking a Balance

Too many networks

- carries IPv4 problems forward
- negate advantages of flat networks
- more networks to manage and track

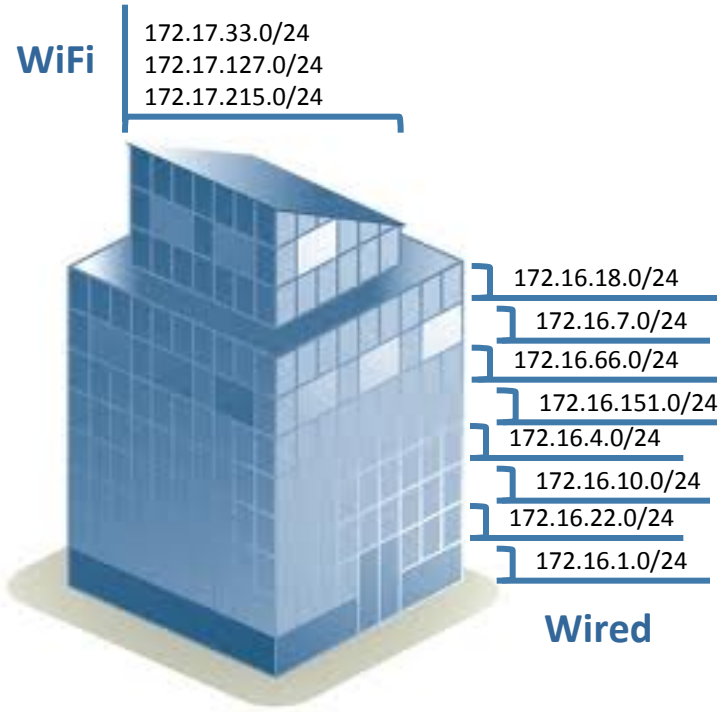


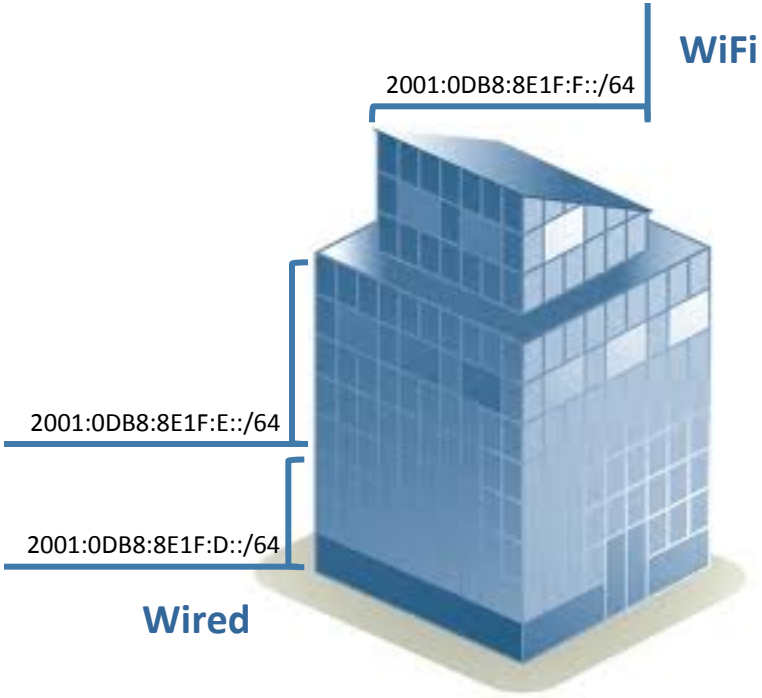
Too few networks

- lack of management framework
- difficult to delegate control
- no segregation of traffic

IPv6 Network Creation

Opportunity to simplify network infrastructure





IPv6 Addressing

IP Addressing

IPv6 addresses are unfamiliar

- Addresses are more complex, longer and harder to remember

No more static IP addresses

- Locally using Stateless Address Auto-configuration
- Remotely using DHCPv6

“dual-stacked” networks look to be a must

- Slow transition requires both IPv6 and IPv4
- Multiple IP addresses per client (IPv4 and IPv6)

IPv6 Addresses – The Differences

How do IPv6 addresses differ from IPv4?

IPv6 addresses are far more complicated

- Longer– 4 times longer than IPv4
- Hexadecimal – numbers (0-9) and letters (A-F)
- Require more advanced subnetting

The idea of easily managing and remembering IP addresses and networks is a thing of the past

IP Address Game

How many can remember this IP address?

172.37.196.146

IP Address Game – IPv6

How many can remember this IP address?

2001:0DB8:8E1F:F:DCB1:1010:9234:4088

Needle In A Haystack

DCD1:1010:9234:4088

DCB1:1010:9234:5088

DCB1:101A:9234:4088

DCB1:1010:9234:4088

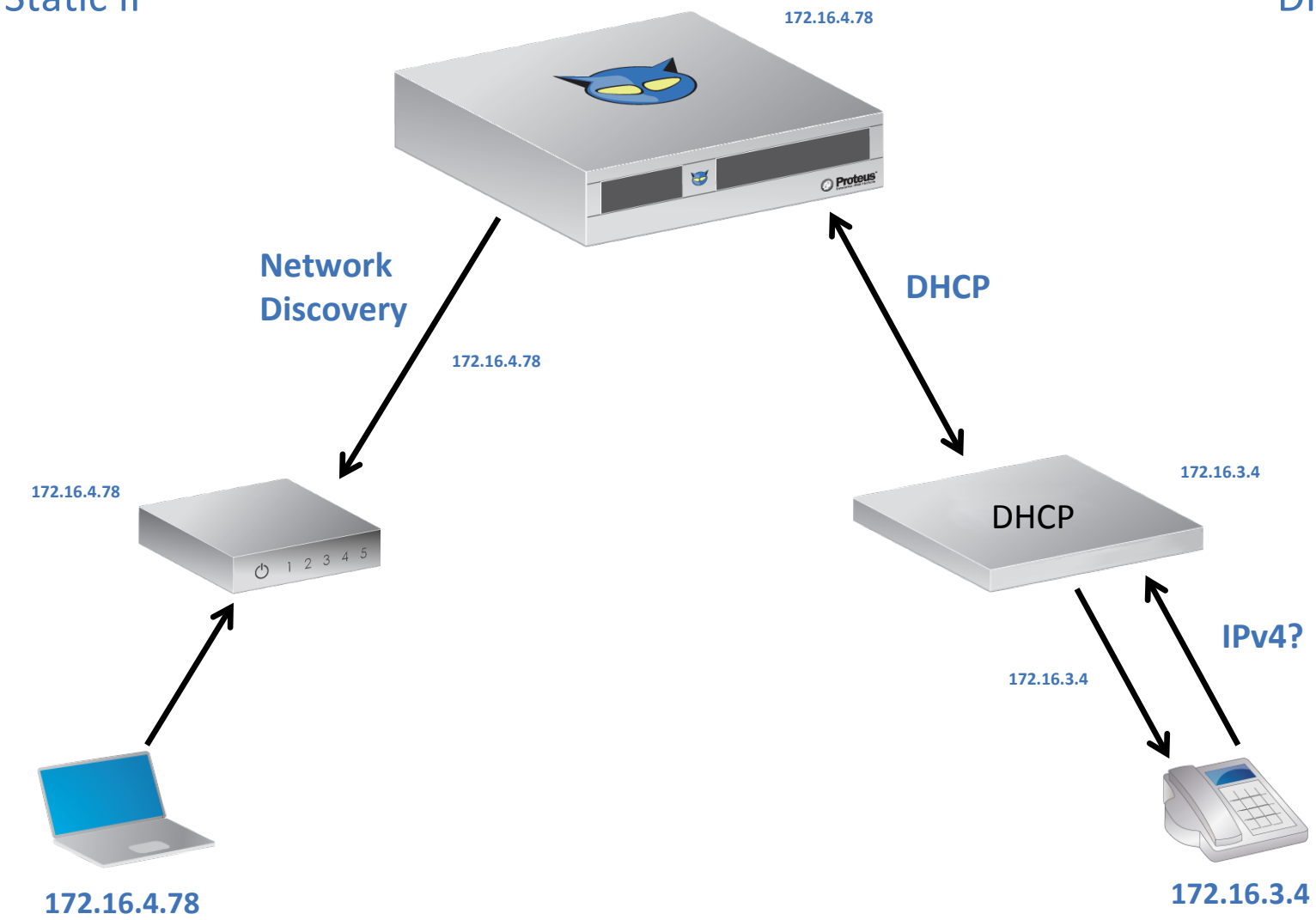
DCB7:1010:9234:4088

DCB1:1010:9234:4D88

DCB1:1010:8234:4088

DCB1:7010:9234:4088

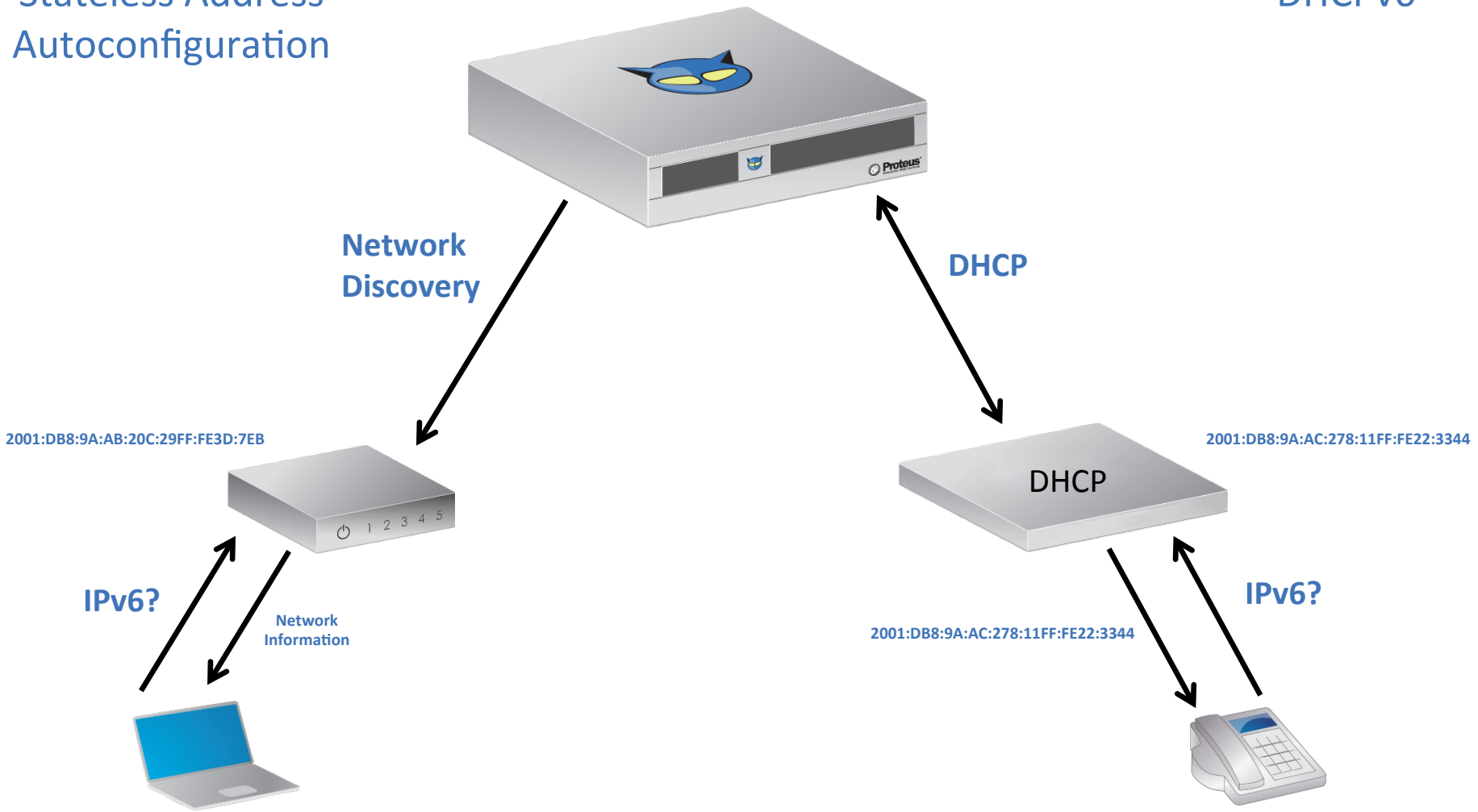
IPv4 Assignment



IPv6 Assignment

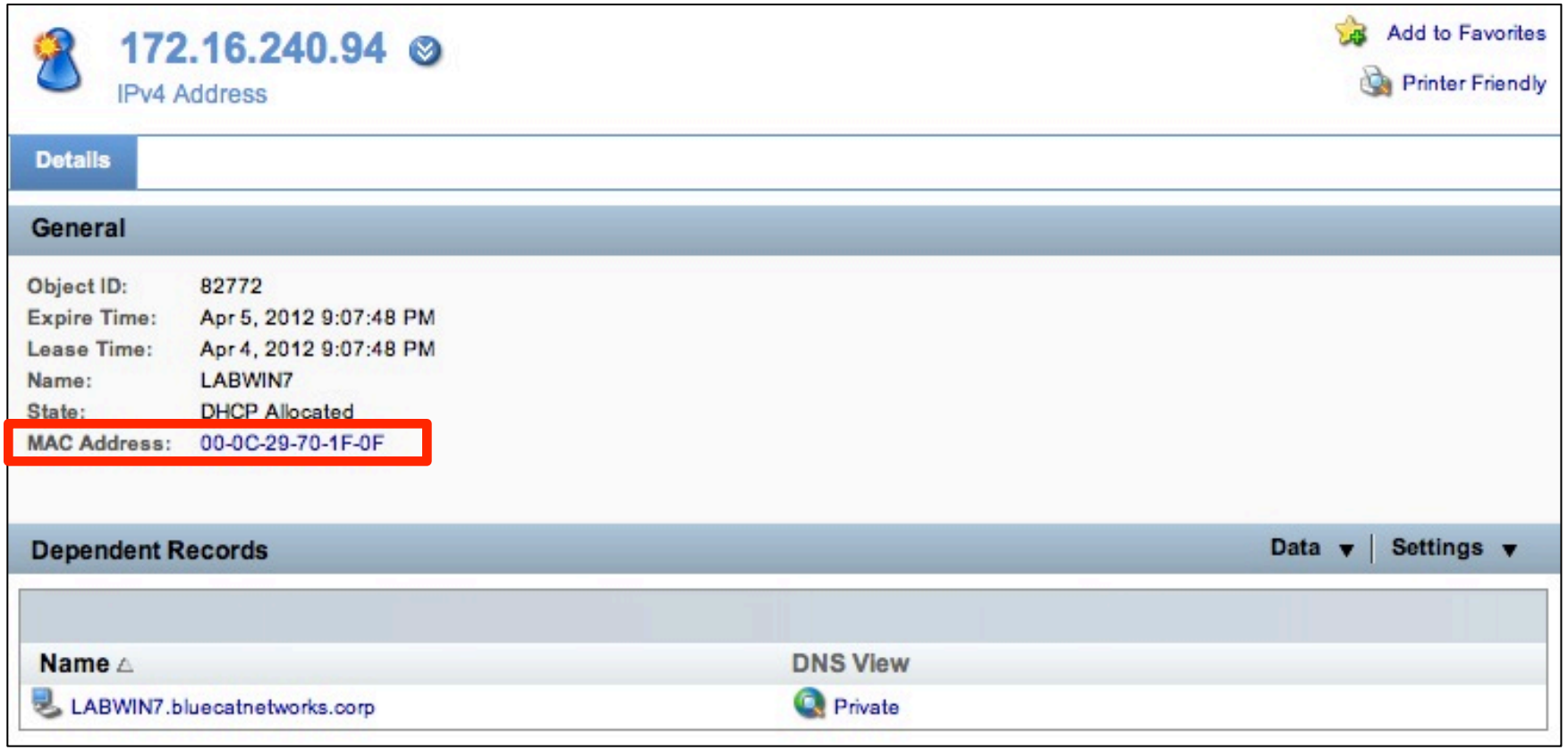
Stateless Address Autoconfiguration

DHCPv6



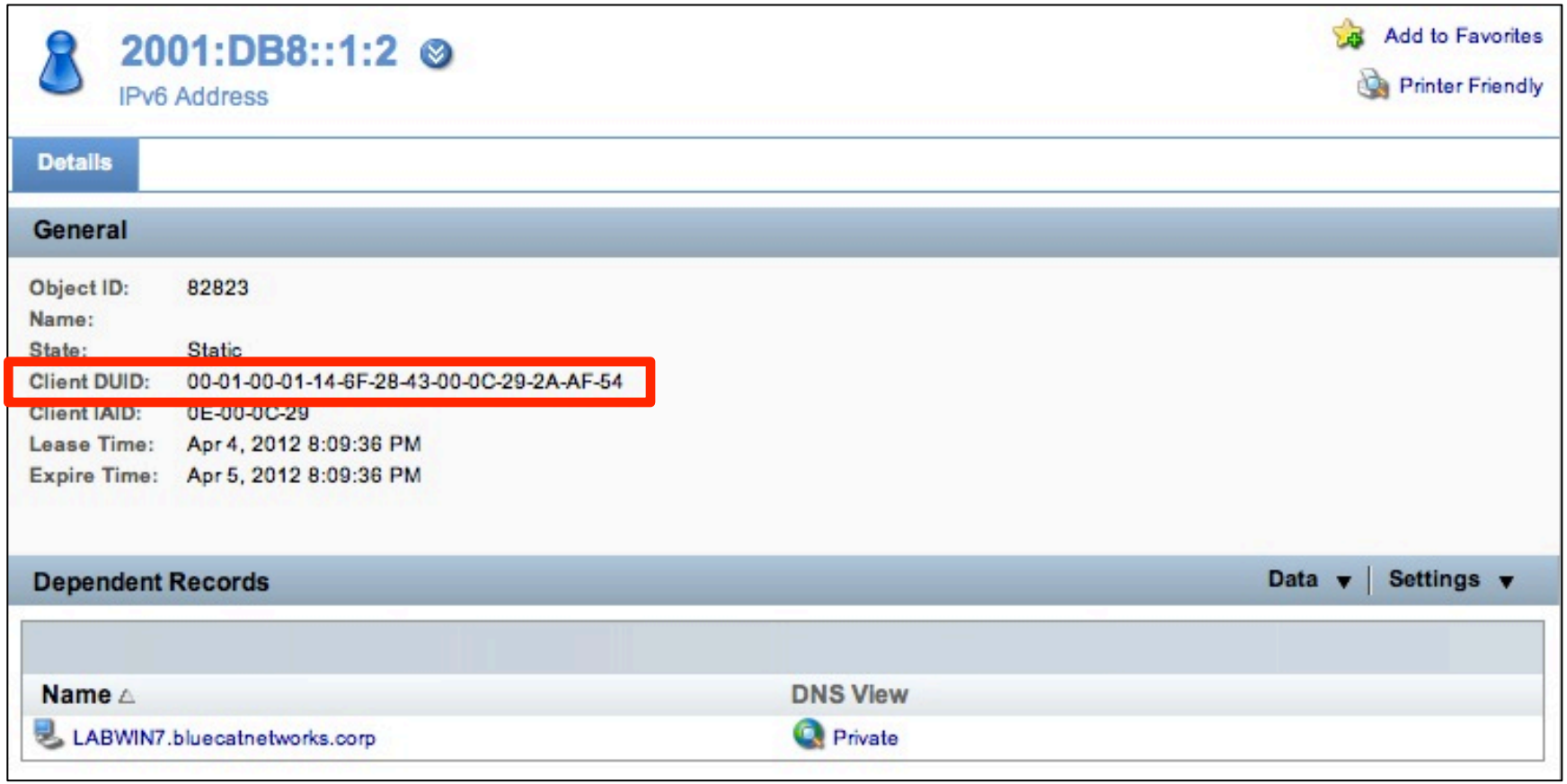
DHCP Leases – IPv4

DHCP lease data tracks MAC to IP relationship



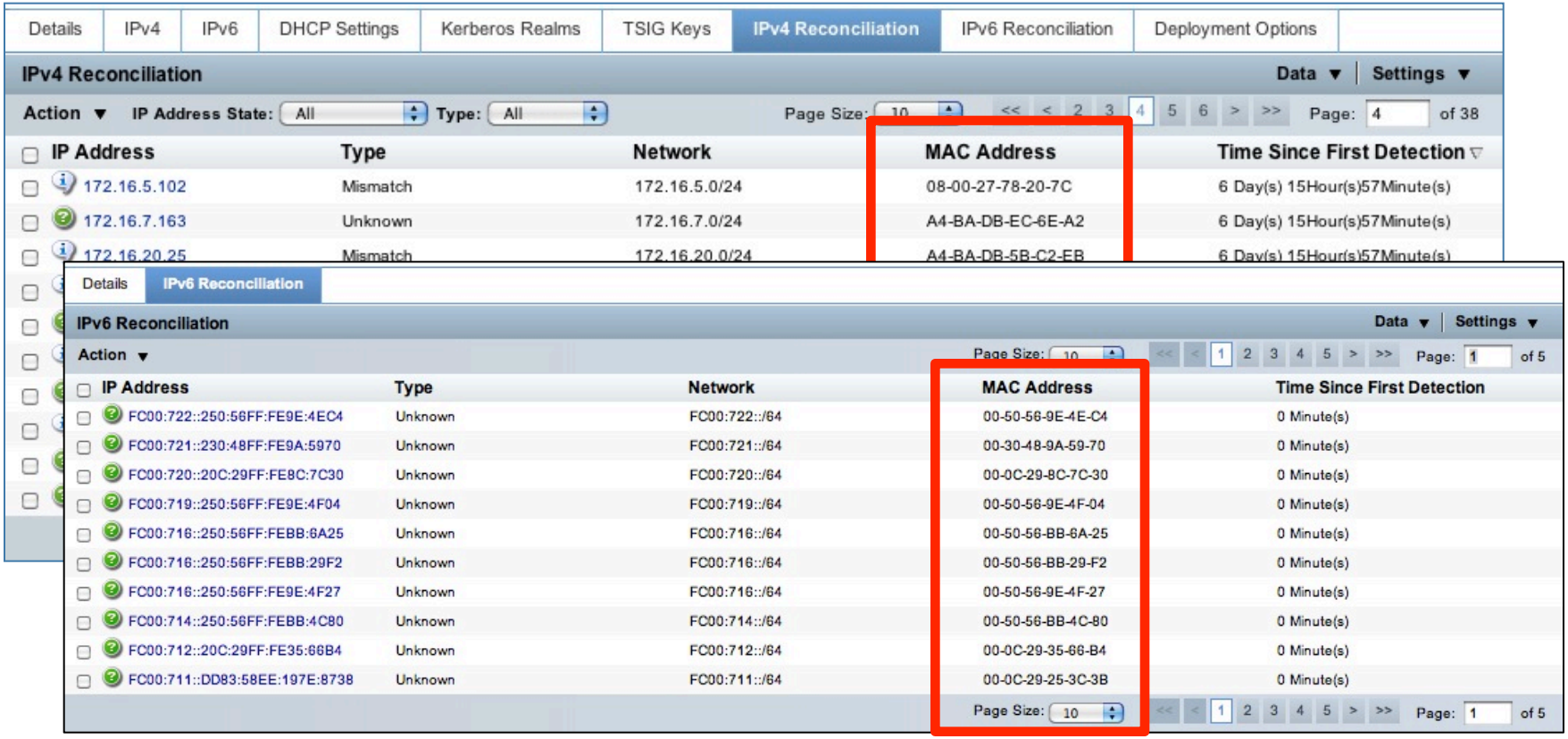
DHCP Leases – IPv6

DHCPv6 lease data tracks DUID to IP relationship



Network Discovery

Maps IP to MAC relationship (and more)



Network Discovery

Discovers Layer 3 and Layer 2 data

Reconcile Summary Page

General

IP Address:	172.16.45.11
Type:	Unknown
Reconciliation Result:	Automated Acceptance
First Detection:	Jan 27, 2012 1:23:59 PM
Last Detection:	Apr 4, 2012 9:10:33 PM
FQDN:	
MAC Address:	00-50-56-77-84-AA
Configuration ID:	34
Connected Router Port:	172.16.2.1 (TORSWCC01a.bluecatnetworks.corp) : 45 (Vlan45)
Connected Switch Port:	172.16.20.14(TORSWCC04) : Gi0/28 [ifindex=10128 , Description=GigabitEthernet0/28 , Speed=1000 Mbps , VLAN=45 (TORvMotion1)]
End of SubNet:	172.16.45.255
Network:	172.16.45.0/24
Proteus Discovery State:	Not Allocated
Start of SubNet:	172.16.45.0
Time Since First Detection:	68 Day(s) 7Hour(s)46Minute(s)

Tracking – MAC Address

The MAC address is a unique identifier for a device

- DHCP gives IPv4 to MAC relationship
- DHCPv6 gives IPv6 to DUID relationship
- Network Discovery gives IPv4 to MAC and IPv6 to MAC relationship

IPv4 ←→ MAC ←→ IPv6 ←→ DUID

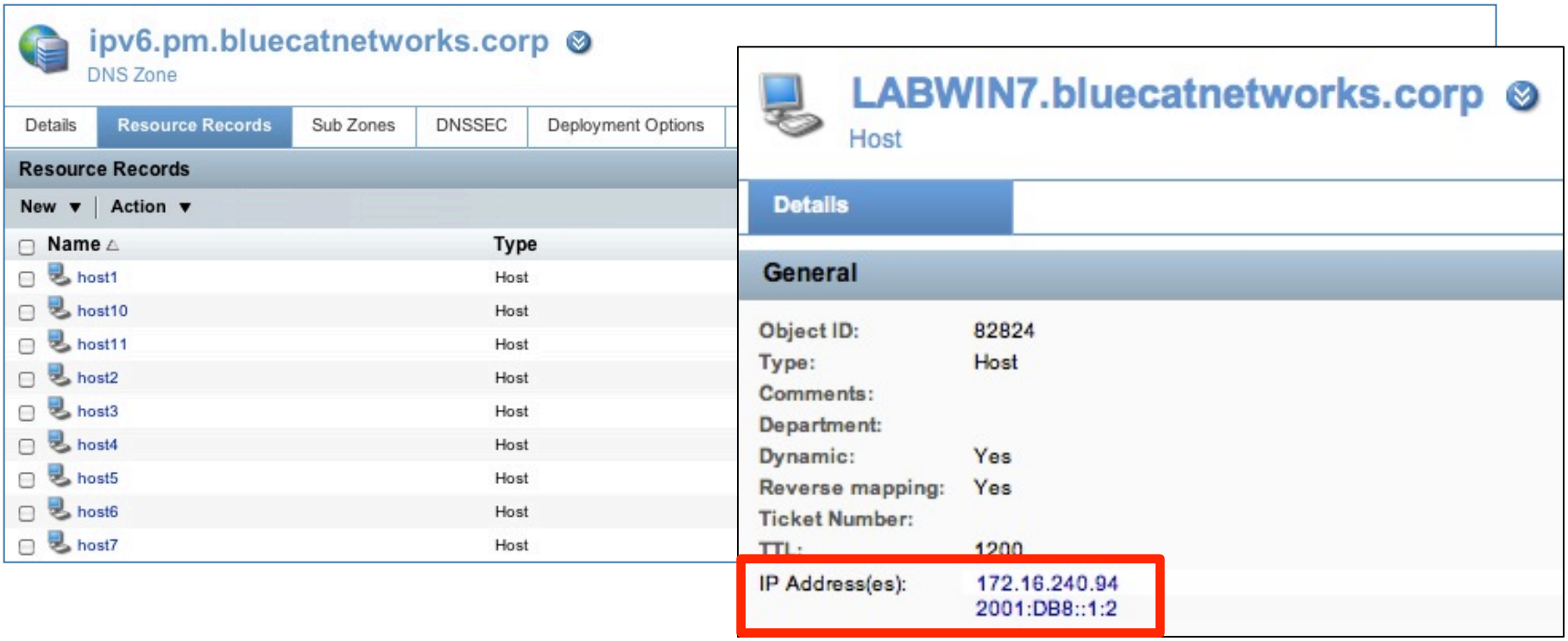
Dual-Stacked – MAC

IPv6 DNS

IPv6 DNS

DNS has had support for IPv6 for some time

- A record for IPv4
- AAAA record for IPv6



Conclusion

DDI is Critical to IPv6

Leveraging DDI, organizations will be able to:

- Track IPv6 networks
  IPAM products provide tools to model and track networks
- Discover existing IPv4 and IPv6 space
  Track stateless IP address usage directly from routers
- Integrate dynamically assigned IPs
  Allocate stateful IP addresses through DHCP server integration
- Map IP addresses to names
  Provides a single source for all name and address information
- Track “dual-stacked” systems
  Map IPv4 and IPv6 addresses to a single system for tracking

Questions?

Thank You

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