Implementing and securing a resilient network services infrastructure

Implementing a resilient network services infrastructure

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Agenda

- The need for resilience
- DNS resilience
  - Challenges and Solutions
- DHCP resilience
  - Challenges and Solutions
- The benefits of integrated IPAM, DNS, DHCP
- Summary
- Q&A

The need for resilience

- Without core network services (DNS & DHCP)
  - Users can't access the network/internet
  - Email not working
  - Apps not working
- Stuff breaks! Users are on the phone to support (unless it's VoIP!)
- Resilient DNS/DHCP services can eliminate potential network downtime

DNS resilience

Existing DNS environment?

- May have lots of Microsoft DNS...
  - AD integrated
  - DNS running on all your DC's
- It probably works more by accident than by design...
  - There are likely to be inconsistencies
- Patch Tuesday forces a monthly reboot?

Existing DNS environment?

- Hybrid deployment...
  - Both Linux and Microsoft DNS servers
- Keeping BIND updated can be a challenge
  - Security vulnerabilities
  - How do you patch?
- Do you integrate BIND and AD?
  - Or run completely separate environments?

DNS support & resilience

- Can you count on a vendor for support?
- Have you configured any kind of resilience?
  - VIPs or Windows/Linux Cluster
  - RAID 1 to combat HDD failure?
  - Dual PSU?
- Are you doing any monitoring and alerting?

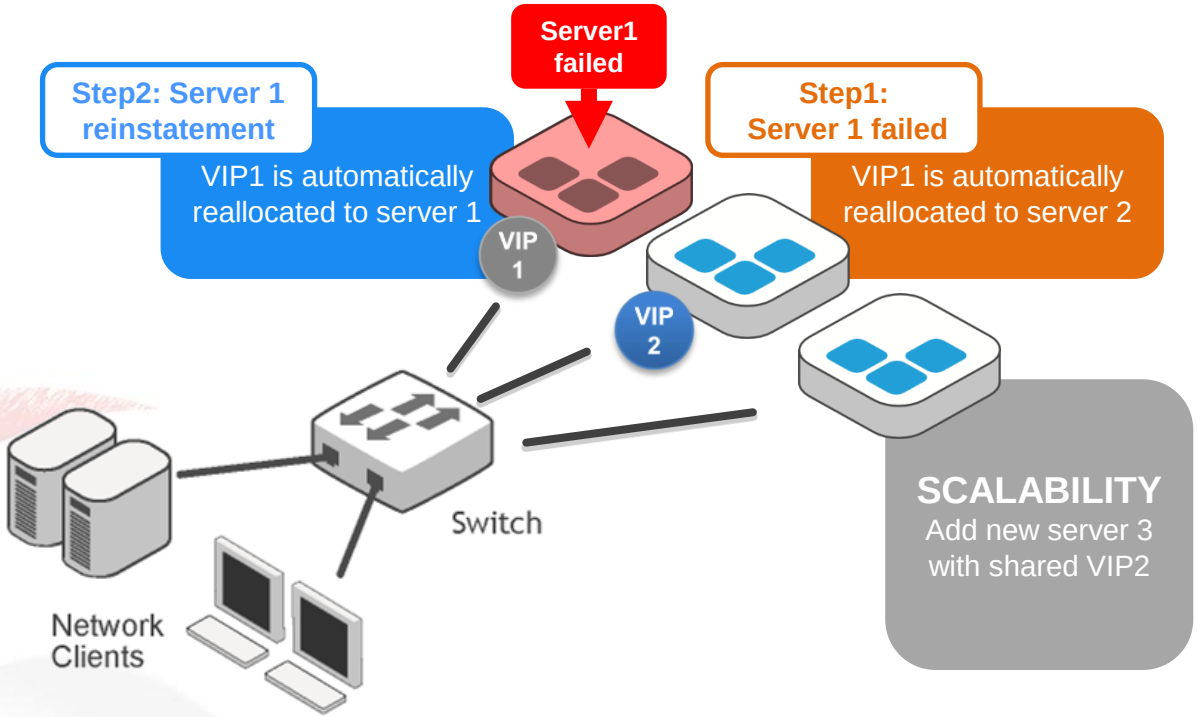
DNS deployment considerations

- Internal DNS:
  - Clients configured to talk to 2 or more servers
  - Local survivability needed ? Local DNS service vs Centralised service
- External DNS:
  - Separation of services:
    - Authoritative (offsite secondary, geographic diversity)
    - Recursive (but no open recursive!)

DNS High Availability

- Shared VIP across multiple DNS servers
  - Commonly use Router Redundancy Protocols
- Benefits:
  - Lose one node and another node provides service
  - No downtime during upgrades/maintenance
- Considerations:
  - Must be on same layer 2 network
  - Number of HA pairs

DNS High-availability



DNS Anycast

- Allows multiple, geographically diverse DNS servers to advertise the same IP address
  - Looks like multiple routes to the same server
- A user's query is routed to their nearest DNS server
- If that server dies, queries get routed to the next nearest instance

DNS Anycast – benefits

- Increased Reliability/Availability. Lose several DNS servers and we've still got service
- Improved performance
- Load balancing
- Resilience against DDoS attacks (localised impact of the attack)
- Simplified Client Configuration
- Internet Root servers use it – so it can't be bad

DNS Anycast – considerations

- Consistent data on DNS servers
- Rollout is not a trivial task
- Need a good relationship with the network guy (better still - you are the network guy)
- Troubleshooting

Load balancers (hardware)

- Use a load balancing appliance in front of a DNS server farm
- Load balancer will distribute queries and monitor DNS servers
- Good:
  - Existing infrastructure may support this
  - No DNS outage when a server fails or during maintenance

Load balancers

- Considerations:
  - Additional technology now in the data flow
  - Consistent data on DNS servers
  - May complicate troubleshooting
  - Different teams likely to be involved - finger pointing
  - Expense of new kit if there isn't enough capacity in existing load balancer appliances

Other DNS considerations

- Standard DNS security: version updates (DNS binary & OS), ACLs, data flows
- DNSSEC: Data integrity - validate the origin and integrity of DNS data
- DNS Firewall (RPZ-based) – block access to Malware sites at the DNS level
- DDoS mitigation service

DHCP resilience

Existing DHCP environment?

- Linux and/or Microsoft?
  - Is failover deployed?
    - Failover is not split-scopes!
- Many devices dependent upon DHCP
  - VoIP Phones, wireless clients, desktops etc.
- Support/management/monitoring
- How do you document IP allocations?

Management headaches

- Microsoft DNS/DHCP use separate MMC consoles
  - And you have to know which server to connect to
  - Limited granular access control
- Linux is primarily command line driven
- IPAM normally done elsewhere
  - e.g. In a spreadsheet

DHCP – Single server

- Individual server(s) doing DHCP
- Server dies
  - No-one can get a new IP
  - Clients with a lease okay up to expiry time
- How long to restore the configuration?
- Lost some or all of the IP lease information
- Clients may have to change IP address

DHCP split-scope

- Multiple, independent DHCP servers
- Typically known as “80/20 split”
- DHCP servers are independent of each other
- If you lose the 80% server, does the 20% server have the capacity to handle all clients
- A client will have to change its IP address when getting a lease from the "other" server

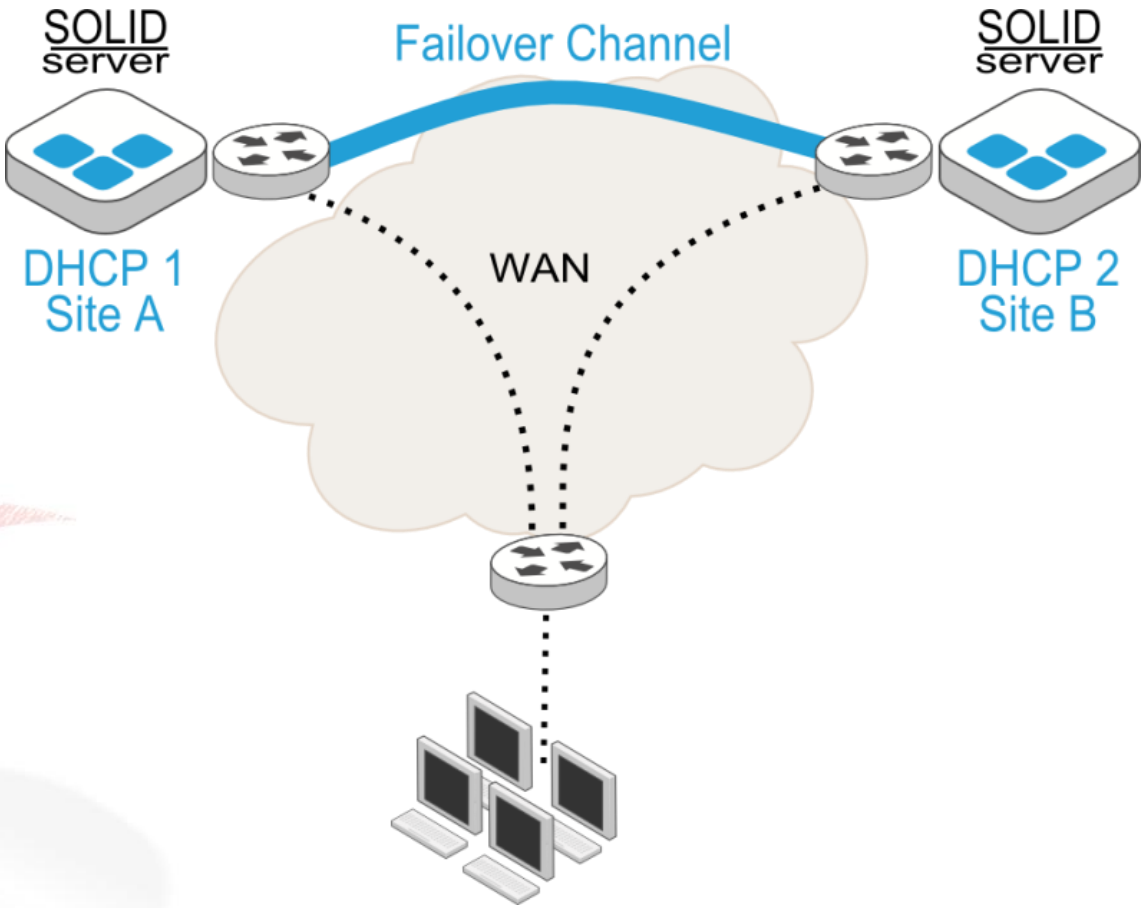
DHCP failover

- DHCP protocol level redundancy
- Two DHCP servers in a “relationship”
  - Doesn’t have to be a monogamous relationship!
- Share a common pool of DHCP addresses
- Synchronise lease information
- Consideration:
  - As an admin, you need to know how the failover behaves if you do lose a DHCP server

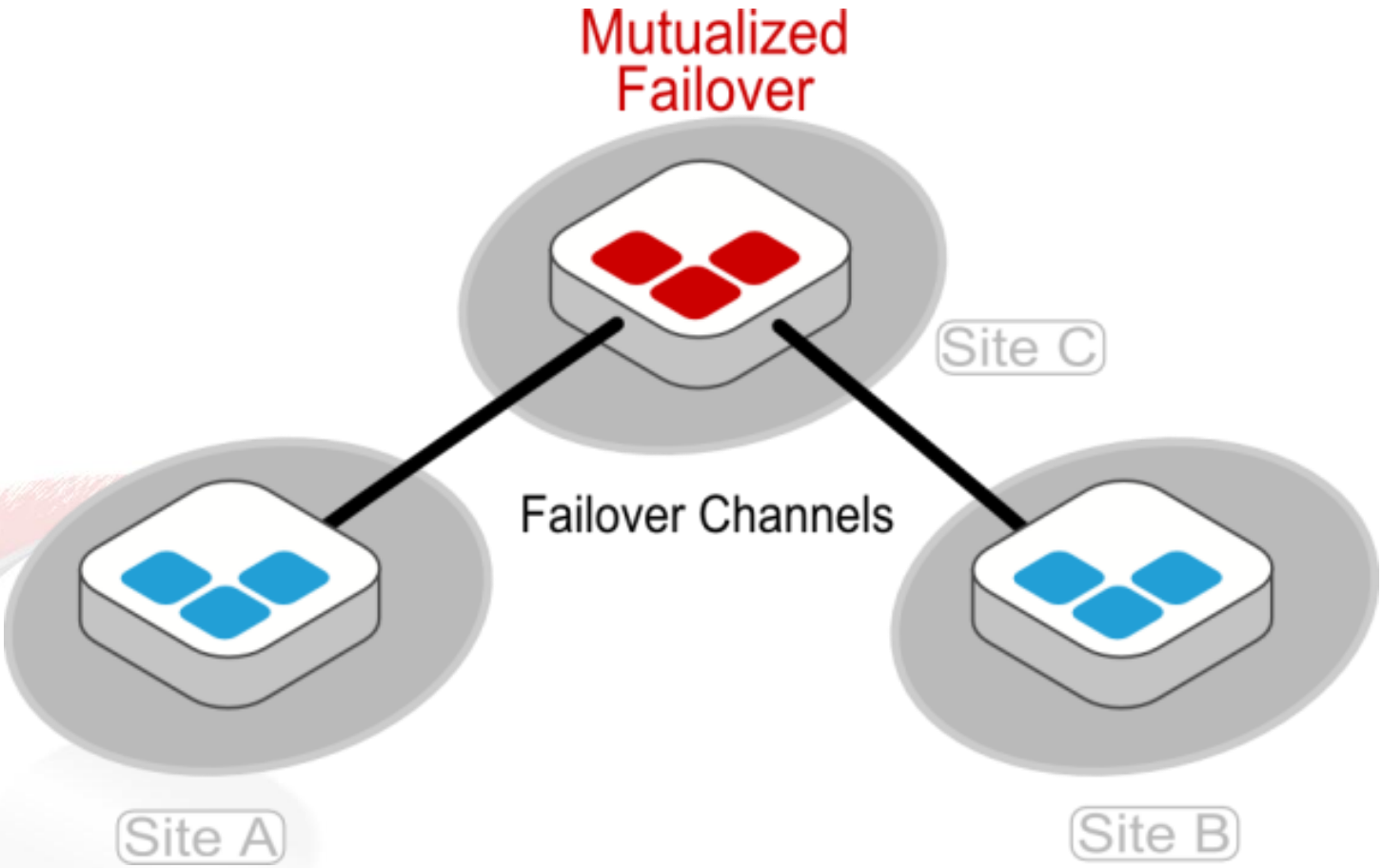
DHCP failover benefits

- Benefits:
  - Resiliency – if one server is down, the other still provides service
  - No risk of duplicate IP addresses
  - Load-balancing – Active/Active
  - Geographically separate locations - different subnets

DHCP One-to-one failover



DHCP Star Failover



IPAM / DDI

What is IPAM

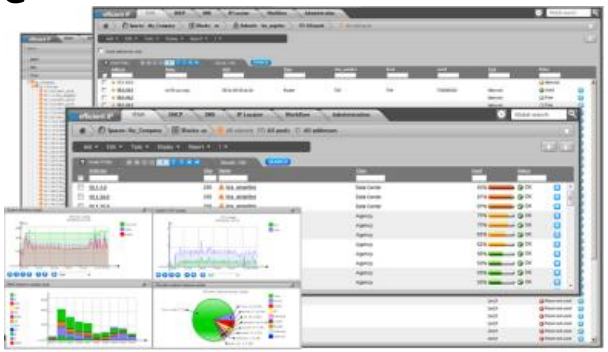
- IPAM is a management process that involves documenting IP subnets and addresses
- IPAM benefits:
  - Centralised view of an IP plan
  - Avoid service disruption - duplicate IPs
  - Capacity planning for future growth
  - Granular role based delegation
  - Auditing

How does DDI fit in?

- Integrating IPAM with DNS and DHCP
- Enables:
  - Backups and Disaster Recovery process for DNS/DHCP configuration and IPAM data
  - Move away from traditional "server-by-server" management to an architecture-based administration
  - Simplify provisioning of IP/DHCP/DNS
    - Do it once

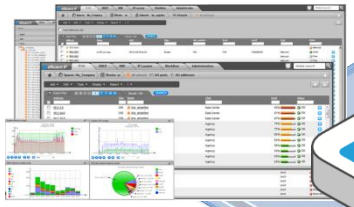
Introducing a DDI solution

- IP address plan management
- Integrated network services engines: DNS-DHCP-NTP-TFTP
- Multi-vendor DNS & DHCP services management
  - Microsoft – ISC – Cisco – SOLIDServer™
- Active IP address tracking with IPLocator module
- Unified system management
  - Integrated zero admin database
  - Hardened OS with embedded stateful firewall
  - Simplified upgrades, backups and disaster recovery



SOLID™ server

Multi-vendor/heterogeneous support



Centralised DDI
Management and backup
Active mode

Data Center A

Centralised DDI Management
and backup
Recovery mode

Data Center B

Microsoft
CERTIFIED
Partner

Data centre 1

Data centre 2

Microsoft
DNS DHCP

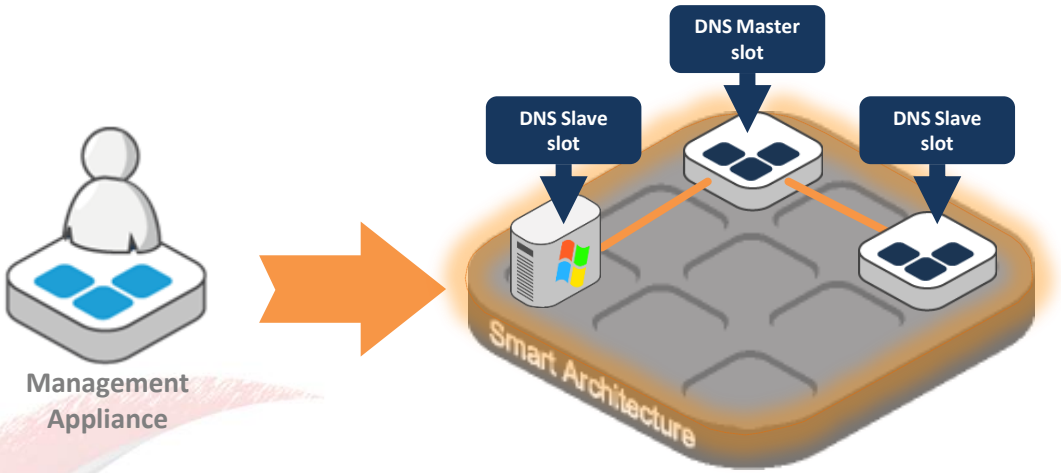
Open source
DNS DHCP

Cisco IOS

SOLIDserver
DNS-DHCP-NTP-TFTP
High Availability

Existing DNS DHCP
architecture
management

SMART Architectures™: DNS-DHCP Architecture Management



Each slot has a predefined role in the SmartArchitecture™

Each DNS server is inserted in the appropriate slot

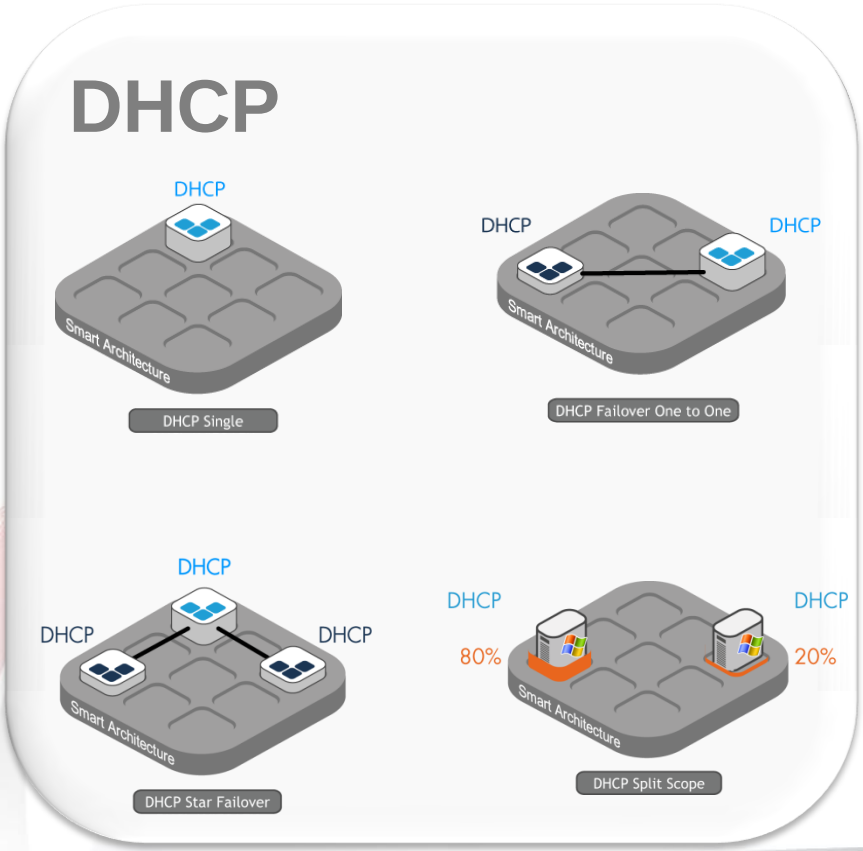
Automated configurations of all servers according to their role in the SmartArchitecture™

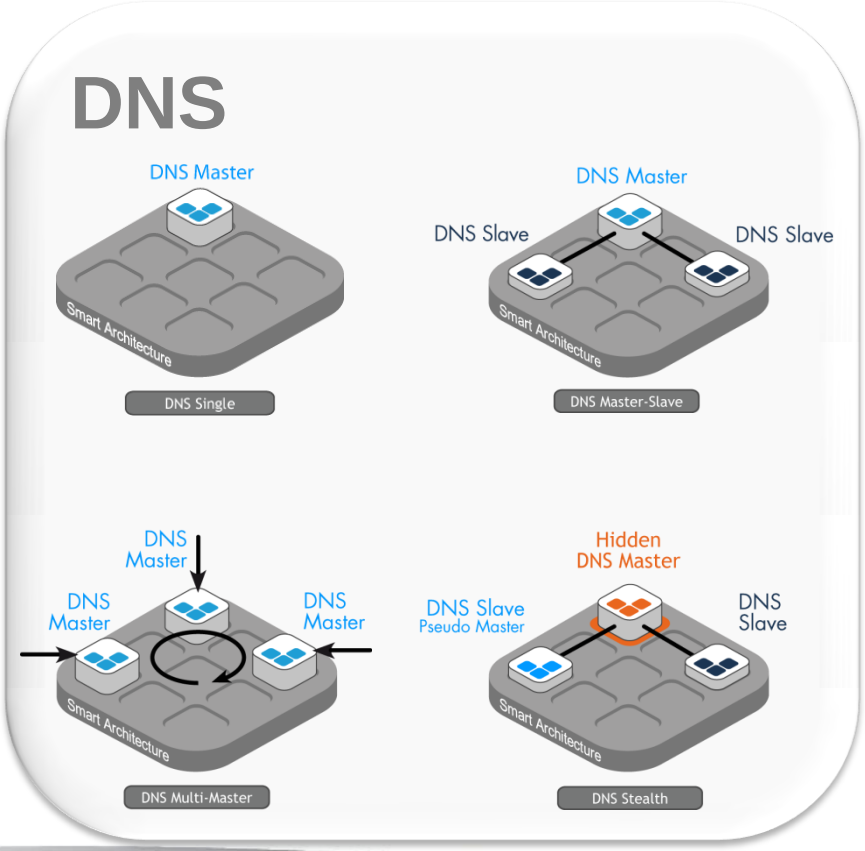
SmartArchitecture™ are Templates of DNS or DHCP architectures

Ex: Master-Slave

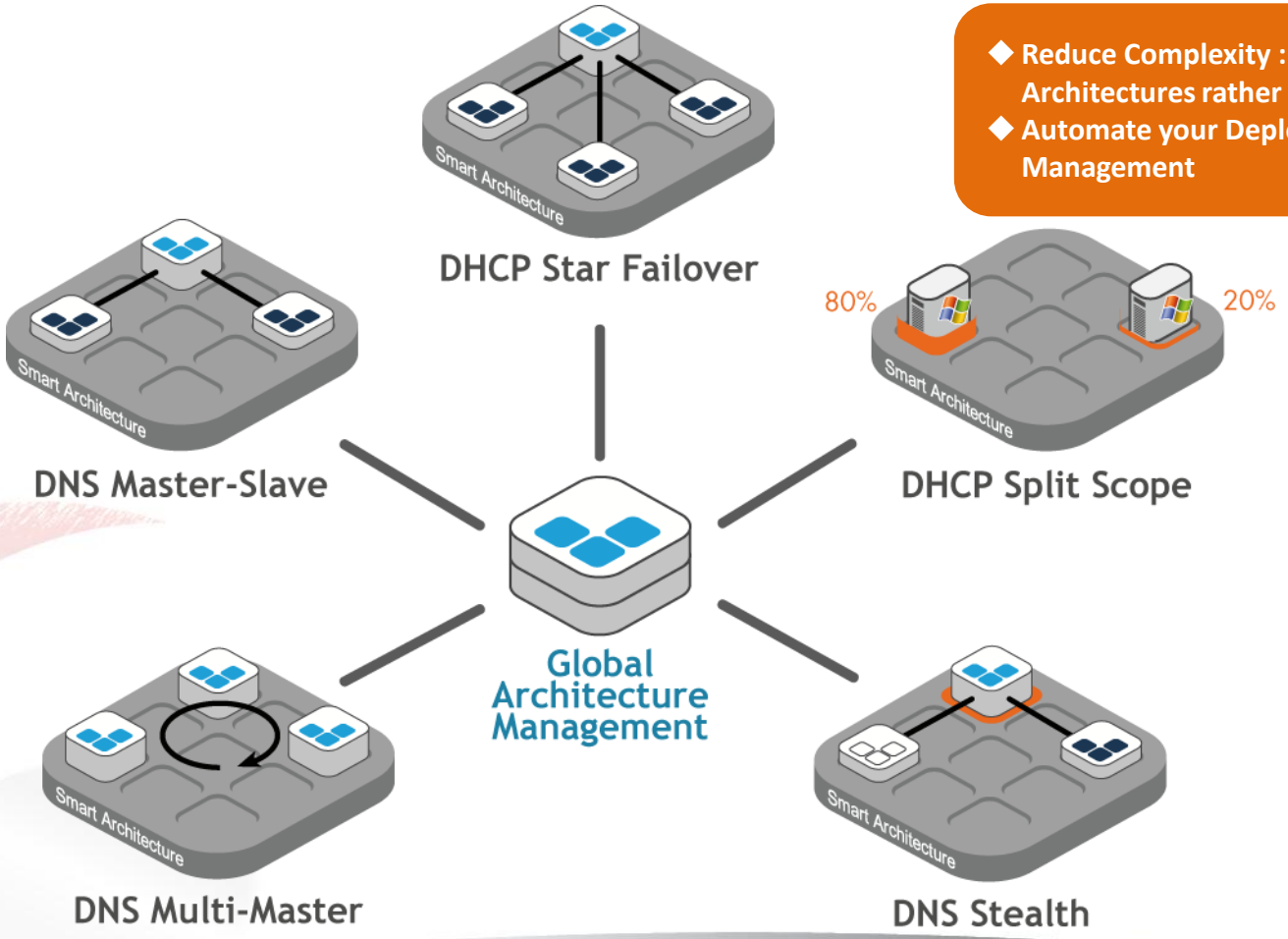
SMART Architectures™: Architecture Management

- Smart Architecture™ Library



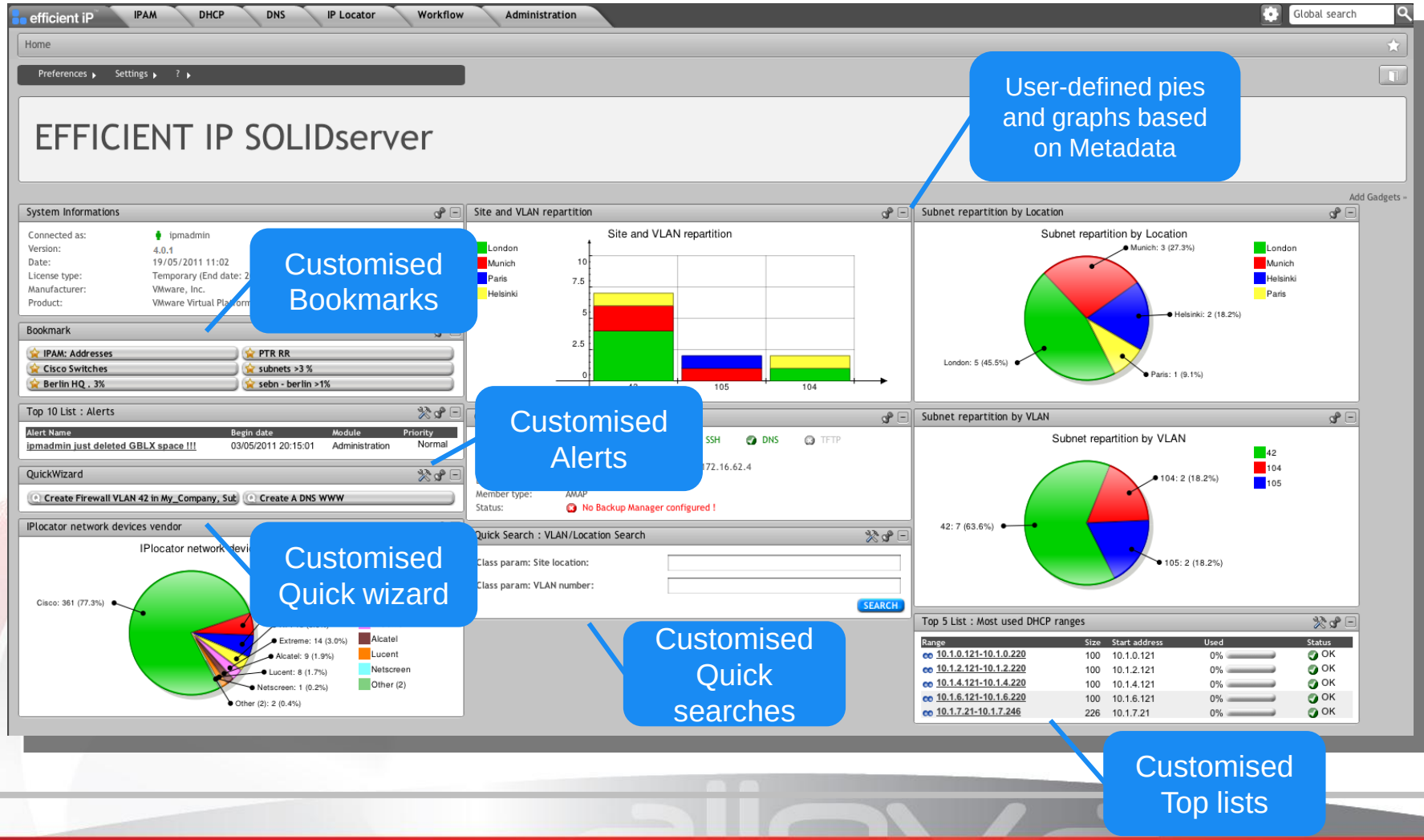


SMART Architectures™: Move to Architecture Management

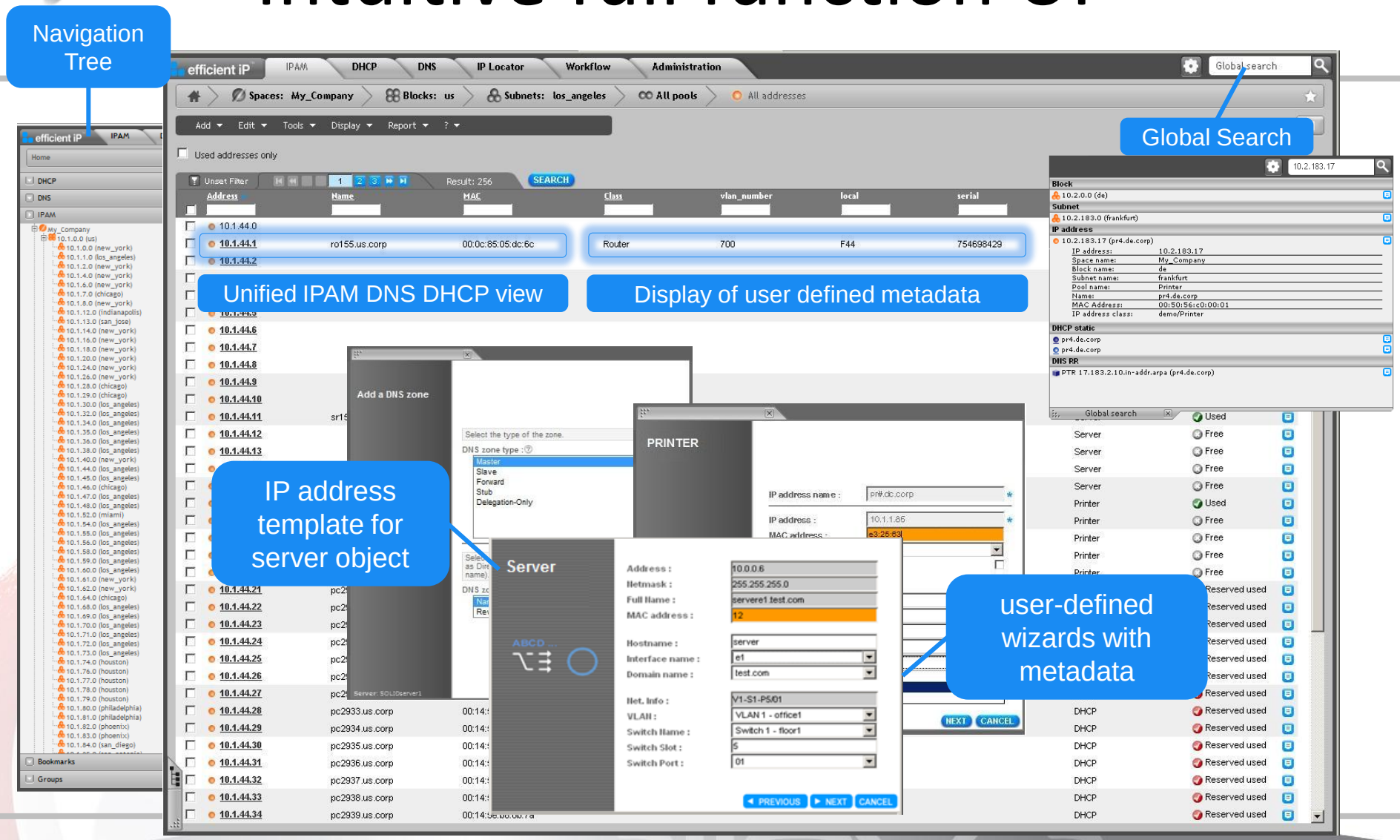


- Reduce Complexity : Manage Architectures rather than servers
- Automate your Deployment and Management

User defined home pages

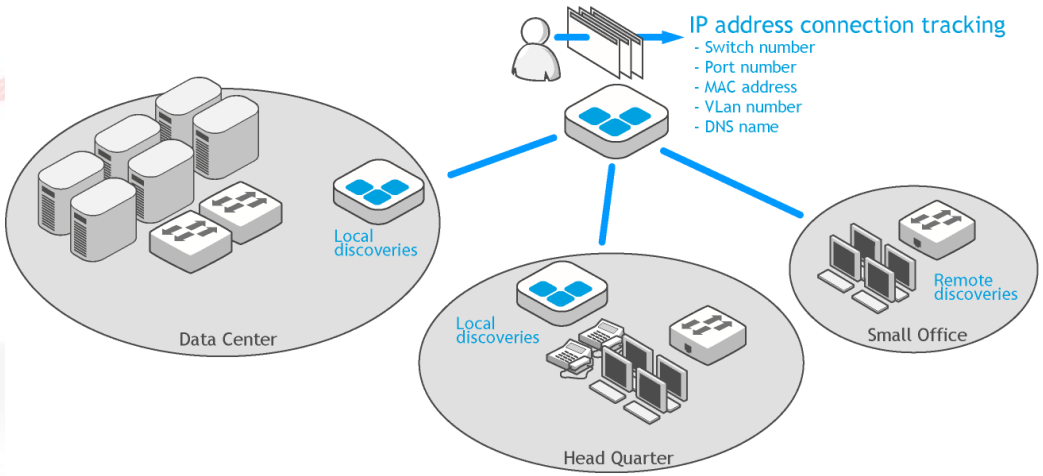


Intuitive full function UI



DDI Reconciliation

- Active IP address tracking with IPLocator
  - Identify IP/MAC address connections on the network
  - Identify associated switch and switch port



Summary

- The need for resilient network services
- Deploying resilient DNS services
- Deploying resilient DHCP services
- Benefits of an integrated DNS, DHCP, IPAM solution

Thank You

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