



deploy

IPv6 Address autoconfiguration  
stateless & stateful



# Agenda

**Stateless Autoconfiguration**

**Stateful Autoconfiguration (DHCPv6)**

**Conclusions**



# Stateless Autoconfiguration

**Provides plug & play networking for hosts**

**On network initialisation a node can obtain:**

- IPv6 prefix(es)
- Default router address(es)
- Hop limit
- (link local) MTU
- validity lifetime

**DNS server addresses are not normally supplied**

- Though there is an experimental DNS extension (RFC5006)
  - Though not yet available in any OS

# Stateless Autoconfiguration

**Hosts can automatically get an IPv6 address**

**Only routers have to be manually configured**

- Or can use the *Prefix Delegation* option (RFC 3633)

**Servers should be manually configured**

**Link-local (as opposed to Global) addresses  
are usually autoconfigured on all nodes**

# Stateless Autoconfiguration

## IPv6 Stateless Address Autoconfiguration

- Defined in RFC 4862

## Hosts listen for Router Advertisements (RA) messages

- Periodically sent out by routers on the local link, or requested by the host using an RA using a solicitation message
- RA messages provide information to allow for automatic configuration

## Hosts can create a Global unicast IPv6 address by combining:

- Its interface's EUI-64 (based on MAC) address or random ID
- Link Prefix (obtained via Router Advertisement)

Global Address = *Link Prefix* + *EUI-64 address*

# Stateless Autoconfiguration

**Usually, the router sending the RA messages is the default router**

**If the RA doesn't carry a prefix**

- The hosts don't configure (automatically) any global IPv6 address (but may configure the default gateway address)

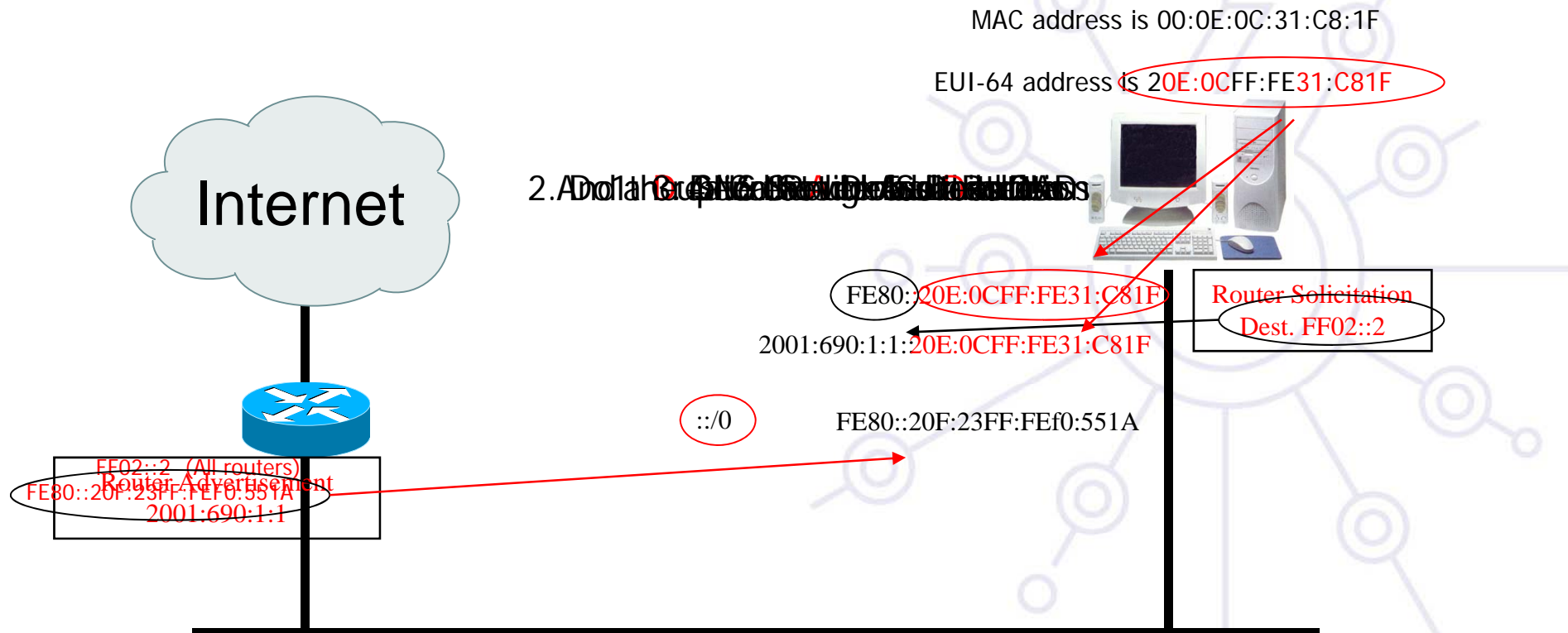
**RA messages contain two flags**

- Indicate what type of stateful autoconfiguration (if any) should be performed
  - Though the interpretation of ManagedFlag and OtherConfigFlag is currently a little ambiguous

**IPv6 addresses usually based on NIC MAC address**

- Though hosts can use Privacy Extensions (RFC4941)
  - E.g. Vista uses random EUI-64 as default

# Stateless Autoconfiguration /2



# Statefull Autoconfiguration DHCPv6

## Dynamic Host Configuration Protocol for IPv6

- Defined in RFC 3315
- Stateful counterpart to IPv6 Stateless Address Autoconfiguration.

## According to RFC 3315 DHCPv6 is used when:

- No router is found
- Or if Router Advertisement message enables use of DHCP
  - Using ManagedFlag and OtherConfigFlag

## There is also 'stateless DHCPv6' (RFC3736)

- Used by clients that already have an address
- Based upon standard DHCPv6



# Statefull Autoconfiguration

## DHCPv6 /2

### DHCPv6 works in a client / server model

- **Server**
  - Responds to requests from clients
  - Optionally provides the client with:
    - IPv6 addresses
    - Other configuration parameters (DNS servers...)
  - Listens on the following multicast addresses:
    - All\_DHCP\_Relay\_Agents\_and\_Servers (FF02::1:2)
    - All\_DHCP\_Servers (FF05::1:3)
  - Provides means for securing access control to network resources
  - Usually storing client's state, though 'stateless operation' is also possible (the usual method used for IPv4 today)

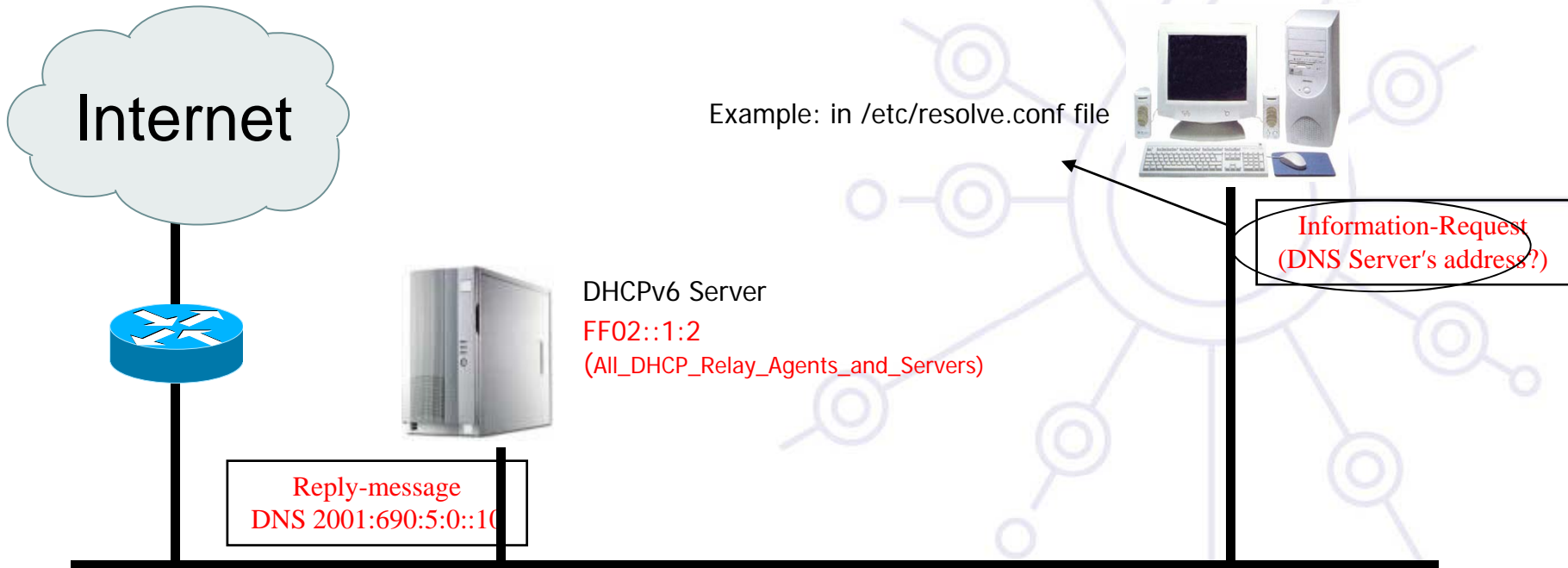
# Statefull Autoconfiguration

## DHCPv6 /3

- **Client**
  - Initiates requests on a link to obtain configuration parameters
  - Uses its link local address to connect the server
  - Sends requests to FF02::1:2 multicast address (All\_DHCP\_Relay\_Agents\_and\_Servers)
- **Relay agent**
  - A node that acts as an intermediary to deliver DHCP messages between clients and servers
  - On the same link as the client
  - Listens on multicast address:
    - All\_DHCP\_Relay\_Agents\_and\_Servers (FF02::1:2)

# Statefull Autoconfiguration DHCPv6 / 4

32. Client sends DHCPv6 Information-Request  
 33. Server responds with DHCPv6 Reply message



# Conclusion

## The two types of configuration complement each other

- Example: we can obtain the address from stateless autoconfiguration and the DNS server address from DHCPv6

## In dual-stack networks we can obtain IPv4 DNS server addresses from DHCPv4

## DHCPv6 clients not shipped in all Operating Systems

- Vista/Windows7 contains DHCPv6 client
- Third party clients are available for all Oses
  - E.g. Dibbler, ISC DHCP, Red Hat DHCPv6



DEPLOY

Questions ?