IBM eServer™

Automated Domain Name Registration: Operation

e business on demand software

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A Sysplex ADNR "owns" the zones it maintains!

- **ADNR exclusively owns the zones defined in its configuration**
  - A zone is owned by a Sysplex ADNR and is unique to a single z/OS® Sysplex
  - Zones should not be shared between ADNRs in multiple z/OS Sysplexes
  - Resources should not be manually added/updated/deleted in those zones
- **During start-up, ADNR does a zone transfer to learn which resources are currently in the zone (from a previous start of that Sysplex ADNR)**
  - Based on that information and what ADNR learns from the z/OS LBA, it will add/delete/update resource records in the DNS
  - This approach was chosen to avoid any windows where otherwise available resources would be seen as unavailable (not registered in the DNS)
- **To determine the contents of a zone that ADNR owns:**
  - Use the DNS dig client to manually display the contents of the zone. dig will require the transaction signature (TSIG) key for zones that have TSIG security protection.

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Example ADNR config file - 1 of 4

```
001 debug_level             7               # Error, Warning, Event
002
003 uuid                    mycorp_sysplex_adnr
004
005 dns                     network_name_server # Label used by other stmts
006                                         #  and commands
007 {
008   dns_id                10.1.10.55      # Network name server
009
010   zone                  mvsplex.mycorp.com_zone
011                                         # Label used by other stmts
012                                         #  and commands
013   {
014     domain_suffix       mvsplex.mycorp.com
015                                         # Zone name in name server
016   }                                     # end of zone
017
018 }                                       # end of dns
019
020 gwm                     z/os_lba_advisor
021 {
022   gwm_id                10.1.5.1..3860  # LBA lb_connection_v4 address
023   host_connection_addr  10.1.10.11      # Local address
024 }                                       # end of gwm
```

Name ADNR registers with z/OS LBA

The DNS ADNR updates

The zone ADNR updates

The z/OS LBA ADNR talks to

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Example ADNR config file - 2 of 4

```
026 host_group              production_sysplex
027                                     # Addrs available to intranet
028 {
029   host_group_name       prodplex    # Prepended to domain suffix
030   dns                   network_name_server # Name server to update
031   zone                  mvsplex.mycorp.com_zone
032                                     # Determines zone suffix for
033                                     #  this group
034                                     #  (mvsplex.mycorp.com)
035
036   member                            # sysa.mvsplex.mycorp.com,
037                                     #  and
038                                     #  prodplex.mvsplex.mycorp.com
039   {
040     host_name           sysa        # Prepended to domain suffix
041     ipaddrlist          sysa_vipa_addrs
042     ipaddrlist          sysa_non_vipa_addrs
043   }
044
045   member                            # sysb.mvsplex.mycorp.com,
046                                     #  and
047                                     #  prodplex.mvsplex.mycorp.com
048   {
049     host_name           sysb        # Prepended to domain suffix
050     ipaddrlist          sysb_vipa_addrs
051     ipaddrlist          sysb_non_vipa_addrs
052   }
053
054 }                                   # end of host_group
```

A host group

Host group name

DNS and zone to update

Host name

IP addresses to monitor (indirectly defined)

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Example ADNR config file - 3 of 4

```
056 ipaddrlist              sysa_vipa_addrs
057 {
058   ipaddr                10.1.10.3
059 }                                   # end of ipaddrlist
060
061 ipaddrlist              sysa_non_vipa_addrs
062 {
063   ipaddr                10.1.10.22      # OSA on sysa
064 }                                   # end of ipaddrlist
065
066 ipaddrlist              sysb_vipa_addrs
067 {
068   ipaddr                10.1.10.11
069 }                                   # end of ipaddrlist
070
071 ipaddrlist              sysb_non_vipa_addrs
072 {
073   ipaddr                10.1.10.1       # OSA on sysb
074 }                                   # end of ipaddrlist
```

IP Address lists to be referenced in other definitions

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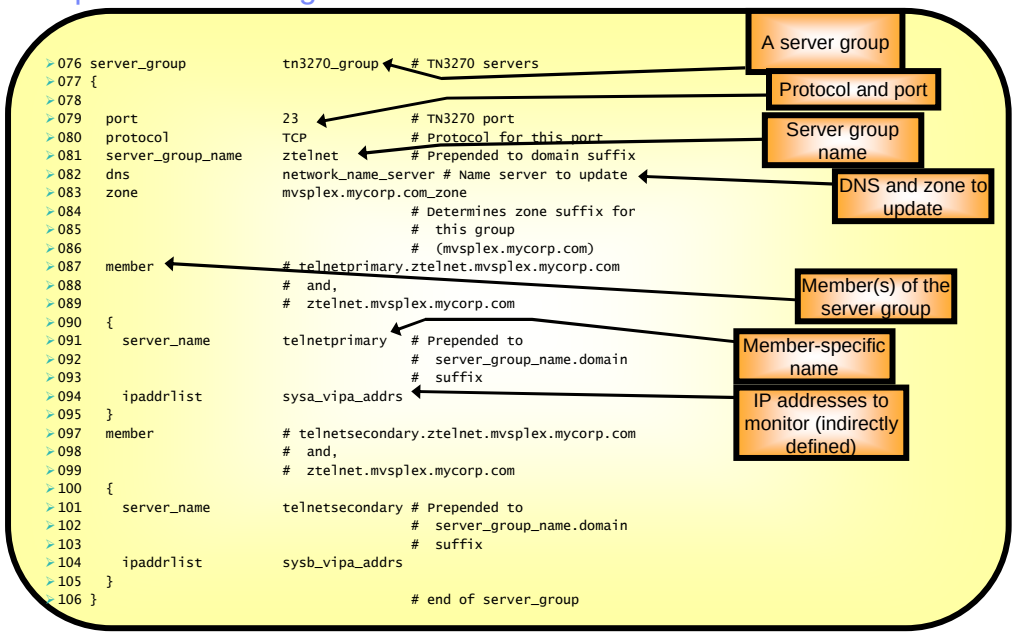
Example ADNR config file - 4 of 4




```
076 server_group            tn3270_group  # TN3270 servers
077 {
078
079   port                  23            # TN3270 port
080   protocol              TCP           # Protocol for this port
081   server_group_name     ztelnet       # Prepended to domain suffix
082   dns                   network_name_server # Name server to update
083   zone                  mvsplex.mycorp.com_zone
084                                       # Determines zone suffix for
085                                       #  this group
086                                       #  (mvsplex.mycorp.com)
087   member                # telnetprimary.ztelnet.mvsplex.mycorp.com
088                         #  and,
089                         #  ztelnet.mvsplex.mycorp.com
090   {
091     server_name         telnetprimary # Prepended to
092                                       #  server_group_name.domain
093                                       #  suffix
094     ipaddrlist          sysa_vipa_addrs
095   }
097   member                # telnetsecondary.ztelnet.mvsplex.mycorp.com
098                         #  and,
099                         #  ztelnet.mvsplex.mycorp.com
100   {
101     server_name         telnetsecondary # Prepended to
102                                       #  server_group_name.domain
103                                       #  suffix
104     ipaddrlist          sysb_vipa_addrs
105   }
106 }                                     # end of server_group
```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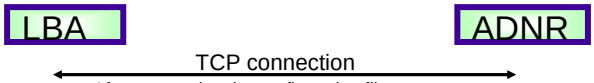
Overview of Flows - Bringup

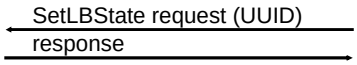
NOTES

ADNR communicates with the GWM as a Load Balancer using architected SASP flows:

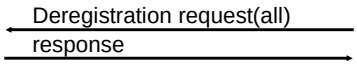


After processing the configuration file,

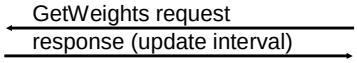
ADNR opens a TCP connection to its GWM.



Once the connection is open, ADNR sends and receives a SetLBState request and response. The request identifies itself to the GWM with a Universally Unique ID (UUID) to distinguish it from other "Load Balancers".



ADNR issues a blanket Deregister all which removes any resources that the GWM may have for this "Load Balancer" from a previous connection.



ADNR sends and receives a GetWeights request and response. The response contains the update interval which is used to determine:

- How long to wait for convergence
- The TTL (Time To Live) for Resource Records (unless overridden by configuration)

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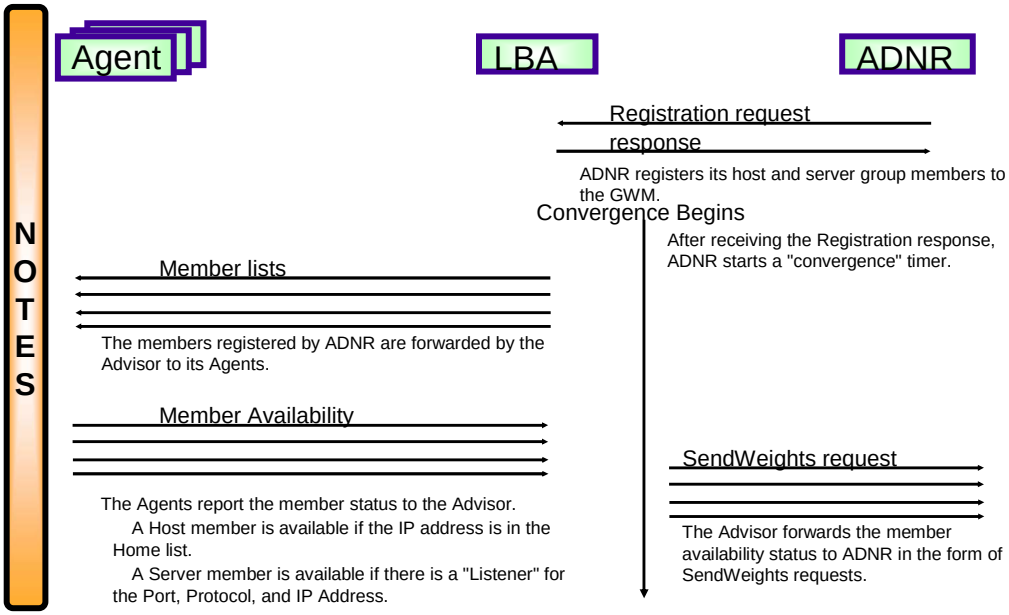
Overview of Flows - Bringup..



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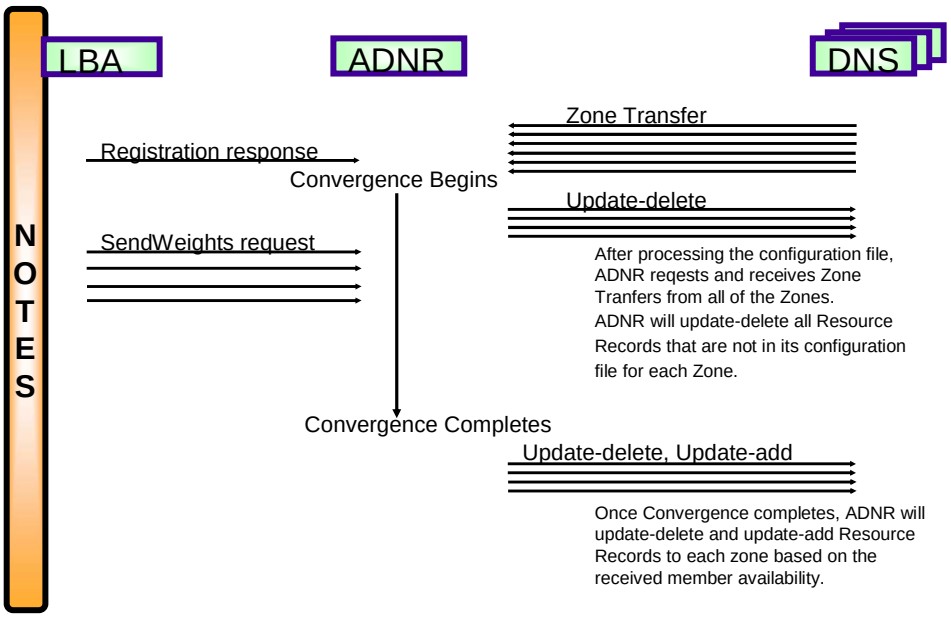
Overview of Flows - Bringup..



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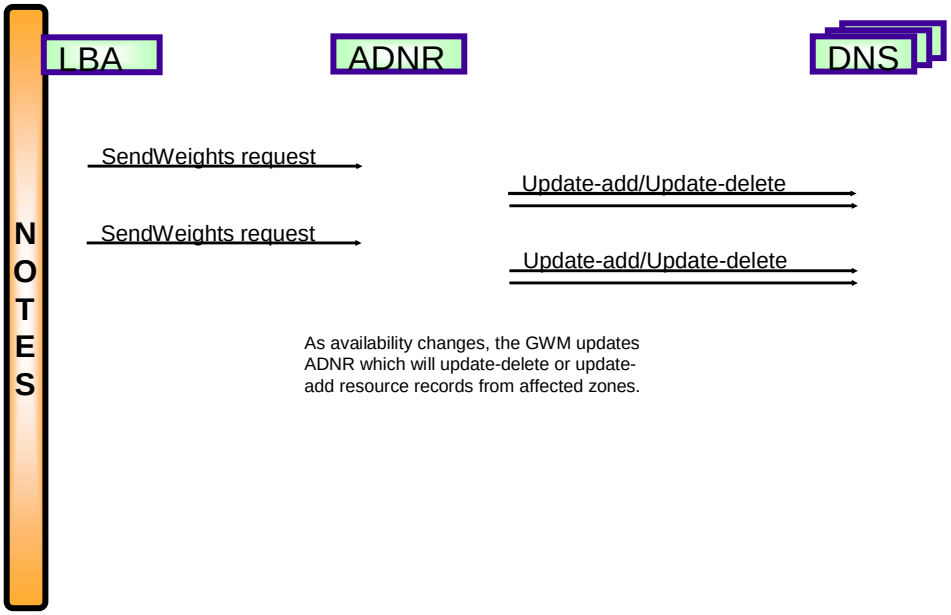
Overview of Flows - Steady State



NOTES

As availability changes, the GWM updates ADNR which will update-delete or update-add resource records from affected zones.

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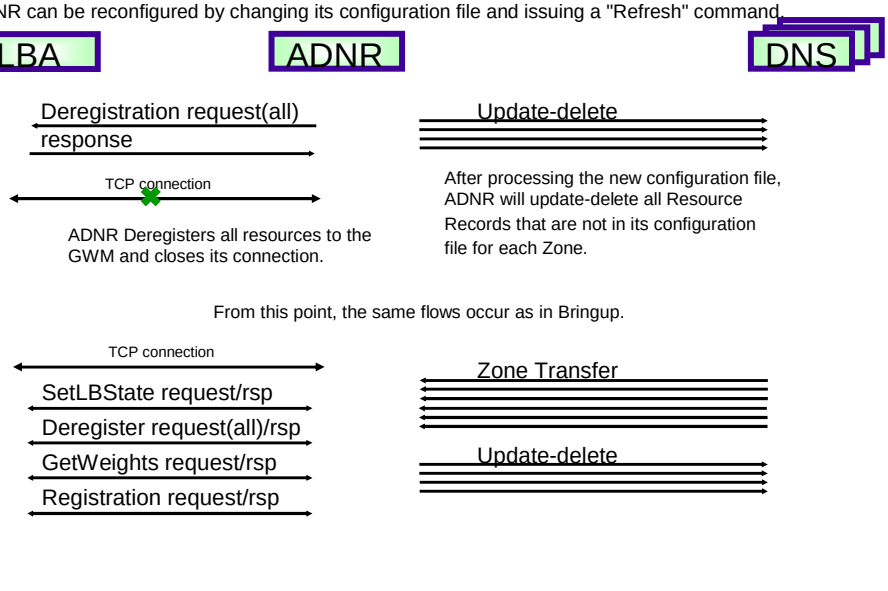
Overview of Flows - Reconfiguration

NOTES

ADNR can be reconfigured by changing its configuration file and issuing a "Refresh" command.



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Zone synchronization - convergence

- **Once convergence completes, ADNR will attempt to update all of the nameserver's zones with the appropriate resource records.**
  - Resource records that are no longer available will be update-deleted from each zone.
  - Resource records that are available will be update-added to each zone (if they are not already present).
- **Once this has occurred the Zone will be in the SYNCHRONIZED state**
  - As ADNR's GWM state becomes GWM_ACTIVE, each Zone will change state from RESYNCH_RECONCILE_PENDING
  - Assuming that there are no errors, each Zone will transiently enter RESYNCH_ZONE_UPDATE_PENDING state while the updates are in progress
  - Finally the Zone will enter the SYNCHRONIZED state
  - Issue a MODIFY procname,DISP,ZONES command to verify the zone state
- **Zones which are not responding (NOT_RESPONSIVE_*) will not become synchronized until the zone becomes responsive**

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Automatic restart of ADNR

- **Ensure that automation is in place to restart ADNR on the same/other system in the sysplex in cases of failures (of ADNR or the System)**
- **Can be accomplished with Automatic Restart Manager (ARM) policy or other automation**
  - Note that while TCP/IP's AUTOLOG can be used to start ADNR, it can NOT be used to monitor the availability of ADNR after initial startup.
- **To enable ADNR to restart and operate properly on another TCP/IP stack (CINET) or on another sysplex system, ADNR must be configured with a unique application-instance DVIPA on the host_connection_addr keyword of the gwm statement.**
- **ADNR may be (re)started while the Advisor is already running or vice versa**
- **ADNR may be (re)started while its name servers are already running or vice versa**
- **Because ADNR relies on the LBA Advisor and Agent, those applications also need to be similarly configured for high availability. See next page.**

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Advisor (GWM) outage

- **Mechanisms should be in place to keep the Advisor highly available in order to ensure ADNR continues to receive near real-time data.**
  - Use of DVIPAs
  - Automatic Restart Manager (ARM)
  - TCP/IP Autolog
  - Other automation
- **ADNR periodically attempts to reconnect to the Advisor when the connection to it is lost.**
- **When the connection to the Advisor is reestablished, ADNR resynchronizes the availability status of the sysplex resources with its name servers**
  - Update-deletes any RRs representing resources which became unavailable during the outage
  - Update-adds any RRs representing resources which became available during the outage

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Name server availability

- **Name servers must also be highly available**
  - To clients requiring name resolution
  - To ADNR for near real-time dynamic updates
- **Typical DNS setups have multiple authoritative name servers per zone**
  - One primary name server
  - One or more secondary name servers
    - Secondary name servers replicate data from the primary name server
  - Avoids single point of failure for client queries
- **Single point of failure possibility still exists for the name server ADNR updates**
  - No architected schemes to avoid this
  - Possible solutions:
    - z/OS name server with VIPA takeover and shared file system
    - z/OS name server with automation for recovery
    - Network name server with automation for recovery

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Name server outage/config mismatch

- **ADNR issues an immediate action console message when it needs to update a name server and...**
  - Name server is down
  - Name server is unreachable
  - Name server and ADNR are incompatibly configured
- **Examples of incompatible configurations:**
  - Incorrect IP address of name server configured in ADNR
  - Name server specified is not actually authoritative for the zone being updated
  - Name server is not configured to allow ADNR to perform zone transfers
  - Name server is not configured to allow dynamic updates from ADNR
  - Zone transfer key mismatch between ADNR and name server
  - Zone update key mismatch between ADNR and name server
- **ADNR periodically sends health probes to name server it cannot update**
  - 1) dynamic update-add + update-delete
  - 2) zone transfer
  - ADNR resynchronizes the availability status of the sysplex resources with the name server when both health probes are successful
    - Update-deletes any RRs representing resources that became unavailable during the outage
    - Update-adds any RRs representing resources which became available during the outage

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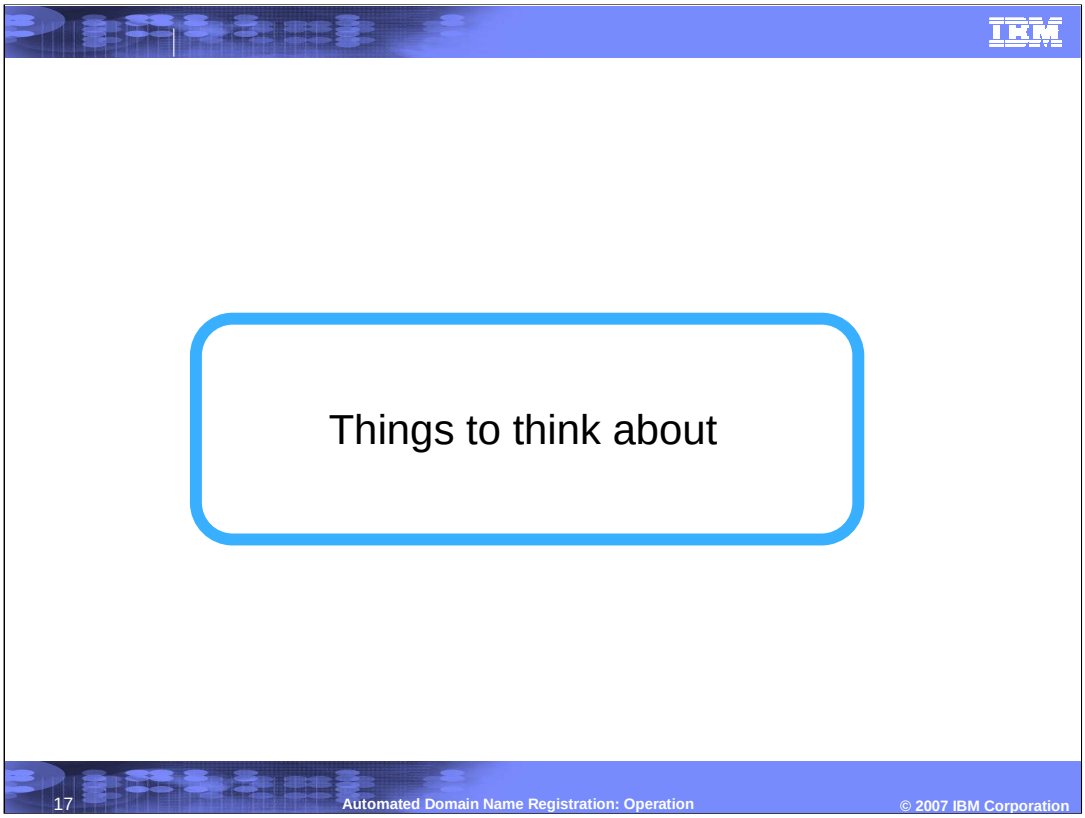
IBM
Things to think about
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Supported name servers

- **Supported name servers**
  - Any name server which supports RFC 2136 (DNS Update)
  - Includes BIND 8 and BIND 9
    - Includes z/OS BIND 9
  - Microsoft® Windows® 2000 and 2003 Servers
- **Does NOT include z/OS BIND 4.9.3**

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Zone issues

- **ADNR will examine the contents of zones specified on the dns statement during zone resynchronization. Address (A and AAAA) RRs other than those representing active ADNR managed resources will be update-deleted. Glue records will be ignored. All other RRs will not be deleted.**
- **Zones managed by ADNR must be updated exclusively by ADNR. The zones and zone files should not be edited by hand nor should anyone or any other program perform dynamic updates to the zones.**
- **Orphaned resource records (RRs)**
  - RRs in a name server which ADNR can no longer remove
  - May cause clients to attempt to connect to unavailable servers
  - Causes:
    - ADNR unable to delete RRs during a F REFRESH operation due to network or name server problems
    - Improper F REFRESH procedures (like removing a dns statement from the config file while ADNR is down)
  - Solutions:
    - Remove name server from service
    - "Flush" the name server or zone using ADNR. Consists of adding a dns or zone statement to ADNR, but not referencing the zone(s) from any ADNR goups, followed by a F REFRESH when ADNR can communicate with the name server or zone.

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LBA compatibility

- **ADNR is compatible with all versions of the z/OS Load Balancing Advisor (V1R4 and higher).**
- **If using a down-level Advisor or Agent, obtain the latest maintenance for the LBA component.**

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Migrating from DNS/WLM

- **ADNR provides one of the two main functions of DNS/WLM**
  - ADNR supports automated DNS registration of application-specific hostnames
  - ADNR does not support load balancing using Sysplex-awareness
- **ADNR can be used to replace DNS/WLM load balancing functions if:**
  - A hostname resolution approach to load balancing is sufficient for your environment (such as no client caching issues)
  - An alternative solution like SD or external load balancing solution based on the LBA can not be deployed
  - Round-robin distribution is sufficient for your sysplex load balancing needs
    - Note: Some resolvers, including the z/OS resolver, may re-sort the returned addresses
    - ADNR merely registers when servers and addresses are available, it does not provide WLM-based load-balancing recommandations
- **ADNR has many advantages over DNS/WLM**
  - Uses the updated BIND 9 name server instead of the older BIND 4.9.3 name server
  - Name server need not reside on z/OS
  - No need for target servers or TCP/IP stacks to register with WLM. This means any z/OS server can participate
  - No limit to the number of IP addresses supported per TCP/IP stack. DNS/WLM has a limit of 15.
  - Supports IPv6.

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