

Best Practices: Getting Started With Informix Connection Manager

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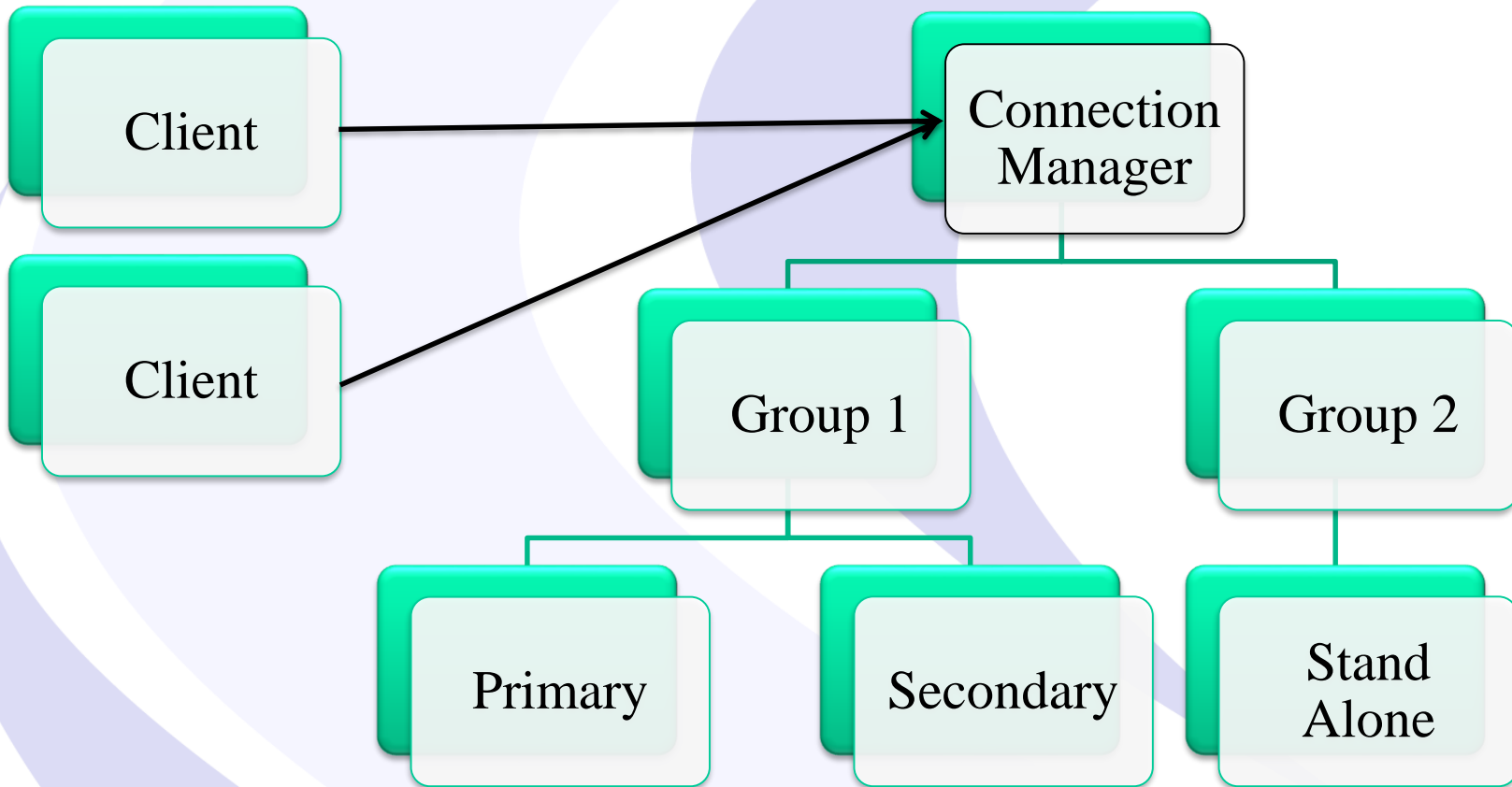
About This Talk

- Created to give an entry point for getting going with connection manager
- Supplement the rather sparse documentation on the topic
- Document some of the confusion I ran into configuring this for clients
- Assistance provided from others actively using connection manager in production environments

What Is Connection Manager

- Introduced in 11.5 (revamped in 11.7)
- Bundled with the engine, also included with the csdk
- Standalone program that runs and passes connections to the correct server or group
- Can be used as a central broker for connections
- Can be run solo or with a group of CM servers working together
- Intended for HA, but very useful in any replicated environment
- OAT module to monitor Connection Manager

Topology



Setting Up Access

- Can be as simple as one server and one CM
 - Client -> Connection Manager -> Instance
- It can be configured as a replication set
 - Client -> Connection Manager -> Primary + HDR + RSS
- It can be configured with multiple groups each with their own rules
- Clients connect to the CM on the listener that will tell the manager where to redirect them and what rules to use
- If the connection manager server is not trusted to the Informix server, use an encrypted password to authenticate

Relevant Files

- **SQLHOSTS**
 - Specifies the groups, also controls the CM listeners
- **\$INFORMIXDIR/bin/oncmsm**
 - Connection Manager Binary
- **\$INFORMIXDIR/etc/cmsm.cfg.sample**
 - Sample config file, there are several versions
- **\$CMALARMPROGRAM**
 - Program, defined in configs that triggers on a failover

ONCONFIG Parameters

- **DRAUTO** – Controls failover processing, 3 means it will rely on the connection manager to initiate failovers.
- **HA_FOC_ORDER** – Default order (HDR,RSS,SDS) to fail over servers.

oncmsm

- **Startup:**
 - `$INFORMIXDIR/bin/oncmsm -c $INFORMIXDIR/etc/cmsm.cfg`
 - Optional environmental variable `$CMCONFIG`
- **Commands:**
 - `oncmsm -k -c <config file>`
 - Shutdown
 - `oncmsm -r -c <config file>`
 - Reload with updated config file

Basic Example - SQLHOSTS

```
#Instance Config port 9088
instance1_tcp      onsoctcp      host_ip      sqlexec
#Connection Manager Listener
report_group      onsoctcp      host_ip      9090
```

Basic Example – cmsm.cfg

```
NAME samplecsm
```

```
LOGFILE
```

```
    ${INFORMIXDIR}/tmp/cmsm.log
```

```
CLUSTER samplecluster {
```

```
    INFORMIXSERVER    instance1_tcp
```

```
    SLA    report_group
```

```
    DBSERVERS=primary
```

```
}
```

Base CM Config Sample

NAME cm_1

LOGFILE

 \${INFORMIXDIR}/tmp/cmsm.log

LOG 1

CM_TIMEOUT 300

<Connection Info>

cmsm.cfg Parameters

- **NAME** – Must be unique across the cluster
- **LOG** – log level, 1 is on
- **LOGFILE** – Path to CM log
- **CM_TIMEOUT** – Number of seconds to wait for a response before promoting the next highest ranked connection manager. (60 default)
- **EVENT_TIMEOUT** – Number of seconds to wait before failover occurs of Informix servers. If a secondary triggers 'primary offline' it will also trigger failover before the timeout (default 60)
- **SECONDARY_EVENT_TIMEOUT** – Seconds to wait before disconnecting from a secondary (Default 60)
- **SQLHOSTS** – If it should use a local, remote or both SQLhosts files to find instances. (Default local + remote)
- **LOCAL_IP** – Optional, can be used to tie CM to a specific IP address to listen for database status changes
- **MACRO** – Used to create variables to be used in other parts of the script

Connection Types

- **CLUSTER** – Group or selection of servers to connect to that support HDR failover
- **GRID** – ER Grid to connect to
- **REPL_SET** – ER replicate set to connect to
- **SERVERSET** – Unrelated servers that do not use failover

CLUSTER Example

```
CLUSTER cluster_1
{
  INFORMIXSERVER repl1_tcp
  SLA report_1 DBSERVERS=(PRI,HDR) \
              POLICY=WORKLOAD
  FOC ORDER=ENABLED \
      PRIORITY=1
  CMALARMPROGRAM $INFORMIXDIR/etc/CMALARMPROGRAM.sh
}
```

Cluster Example

CLUSTER cluster_1 – Unique name of cluster, needs to be identical on other connection managers

```
{  
  INFORMIXSERVER repl1_tcp -- The sqlhost entry (group or server) the  
    connection manager will listen on  
  SLA report_1 \ -- the SLA is for the report_1 group in sqlhosts  
    DBSERVERS=(PRI,HDR) \ -- This is the order it will  
    maintain  
    POLICY=WORKLOAD – This is the type of SLA policy it uses  
  FOC ORDER=ENABLED \ -- Says to use the failover order above  
    PRIORITY=1 – Says this connection manager is the first  
    one to handle failover for this SLA  
  CMALARMPROGRAM $INFORMIXDIR/etc/CMALARMPROGRAM.sh –  
    If failover fails after 8 attempts it calls this program.  
}
```

INFORMIXSERVER

- Works with all 4 types of connection
- Specify the group of servers or standalone server this SLA should service
- This is what the connection manager will connect to when it comes up to establish the replication status

SLA

- Service Level Agreement
- This is the directive of how a connection manager should treat a particular group of servers
- Any linked connection managers should have similar settings and the same name for a group
- Each SLA will have its own listener port

SLA - DBSERVERS

- List of servers to connect to, and the order to connect to them in
- Can use server names, group names, server aliases, server types (HDR, SDS, ANY)

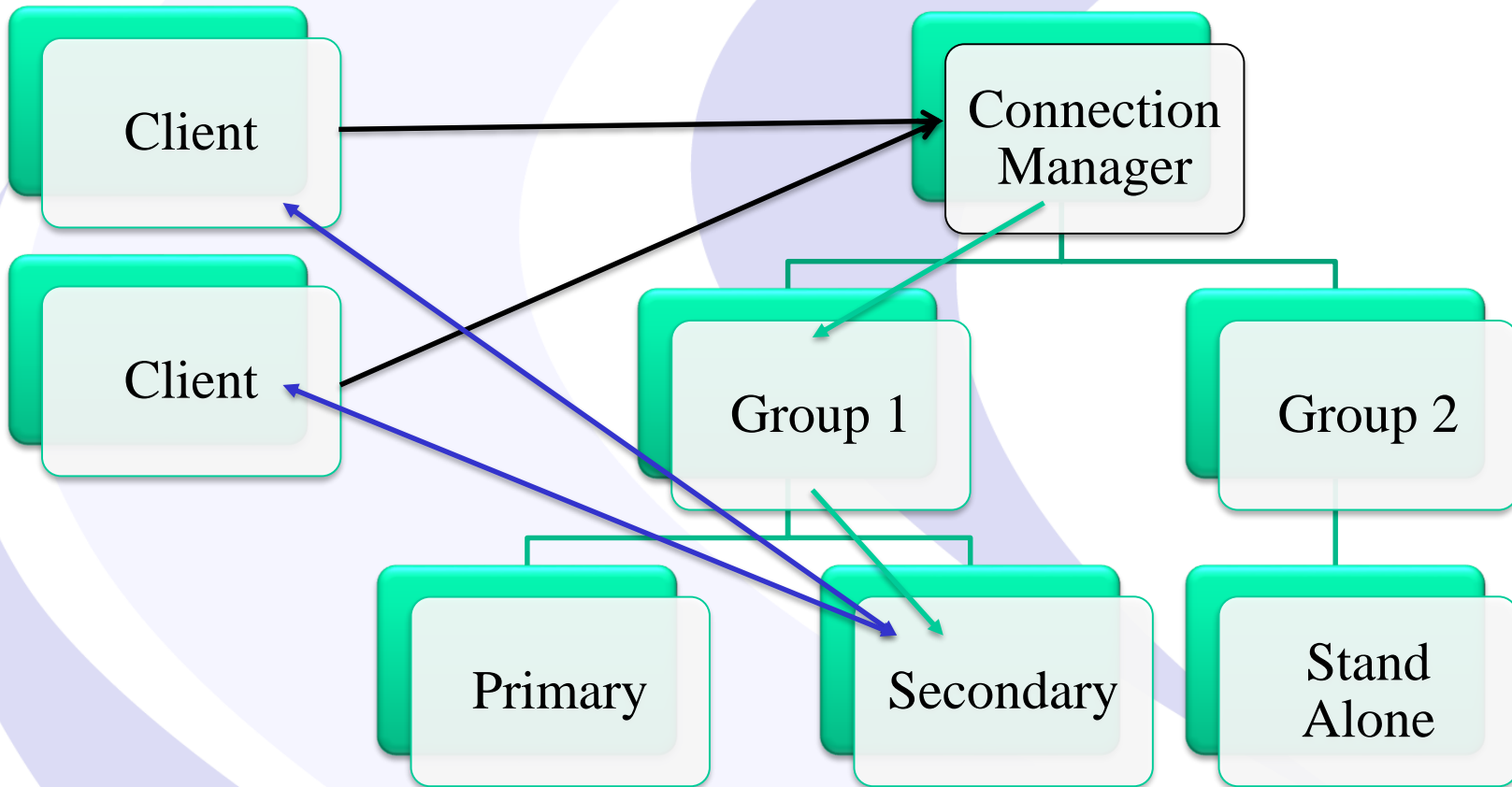
DBSERVERS - Cluster Keywords

- PRI, PRIMARY
- HDR – Secondary
- SDS – Shared disk secondary
- RSS
- ANY

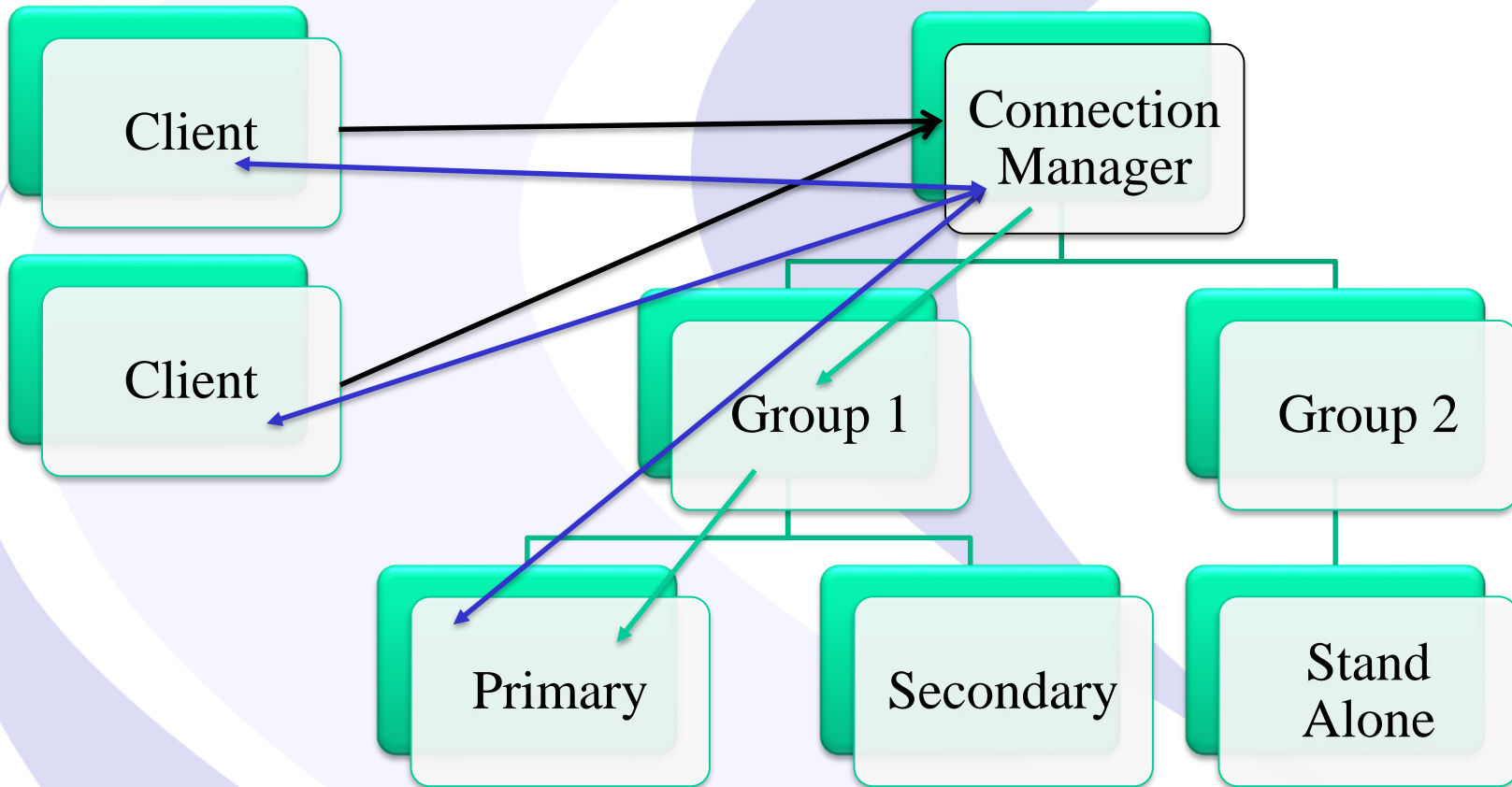
SLA - MODE

- Redirect – (Default) this will redirect the client directly to the server, only works with versions later then CSDK 3.0 and JDBC 3.5.1
- PROXY – Will pass all data through the connection manager directly, allows for older clients to be supported. Also use this if the client cannot directly access the Informix server.

Topology - Redirect



Topology - PROXY



SLA - USEALIASES

- On – Default, this will add any entries in DBSERVERALIASES into the mix.
- OFF – Only will use DBSERVERNAME none of the aliases

SLA - WORKERS

- Numerical Value – Default is 4.
- Used to define how many worker threads the CM is allocated

SLA - POLICY

- **WORKLOAD** – (Default) – Assigns the work to the least busy server at the time
- **ROUNDROBIN** – Rotates between all of the available servers
- **FAILURE** – Requests pointed to the server with the fewest apply failures. (Replset and GRID only)
- **LATENCY** – Redirects to the server with the lowest transaction latency (Replset and GRID only)
- **SECAPPLYBACKLOG**:<num of pages> -- Stops sending requests to the secondary after it exceeds the number of pages in a backlog. CLUSTER only. (version 12.10xc2 or 11.70xc8 required)

FOC

- Is used as a stand alone element inside a connection type to define how failover occurs
- Also used to specify the priority between servers

FOC - ORDER

- If not defined, the primary server's HA_FOC_ORDER parameter is used
- Default if neither are set is SDS, HDR, RSS
- If enabled it will use the order defined by the DBSERVERS in the SLA
- **ENABLED** – Means the connection manager will allow failover

FOC - PRIORITY

- Defines the priority between connection managers.
- Must be a positive number, the lower the number the higher the priority
- Required for CLUSTER types

FOC - TIMEOUT

- Additional time before a failover occurs
- Adds to the value of `EVENT_TIMEOUT`
- Defaults to 0

SQLHOSTS

- Connection manager will use SQLHOSTS like any other Informix tool
- By default will read the local SQLHOSTS and if a server is not found it will probe the remote sqlhosts for other relevant hosts
- Will use the INFORMIXSERVER directive in the SLA section to determine the primary server or group to connect to
- The SLA name will be the connection name for the connection manager listener for that SLA.
- Best practices is to always use groups when doing replication rather than individual servers

Sample Config

```
NAME connection_manager_1  
LOG 1  
LOGFILE $INFORMIXDIR/tmp/my_cm1_log.log  
EVENT_TIMEOUT 20
```

Name Of This Connection Manager

```
CLUSTER primary_cluster  
{  
  INFORMIXSERVER cluster1  
  SLA report_1 DBSERVERS=(PRI,HDR) \  
    POLICY=WORKLOAD  
  FOC ORDER=ENABLED \  
  PRIORITY=1  
}
```

Cluster Name, Shared Among Connection Managers

Informix Group/Server To connect to

Connection Manager Listener

SQLHOSTS - Example

#HDR Pair of Servers

cluster_1	group	-	-	c=1,e=repl2_tcp
repl1_tcp	onsoctcp	server1	9088	g=cluster_1
repl2_tcp	onsoctcp	server2	9088	g=cluster_1

#Group of connection managers that service the report
SLA

report	group	-	-	c=1,e=report_2
report_1	onsoctcp	server1	10088	g=report
report_2	onsoctcp	server2	10088	g=report

Application Set Up

SQLHOSTS:

```
report      group      -      -  
  c=1,e=report_2  
report_1    onsoctcp  server1  10088  
  g=report  
report_2    onsoctcp  server2  10088  
  g=report
```

- Set up your application to connect to report_1

Oncmsm Log - Startup

22:45:41 listener report initializing
22:45:41 listener report_rr initializing
22:45:41 listener current_rss initializing
22:45:41 listener proxy_rss initializing
22:45:41 Listener report_rr DBSERVERS=(HDR,RSS) POLICY=ROUNDROBIN is active with 4 worker threads
22:45:41 Listener current_rss DBSERVERS=RSS POLICY=SECAPPLYBACKLOG:5500+WORKLOAD is active with 4 worker threads
22:45:41 Listener report DBSERVERS=(HDR,RSS) POLICY=WORKLOAD is active with 4 worker threads
22:45:41 Listener primary_cm DBSERVERS=primary is active with 4 worker threads
22:45:41 Listener proxy_rss DBSERVERS=RSS POLICY=WORKLOAD MODE=PROXY is active with 4 worker threads
22:45:42 Connection Manager successfully connected to maytcp
22:45:42 The server type of cluster aos_cluster server furytcp is Primary.
22:45:48 The server type of cluster aos_cluster server fury is Primary.
22:46:04 Connection Manager started successfully

Oncmsm Log – Startup Cont

22:46:04 Connection Manager successfully connected to coulsontcp
22:46:04 Cluster aos_cluster Arbitrator FOC ORDER=ENABLED PRIORITY=1
22:46:04 Connection Manager successfully connected to furynosql
22:45:42 The server type of cluster aos_cluster server furytcp is Primary.
22:45:48 The server type of cluster aos_cluster server fury is Primary.
22:46:04 Connection Manager started successfully
22:46:04 Connection Manager successfully connected to coulsontcp
22:46:04 Cluster aos_cluster Arbitrator FOC ORDER=ENABLED PRIORITY=1
22:46:04 Connection Manager successfully connected to furynosql
22:46:04 Connection Manager successfully connected to furytcp
22:46:04 Connection Manager successfully connected to furyrest
22:46:35 CM cm_1 arbitrator for aos_cluster is active
22:46:35 Cluster aos_cluster Arbitrator FOC ORDER=SDS,HDR,RSS PRIORITY=1
TIMEOUT=0

Oncmsm log - Connections

23:04:23 SLA report_rr redirect SQLI client from
10.10.20.60 to maytcp may.10088

23:30:25 SLA report_rr redirect SQLI client from
10.10.20.71 to furynosql fury.10098

23:30:25 SLA primary_cm redirect SQLI client from
10.10.20.63 to furynosql fury.10098

onstat -g cmsm

```
informix@fury:~$ onstat -g cmsm

IBM Informix Dynamic Server Version 12.10.UC4DE -- On-Line (Prim) -- Up 00:23:45 -- 154032 Kbytes
Unified Connection Manager: cm_1                               Hostname: fitz

CLUSTER      aos_cluster      LOCAL
Informix Servers: shield_group
SLA          Connections    Service/Protocol  Rule
primary_cm   1              20100/onsoctcp    DBSERVERS=primary
report       9              20101/onsoctcp    DBSERVERS=(HDR,RSS) POLICY=WORKLOAD
report_rr    25             20102/onsoctcp    DBSERVERS=(HDR,RSS) POLICY=ROUNDROBIN
current_rss  0              20103/onsoctcp    DBSERVERS=RSS POLICY=SECAPPLYBACKLOG:5500+WORKLOAD
proxy_hdr    5              20104/onsoctcp    DBSERVERS=HDR POLICY=WORKLOAD MODE=PROXY

Failover Arbitrator: Active Arbitrator, Primary is up
ORDER=SDS,HDR,RSS PRIORITY=1 TIMEOUT=0

informix@fury:~$ █
```

Best Practices

- Use groups rather than individual servers
- Run more than one connection manager
- Make sure the connection managers are on different servers from the instances.
- If running PROXY mode make sure to have the resources on the CM to handle the data.
- Make sure to set up applications to use the group of connection managers, or at least failover.
- Make sure applications reconnect with at least a short delay.

Things To Be Cautious Of

- Split Brain
- Listeners missing info
- Alias issues
- Missing Trusted status
- Make sure DBSERVERNAME is the TCP Port

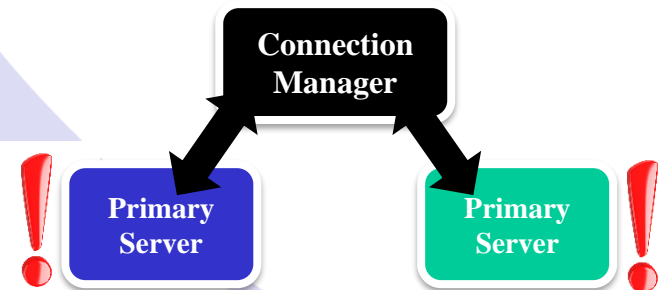
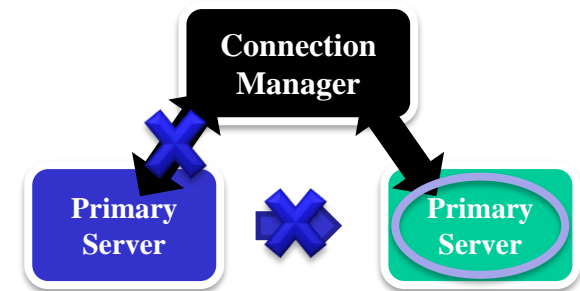
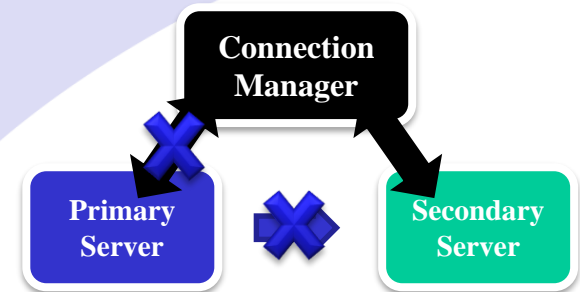
Split Brain

- Two Primary Servers on the same network
- Need to restore one of the servers and re-establish HDR
- Reduce the chance of this situation by having a reliable network connection
- Can use the Connection Manager Alarm Program to shutdown the Primary server if the Secondary cannot be reached AND can't get to the network – See article on IBM developerWorks:

https://www.ibm.com/developerworks/community/blogs/informix_admins_blog/entry/preventing_hdr_split_brain_scenaro

Auto Failover and Network Loss

- What if the PRIMARY server loses the network connection?
- Connection Manager will promote the secondary server, incorrectly assuming that the primary is down
- When network connectivity is restored, there will be TWO primary servers – **Split Brain**



Listeners Missing Info

- Will get a -930 error
- Can be caused due to missing entries from sqlhosts on the connection manager server
- Can also get errors if the port is in use, each SLA needs a unique port

Alias Issues

- By default will probe all of the systems in the cluster for DBSERVERALIAS values
- Can be disabled by USEALIAS
- If it sees tcp connections that appear valid but cannot be reached by client, such as a private replication interface, it will still try to offer them for REDIRECT connections

Missing Trusted Sources

- If one of your servers does not trust the connection manager server it will not be able to connect successfully.
- This can be resolved by using the password management process.

Encrypted Password

- Set up a file defining the servers and what passwords to use
- Use onpassword to encrypt the file
- Stored as
\$INFORMIXDIR/etc/passwd_file
- Uses a key to encrypt/decrypt to make changes in the future

More Resources

- **Connection Manager Manual Examples**

https://www.ibm.com/support/knowledgecenter/SSGU8G_12.1.0/com.ibm.admin.doc/ids_admin_1437.htm

- **Informix Replication Technologies:**

<http://www.ibm.com/developerworks/data/library/techarticle/dm-0807geib/>

- **Andrew Ford's Blog – Setting up HDR:**

<http://www.informix-dba.com/2010/08/informix-hdr-will-save-your-butt.html>

- **Connection Manager Alert List**

https://www.ibm.com/support/knowledgecenter/SSGU8G_11.70.0/com.ibm.adref.doc/ids_adr_1148.htm

Questions?



Send follow-up questions to
tom@advanceddatatools.com

Next Webcast

Informix Best Practices

- Informix Auditing by Mike Walker
 - Thursday, July 27, 2017 at 2:00pm EST
- Stay tuned for upcoming announcements about the next set of webcasts

Please register for each webcast here at:

<http://advanceddatatools.com/Informix/NextWebcast.html>

Upcoming WAIUG Meeting

- Aug 8th 2017 – Tysons Corner VA
- 8:30-1pm
- What HCL Brings to the Informix World – Stuart Litel
- Enterprise Replication – Shawn Moe
- Free
- <http://www.waiug.org> to RSVP

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