Getting Going With Informix Connection Manager

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xDB SYSTEMS

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

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What Is Connection Manager

Introduced in 11.5 (revamped in 11.7)

Bundled with the engine, also included with the csdk

Standalone program that 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

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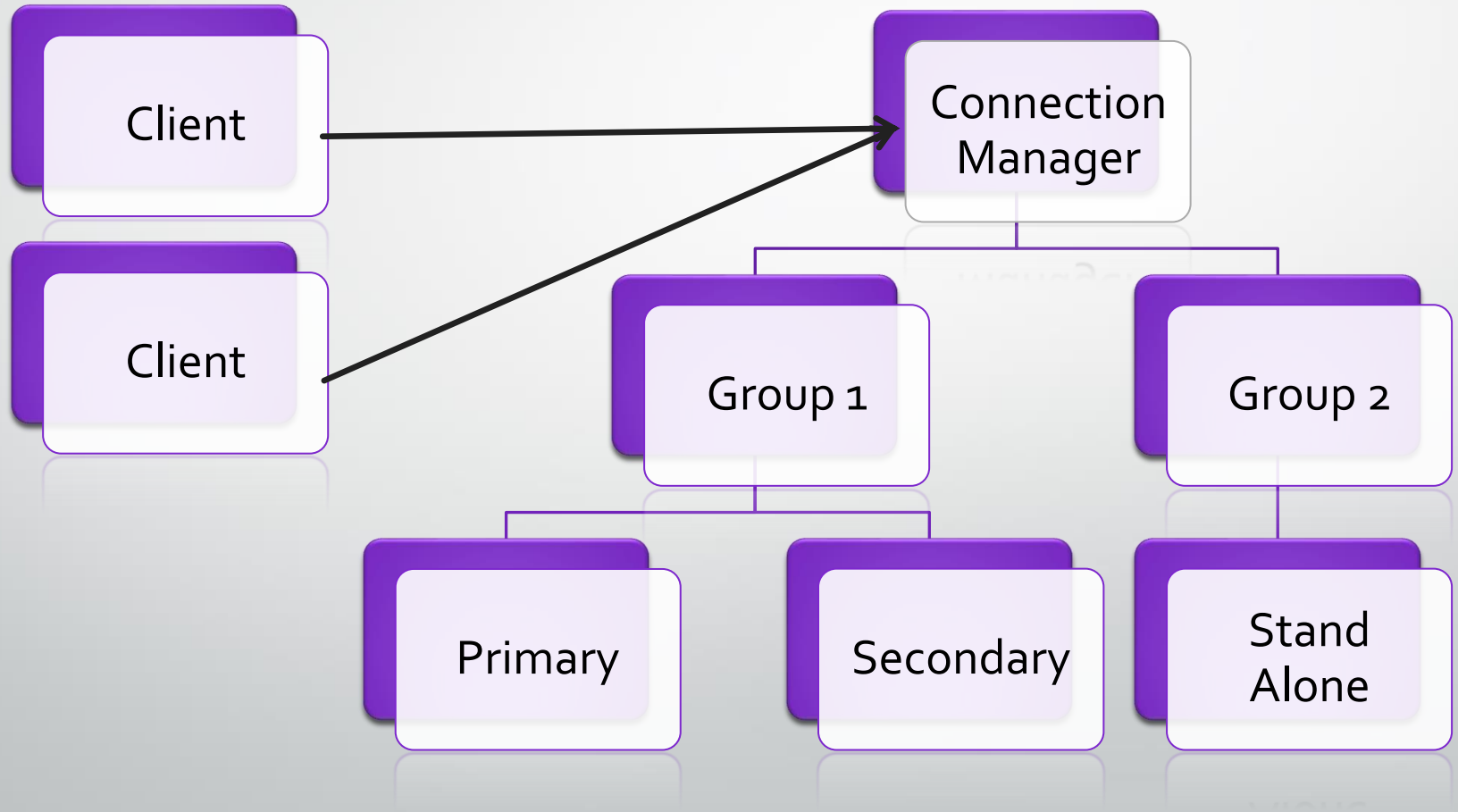
Topology



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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 onpassword to authenticate

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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

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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 environment 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    onsoctcphost 192.168.1.2 9088

#Connection Manager Listener
report_group     onsoctcphost 192.168.1.2  9090
```

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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_TIMOUT – 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

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Connection Types

CLUSTER – Group or selection of servers to connect to that support HDR failover

GRID – ER Grid to connect to

REPLSET ER replicate set to connect to

SERVERSET – Unrelated servers that do not use failover

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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
}
```

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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
}
```

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

– The sqlhost entry (group or server) the connection manager will listen on

– The SLA is for the report_1 group in sqlhosts

– This is the order it will maintain

– This is the type of SLA policy it uses

– Use the failover order above

– This connection manager is the first one to handle failover for this SLA

– Calls this program if failover fails after 8 attempts

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

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SLA

Service Level Agreement

This is the directive of how a connection manager should treat a particular group of servers

Any linked connection mangers should have similar settings and the same name for a group

Each SLA will have its own listener port

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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)

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DBSERVERS - Cluster Keywords

PRI, PRIMARY

HDR – Secondary

SDS – Shared disk secondary

RSS

ANY

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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.

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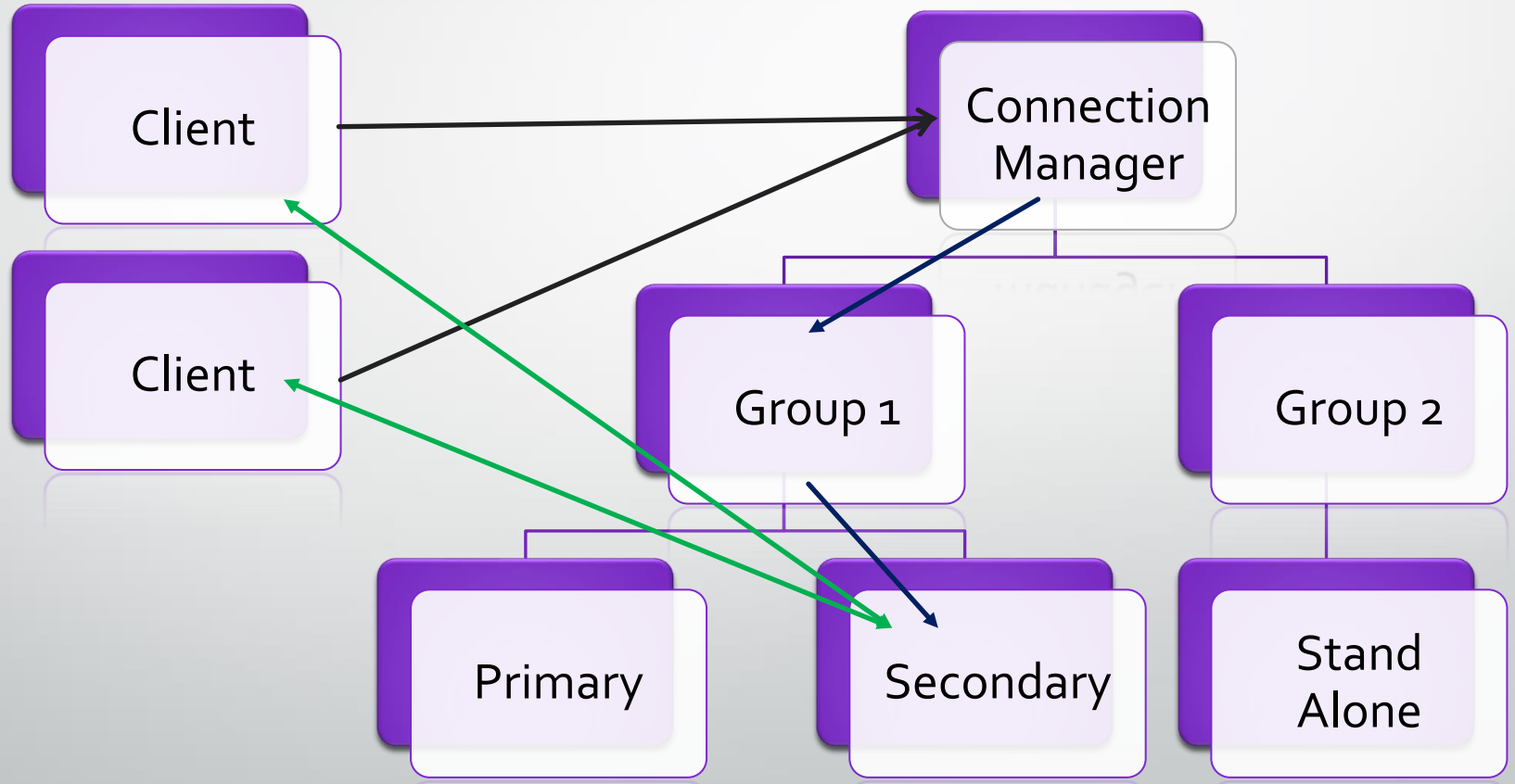
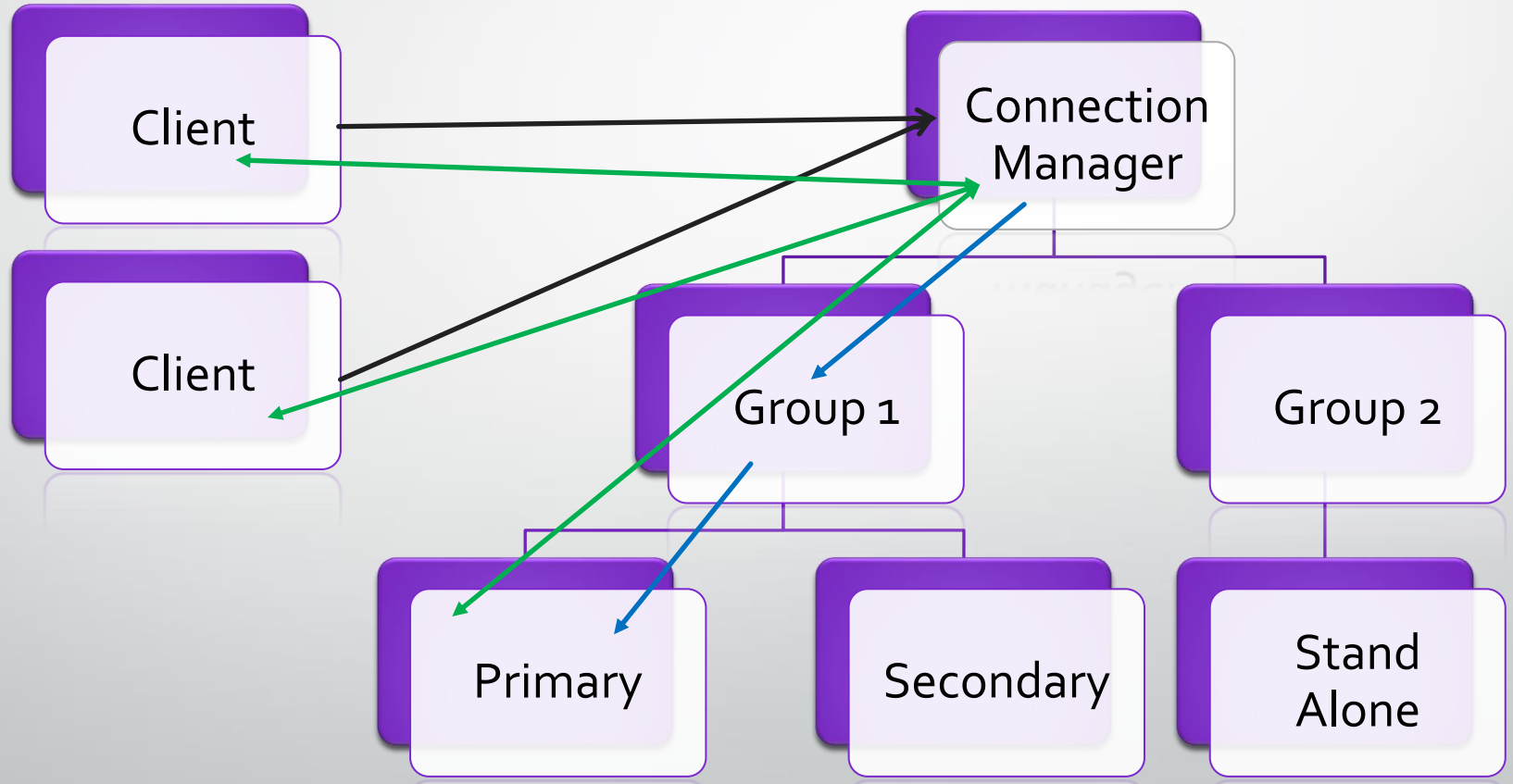
Topology - Redirect



Topology - PROXY



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SLA - USEALIASES

ON – Default, this will add any entries in DBSERVERALIASES into the mix.

OFF – Only will use DBSERVERNAME, none of the aliases

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SLA - WORKERS

Numeric Value – Default is 4

Defines how many worker threads the CM is allocated

SLA - POLICY

WORKLOAD – (Default) – Assigns the work to the least busy server at the time

ROUNDROBIN – Alternates between all 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 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)

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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

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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

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FOC - TIMEOUT

Additional time before a failover occurs

Adds to the value of EVENT_TIMEOUT

Defaults to 0

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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 practice is to always use groups when doing replication rather then individual servers

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Sample Config

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

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

Name of this Connection Manager

Cluster Name, Shared Among Connection Managers

Informix Group/Server To connect to

Connection Manager Listener

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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
```

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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 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 Continued

```
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
```

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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
```

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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:~$
```

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Best Practices

- Use groups rather then 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 load
- Make sure applications use the group of connection managers, or at least can failover
- Make sure applications reconnect with at least a short delay

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Things To Be Cautious Of

- Split Brain
- Listeners missing info
- Alias issues
- Missing Trusts
- Make sure DBSERVERNAME is the TCP listener

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Split Brain

Two Primary Servers on the same network

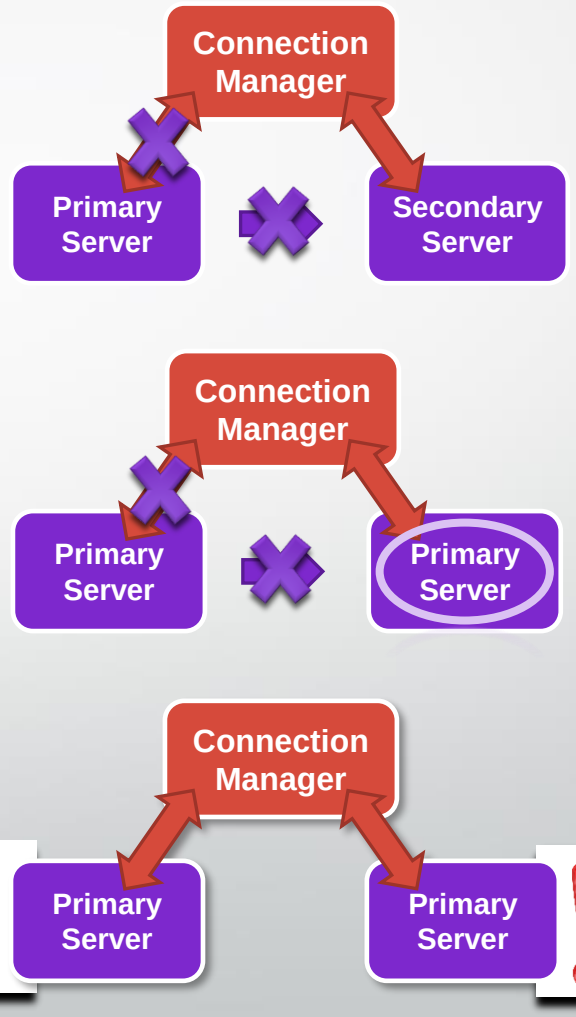
Need to restore one of the servers and re-establish HDR

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

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**



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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

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Alias Issues

- By default, will probe all of the systems in the cluster for DBSERVERALIASES values
- Can be disabled by USEALIASES
- 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 onpassword 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:**

  https://www.ibm.com/docs/en/informix-servers/12.10?topic=replication-informix-enterprise-technical-overview

- **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/docs/en/informix-servers/12.10?topic=alarms-connection-manager-event-alarm-ids

- **Setting Up Connection Manager using onpassword**

  https://www.ibm.com/docs/en/informix-servers/14.10?topic=ccm-creating-password-file-connecting-database-servers-untrusted-networks

- **Set Up SSL With Connection Manager**

  https://www.ibm.com/docs/en/informix-servers/12.10?topic=management-example-configuring-ssl-connection

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Questions?

Send follow-up questions to
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Thank You

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