CUCM Database Replication

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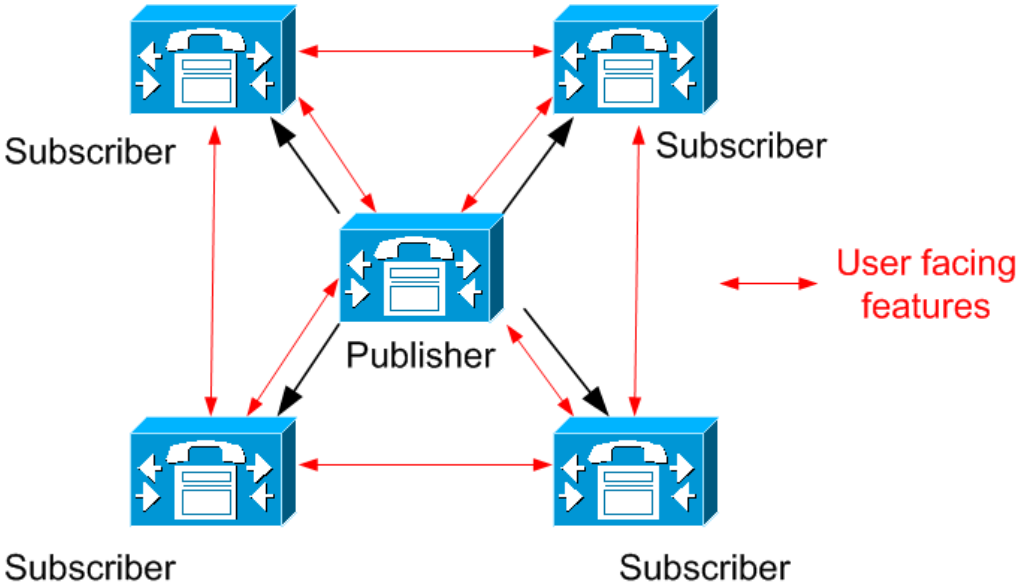
Training Session Agenda

- Database Replication Architecture
- Database Replication Setup
- Monitoring Replication (setup)
- Troubleshooting steps
- Cli commands
- Q&A

Cisco Unified Communications Manager

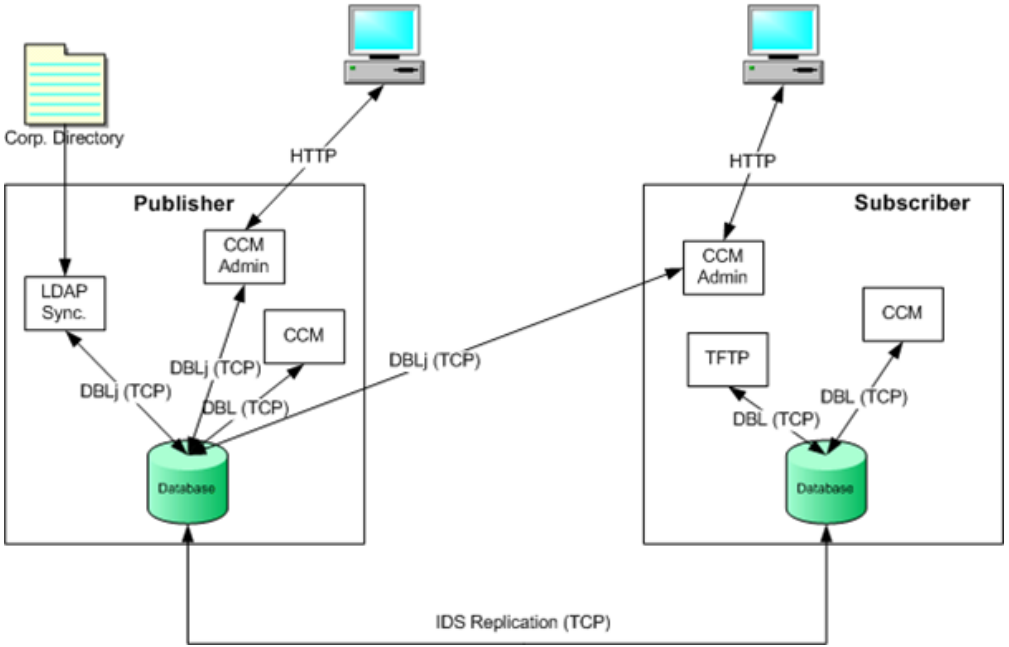
Database Replication Architecture

Architecture



- Most data is written in database of publisher and then replicated to subscribers
- User facing features can also be written in subscriber and are replicated to publisher

CUCM Data Access



- CCM Admin page on Subscriber queries database on Publisher
- Query local database via cli: run sql select * from region
- A change is being replicated to the database of the Subscriber and the ccm service is updated via a change notify

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Database Replication Setup

Steps in Replication

1. Define

   Identifies which servers will participate and defines those nodes locally and on other nodes
   (cdr define server)

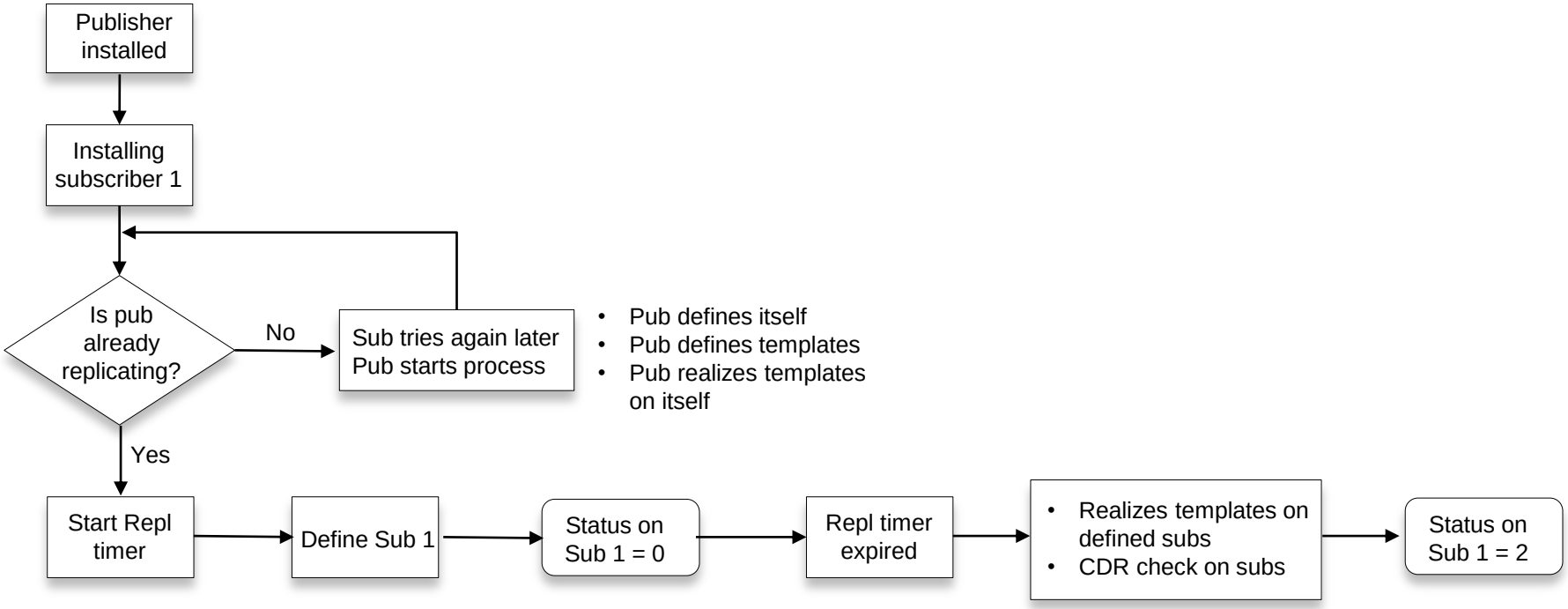
2. Define Replicates

   Define what tables will be replicated and what to do in case of collisions, stored in the syscdr database
   (cdr realize templates)

3. Replicate

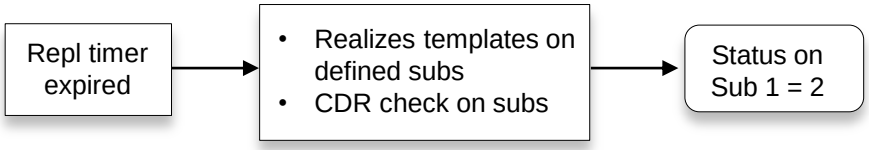
   Actual sync of data
   (cdr check)

Replication Process



- Pub defines itself
- Pub defines templates
- Pub realizes templates on itself

Replication Process cont'd



- Once the Repl timer expired other Subscribers will only be able to start the replication setup process once the first batch is completed
  - During an upgrade don't switch version on nodes one by one with time interval larger than the Repl timer, switch version together or in 2 batches
  - Increase repl timer for large clusters to allow all subscribers setup the replication in one batch (see next slide)
  - When clustering over wan, consider to sync local servers first

Repl Timer

- Default set to 300 seconds:

```
admin:show tech repltimeout

 ------------------show tech repltimeout ------------------

 The Replication timeout is set to 300 seconds
```

- Configurable on publisher via cli:

```
admin:utils dbreplication setrepltimeout ?
Syntax: utils dbreplication setrepltimeout [integer value of new timeout in seconds]
```

Cisco Unified Communications Manager

Monitoring Replication

Utils dbreplication runtimestate

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BROADCAST SYNC Completed on 2 servers at: 2013-04-18-15-41
     Last Sync Result: SYNC COMPLETED  603 tables sync'ed out of 603
     Sync Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                                PING            CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?    (ID) & STATUS   QUEUE   TABLES  LOOP?   (RTMT) & details
-----------     ------------    ------  ----    -------------   -----   -------  -----   ----------------
MFCl1Pub        10.48.36.203    0.041   Yes     (2)  Connected   0      match   Yes     (2) PUB Setup Completed
MFCl1Sub2       10.48.36.149    1.158   Yes     (4)  Connected   0      match   Yes     (2) Setup Completed
MFCl1Sub1       10.48.36.206    0.177   Yes     (3)  Connected   0      match   Yes     (2) Setup Completed
```

Summary Text

Summary Table of Servers

Utils dbreplication runtimestate cont'd

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BROADCAST SYNC Completed on 2 servers at: 2013-04-18-15-41
     Last Sync Result: SYNC COMPLETED  603 tables sync'ed out of 603
     Sync Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                                PING                CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?        (ID) & STATUS   QUEUE   TABLES  LOOP?   (RTMT) & details
-----------     ------------    ------  ----        -------------   -----   -------  -----   -----------------
MFCl1Pub        10.48.36.203    0.041   Yes         (2)  Connected   0      match   Yes     (2) PUB Setup Completed
MFCl1Sub2       10.48.36.149    1.158   Yes         (4)  Connected   0      match   Yes     (2) Setup Completed
MFCl1Sub1       10.48.36.206    0.177   Yes         (3)  Connected   0      match   Yes     (2) Setup Completed
```

Shows if A Cisco DB Replicator is working

Utils dbreplication runtimestate cont'd

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BROADCAST SYNC Completed on 2 servers at: 2013-04-18-15-41
     Last Sync Result: SYNC COMPLETED  603 tables sync'ed out of 603
     Sync Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                                PING                CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?        (ID)  & STATUS  QUEUE   TABLES  LOOP?   (RTMT)  & details
-----------     ------------    ------  ----        --------------  -----   -------  -----   -----------------
MFCl1Pub        10.48.36.203    0.041   Yes         (2)   Connected   0       match   Yes     (2) PUB Setup Completed
MFCl1Sub2       10.48.36.149    1.158   Yes         (4)   Connected   0       match   Yes     (2) Setup Completed
MFCl1Sub1       10.48.36.206    0.177   Yes         (3)   Connected   0       match   Yes     (2) Setup Completed
```

Unique ID in cluster and shows if replication has been set-up

Utils dbreplication runtimestate cont'd

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BROADCAST SYNC Completed on 2 servers at: 2013-04-18-15-41
     Last Sync Result: SYNC COMPLETED  603 tables sync'ed out of 603
     Sync Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                                PING            CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?    (ID) & STATUS   QUEUE   TABLES  LOOP?   (RTMT) & details
-----------     ------------    ------  ----    -------------   -----   -------  -----   -----------------
MFCl1Pub        10.48.36.203    0.041   Yes     (2)  Connected   0      match   Yes     (2) PUB Setup Completed
MFCl1Sub2       10.48.36.149    1.158   Yes     (4)  Connected   0      match   Yes     (2) Setup Completed
MFCl1Sub1       10.48.36.206    0.177   Yes     (3)  Connected   0      match   Yes     (2) Setup Completed
```

Replication data and control queues in bytes

Utils dbreplication runtimestate cont'd

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BROADCAST SYNC Completed on 2 servers at: 2013-04-18-15-41
     Last Sync Result: SYNC COMPLETED  603 tables sync'ed out of 603
     Sync Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                                PING                CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?        (ID) & STATUS   QUEUE   TABLES  LOOP?   (RTMT) & details
-----------     ------------    ------  ----        -------------   -----   ------- -----   ----------------
MFCl1Pub        10.48.36.203    0.041   Yes         (2)  Connected  0       match   Yes     (2) PUB Setup Completed
MFCl1Sub2       10.48.36.149    1.158   Yes         (4)  Connected  0       match   Yes     (2) Setup Completed
MFCl1Sub1       10.48.36.206    0.177   Yes         (3)  Connected  0       match   Yes     (2) Setup Completed
```

Shows if Pub and Sub versions of CUCM match

Utils dbreplication runtimestate cont'd

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BROADCAST SYNC Completed on 2 servers at: 2013-04-18-15-41
     Last Sync Result: SYNC COMPLETED  603 tables sync'ed out of 603
     Sync Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                                PING                CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?        (ID) & STATUS   QUEUE   TABLES  LOOP?   (RTMT) & details
-----------     ------------    ------  ----        -------------   -----   -------  -----  -----------------
MFCl1Pub        10.48.36.203    0.041   Yes         (2)  Connected   0      match   Yes     (2) PUB Setup Completed
MFCl1Sub2       10.48.36.149    1.158   Yes         (4)  Connected   0      match   Yes     (2) Setup Completed
MFCl1Sub1       10.48.36.206    0.177   Yes         (3)  Connected   0      match   Yes     (2) Setup Completed
```

Indicator if replication-dynamic real-time replication is working

Utils dbreplication runtimestate cont'd

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BROADCAST SYNC Completed on 2 servers at: 2013-
     Last Sync Result: SYNC COMPLETED  603 tables sync'ed out of 603
     Sync Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                                PING            CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?    (ID) & STATUS   QUEUE   TABLES  LOOP?   (RTMT) & details
-----------     ------------    ------  ----    --------------  -----   -------  -----  -----------------
MFCl1Pub        10.48.36.203    0.041   Yes     (2)  Connected   0      match   Yes     (2) PUB Setup Completed
MFCl1Sub2       10.48.36.149    1.158   Yes     (4)  Connected   0      match   Yes     (2) Setup Completed
MFCl1Sub1       10.48.36.206    0.177   Yes     (3)  Connected   0      match   Yes     (2) Setup Completed
```

0= Replication set-up in progress
1= Not Used
2= Replication set-up successful
3= Real-Time replication out of sync or not available
4= Replication set-up failure

RTMT Replication counter

Steps in Replication - Define

- Publisher is waiting for Subscribers to define “Batching Sync Requests”:

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BATCHING SYNC Requests from nodes at: 2013-04-18-15-14
     Sync Request Progress: Received 2 node requests for DB sync
     Sync Request Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                                PING            CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?    (ID) & STATUS   QUEUE   TABLES  LOOP?   (RTMT) & details
-----------     ------------    ------  ----    -------------   -----   -------  -----   ----------------
MFCl1Pub        10.48.36.203    0.045   Yes     (2)  Connected  0       match   Yes     (2) PUB Batching Sub Req's
MFCl1Sub1       10.48.36.206    0.181   Yes     (3)  Connected  0       match   Yes     (0) Setup Requested
MFCl1Sub2       10.48.36.149    0.783   Yes     (4)  Connected  0       match   Yes     (0) Setup Requested
```

Steps in Replication – Define cont'd

- For every subscriber there will be a define log file on the publisher:

```
admin:file list activelog cm/trace/dbl date detail
18 Apr,2013 15:38:20      <dir>    ncsj
18 Apr,2013 15:38:20      <dir>    dblj
18 Apr,2013 15:38:20      <dir>    sdi
18 Apr,2013 15:35:11        2,590  2013_04_18_15_34_36_mfcl1sub1_ccm9_0_1_10000_37_dbl_repl_cdr_define.log
18 Apr,2013 15:38:10        3,194  2013_04_18_15_37_35_mfcl1sub2_ccm9_0_1_10000_37_dbl_repl_cdr_define.log
```

- This file will end with a checksum of [64] if the define was successful:

```
admin:file view activelog cm/trace/dbl/2013_04_18_15_34_36_mfcl1sub1_ccm9_0_1_10000_37_dbl_repl_cdr_define.log

...

[18/04/2013 15:35:11] size of cdr_err_define.out is [64]
```

Steps in Replication – Repl Timer Expires

- Broadcast Sync is proceeding, progress can be followed in “Sync Progress”:

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BROADCAST SYNC Started on 2 server(s) at: 2013-04-18-15-40
     Processing Table: typeviprfilterelement
     Sync Progress: 199 tables sync'ed out of 603
     Sync Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                            PING            CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?    (ID) & STATUS   QUEUE   TABLES  LOOP?   (RTMT) & details
-----------     ------------    ------  ----    --------------  -----   -------  -----   ----------------
MFCl1Pub        10.48.36.203    0.033   Yes     (2)  Connected   0      match   Yes     (2) PUB Setting Subs
MFCl1Sub1       10.48.36.206    0.143   Yes     (3)  Connected   160    match   Yes     (0) Setup in Progress
MFCl1Sub2       10.48.36.149    0.741   Yes     (4)  Connected   160    match   Yes     (0) Setup in Progress
```

Steps in Replication – Repl Timer Expires cont'd

- Broadcast started after the Repl Timer expired, timer started when first Subscriber was defined:

```
admin:file list activelog cm/trace/dbl date detail
18 Apr,2013 15:41:34      <dir>    ncsj
18 Apr,2013 15:41:34      <dir>    dblj
18 Apr,2013 15:41:34      <dir>    sdi
18 Apr,2013 15:35:11        2,590  2013_04_18_15_34_36_mfcl1sub1_ccm9_0_1_10000_37_dbl_repl_cdr_define.log
18 Apr,2013 15:38:10        3,194  2013_04_18_15_37_35_mfcl1sub2_ccm9_0_1_10000_37_dbl_repl_cdr_define.log
18 Apr,2013 15:40:11            0  2013_04_18_15_40_11_dbl_repl_output_Broadcast.log
18 Apr,2013 15:41:34      569,378  2013_04_18_15_40_11_dbl_repl_cdr_Broadcast.log
```

Replication finished:

- Status is 2 on every server in the cluster:

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: BROADCAST SYNC Completed on 2 servers at: 2013-04-18-15-41
     Last Sync Result: SYNC COMPLETED  603 tables sync'ed out of 603
     Sync Errors: NO ERRORS

DB Version: ccm9_0_1_10000_37
Number of replicated tables: 603
Repltimeout set to: 300s

Cluster Detailed View from MFCl1Pub (3 Servers):

                                PING            CDR Server      REPL.   DBver&  REPL.   REPLICATION SETUP
SERVER-NAME     IP ADDRESS      (msec)  RPC?    (ID) & STATUS   QUEUE   TABLES  LOOP?   (RTMT) & details
-----------     ------------    ------  ----    --------------  -----   -------  -----   ----------------
MFCl1Pub        10.48.36.203    0.062   Yes     (2)  Connected   0      match   Yes     (2) PUB Setup Completed
MFCl1Sub1       10.48.36.206    0.152   Yes     (3)  Connected   160    match   Yes     (2) Setup Completed
MFCl1Sub2       10.48.36.149    0.789   Yes     (4)  Connected   160    match   Yes     (2) Setup Completed
```

Replication finished cont'd:

- Replication setup is finished when Output Broadcast file has size:

```
admin:file list activelog cm/trace/dbl date detail

  ...

18 Apr,2013 15:35:11         2,590  2013_04_18_15_34_36_mfcl1sub1_ccm9_0_1_10000_37_dbl_repl_cdr_define.log
18 Apr,2013 15:38:10         3,194  2013_04_18_15_37_35_mfcl1sub2_ccm9_0_1_10000_37_dbl_repl_cdr_define.log
18 Apr,2013 15:41:43         1,766  2013_04_18_15_40_11_dbl_repl_output_Broadcast.log
18 Apr,2013 15:41:43       635,615  2013_04_18_15_40_11_dbl_repl_cdr_Broadcast.log
```

- This file will end with a checksum of [64] if the replication setup was successful:

```
admin:file view activelog cm/trace/dbl/2013_04_18_15_40_11_dbl_repl_output_Broadcast.log
  ...
[18/04/2013 15:41:43] size of cdr_check.out is [64]

[18/04/2013 15:41:43] Replication Setup Successful
end of the file reached
```

Cisco Unified Communications Manager

Troubleshooting

What can go wrong?

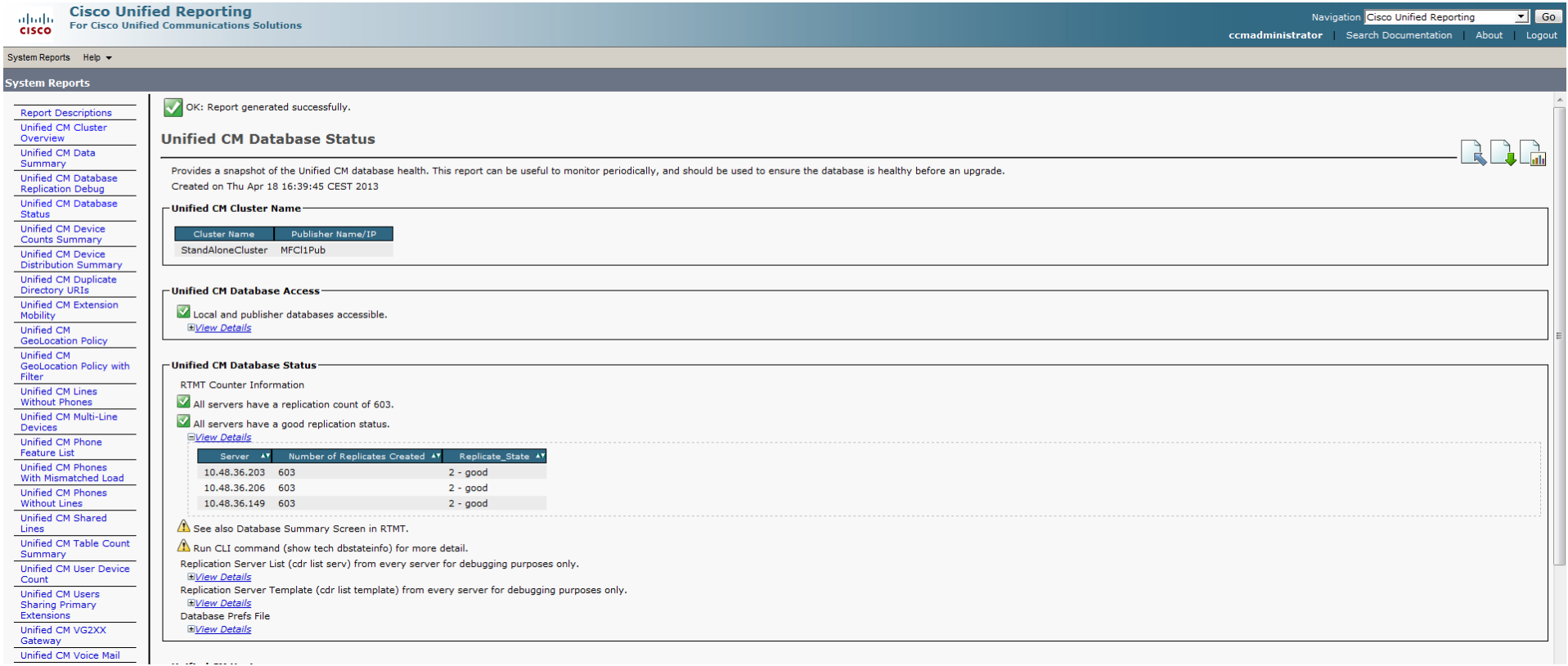
- Typical scenarios causing database replications to break:

1. Network connectivity issues between nodes
   - general connectivity issues
   - MTU
   - Firewall blocking ports

2. Changing ip/hostname
   - It is important to follow the documented procedure

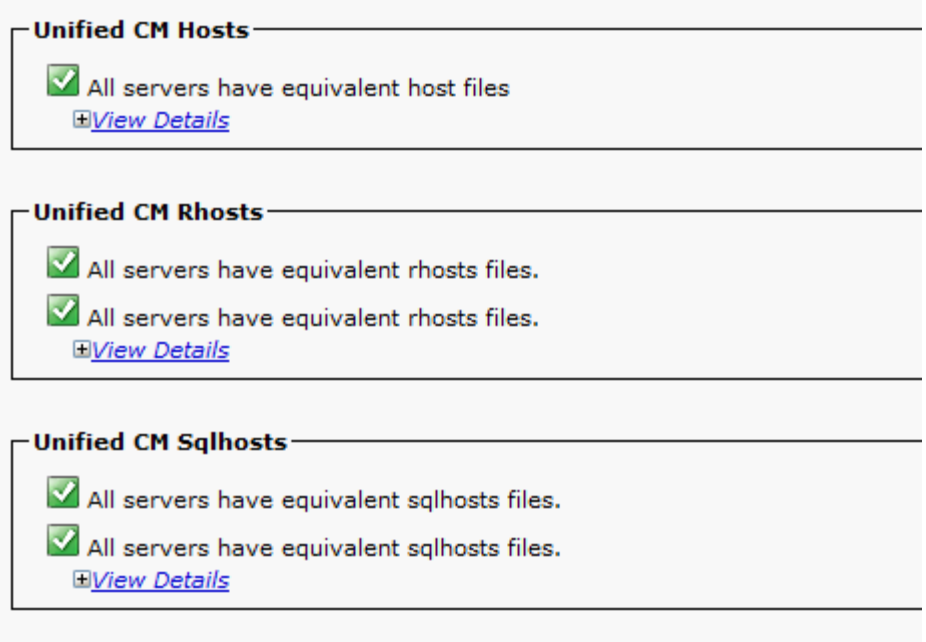
3. Mismatch in security password
   - CSCth87452: A Cisco DB service will not start after changing security password
   - CSCtn79868: pwrecovery tool resetting only sftpuser password

Verify status



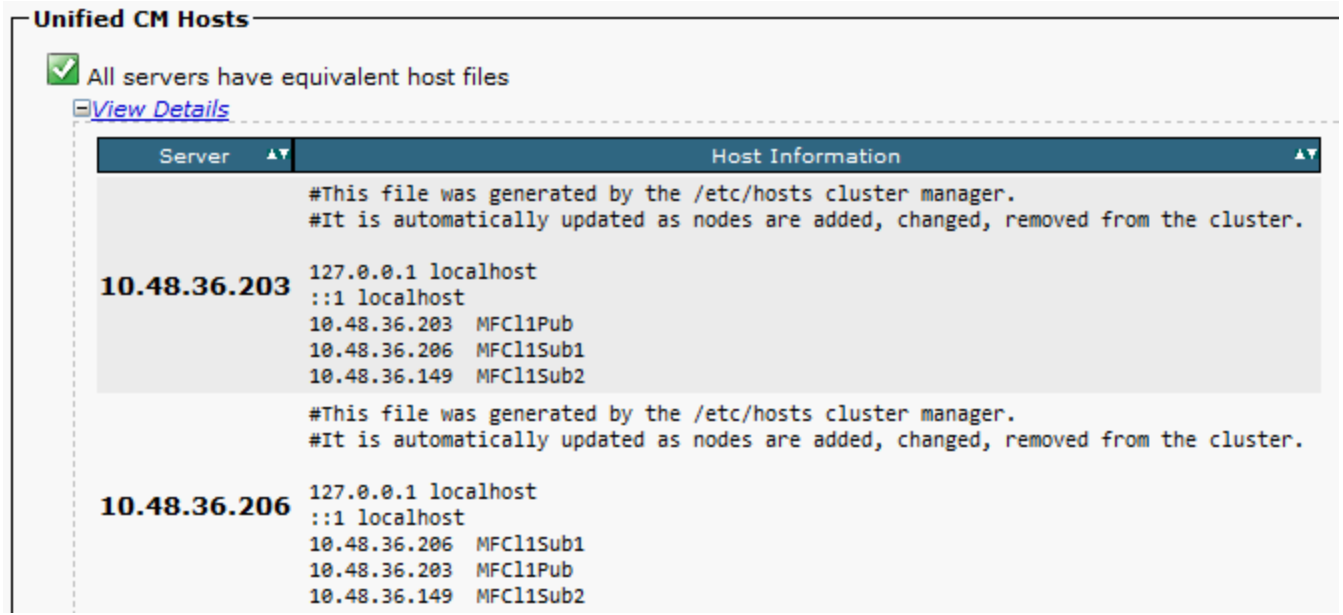
Verify files are in sync

- Available in the Unified CM Database Status report:



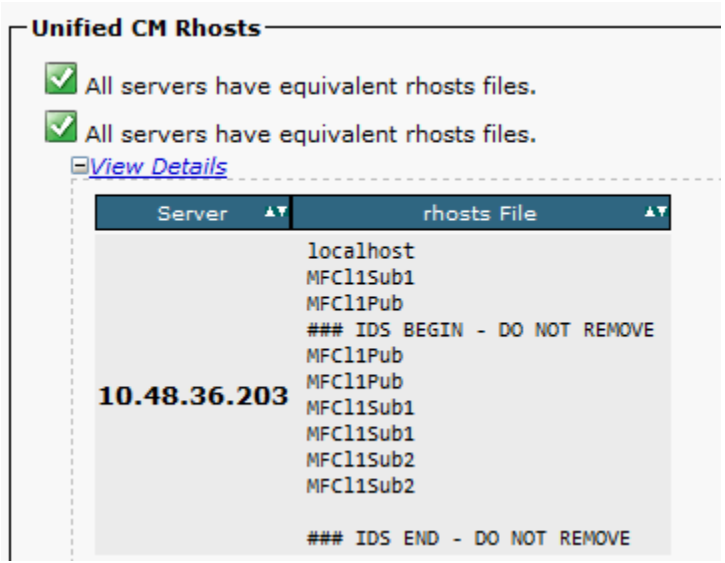
Verify files are in sync - Hosts file

- Subscriber authenticates to Publisher using the security password
- When successful Cluster Manager inject entry in hosts file and add policy in firewall



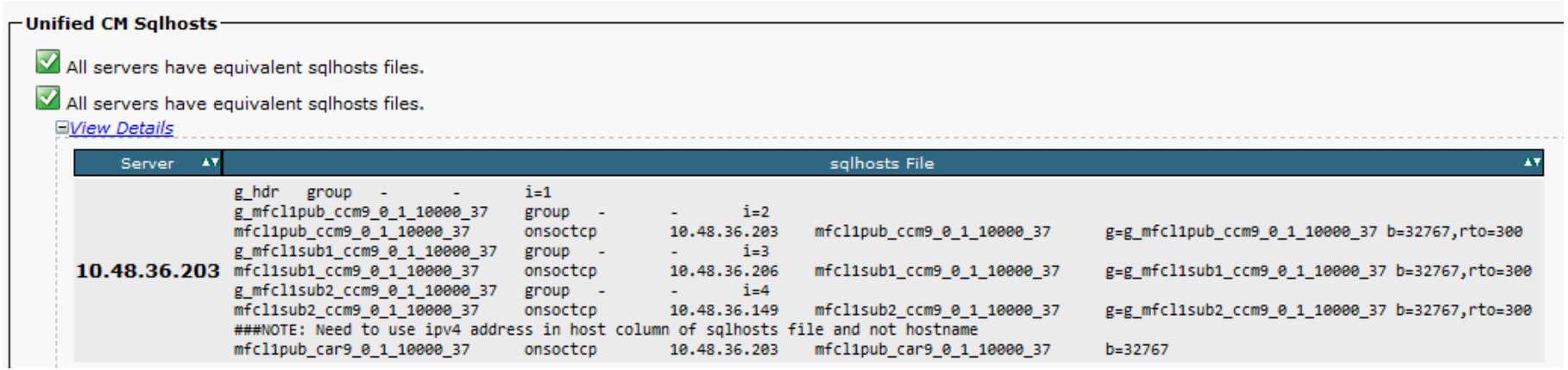
Verify files are in sync - Rhosts file

- Used by the Informix database authentication mechanism
- Build based on HOSTS file
- Created by A Cisco DB



Verify files are in sync - Sqlhosts file

- Contains the connectivity information for each database server
- Created by A Cisco DB



Verify ntp - Publisher

- Publisher syncs to external ntp server

```
admin:utils ntp status
ntpd (pid 4983) is running...

     remote           refid      st t when poll reach   delay   offset  jitter
==============================================================================
*10.48.36.200    144.254.15.121   2 u   24 1024  377    2.162  -14.815   8.595
+10.48.79.200    144.254.15.121   2 u  773 1024  377    6.494    0.361   5.795


synchronised to NTP server (10.48.36.200) at stratum 3
   time correct to within 71 ms
   polling server every 1024 s

Current time in UTC is : Thu Apr 18 15:04:57 UTC 2013
Current time in CET is : Thu Apr 18 17:04:57 CEST 2013
```

- Cisco recommends synchronizing Unified CM with a Cisco IOS or Linux-based NTP server, Windows Time Services as an NTP server is not recommended or supported

Verify ntp - Subscriber

- Subscribers sync with publisher

```
admin:utils ntp status
ntpd (pid 20920) is running...

     remote           refid      st t when poll reach   delay   offset  jitter
==============================================================================
*10.48.36.203    10.48.36.200     3 u  684 1024  377    0.295   -5.539   0.568


synchronised to NTP server (10.48.36.203) at stratum 4
   time correct to within 108 ms
   polling server every 1024 s

Current time in UTC is : Thu Apr 18 15:05:15 UTC 2013
Current time in CET is : Thu Apr 18 17:05:15 CEST 2013
```

Verify network connectivity

- CLI command ‘utils network connectivity:

1. Subscriber nodes communicate to Publisher node via TCP and UDP (port 8500)
2. Test validates that the Sub is properly authenticated against the Pub
3. Echo request/reply packets via UDP and TCP validates proper handling of IP fragment
4. Same test validates proper MTU settings
5. Additionally, sends request to installed private ports used by other CCM application components

Verify network connectivity cont'd

- CLI command 'utils network connectivity:

```
admin:utils network connectivity


This command can take up to 3 minutes to complete.
Continue (y/n)?y
Running test, please wait ...
.
Network connectivity test with MFCl1Pub completed successfully.
```

Verify firewall has entries for other servers

- Each server should have entry for all nodes in cluster:

```
admin:utils firewall ipv4 list
  ...
24   ACCEPT     tcp  --  10.48.36.149         0.0.0.0/0           tcp dpt:1500
  ...
27   ACCEPT     tcp  --  10.48.36.203         0.0.0.0/0           tcp dpt:1500
```

- Entries are added by Cluster Manager when authentication between nodes is successful

Cisco Unified Communications Manager

Cli commands explained

Before running any commands…

- Make sure all tests covered in troubleshooting section has been completed successfully, failing to do so will bring your cluster in worse scenario when executing the cli commands

Steps in Replication - recap

1. Define

   Identifies which servers will participate and defines those nodes locally and on other nodes
   (cdr define server)

2. Define Replicates

   Define what tables will be replicated and what to do in case of collisions, stored in the syscdr database
   (cdr realize templates)

3. Replicate

   Actual sync of data
   (cdr check)

Utils dbreplication status

- This command will verify if all tables are in sync and generates a report, the report contains what tables are not in sync (if any)

```
admin:utils dbreplication status

 ---------------------- utils dbreplication status ---------------------

Replication status check is now running in background.
Use command 'utils dbreplication runtimestate' to check its progress

The final output will be in file cm/trace/dbl/sdi/ReplicationStatus.2013_05_15_11_04_08.out

Please use "file view activelog cm/trace/dbl/sdi/ReplicationStatus.2013_05_15_11_04_08.out " command to see the output
```

Utils dbreplication status cont'd

- This command takes a while to complete, progress can be monitored via 'utils dbreplication runtimestate'

```
admin:utils dbreplication runtimestate

DB and Replication Services: ALL RUNNING

DB CLI Status: No other dbreplication CLI is running...

Cluster Replication State: Replication status command started at: 2013-05-15-11-04
     Replication status command in PROGRESS 36 tables checked out of 603
     Processing Table: typetimezone

     Use 'file view activelog cm/trace/dbl/sdi/ReplicationStatus.2013_05_15_11_04_08.out' to see the details
```

Utils dbreplication repair

- This executes step 3 (actual sync of data)
- This fixes out of sync data
- Runs on all tables in replication on all servers that are included in the command
- Outcome to be confirmed by running ‘utils dbreplication status’

Utils dbreplication repairtable or repairreplicate

- Same as repair command but runs on only one table or replicate (much faster)
- Useful on large clusters where only one/few tables are out of sync

Utils dbreplication stop

- This command stops the replication set-up
- The only way to recover from a stop is with a reset
- This command pauses for the duration of repltimeout timer and then kills currently running replication commands again
- This command also kills auto recovery
- Use with caution!

Utils dbreplication dropadmindb

- This command drops the syscdr database (created in step 2)
- Need to run ‘utils dbreplication stop’ prior this command
- Can be used when there is a looping attempt to define a server in replication (step 1), usually the issue is on the pub and not on the failing sub

Utils dbreplication reset

- This command causes replication to be torn down and set-up again
- Executes all three steps

Utils dbreplication rebuild

- This command does stop, drop and reset all in one command (available as of CUCM 9.x)

Cisco Unified Communications Manager

Q&A

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- Please post open questions to our support forums: https://supportforums.cisco.com

Thank you.