



IBM Software Group

MQ Pub/Sub: direct routing clusters and proxy subscriptions

<http://www-01.ibm.com/support/docview.wss?uid=swg27050262>

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Date last updated: 03-Oct-2017



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Related presentations

This presentation is one of a series.
For the complete list, please see:

<https://developer.ibm.com/answers/questions/402074/mq-pubsub-training-presentations.html>

MQ Pub/Sub: training presentations



Related zip file

This techdoc has 1 zip file with files that are discussed in this presentation:

QMPS-pub-sub-direct-routing-clusters.zip

The included files contain information after the clustered topic was created in PR 4 and the subscriber was created in PR 7.

The runmqsc* files contain a variety of commands to display the topics, etc.

runmqsc_CDPR4_after_subscribe.txt => PR 4

runmqsc_CDPR7_after_subscribe.txt => PR 7

amqrfdm_CDRPR6.stdout => cluster cache in PR 6

amqrfdm_CDRPR7.stdout => cluster cache in PR 7



Agenda

- Review of using **clustered queues in a cluster**
- Adding a **clustered topic**
- Notice impact that in **direct route clusters:**
the auto defined cluster-senders are created in all partial repositories!
- **Proxy subscriptions** are briefly explained.



Tutorials for creating a cluster

The cluster for this presentation was based on the following tutorials:

<http://www-01.ibm.com/support/docview.wss?uid=swg27038687>

Cluster setup and basic usage of clustered queues and topics in MQ 7

The above WSTE is based on these tutorials:

<http://www.ibm.com/support/docview.wss?uid=swg27037038>

Setup of a cluster and basic usage of clustered queues in MQ 7

<http://www.ibm.com/support/docview.wss?uid=swg27038974>

Basic usage of clustered topics in WebSphere MQ 7



Initial topology of Direct Routing cluster

There are 2 hosts.

Each host has 4 queue managers:

- 1 Full Repository (FR)
- 3 Partial Repositories (PR)

Each FR is connected to the 6 PRs

Each PR is connected to the 2 FRs

There are no connections between the PRs.

There are no clustered queues, nor clustered topics

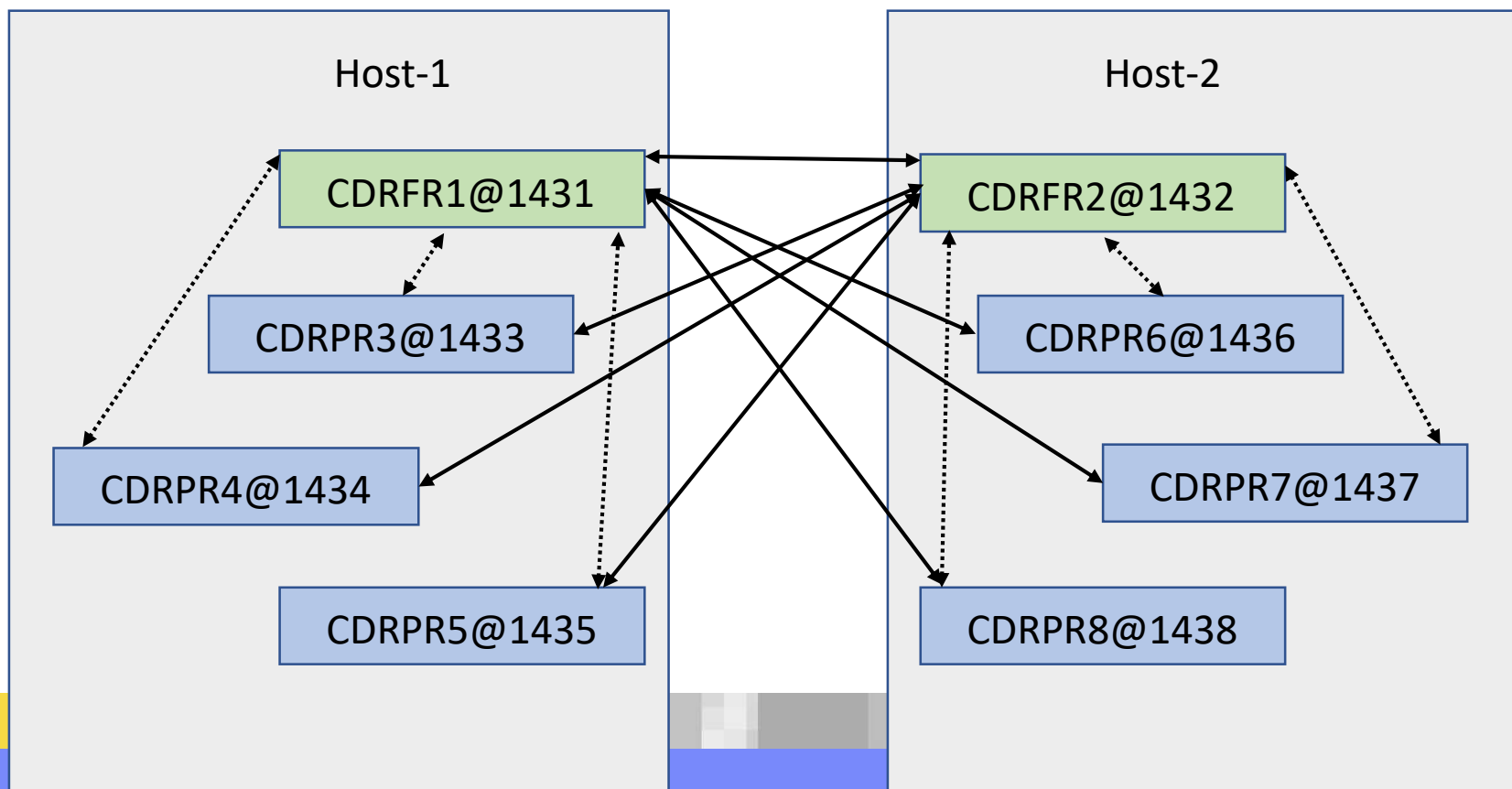


Initial topology of Direct Routing cluster

Cluster-sender and cluster-receiver channels that connect the queue managers.

Dotted line: manually created

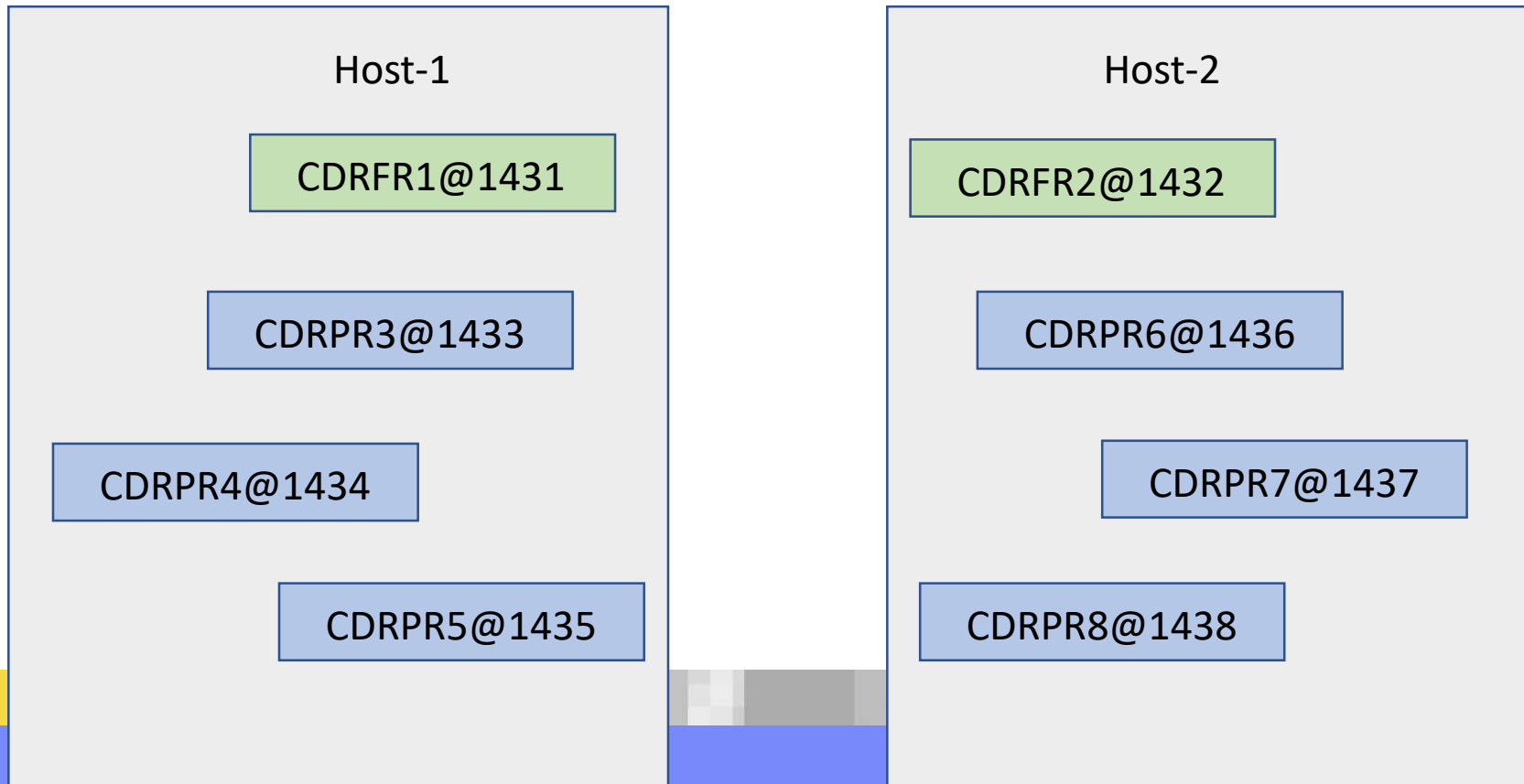
Solid line: automatically created



Simpler view of the topology

To simplify the view, let's hide the cluster channels for the infrastructure.

Only NEW channels will be shown later on.



PR 7 only has CS channels to the FRs

The PR number 7 (CDRPR7) will be used later on.

Currently, it has ONLY 2 cluster-sender channels, one to each of the FRs:

- TO.CDRFR2 was manually created when PR was added to cluster.
- TO.CDRFR1 was automatically created.

Both channels are shown in the tab “**Cluster-sender Channels**”, in the folder “Queue Manager Clusters” of the MQ Explorer (next page)



PR 7 only has CS channels to the FRs

- Queue Managers
 - CDRFR1
 - CDRFR2 on 'mosquito.raleigh.ibm.com'
 - CDRPR3
 - CDRPR4
 - CDRPR5
 - CDRPR6 on 'mosquito.raleigh.ibm.com'
 - CDRPR7 on 'mosquito.raleigh.ibm.com'
 - CDRPR8 on 'mosquito.raleigh.ibm.com'
 - QM75 on 'localhost(1475)'
 - QM903
 - QMPS
 - QMPS on 'mosquito.raleigh.ibm.com(1475)'
- Queue Manager Clusters
 - CLUSTERDR
 - Full Repositories
 - CDRFR1
 - CDRFR2
 - Partial Repositories
 - CDRPR3
 - CDRPR4
 - CDRPR5
 - CDRPR6
 - CDRPR7

Cluster Queues Cluster Topics Cluster-sender Channels Cluster-receiver Channels

Cluster-sender channels:

CDRFR1 - Full Repository

```

graph LR
    CDRPR7[CDRPR7] -- 1 --> CDRFR1[CDRFR1]
            
```

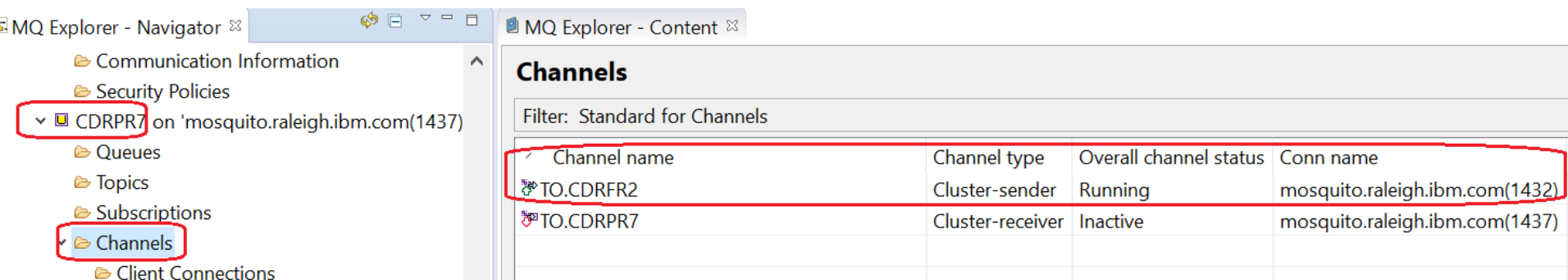
Channel name	Cluster queue manager	Queue manager type	Definition type
TO.CDRFR1	CDRFR1	Repository	Auto cluster-sender
TO.CDRFR2	CDRFR2	Repository	Auto explicit cluster-sender



PR 7 only has CS channels to the FRs

The MQ Explorer, under the **Channels folder** for the queue manager, shows **ONLY** the manually created channels.

The automatically created channels are **NOT** shown. In this case, **TO.CDRFR1** is **NOT** shown.



MQ Explorer - Navigator

- Communication Information
- Security Policies
- CDRPR7 on 'mosquito.raleigh.ibm.com(1437)'
 - Queues
 - Topics
 - Subscriptions
 - Channels
 - Client Connections

MQ Explorer - Content

Channels

Filter: Standard for Channels

Channel name	Channel type	Overall channel status	Conn name
TO.CDRFR2	Cluster-sender	Running	mosquito.raleigh.ibm.com(1432)
TO.CDRPR7	Cluster-receiver	Inactive	mosquito.raleigh.ibm.com(1437)

Notes: runmqsc shows manual channels

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To narrow the scope of the output list, the SYSTEM* channels were removed.

Notice that **only the 2 channels that were manually created are shown.**

The cluster-sender channels that are created automatically are NOT shown (for example, TO.CDRFR1 for FR1)

```
runmqsc CDRPR7
display channel(*)
```

```
1 : display channel(*)
```

```
AMQ8414I: Display Channel details.
```

```
CHANNEL(TO.CDRFR2)
```

```
CHLTYPE(CLUSSDR)
```

```
AMQ8414I: Display Channel details.
```

```
CHANNEL(TO.CDRPR7)
```

```
CHLTYPE(CLUSRCVR)
```

Notes: amqrfdm shows automatic channels

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The utility amqrfdm is used to view the cluster cache. (More details later on)
It is invoked by runmqras (when using “-section cluster”).

Issue the following to manually run the utility (include the flag -d):

```
amqrfdm -m CDRPR7 -d > amqrfdm_CDRPR7.stdout
```

The following entry is for the auto cluster sender channel to the other FR: CDRFR1
To keep listing brief, some lines were removed.

```
Qm(CDRFR1 ) Live Seq(1505574418)
Channel(TO.CDRFR1 ) Stopped ChlSeq(26) DestSeqFactor(0)
CLWLChannelRank(0) CLWLChannelPriority(0) CLWLChannelWeight(50)
XmitQ(SYSTEM.CLUSTER.TRANSMIT.QUEUE )
Conname('angelito.raleigh.ibm.com(1431)')
Desc( )
UUID(CDRFR1_2017-09-13_13.09.49 )
QMFlags(2272: Repos CLUSSDR Auto Joined InUse Refresh )
State: Flags(0) MsgId(414D51204344525052372020202020C400BD59A4AD4721)
Product: MQMM Version: 09000300
ChosenCount(8)
Cluster(CLUSTERDR ) Live Seq(1505574418)
Exp(Mon 16 Oct 2017 10:50:14 AM GMT) Raw(x59E48EE6)
Upd(Sat 16 Sep 2017 10:50:14 AM GMT) Raw(x59BD01E6)
QMFlags(2032: Repos CLUSSDR Auto Joined )
```

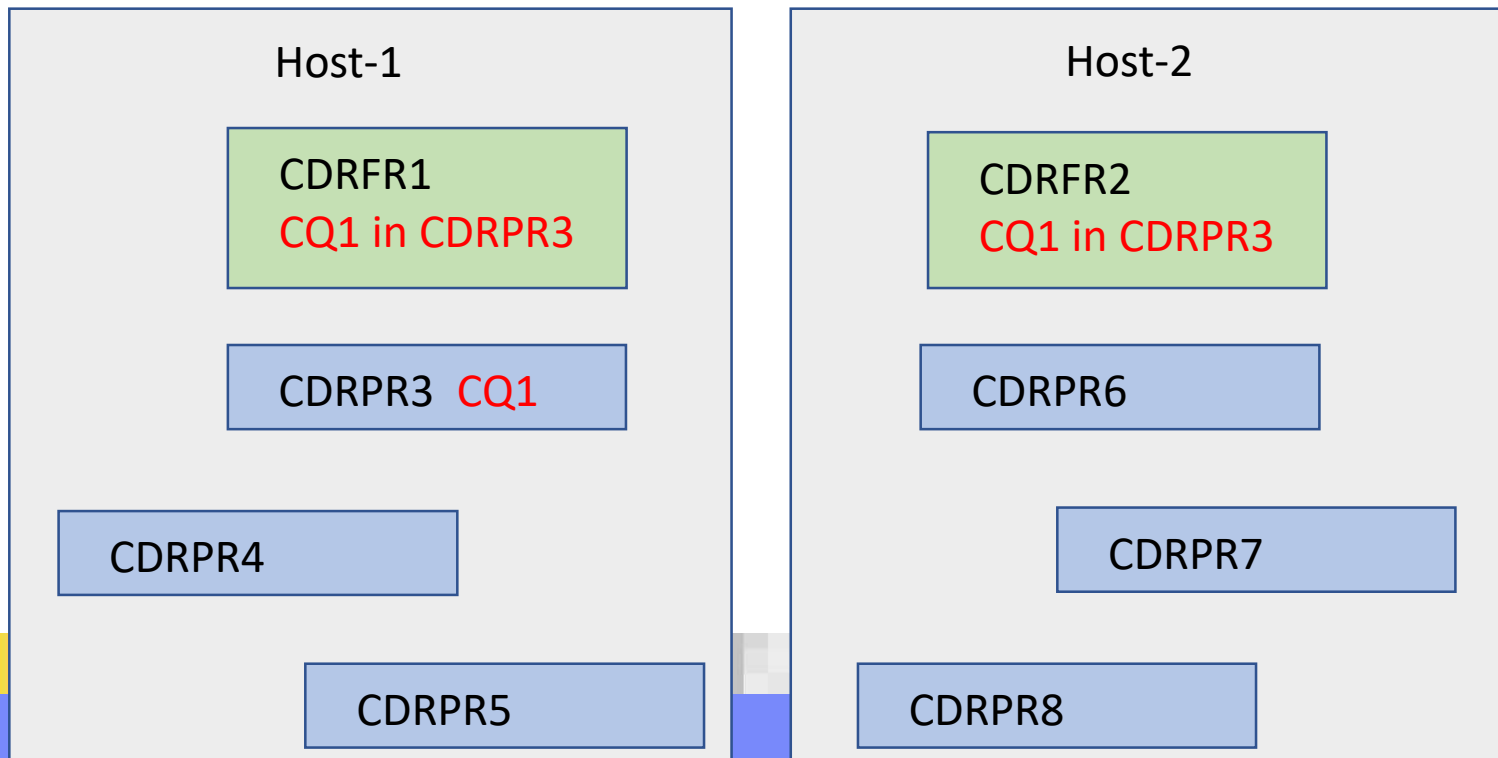
Adding a clustered QUEUE in PR 3

Let's add a local queue CQ1 in PR 3: CDRPR3

define qlocal(CQ1) cluster(CLUSTERDR)

It is made a **clustered queue**. The FRs know it.

But the other PRs DO NOT know about it yet.



FRs know the local CQ1 is in PR 3

- The FRs know that the local CQ1 for the clustered queue CQ1 is in PR 3 (CDRPR3)

The screenshot displays the IBM MQ Explorer interface. On the left, a tree view shows the hierarchy: Queues > Topics > Subscriptions > Channels > Client Connections > Channel Authentication Records > Telemetry > Listeners > Services > Process Definitions > Namelists > Authentication Information > Communication Information > Security Policies. Below this, several queue managers are listed, including CDRPR8 on 'mosquito.raleigh.ibm.com(1438)', QM75 on 'localhost(1475)', QM903, QMPS, and QMPS on 'mosquito.raleigh.ibm.com(1424)'. Under 'Queue Manager Clusters', 'CLUSTERDR' is expanded to show 'Full Repositories' with 'CDRFR1' and 'CDRFR2' listed. The 'CDRFR2' entry is highlighted with a red box.

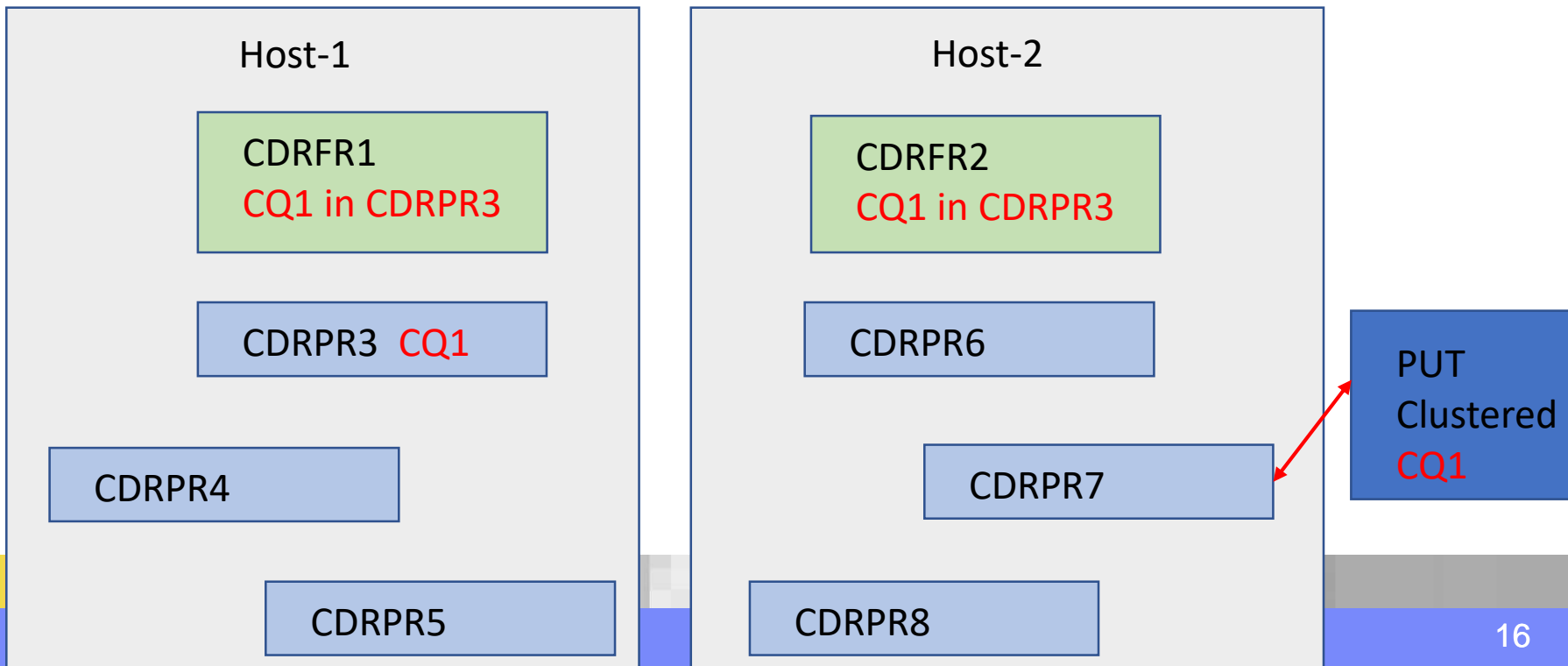
The main pane shows the 'Cluster Queues' tab. A table lists the configuration for queue CQ1:

Queue name	Queue type	End type	Cluster queue type	Cluster queue manager	QMID
CQ1	Cluster		Local queue	CDRPR3	CDRPR3_2017-09-13_13.14.19

The 'Cluster queue manager' column shows 'CDRPR3', which is the primary repository (PR 3) for the local queue CQ1. A '1 CDRFR2' icon is visible in the top right corner of the main pane.

Put done to clustered queue in another PR

A PUT application connects to PR 7 (CDRPR7) and wants to put a message into Clustered Queue CQ1



Put done to clustered queue in another PR

Initially CDRPR7 does not know about CQ1

Nor in the list of Local queues

IBM MQ

- Queue Managers
 - CDRFR1
 - CDRFR2 on 'mosquito.raleigh.ibm.c
 - CDRPR3
 - CDRPR4
 - CDRPR5
 - CDRPR6 on 'mosquito.raleigh.ibm.c
 - CDRPR7 on 'mosquito.raleigh.ibm.c**
 - Queues**

Queues		
Filter: Standard for Queues		
Queue name	Queue type	Cu
Q1	Local	0
QS2	Local	3

Nor in the list of Cluster Queues

Queue Manager Clusters

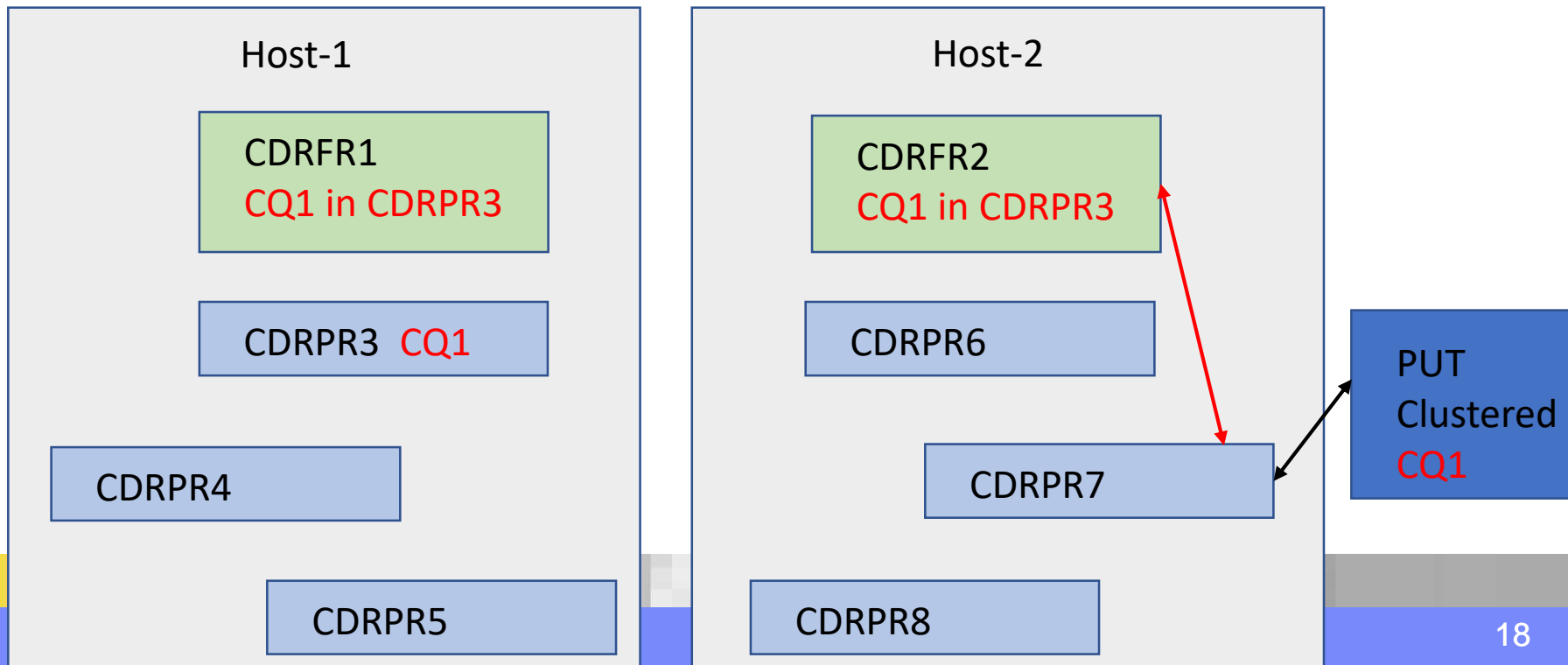
- CLUSTERDR
 - Full Repositories
 - CDRFR1
 - CDRFR2
 - Partial Repositories
 - CDRPR3
 - CDRPR4
 - CDRPR5
 - CDRPR6
 - CDRPR7**
 - CDRPR8

Cluster Queues		
Queue name	Queue type	Descr



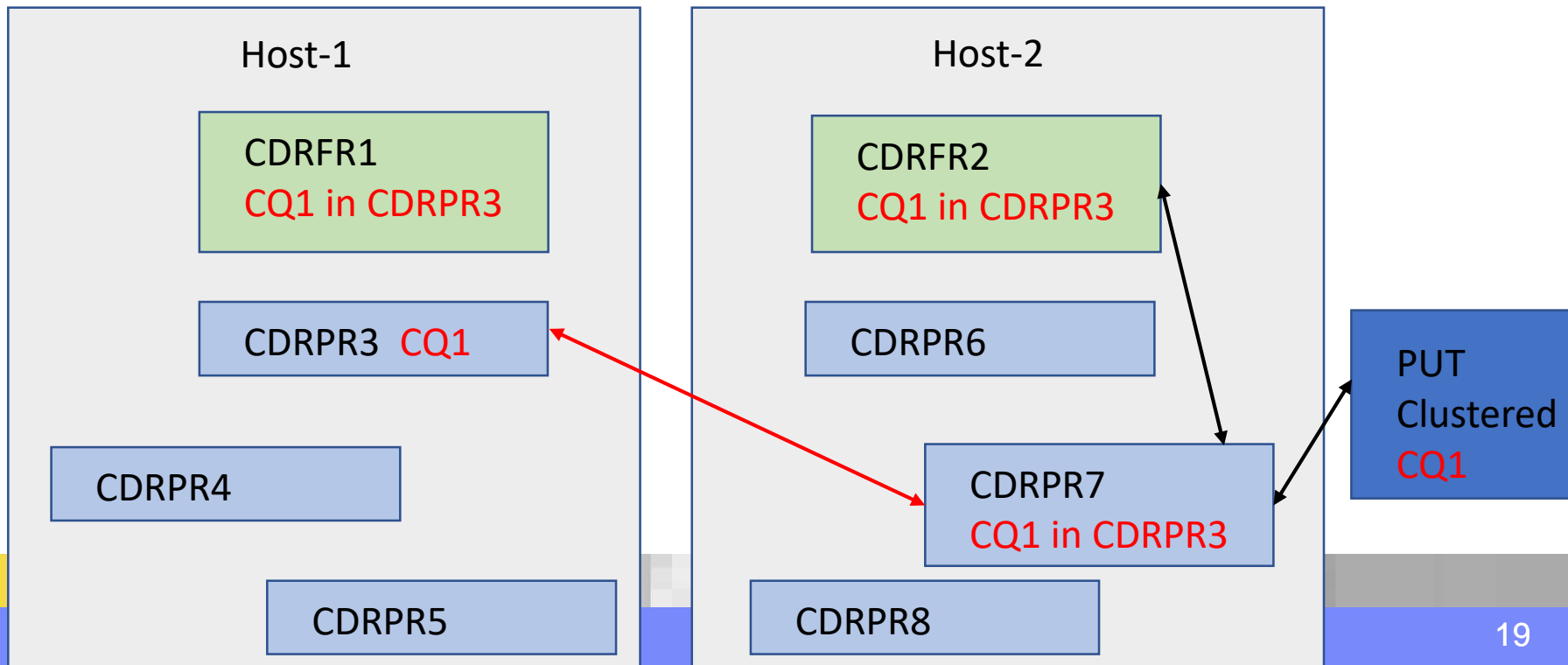
Adding a clustered queue in a PR

CDRPR7 asks a FR if there is a clustered queue CQ1 and if so, asks where the local copy is located



Adding a clustered queue in a PR

The FR indicates that local CQ1 is in CDRPR3.
The clustering code **creates automatically a cluster sender channel** from CDRPR7 to CDRPR3.



PR 7 has now a channel to PR 3

PR 7 now knows that the clustered CQ1 points to the local queue CQ1 in PR 3.

The screenshot displays the IBM MQ console interface. On the left, a tree view shows the hierarchy of objects, with 'CDRPR7' highlighted under 'Queue Manager Clusters'. The main pane shows the 'Cluster Queues' tab, which contains a table of queue configurations. The table has five columns: 'Queue name', 'Queue type', 'Cluster queue type', 'Cluster queue manager', and 'QMID'. The row for 'CQ1' is highlighted, showing it is a 'Cluster' type queue with a 'Local queue' as its 'Cluster queue type', managed by 'CDRPR3', and with a 'QMID' of 'CDRPR3_2017-09-13_13.14.19'. A red box highlights the 'Cluster Queues' tab, and another red box highlights the 'CQ1' row in the table. A third red box highlights the 'CDRPR7' object in the left tree view.

Queue name	Queue type	Cluster queue type	Cluster queue manager	QMID
CQ1	Cluster	Local queue	CDRPR3	CDRPR3_2017-09-13_13.14.19

PR 7 has now a channel to PR 3

The “auto cluster-sender” channel TO.CDRPR3 was added to PR 7 to connect it to PR 3, in order to send a message to the queue CQ1.

Cluster Queues Cluster Topics **Cluster-sender Channels** Cluster-receiver Channels

Cluster-sender channels:

CDRFR1 - Full Repository

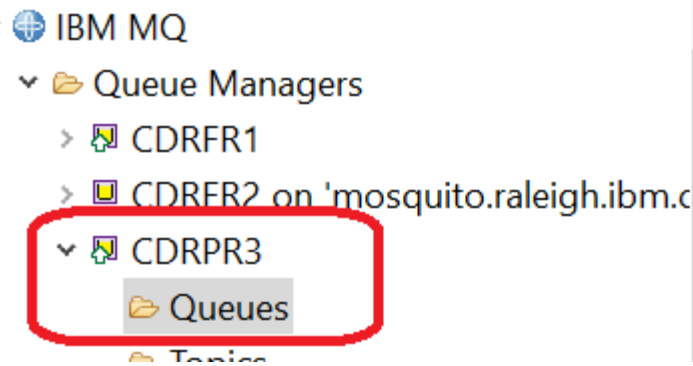
CDRPR7 → 1 CDRFR1

Channel name	Cluster queue manager	Queue manager type	Definition type	Xi
TO.CDRFR1	CDRFR1	Repository	Auto cluster-sender	TC
TO.CDRFR2	CDRFR2	Repository	Auto explicit cluster-sender	TC
TO.CDRPR3	CDRPR3	Normal	Auto cluster-sender	TC

PR 7 has now a channel to PR 3

The message that was placed in PR 7 was transmitted to PR 3 and stored in the local queue CQ1.

The number of messages in that queue went from 0 to 1

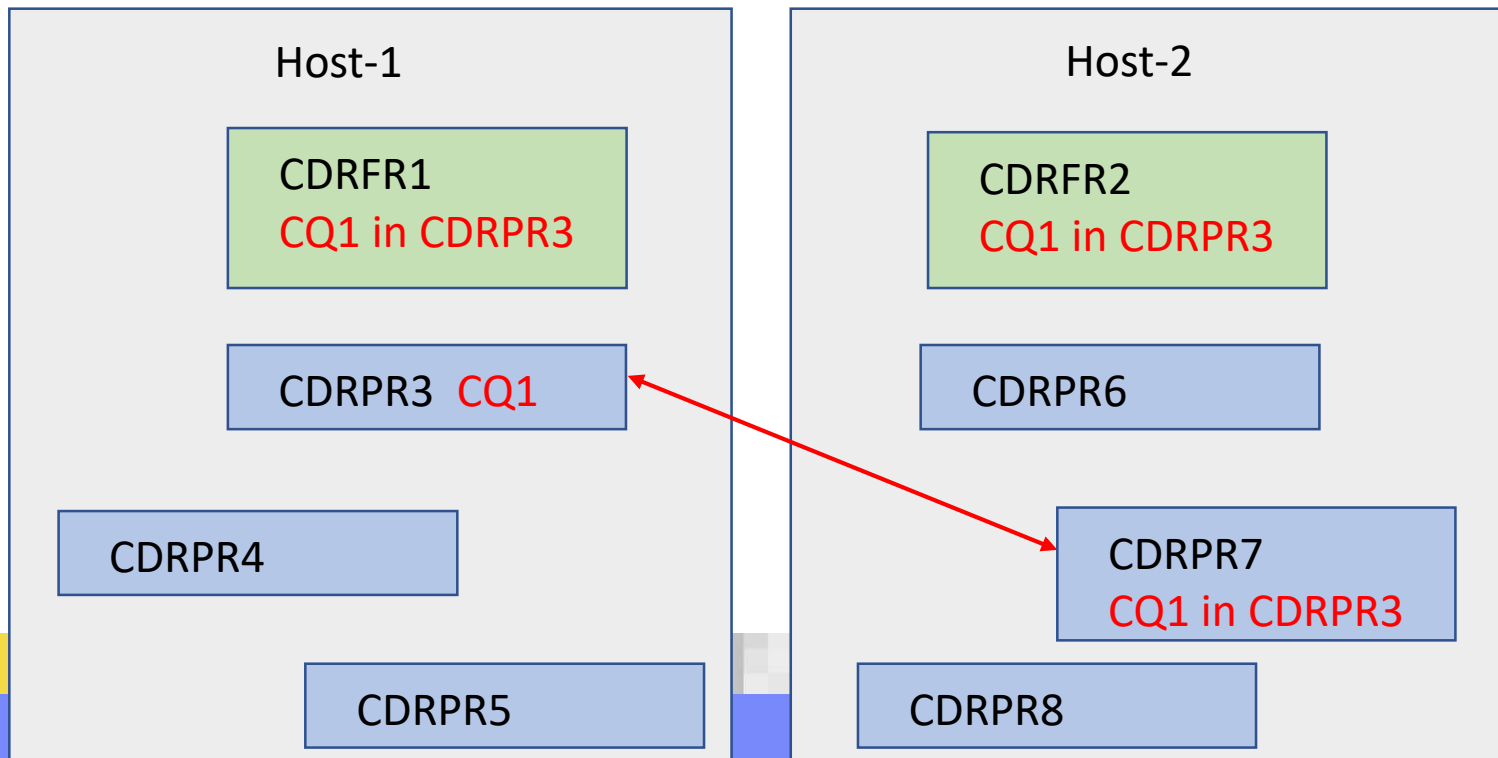


A screenshot of the IBM MQ console showing a table of Queues. The table is titled 'Queues' and has a filter set to 'Standard for Queues'. The table has four columns: 'Queue name', 'Queue type', 'Current queue depth', and an unlabeled column. The row for 'CQ1' is highlighted with a red rectangle, showing a current queue depth of 1. The row for 'Q1' shows a current queue depth of 0.

Queue name	Queue type	Current queue depth	
CQ1	Local	1	0
Q1	Local	0	0

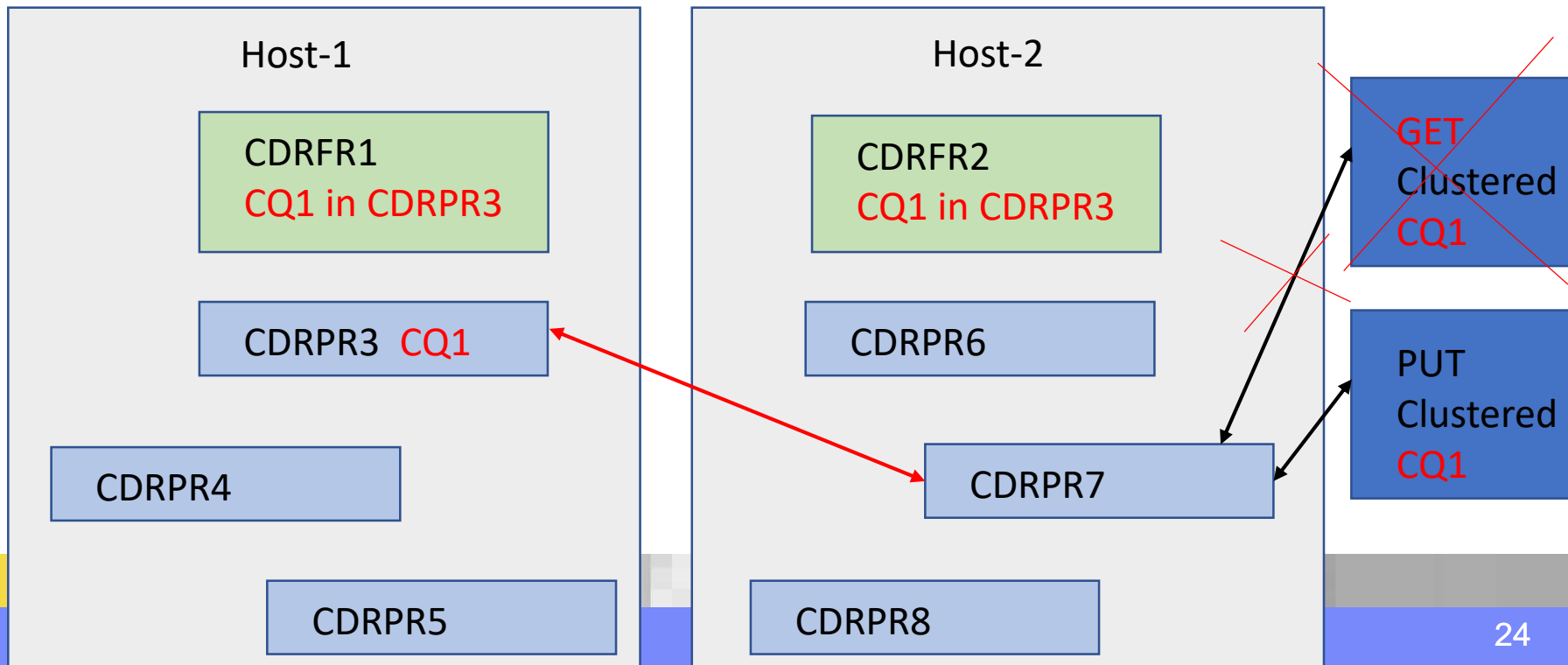
Queues, ONLY needed channel is created

- At this point ONLY the cluster sender from PR 7 to PR 3 was added automatically.
- No additional channels were created.



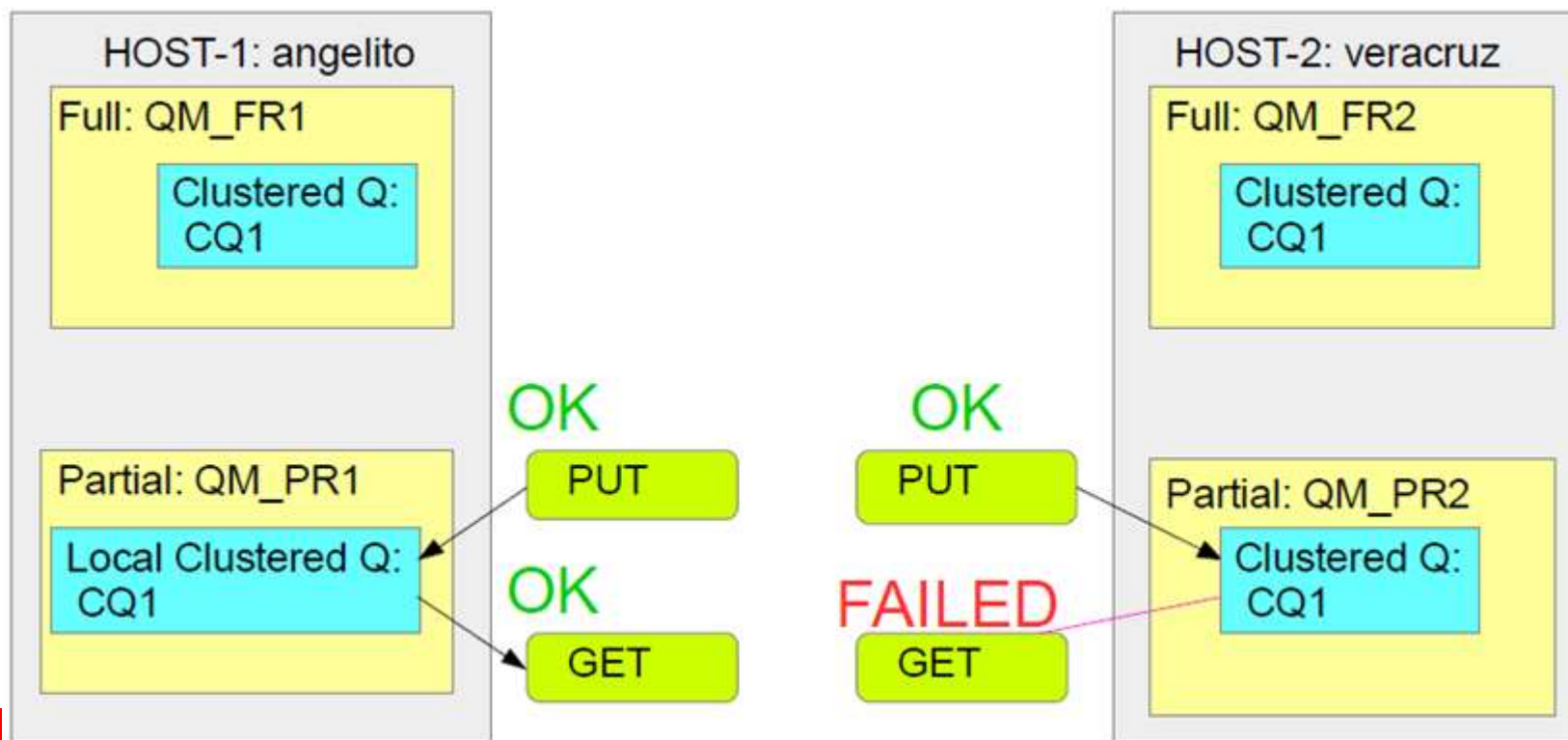
Extra: MQGET cannot be done indirectly

The PUT application for CQ1 is in CDRPR7.
Could we have a GET application for CQ1 also in CDRPR7?
ANSWER: NO!!



Extra: MQGET must be done directly local Q

The tutorial for setup of a cluster shows in page 44:
MQ GETs are OK only when using the local Q.



MQ cluster utility: amqrfdm to view cache

The MQ utility “**amqrfdm**” can be used to view the cluster cache for a queue manager.

Used by “runmqras” with “**-section cluster**”.

You can also run it manually (must specify **-d**).

Unix example: For the Partial Repository CDRPR7

```
amqrfdm -m CDRPR7 -d > amqrfdm_CDRPR7.txt
```

Windows example: For the Full Repository CDRFR1

```
"C:\Program Files\IBM\MQ\bin64\amqrfdm.exe" -m CDRFR1  
-d > "C:\temp\amqrfdm_CDRFR1.txt"
```



Notes: Viewing the cluster cache, FR

notes

* Windows example: For the Full Repository CDRFR1

"C:\Program Files\IBM\MQ\bin64\amqrfdm.exe" -m CDRFR1 -d > "C:\temp\amqrfdm_CDRFR1.txt"

Example for clustered queue CQ1:

It shows 2 entries:

The 1st is for the "clustered Queue" itself.

The 2nd, for the corresponding "local" queue, which is in CDRPR3.

```

Q(CQ1                                     ) Live      Seq(0)
  Offset: @11510
  ptr(880D2E90)
  Cluster (CLUSTERDR                       )
  UUID (CDRPR3 2017-09-13 13.14.19         )
  SubID(15E      7C3C49B9)
  Exp(10/13/2017 6:43:13 PM) Raw(x59E10941)
  Upd(9/13/2017 6:43:13 PM) Raw(x59B97C41)
  Flags(No Ack ClusQ )

QLOCAL (CQ1                               ) 3 Live      Seq(1505322879)
  Offset: @113A0   Clusters: @11290
  ptr(880D2D20) clus(880D2C10)
  QDesc (
  UUID (CDRPR3 2017-09-13 13.14.19         )
  DefBind(0) DefPersistence(0) DefPriority(0) DefPutResponse(1) InhibitPut(0)
  CLWLQueuePriority(0) CLWLQueueRank(0)
  Cluster (CLUSTERDR                       ) Live      Seq(1505322879)

```

Notes: Viewing the cluster cache, PR 7

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Unix example: For the Partial Repository CDRPR7
amqrfdm -m CDRPR7 -d > amqrfdm_CDRPR7.txt

There are 2 highlights:

This PR knows that CQ1 is a clustered queue in PR 3, and knows the cluster sender channel to use.

1) The clustered queue CQ1 has a local in CDRPR3

```
QLOCAL (CQ1                                     )
  QDesc (                                           )
  UUID(CDRPR3_2017-09-13_13.14.19                )
```

2) To connect to CDRPR3 it is necessary to use the channel: TO.CDRPR3

```
Qm (CDRPR3                                     ) Live      Seq(1505574920)
Channel (TO.CDRPR3                             ) Running    ChlSeq(11) DestSeqFactor(0)
  CLWLChannelRank(0) CLWLChannelPriority(0) CLWLChannelWeight(50)
XmitQ (SYSTEM.CLUSTER.TRANSMIT.QUEUE          )
Conname ('angelito.raleigh.ibm.com(1433)')
  Desc(                                           )
  UUID(CDRPR3_2017-09-13_13.14.19                )
  QMFlags(270: CLUSSDR Auto Joined InUse Refresh )
  Product: MQMM      Version: 09000300
  Cluster(CLUSTERDR                                     ) Live      Seq(1505574920)
QMFlags (30: CLUSSDR Auto Joined )
```

Now let's add a clustered topic

Let's define a **clustered topic object in PR 4** and a **subscriber in PR 7**

Notice that at this point, there are no cluster channels between these 2 PRs.

A cluster sender channel will be added automatically between these 2 PRs...

but (spoiler alert!) a side effect is that: similar channels will be added between ALL the PRs!

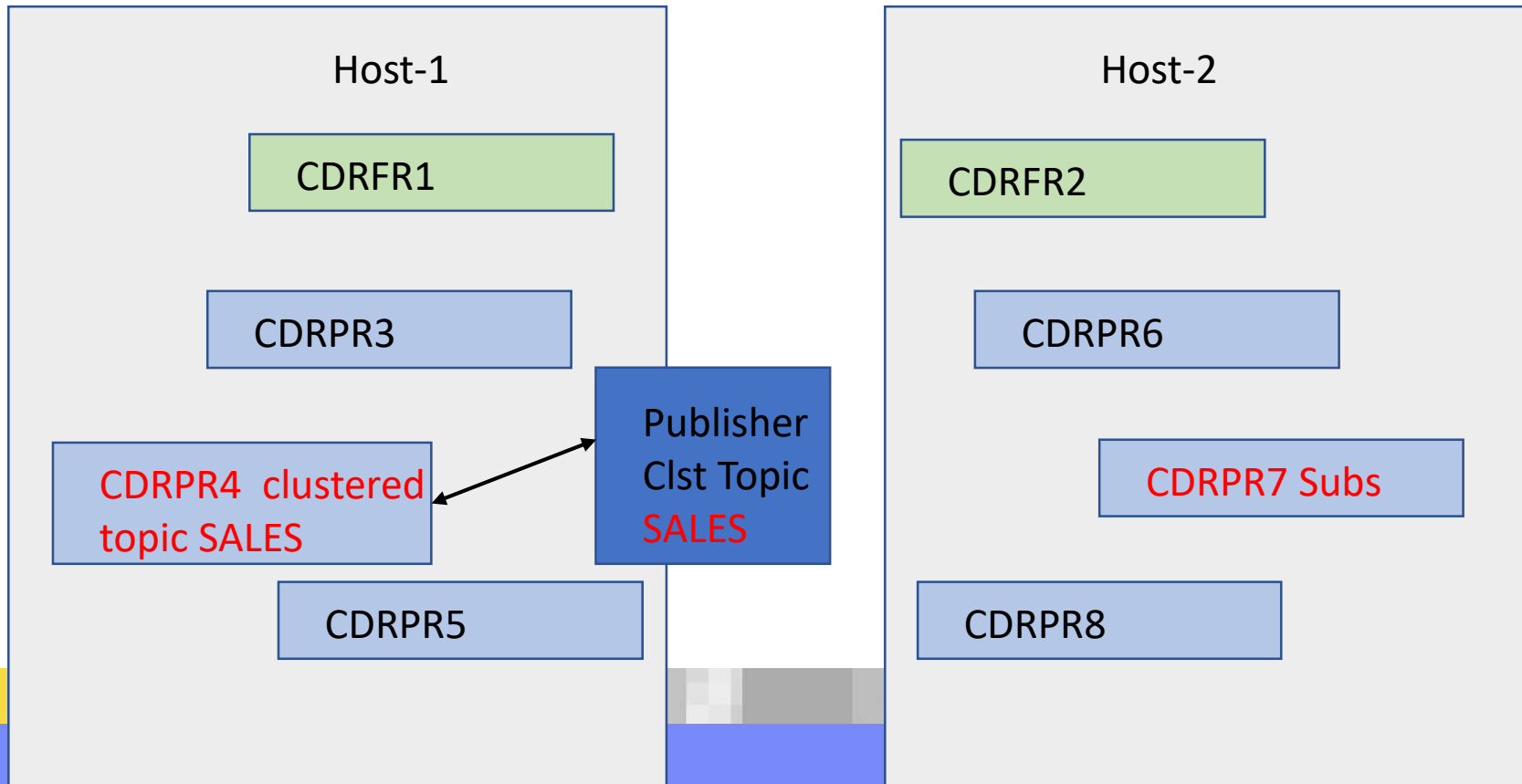


Pub Topic in PR 4 and subscriber in PR 7

PR 4 will have a Clustered Topic and a Publisher

PR 7 will have a Subscriber

At this point, there is NO channel between them.



Now let's add a clustered topic

Adding a clustered topic in PR 4:

DEFINE TOPIC(SALES) TOPICSTR('sales') CLUSTER(CLUSTERDR)

Notice default: CLROUTE(DIRECT) => direct routing cluster

display topic(SALES)

```
1 : display topic(SALES)
```

```
AMQ8633I: Display topic details.
```

TOPIC (SALES)

TOPICSTR (sales)

CLUSTER (CLUSTERDR)

```
DURSUB (ASPARENT)
```

```
SUB (ASPARENT)
```

```
DEFPRTY (ASPARENT)
```

```
ALTDATE (2017-09-16)
```

```
PMSGDLV (ASPARENT)
```

```
PUBSCOPE (ASPARENT)
```

```
PROXYSUB (FIRSTUSE)
```

```
MDURMDL ( )
```

```
MCAST (ASPARENT)
```

```
USEDLQ (ASPARENT)
```

```
TYPE (LOCAL)
```

```
DESCR ( )
```

CLROUTE (DIRECT)

```
PUB (ASPARENT)
```

```
DEFPERSIST (ASPARENT)
```

```
DEFPRESP (ASPARENT)
```

```
ALTTIME (15.18.33)
```

```
NPMSGDLV (ASPARENT)
```

```
SUBSCOPE (ASPARENT)
```

```
WILDCARD (PASSTHRU)
```

```
MNDURMDL ( )
```

```
COMMINFO ( )
```

```
CUSTOM ( )
```

Both FRs know about clustered topic

Now both FRs know that there is a clustered topic called SALES in CDRPR4

The screenshot displays the IBM MQ console interface. On the left, a tree view shows the hierarchy of objects, with 'Full Repositories' and 'CDRFR1' highlighted. The main window shows the 'Repository data for queue manager CDRFR1' page. The 'Cluster Topics' tab is selected and circled in red. Below the tab, a table lists the repository data for the 'SALES' topic. The table has the following columns: Topic name, Topic type, Topic string, Cluster name, Cluster queue manager, QMID, and Cluster route. The row for 'SALES' is circled in red.

Topic name	Topic type	Topic string	Cluster name	Cluster queue manager	QMID	Cluster route
SALES	Cluster	sales	CLUSTERDR	CDRPR4	CDRPR4_2017-09-13_13.15.47	Direct

Pubs and Subs can be done from any PR

One feature of distributed Pub/Sub is that you can use Publishers in one or more PRs, and you can use Subscribers in one or more PRs

In a **“direct route cluster”**, the knowledge about a clustered topic needs to be broadcasted to all PRs.

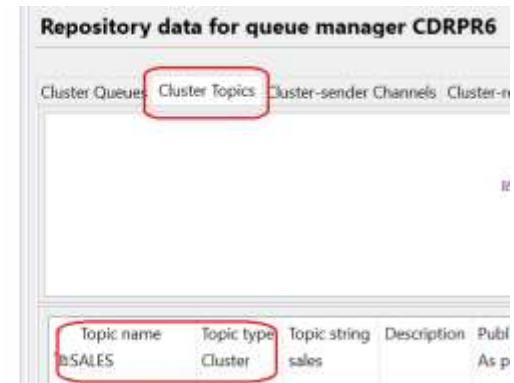
In order to provide a minimal direct route between the PRs, **cluster sender channels will be created between all the PRs.**



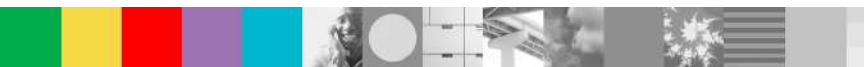
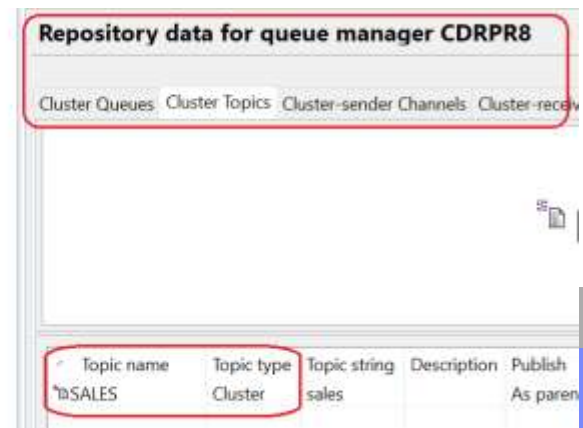
All PRs know about the Clustered Topic

All the PRs receive notification about the Clustered Topic SALES:

View of CDRPR6



View of CDRPR8



Notes: amqrfdm shows clustered topic

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Partial view of the cluster cache for PR 6.

This PR is not going to be used in the scenario, but for that reason it is chosen for this example.

Notice that even though there are no plans to use the clustered topic SALES in this PR, this clustered topic is now included in the cluster cache for this PR.

Why? Because in the future a Publisher or a Subscriber could run in this PR.

** Clustered Topic Object: refers to PR 4

```

TOPIC(SALES                               ) 2 Live   Seq(1505575405)
UUID(CDRPR4_2017-09-13_13.15.47           )
DefPersistence(-1) DefPriority(-2) DefPutResponse(0) InhibitPub(0) InhibitSub(0)
DurableSubs(0) NonPersMsgDiv(0) PersMsgDiv(0) PubScope(1) SubScope(1)
ProxySub(2) Wildcard(2) Routing(0)
Cluster(CLUSTERDR                         ) Live   Seq(1505575405)

```

** Topic String for the topic object

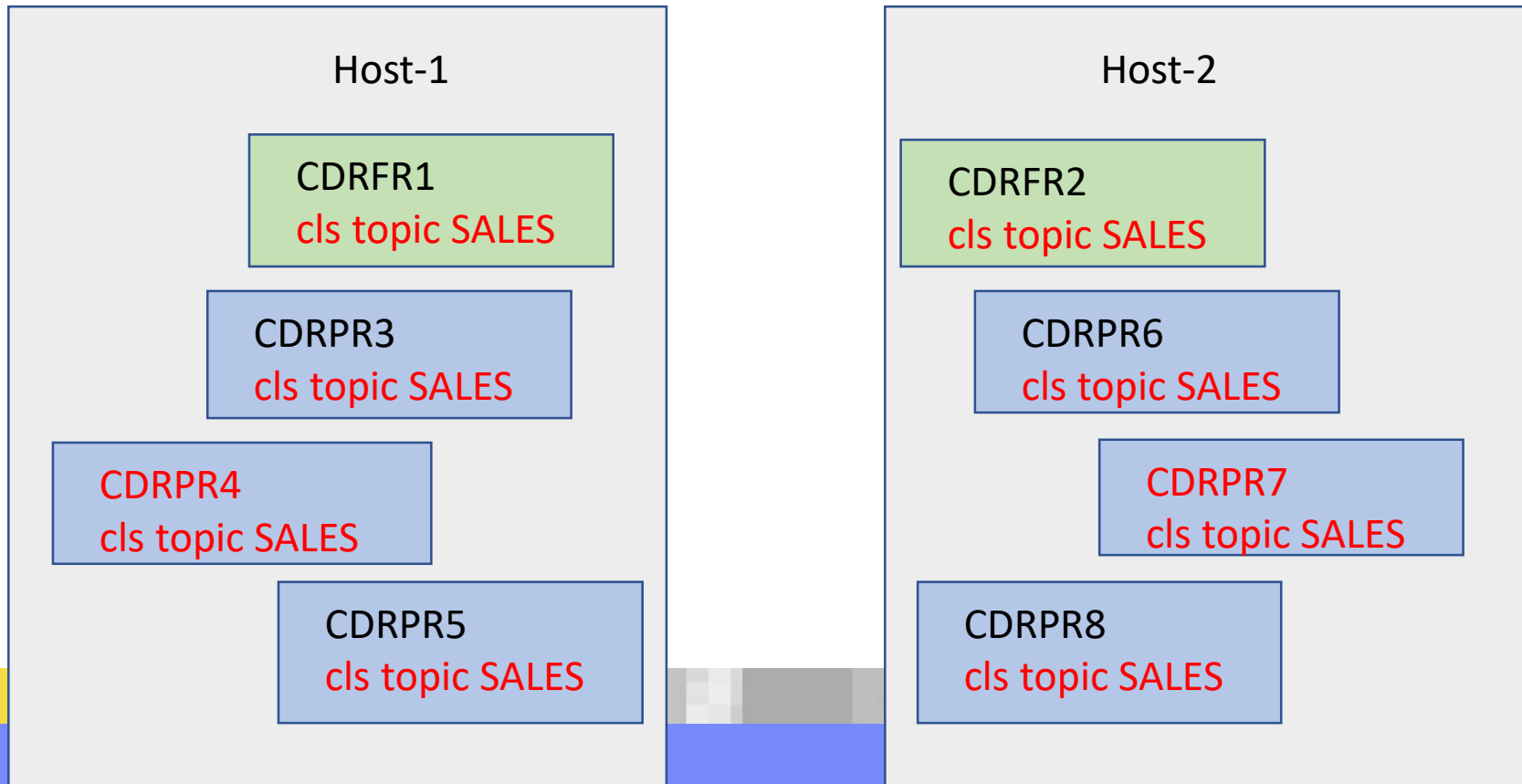
```

TOPSTR Topic(SALES                         )
UUID(CDRPR4_2017-09-13_13.15.47           )
Str('sales')

```

All PRs know about the clustered topic

At this point, all the queue managers know the existence of the clustered topic SALES.



Cluster channels are created for ALL PRs !

In addition, **auto cluster channels are created for all the PRs!!** The following shows CDRPR4

Repository data for queue manager CDRPR4

Cluster Queues Cluster Topics **Cluster-sender Channels** Cluster-receiver Channels

Cluster-sender channels:

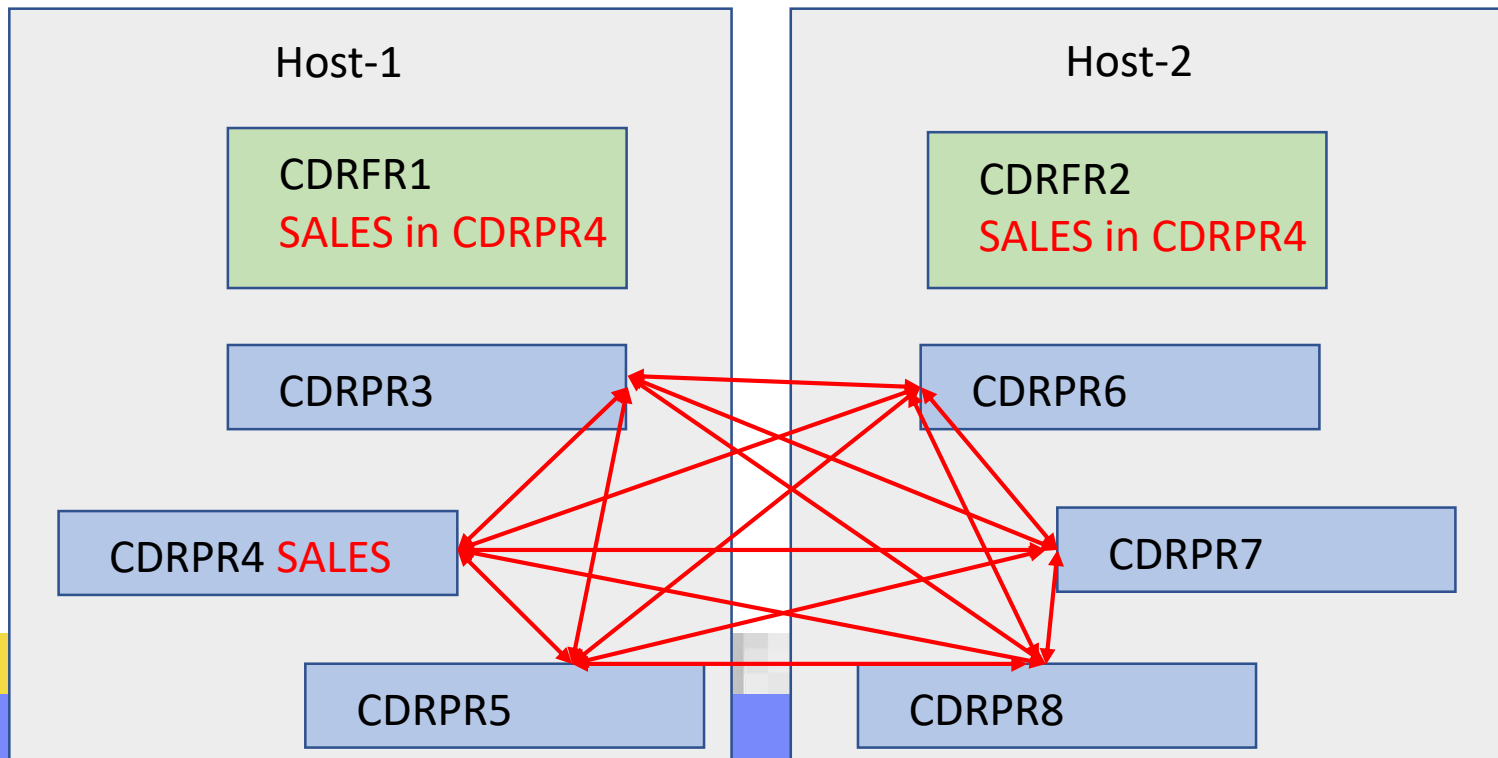
CDRFR1 - Full Repository

CDRPR4 → 1 CDRFR

Channel name	Cluster queue manager	Queue manager type	Definition type
TO.CDRFR1	CDRFR1	Repository	Auto explicit cluster-sender
TO.CDRFR2	CDRFR2	Repository	Auto cluster-sender
TO.CDRPR3	CDRPR3	Normal	Auto cluster-sender
TO.CDRPR5	CDRPR5	Normal	Auto cluster-sender
TO.CDRPR6	CDRPR6	Normal	Auto cluster-sender
TO.CDRPR7	CDRPR7	Normal	Auto cluster-sender
TO.CDRPR8	CDRPR8	Normal	Auto cluster-sender

Connections between all PRs

- There is now connection between all PRs.
- It is called “**direct routing cluster**” because there is a **direct route** between all the queue managers.
- To go from PR 4 to PR 7, no need to go thru PR 3.



Notes: amqrfdm shows auto cluster-senders

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Partial view of the cluster cache for PR 7, showing 2 cluster-senders.

This channel is expected between PR 7 and PR 4 (which has the clustered topic)

```
Qm(CDRPR4                ) Live  Seq(1505575405)
Channel(TO.CDRPR4        ) Stopped  ChlSeq(15) DestSeqFactor(0)
CLWLChannelRank(0) CLWLChannelPriority(0) CLWLChannelWeight(50)
XmitQ(SYSTEM.CLUSTER.TRANSMIT.QUEUE        )
Conname('angelito.raleigh.ibm.com(1434)')
Desc(                )
UUID(CDRPR4_2017-09-13_13.15.47        )
QMFlags(270: CLUSSDR Auto Joined InUse Refresh )
```

But notice that other auto cluster-sender channels to other PRs are also created, such as to PR6

```
Qm(CDRPR6                ) Live  Seq(1505558079)
Channel(TO.CDRPR6        ) Inactive  ChlSeq(18) DestSeqFactor(0)
CLWLChannelRank(0) CLWLChannelPriority(0) CLWLChannelWeight(50)
XmitQ(SYSTEM.CLUSTER.TRANSMIT.QUEUE        )
Conname('mosquito.raleigh.ibm.com(1436)')
Desc(                )
UUID(CDRPR6_2017-09-13_07.39.27        )
QMFlags(270: CLUSSDR Auto Joined InUse Refresh )
```

Create subscriber in PR 7

Let's create a subscriber SUBSALES in PR 7, which uses a provided queue.

```
DEFINE QLOCAL(QS2)
```

```
DEFINE SUB('SUBSALES2') TOPICSTR('sales') +  
DESTCLAS(PROVIDED) DEST(QS2)
```



Create subscriber in PR 7

View in MQ Explorer of ALL the Subscribers for PR7.
Note: You must enable the option to see all SYSTEM objects!

MQ Explorer - Navigator

- IBM MQ
 - Queue Managers
 - CDRFR1
 - CDRFR2 on 'mosquito.raleigh.ibm.com'
 - CDRPR3
 - CDRPR4
 - CDRPR5
 - CDRPR6 on 'mosquito.raleigh.ibm.com'
 - CDRPR7 on 'mosquito.raleigh.ibm.com'
 - Queues
 - Topics
 - Subscriptions

MQ Explorer - Content

Subscriptions

Filter: Standard for Subscriptions

Subscription name	Topic name	Topic string	Destination class	Durable	Destination name	Type
CDRPR7 SYSTEM.BROKER.INTER.BR...	SYSTEM.B...	SYSTEM.BR...	Provided	Yes	SYSTEM.BROKER.INTER.B...	API
SUBSALES2		sales	Provided	Yes	QS2	Admin
SYSTEM.DEFAULT.SUB			Provided	Yes		Admin

Publish in PR 4

We will publish in PR 4 and we expect the subscriber in PR 7 to receive a message.

```
C:\> amqspub sales CDRPR4
```

```
Sample AMQSPUBA start
```

```
target topic is sales
```

```
TEST-PUB
```

```
Sample AMQSPUBA end
```

Question: How does PR 4 know that it needs to send a message to a subscriber SUBSALES2 in PR 7?



Proxy Subscribers

When a subscriber is created for a clustered topic, each queue manager will broadcast to the other queue managers an entity called:

a proxy subscriber

This Proxy Subscriber will specify:

Topic String: sales

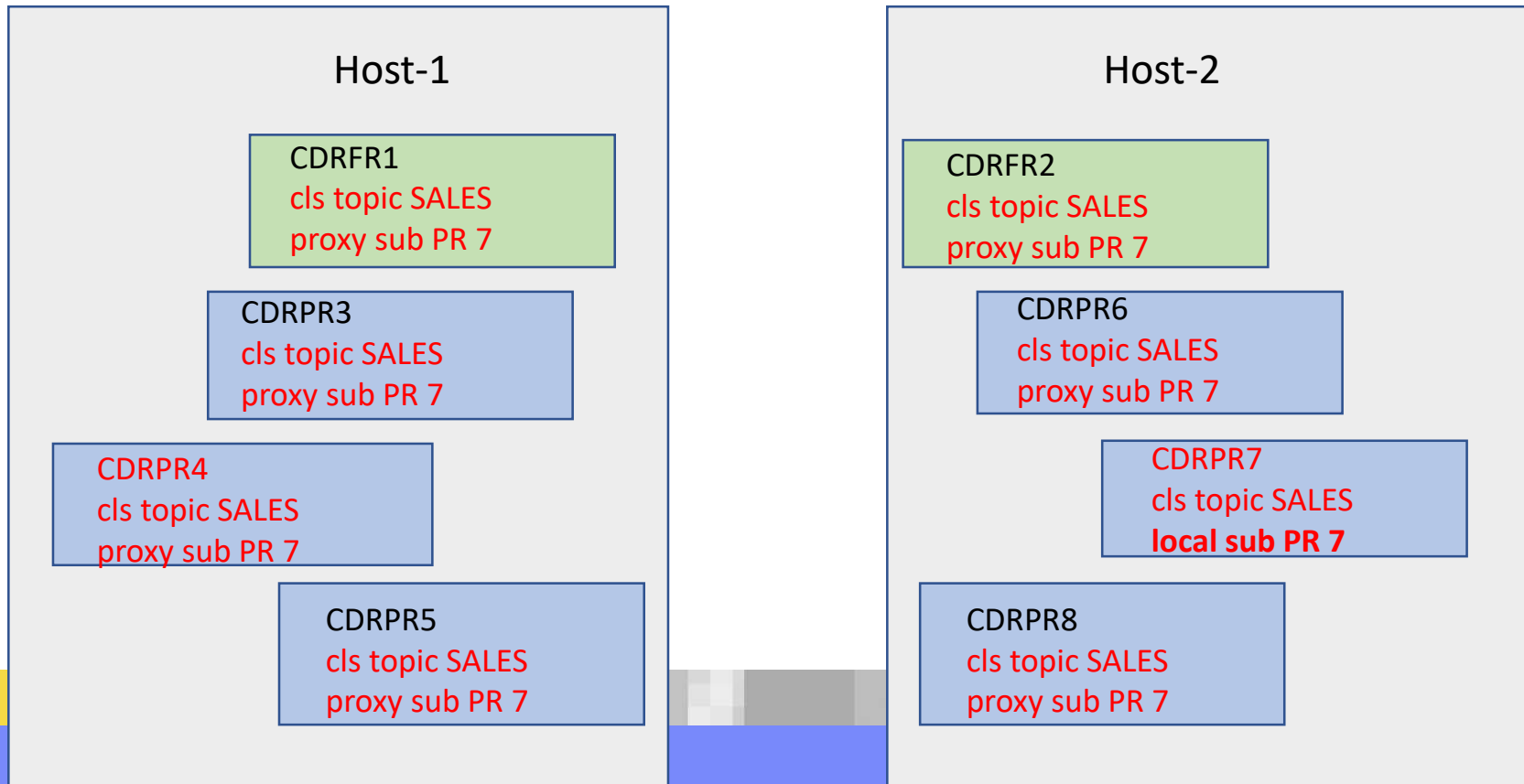
Destination queue manager: CDRPR7

Cluster Name: CLUSTERDR



All PRs know about the Proxy Subscriber

At this point, all the queue managers know the existence of the proxy subscriber in PR 7 (in addition to the clustered topic SALES)



Proxy subscriber in PR 4 pointing to PR 7

Note: Enable to see the SYSTEM objects 

Name: **SYSTEM.PROXY.CDRPR7 CLUSTERDR sales**

Topic String: sales

Destination name: SYSTEM.INTER.QMGR.PUBS

Destination queue manager: CDRPR7

Type: Proxy

IBM MQ

- Queue Managers
 - CDRFR1
 - CDRFR2 on 'mosquito.raleigh.ibm.com'
 - CDRPR3
 - CDRPR4**
 - Queues
 - Topics
 - Subscriptions**
 - Channels

Subscriptions

Filter: Standard for Subscriptions

Subscription name	Topic name	Topic string
CDRPR4 SYSTEM.BROKER.INTER.BROKER.CO...	SYSTEM.B...	SYSTEM.BR...
SYSTEM.DEFAULT.SUB		
SYSTEM.PROXY.CDRPR7 CLUSTERDR sales		sales

Composite view
(right columns) →

Subscriptions

Filter: Standard for Subscriptions

Destination name	Destination queue manager	Type
SYSTEM.BROKER.INTER.BR...	CDRPR4	API
		Admin
SYSTEM.INTER.QMGR.PUBS	CDRPR7	Proxy

Subscriber in PR 7 receives

Because of Proxy Subscriber, the published message is routed to PR 7, using the auto cluster sender channel between PR 4 and PR 7.

Message is received by subscriber in PR 7 (stored in provided queue QS2)

- > CDRFR1
- > CDRFR2 on 'mosquito.raleigh.ibm.com'
- > CDRPR3
- > CDRPR4
- > CDRPR5
- > CDRPR6 on 'mosquito.raleigh.ibm.com'
- ▼ CDRPR7 on 'mosquito.raleigh.ibm.com'
 - Queues
 - Topics

Filter: Standard for Queues

Queue name	Queue type	Current queue depth
Q1	Local	0
QS2	Local	1

Notes: message received in Subs in PR 7

n
o
t
e
s

Confirming receipt in PR 7 of the published message in PR 4 (notice that ReplyToQMgr indicates the queue manager of origin, in this case CDRPR4).

mqm@mosquito: /home/mqm

\$ **amqsbcg QS2 CDRPR7**

AMQSBCG0 - starts here

MQOPEN - 'QS2'

MQGET of message number 1, CompCode:0 Reason:0

****Message descriptor****

StrucId : 'MD ' Version : 2

Report : 0 MsgType : 8

Expiry : -1 Feedback : 0

Format : 'MQSTR '

Priority : 0 Persistence : 0

MsgId : X'414D51204344525052372020202020C400BD599BBC4721'

CorrelId : X'414D51204344525052372020202020C400BD59B1104821'

ReplyToQ : '

ReplyToQMgr : 'CDRPR4

**** Message ****

length - 8 of 8 bytes

00000000: 5445 5354 2D50 5542

TEST-PUB

Channel active between PR 4 and PR 7

Notice that the channel between PR 4 and PR 7 became automatically active:

The screenshot displays the IBM MQ console interface. On the left, a tree view shows the hierarchy of objects, with 'CDRPR4' under 'Queue Manager Clusters' highlighted. The main window shows the 'Cluster-sender Channels' configuration for 'CDRFR1 - Full Repository'. A diagram illustrates the connection between CDRPR4 and CDRFR1. Below the diagram, a table lists the channels:

Channel name	Cluster queue manager	Queue manager type	Definition type	Xmit protocol	Channel status
TO.CDRFR1	CDRFR1	Repository	Auto explicit cluster-sender	TCP	Running
TO.CDRFR2	CDRFR2	Repository	Auto cluster-sender	TCP	Running
TO.CDRPR3	CDRPR3	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR5	CDRPR5	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR6	CDRPR6	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR7	CDRPR7	Normal	Auto cluster-sender	TCP	Running
TO.CDRPR8	CDRPR8	Normal	Auto cluster-sender	TCP	Inactive

Topic status has indicators for proxy subs

The “Topic Status” view has indirect indicators of proxy subs.

For example, PR 6 does not have local Topic objects nor subscribers. But it knows about topic ‘sales’ and that there is a Subscriber (the one in PR 7).

Filter: Standard for topics

CDRPR6 - Topic Status

Queue Manager: CDRPR6

Topic status:

Topic string	Admin topic name	Sub count	Pul
> [Empty]	SYSTEM.BASE.TOPIC	0	0
> \$SYS		0	0
sales	SALES	1	0
> SYSTEM.BROKER.ADMIN.STREAM	SYSTEM.BROKER.ADMIN.STREAM	0	0

One more test

Let's use a pair of PRs that have not been used yet.

PR 5 will have a Publisher on the existing clustered topic SALES

PR 8 will have a **non durable subscriber** (MQ Explorer, by using Test Subscription)

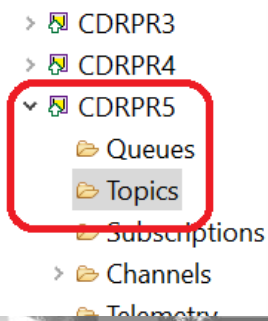
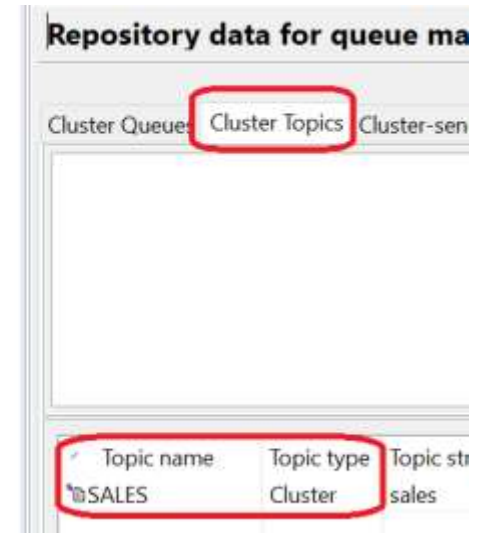


Baseline for PR 5

PR 5 knows about:

clustered topic SALES

Topic Status shows that there is a Sub for SALES



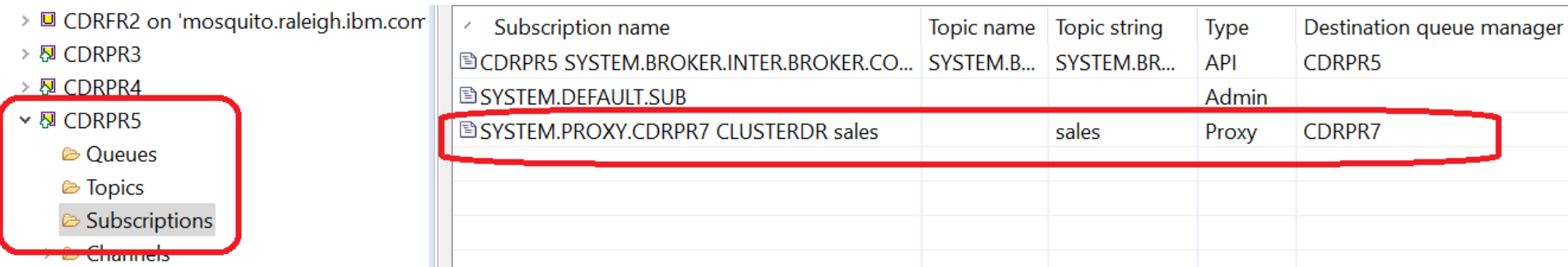
Topic status:

Topic string	Admin topic name	Sub count	Pr
> [Empty]	SYSTEM.BASE.TOPIC	0	0
> \$SYS		0	0
sales	SALES	1	0
> SYSTEM.BROKER.ADMIN.STREA	SYSTEM.BROKER.ADMIN.STREAM	0	0

Baseline for PR 5

PR 5 knows about:

There is a Proxy Subscriber for topic string 'sales' in PR 7



The screenshot shows the IBM MQ Explorer interface. On the left, a tree view displays the hierarchy of objects for CDRPR5, with 'Subscriptions' highlighted. On the right, a table lists the subscriptions. The row for 'SYSTEM.PROXY.CDRPR7 CLUSTERDR sales' is highlighted with a red box.

Subscription name	Topic name	Topic string	Type	Destination queue manager
CDRPR5 SYSTEM.BROKER.INTER.BROKER.CO...	SYSTEM.B...	SYSTEM.BR...	API	CDRPR5
SYSTEM.DEFAULT.SUB			Admin	
SYSTEM.PROXY.CDRPR7 CLUSTERDR sales		sales	Proxy	CDRPR7

Baseline for PR 5

PR 5 knows about:

The cluster sender to PR 8 exists, but it is inactive.

Cluster Queues Cluster Topics **Cluster-sender Channels** Cluster-receiver Channels

Cluster-sender channels:

CDRFR1 - Full Repository

CDRPR5 → 1 CDRFR1

Channel name	Cluster queue manager	Queue manager type	Definition type	Xmit protocol	Channel sta
TO.CDRFR1	CDRFR1	Repository	Auto explicit cluster-sender	TCP	Running
TO.CDRFR2	CDRFR2	Repository	Auto cluster-sender	TCP	Inactive
TO.CDRPR3	CDRPR3	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR4	CDRPR4	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR6	CDRPR6	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR7	CDRPR7	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR8	CDRPR8	Normal	Auto cluster-sender	TCP	Inactive

MQ Explorer Test Subscription in PR 8

In PR 8, from Topic Status, select
“Test Subscription” on topic string ‘sales’
Queue manager determines that is a clustered topic.
A Proxy Subscriber is sent TO ALL PRs!

The screenshot displays the IBM MQ Explorer interface for Queue Manager: CDRPR8. The left-hand tree view shows the hierarchy: CDRPR8 > Topics > sales. The main pane shows the 'Topic status' for the 'sales' topic, which is a clustered topic. A context menu is open over the 'sales' topic, with the 'Test Subscription...' option highlighted. Other options in the menu include 'Compare with...', 'Clear Local Retained Publication...', 'Topic Status - Subscribers...', 'Topic Status - Publishers...', and 'Test Publication...'. The 'Topic status' field is also highlighted in red.

Topic string	Publish	Subscribe	Default
> [Empty]	Allowed	Allowed	All
> \$SYS	Allowed	Allowed	All
> sales	Allowed	Allowed	All
> SYSTEM.BROKE			

MQ Explorer Test Subscription in PR 8

A Proxy Subscriber is sent TO ALL PRs!

Notice that now PR 5 shows a 2nd Proxy Subscriber, the one for PR 8.

The screenshot displays the MQ Explorer interface. On the left, a tree view shows the hierarchy for CDRPR5, with 'Subscriptions' highlighted. The main pane shows a table of subscriptions. A red box highlights the row for 'SYSTEM.PROXY.CDRPR8 CLUSTERDR sales', which is a Proxy subscriber for CDRPR8. A 'Subscribe' dialog box is open in the foreground, showing the subscription details for CDRPR8 on 'mosquito.raleigh.ibm.com(1438)' with the topic string 'sales'.

Subscription Name	Queue Manager	Topic String	Subscriber Type	Target Queue Manager
SYSTEM.DEFAULT.SUB	Admin		Admin	CDRPR5
SYSTEM.PROXY.CDRPR7 CLUSTERDR sales	sales	sales	Proxy	CDRPR7
SYSTEM.PROXY.CDRPR8 CLUSTERDR sales	sales	sales	Proxy	CDRPR8

Subscribe dialog box details:

- Subscribe to: CDRPR8 on 'mosquito.raleigh.ibm.com(1438)'
- Queue Manager: CDRPR8 on 'mosquito.raleigh.ibm.com(1438)'
- Topic String: sales

Publish in PR 5, message received in PR 8

In PR 5 publish a message (Test Publish).

The queue manager knows from the Proxy Subs that needs to send a message to PR 8.

The subscriber in PR 8 receives it.

The screenshot displays the IBM MQ console interface. On the left, a tree view shows the hierarchy: CDRPR4, CDRPR5 (selected), Queues, Topics, Subscriptions, Channels, Telemetry, Listeners, Services, Process D, Namelists, Authentication, Communication, Security P, CDRPR6 on, CDRPR7 on, and CDRPR8 on. The 'Publish Test Message' dialog is open, with the 'Queue Manager' field set to 'CDRPR5' and the 'Topic String' field set to 'sales'. The 'Message data' field contains 'Test-PR5'. Below the dialog, a status bar indicates 'Last published at 11:13:25'. To the right, the 'Subscribe' dialog is open, showing the 'Queue Manager' as 'CDRPR8 on 'mosquito.raleigh.ibm.com'(1438)'' and the 'Topic String' as 'sales'. The 'Messages received' section shows the received message details: 'Time: 11:13:25', 'Topic String: sales', and 'Message: Test-PR5'. Red boxes highlight the 'Queue Manager' and 'Topic String' fields in both dialogs, and the 'Messages received' section in the 'Subscribe' dialog.

Publish in PR 5, message received in PR 8

The cluster sender from PR 5 to PR 8 becomes active.

- Queue Managers
- Queue Manager Clusters
- CLUSTERDR
 - Full Repositories
 - CDRFR1
 - CDRFR2
 - Partial Repositories
 - CDRPR3
 - CDRPR4
 - CDRPR5**
 - CDRPR6
 - CDRPR7
 - CDRPR8
- JMS Administered Objects
- Managed File Transfer
- Service Definition Repositories
- Administered Servers

Cluster Queues Cluster Topics **Cluster-sender Channels** Cluster-receiver Channels

Cluster-sender channels:

CDRFR1 - Full Repository

Channel name	Cluster queue manager	Queue manager type	Definition type	Xmit protocol	Channel status
TO.CDRFR1	CDRFR1	Repository	Auto explicit cluster-sender	TCP	Running
TO.CDRFR2	CDRFR2	Repository	Auto cluster-sender	TCP	Running
TO.CDRPR3	CDRPR3	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR4	CDRPR4	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR6	CDRPR6	Normal	Auto cluster-sender	TCP	Inactive
TO.CDRPR7	CDRPR7	Normal	Auto cluster-sender	TCP	Running
TO.CDRPR8	CDRPR8	Normal	Auto cluster-sender	TCP	Running

Closing Test Sub in PR 8, refreshes cluster

Now let's close the Test Subscriber in PR 8.

This will cause a notification sent to all PRs to remove the corresponding Proxy Subscriber.

Notice that PR 5 shows now only 1 Proxy instead of 2.

The screenshot shows the IBM MQ console interface. On the left, a tree view under 'Queue Managers' shows several instances: CDRFR1, CDRFR2 on 'mosquito.raleigh.ibm.com', CDRPR3, CDRPR4, and CDRPR5. The CDRPR5 instance is expanded, showing 'Queues', 'Topics', and 'Subscriptions' (highlighted in blue). A red box highlights the CDRPR5 instance and its 'Subscriptions' folder. On the right, the 'Subscriptions' table is displayed with the filter 'Standard for Subscriptions'. The table has columns for Subscription name, Topic name, Topic string, Type, and Destination queue. A red box highlights the row for 'SYSTEM.PROXY.CDRPR7 CLUSTERDR sales', which has a Type of 'Proxy' and a Destination queue of 'CDRPR7'.

Subscription name	Topic name	Topic string	Type	Destination queue
CDRPR5 SYSTEM.BROKER.INTER.BROKER.CO...	SYSTEM.B...	SYSTEM.BR...	API	CDRPR5
SYSTEM.DEFAULT.SUB			Admin	
SYSTEM.PROXY.CDRPR7 CLUSTERDR sales		sales	Proxy	CDRPR7

Potential impact in large, busy clusters

Direct Route Clusters rely on MQ maintaining a high level of sharing of information and connectivity between every queue manager in the cluster.

For small and simple networks (that is, a small number of queue managers, and a fairly static set of publishers and subscribers) this could be acceptable.

However, when used in larger or more dynamic environments the overhead might be prohibitive.



The End

This is the end of the presentation.

THANKS!!

