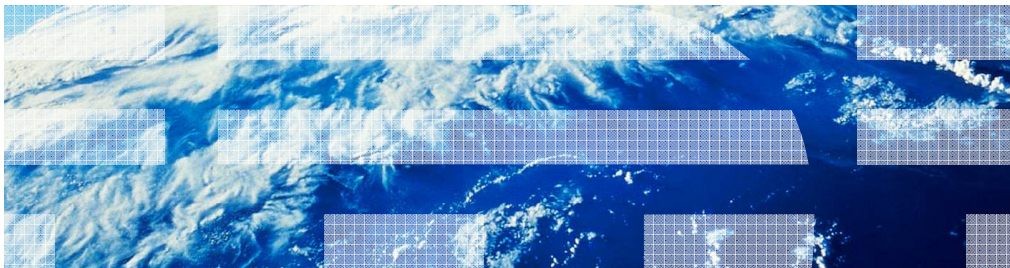

CICS Transaction Server V4.2

Transaction tracking



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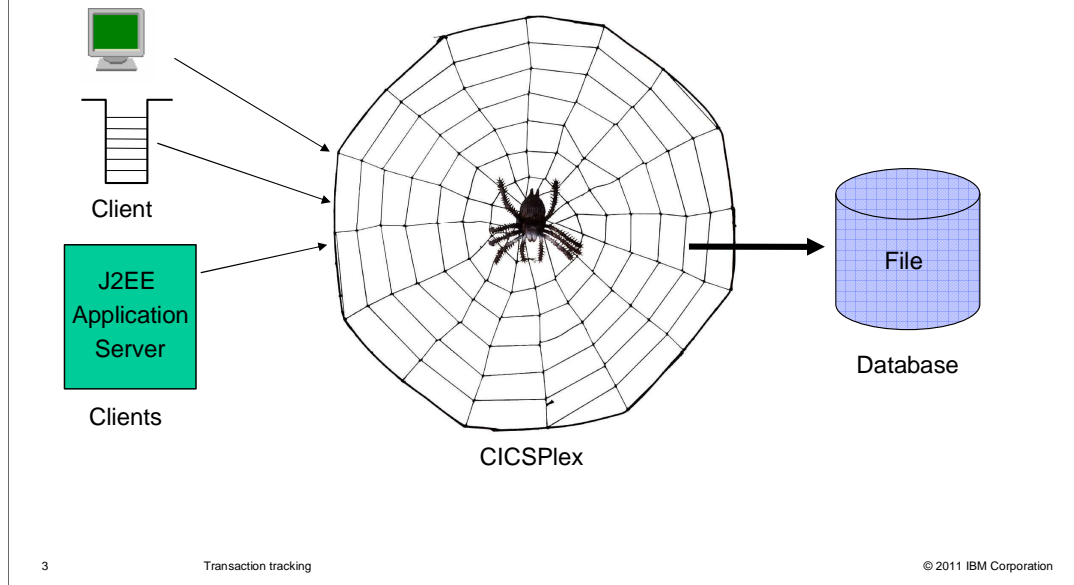
This module describes transaction tracking, a feature that you can use to understand the relationships between tasks across CICS® regions.

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This module provides an overview of transaction tracking, its benefits, and some of the new terminology that has been introduced in CICS TS 4.2. It also describes origin data, previous hop data, adapter support, and how you can view this information in CICS Explorer.

Transaction tracking - today



The vast majority of CICS transactions are either initiated by components outside of CICS, for example WebSphere® MQ, interact with external resource managers such as DB2®, or cause further interactions with transactions in associated CICS regions using intersystem communication or multiregion operation. As part of the CICS SNA to IP modernization initiative, CICS TS 4.2 vastly improves the ability to track transactions as they weave their way through the complex web of associated regions and resources.

Why transaction tracking

- Modern CICS access methods no longer have terminal ID or SNA sessions as principal facilities
 - Lack of visibility about the point of origin
- IP facilities (host name/ports/sockets) are poorly exposed and managed using traditional CICS interfaces (CEMT etc)
 - Inability to manage IP based work requests
- Lack of UOW ID context inheritance in the transaction chain for web based requests:

CWXN -> CWBA for a Web/HTTP transaction

CWXN -> CPIH for web services pipeline

EXEC CICS START → User task

CICS TG -> CSMI over IPIC

CKTI -> WebSphere MQ Trigger task

So why has CICS invested in transaction tracking? Modern CICS transactions, for example those that are triggered from the web, WebSphere MQ, or CICS Transaction Gateway, no longer have terminal IDs or sessions as the principal facility. This means that there is no longer any visibility about the point of origin at which the work was initiated. Secondly TCP/IP facilities such as the IP address, host name, socket descriptor are poorly exposed and managed by traditional CICS interfaces. There is a lack of unit of work ID context inheritance in the transaction chain for web-based requests (such as CWXN and CWBA), meaning that it is not possible to associate the tasks in the transaction chain.

Terminology

- All user transactions have association data
- Association data is metadata that is created for a task

<i>Origin data</i>	Created at <i>point of origin</i> at which the work originated
<i>Previous hop data</i>	Created for requests sent over a connection
<i>Adapter data</i>	Created by START requests from TRUE based adapters such as WebSphere MQ
<i>User correlation data</i>	Created at point of origin by user exit
<i>Transaction group ID</i>	Unique token for all associated tasks

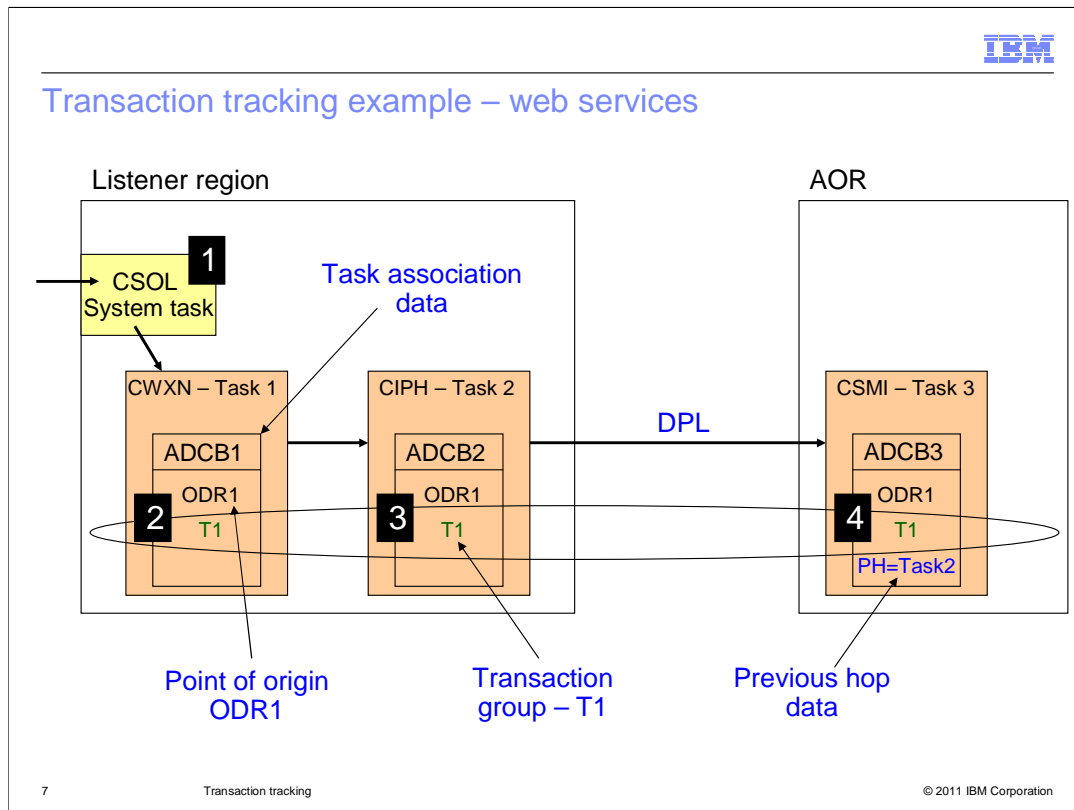
CICS uses these terms to describe transaction tracking. Each user transaction has association data, which is metadata that is created for every task. Origin data is created at the point of origin where the work originated. Previous hop data is created when requests are sent over a connection between CICS regions. Adapter data is created by START requests from adapters that use task related user exits, such as WebSphere MQ. User correlation data is created at the point of origin by a user exit. The transaction group ID is a unique token for all associated tasks.

CICS transaction tracking – CICS TS 4.2 goals

1. The ability to identify entry point into CICS for all CICS users tasks (task association data)
 - Type - facility type such as *web* or terminal and its details
 - Identification details - IP address, user ID, TCP/IP service, termid, session
2. Tracking of **associated tasks** as requests flow between different regions
 - Point of origin inherited from the originating task across all IPIC and MRO connections
 - Common transaction group ID identifies all associated tasks
 - Which tasks have been linked, function shipped, routed or started from where
3. Support for TRUE based adapters (WebSphere MQ, CICS Sockets, WOLA)
 - Tie external adapter data to the CICS generated *point of origin*
4. Ability to display the relationships between tasks in a chain
 - Previous hop data
 - Explorer task association search

Transaction tracking aims to solve a specific set of issues to do with transaction correlation across multiple CICS regions in a CICSplex. CICS creates association data for each task that describes how the task originated, such as from a web or terminal and provides some information about it. This information can include the IP address, the user ID, the TCPIP SERVICE resource, the terminal ID, and session information. However, requests can flow between CICS regions, so in this release you can also track related tasks. For example, the point of origin is inherited from the originating task across all IPIC and MRO connections. The transaction group ID is common to all the associated tasks and is way to identify which tasks are related to each other. CICS also provides information about how the request was initiated. CICS also provides support for data from adapters that use task related user exits, such as WebSphere MQ. Finally, CICS provides a way to display the relationships between the tasks in the chain using previous hop data and the search in the CICS Explorer.

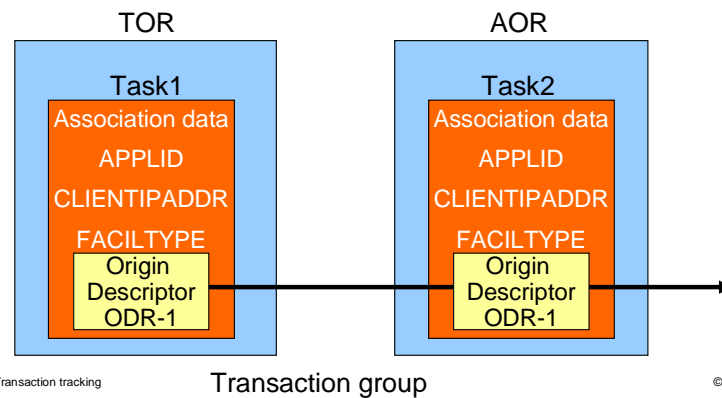
Transaction tracking example – web services



This diagram shows the artifacts involved in transaction tracking for a web services request over HTTP. At point one in the diagram, the sockets listener CSOL receives the HTTP request. This is a system task and does not generate any association data. Having read the data from the socket, the listener attaches the web attach transaction CWXXN. At point 2, the CWXXN transaction creates the point of origin (ODR1) in its task association data using the client IP address and the URIMAP resource that was used in step 1. Because this is a web service request, CWXXN calls the pipeline alias task CIPH to process the SOAP message. At point 3, the CIPH transaction receives the point of origin data from CWXXN and uses this to populate the point of origin in its own task association data (ADCB2). The pipeline links to a CICS program that is defined as remote and invokes a DPL request to the application-owning region using the mirror transaction CSMI. At point 4, the mirror transaction is called in the region and receives the origin data from Task1 and uses this information to populate the point of origin of its association data. Because the request used an MRO communication link, the previous hop section of the association data is populated to define the calling task as the pipeline alias task (CIPH) task2 from the listener region. All the tasks (task1, task2, and task3) in this scenario are associated as they share a common token, the transaction group ID, in their association data that is unique in the CICSplex.

Task association data

- CICS TS 3.2 implemented origin and association data
 - Origin data section propagated across tasks
 - XAPADMGR exit can add information to the Origin Data
 - EXEC CICS INQ ASSOCIATION and ASSOCIATION LIST retrieve information from the descriptor blocks
 - Task Association view in CICS Explorer
- CICS TS 4.2 now propagates data across IPIC and MRO connections
 - DTP/APPC conversations do not propagate association data



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Transaction tracking

Transaction group

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CICS TS 3.2 was the first release to provide task association data. The association data describe properties of the CICS transaction and how it was invoked. This task association data is viewable using a variety of interfaces, including CICS Explorer, the CICSplex SM Web User Interface, and CICS SMF monitoring tools. In CICS TS 4.2, the data is now propagated across IPIC and MRO connections, but not across distributed transaction processing or APPC conversations.

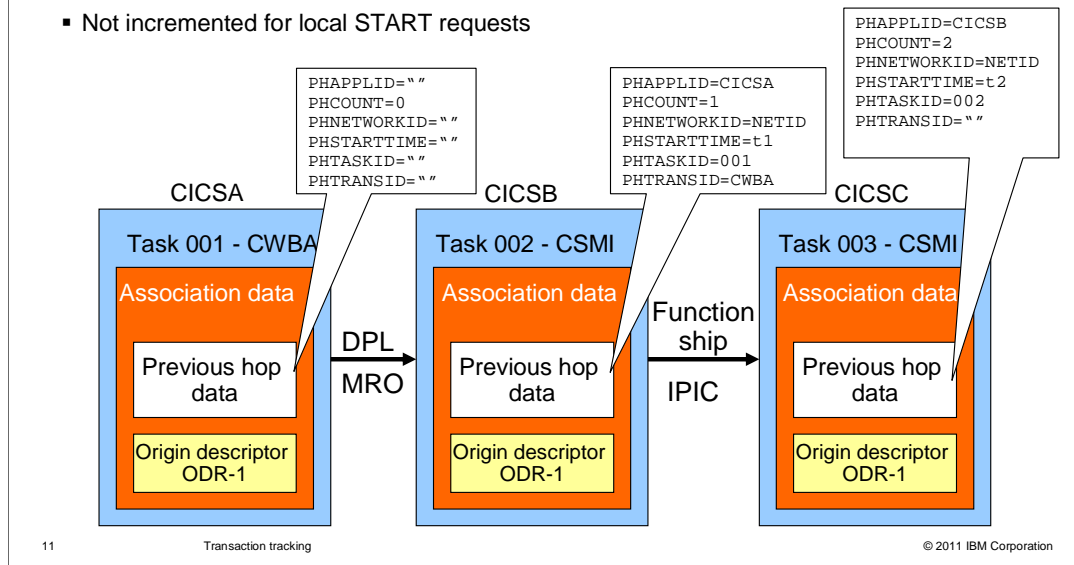
Task Association Data – IP facilities

<i>Appl data</i>	Socket metadata describing protocol, listener, and other information. Can be used as query using command netstat -G
<i>Client IP address</i>	IP address of client device
<i>Client IP format</i>	IPv4 or IPV6
<i>Client port</i>	IP port used on remote client
<i>ClusterConnType</i>	SO_CLUSTERCONNTYPE options returned by Communications Server, describing if the socket is local to the sysplex, LPAR, or external
<i>IPCONN resource</i>	Name of IPCONN used to receive request
<i>Server IP Format</i>	IPv4 or IPv6
<i>Server port</i>	IP port used on z/OS® to service the incoming request
<i>TCP/IP Service</i>	Name of CICS TCPIP SERVICE resource used to listen for this request
<i>TCP/IP security zones</i>	TCP/IP Net Access security zone
<i>TCP/IP job</i>	TCP/IP stack used to service the incoming request

CICS task association data provide extra information about tasks that were initiated by a TCP/IP listener. This information enables listening task to be correlated with both CICS resources, such as a TCPIP SERVICE or IPCONN, and external TCP/IP resources such as the TCP/IP stack and socket.

Previous hops

- Describes number of hops across connections
- Supported for IPIC and MRO
- Not incremented for local START requests



CICS TS 4.2 regions that are connected by MRO or IPIC connections provide previous hop data to describe the relationship between associated tasks as they are routed between regions in a CICSplex. In the diagram, all tasks in the region CICSA that receives the request are at hop count of 0. Tasks routed to the next region are at a hop count one and contain additional previous hop data identifying the CICS region from which the request was sent and the task that ran in that region. When the request is routed to the region CICSC, the hop count reaches 2. The hop count is not incremented for local START requests.

Viewing previous hop data in CICS Explorer

The screenshot shows the IBM CICS Explorer interface. The main window displays the 'Task Association (0000102)' view. The 'Attributes' section is expanded, showing the following data:

Origin Net ID	GBIBMYA
Origin Port	0
Origin Task	0000148
Origin Task Start Date	20110512162301.048536
Origin Task Start Time	16:23:01.0485
Origin Transaction ID	MQGM
Origin User ID	ALISQNB
Origin VTAM LU Name	
Prev Hop Appl Id	IYK3ZAB5
Prev Hop Count	2
Prev Hop Net ID	GBIBMYA
Prev Hop Start Date	20110512162301.050241
Prev Hop Start Time	16:23:01.0502
Prev Hop Task ID	0000156
Prev Hop Trans ID	CSMI
Program	DFHMIRS
Region	IYK3ZAB3
Server IP Address	9.20.138.199
Server IP Format	IPv4
Server Port	4063
Start Date	20110512162301.051130
Start Time	16:23:01.0511

Two callouts are present:

- A blue callout box pointing to the 'Prev Hop Count' field (value 2) contains the text: "Hop count is two – third task in chain".
- A blue callout box pointing to the 'Prev Hop Trans ID' field (value CSMI) contains the text: "Previous transaction information".

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Transaction tracking

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The CICS Explorer Task Association View can display the previous hop data for each task. The screen capture shows that task 102 has a hop count of two and so is the third task in a chain. The previous transaction in the chain was transaction CSMI, running under task 56 in region IYK3ZABS.

Adapter transaction tracking

- **Aim:** Allow non-CICS adapters (WebSphere MQ, CICS Sockets, WOLA) to set origin data for transactions that they start
- Adapter data - extension to task association data
- May be set only once by the first origin adapter task
- Creates new point of origin → prevents all task through same CKTI being associated together
- New extension to the TRUE Context Management parameter list (DFHECON)
 - Four 64 character fields to identify the origin
 - ODAPTRID - Product Identifier
 - ODAPTRDATA1 - Server identifier
 - ODAPTRDATA2 - Adaptor instance starting this task
 - ODAPTRDATA3 - Reason for the START
- Supported by CICS/MQ Trigger monitor and WOLA V8.0.0.1

http://publib.boulder.ibm.com/infocenter/cicsts/v4r2/topic/com.ibm.cics.ts.doc/dfha3/topics/dfha3_ewlm_parms.html

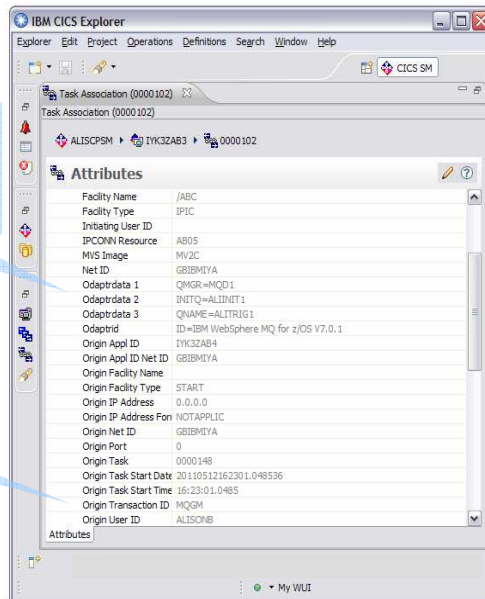
CICS can now track non-terminal START requests from non-CICS adapters such as WebSphere MQ, CICS sockets, and WebSphere Optimized Local Adapter. The adapter can set fields in the origin data of the task that they start in a CICS region. This support includes context management parameters that can be set in a task-related user exit program. For details on these parameters, see the CICS TS 4.2 Information Center.

These fields are in the origin data, so they can be set only once by the originating task. If they already exist, it is not possible for a different adapter to change them. There is a flag that permits the adapter to tell whether adapter data is accepted. The adapter transaction tracking is exploited by the CICS-MQ trigger monitor and WOLA V8.0.0.1.

WebSphere MQ adapter data

Queue Manager = MQO1
 Trigger queue = ALINIT1
 Request queue =
 ALITRIG1

Original started
 transaction =
 MQGM



The CICS Explorer Task Association View can display the adapter data. The screen capture shows the values set by the WebSphere MQ trigger monitor that identify the queue manager, trigger queue, and request queue that initiated the transaction in CICS.

CICS Explorer – CICS TS 4.2

- Associated task search
 - Parent/child relationship for associated tasks (exploiting previous hop)
 - Sorted columns
 - Configurable columns
 - Paging of search results

- IP network centric search
 - Task search based on IP address information and its correlation with task association data
 - Available from following Explorer views:
 - IPCONN → Tasks from IPResolved
 - TCPIP Service → Tasks from TCP/IP Services
 - Task Association → Tasks from Origin IP address

You can also use transaction tracking in CICS Explorer. You can search for task associations and view the parent-child relationship between associated tasks. The relationship is determined by the previous hop data. You can also sort and configure the columns to show the information that is most important to you. As well as searching associated tasks, you can also perform IP network centric searches. IP addresses do not have specific CICS resources, unlike LU6.2 sessions. Instead, this information is contained in IPCONN resources, TCPIP SERVICE resources, and task association data. CICS Explorer provides CICSplex wide searches based on this information.

Transaction tracking example – explorer views

Search → Associated tasks

Tasks associated with task "0015912" in region "IYK2Z32C" - 3 results - 15:38:00

Tasks	Transaction ID	Region	Origin Task	Origin Trans ID	Facility Type	Prev Hop Count	Origin IP ...	Start Time	Run Status
0015911	CWXN	IYK2Z32C	0015911	CWXN	SOCKET	0	9.20.213.71	2011-10-03T14:37:50.521461...	SUSPENDED
0015912	CWBA	IYK2Z32C	0015911	CWXN	WEB	0	9.20.213.71	2011-10-03T14:37:50.522101...	SUSPENDED
0000498	CSMI	IYK2Z32B	0015911	CWXN	MRO	1	9.20.213.71	2011-10-03T14:37:50.523057...	SUSPENDED

Search → Tasks from Origin IP Address

Tasks with Origin IP Address "9.20.213.71" - 6 results - 15:41:24

Tasks	Transaction ID	Region	Origin Task	Origin Trans ID	Facility Type	Prev Hop Count	Origin IP ...	Start Time
SDAYPEG								
IYCWJGWM								
IYK2Z32B								
0000498	CSMI	IYK2Z32B	0015911	CWXN	MRO	1	9.20.213.71	2011-10-03T14:37:50.523057+00:00
0000500	CEDF	IYK2Z32B	0000500	CEDF	STARTTERM	0	9.20.213.71	2011-10-03T14:37:50.742139+00:00
IYK2Z32C								
0015911	CWXN	IYK2Z32C	0015911	CWXN	SOCKET	0	9.20.213.71	2011-10-03T14:37:50.521461+00:00
0015912	CWBA	IYK2Z32C	0015911	CWXN	WEB	0	9.20.213.71	2011-10-03T14:37:50.522101+00:00
0015914	CEDF	IYK2Z32C	0015914	CEDF	STARTTERM	0	9.20.213.71	2011-10-03T14:37:50.527082+00:00

These screen captures show the CICS Explorer views that are available for searching for associated tasks. The first screen capture shows a chain of associated CWXN, CWBA, and CSMI transactions across two connected regions, and their previous hop data. The second screen capture shows the same tasks by originating IP address using the search feature in CICS Explorer. It includes the additional CEDF debugging transactions that are running in each region as they also contain the same originating IP address in their association data.

Task association data collected from WebSphere MQ adapter

Region	Task ID	Start Time	Trans ID	Facility Type	Origin Trans	Origin Ap...	O
JHPAAAF	0001035	2011-05-1...	STAI	START	STAI	JHPAAAF	ST
JHPAAAF	0000486	2011-05-1...	STAI	INFO	STAI	JHPAAAF	ST
JHPCAAR	0001051	2011-05-1...	ST	Open	STAI	JHPCAAR	ST
JHPDABD	0000289	2011-05-1...	CT		STAI	JHPAAAF	ST

Cdsprtd	Cdsprtd 1	Cdsprtd 2	Cdsprtd 3	Appl ID	Client IP ...
ID=IBM WebSphere MQ for z/OS V7.0.1	QMGR=QNDA	INIQ=CTSSVT.IP.INITQ1	QNAME=CTSSVT.IP.APPLQ1	JHPAAAF	0.0.0.0
ID=IBM WebSphere MQ for z/OS V7.0.1	QMGR=QNDA	INIQ=CTSSVT.IP.INITQ1	QNAME=CTSSVT.IP.APPLQ1	JHPBAAY	0.0.0.0
ID=IBM WebSphere MQ for z/OS V7.0.1	QMGR=QNDA	INIQ=CTSSVT.IP.INITQ1	QNAME=CTSSVT.IP.APPLQ1	JHPCAAR	0.0.0.0
ID=IBM WebSphere MQ for z/OS V7.0.1	QMGR=QNDA	INIQ=CTSSVT.IP.INITQ1	QNAME=CTSSVT.IP.APPLQ1	JHPDABD	9.20.45.8

The CICS Explorer can also show you the associated tasks for the WebSphere MQ adapter, as shown in these screen captures.

Summary

- Understand the relationship between tasks
- Support for IPIC and MRO
- View relationships in CICS Explorer

In summary, CICS TS 4.2 provides the ability to understand the relationships between associated tasks in multiple CICS regions when using IPIC and MRO. You can view these relationships and search for tasks using the CICS Explorer.



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