Oracle® Tuxedo Mainframe Adapter for SNA
Reference Guide
12c Release 2 (12.1.3)

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ATMI to CPI-C Function Mapping

The following tables list the most common ATMI function calls and show how their parameters map to CPI-C verbs. The mappings are listed by function call in the following order:

- tpcall()
- tpacall() with or without reply
- tpgetrply()
- tpservice()
- tpreturn()
- tpcancel()
- tpconnect()
- tpsend()
- tprecv()
- tpdiscon()
- tpforward()

The tables show the parameters of the ATMI call, the contents or meaning of the parameters, and notes on usage with the CPI-C verbs.
### Table 1-1  tpcall

<table>
<thead>
<tr>
<th>tpcall()</th>
<th>Parameters</th>
<th>Contents</th>
<th>CPI-C Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>svc</td>
<td></td>
<td>Service Name</td>
<td>Used in CMALLC to identify the CICS transaction to be invoked.</td>
</tr>
<tr>
<td>idata</td>
<td></td>
<td>User data</td>
<td>This data is sent in CMSENDs until completely transmitted.</td>
</tr>
<tr>
<td>len</td>
<td></td>
<td>Length of User data</td>
<td></td>
</tr>
<tr>
<td>odata</td>
<td></td>
<td>Reply data</td>
<td>CMRCV receives the data until it has been completely transmitted (data_received is set to CM COMPLETE_DATA_RECEIVED) and return code is set to CM_OK or CM DEALLOCATE_NORMAL.</td>
</tr>
<tr>
<td>olen</td>
<td></td>
<td>Reply data length</td>
<td></td>
</tr>
<tr>
<td>flags</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPNOTRAN</td>
<td></td>
<td>Not part of a transaction</td>
<td></td>
</tr>
<tr>
<td>TPNOCHANGE</td>
<td></td>
<td>N/A</td>
<td>Local</td>
</tr>
<tr>
<td>TPNOBLOCK</td>
<td></td>
<td>N/A</td>
<td>Local</td>
</tr>
<tr>
<td>TPNOTIME</td>
<td></td>
<td>N/A</td>
<td>Local</td>
</tr>
<tr>
<td>TPSIGRSTRT</td>
<td></td>
<td>N/A</td>
<td>Local</td>
</tr>
</tbody>
</table>

### Table 1-2  tpacall

<table>
<thead>
<tr>
<th>tpacall()</th>
<th>Parameter</th>
<th>Contents</th>
<th>CPI-C Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>svc</td>
<td>Service Name</td>
<td></td>
<td>Used in CMALLC to identify the CICS transaction to be invoked.</td>
</tr>
<tr>
<td>data</td>
<td>User data</td>
<td></td>
<td>This data is sent in CMSENDs until completely transmitted.</td>
</tr>
<tr>
<td>len</td>
<td>Length of user data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1-2 Oracle Tuxedo Mainframe Adapter for SNA Reference Guide
The last data is sent with a CMSEND with send_type set to CMSEND_AND_PREP_TO_RECEIVE. This changes the state of the conversation to receive and a CMRCV is issued to await the reply.

true  Since no reply is expected, a CMDEAL deallocates the conversation after all data has been received.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>cd</td>
<td>call descriptor</td>
<td></td>
</tr>
<tr>
<td>data</td>
<td>User data</td>
<td>Data received from CMRCV if WHAT_RECEIVED set to DATA_COMPLETE.</td>
</tr>
<tr>
<td>len</td>
<td>Length of user data</td>
<td></td>
</tr>
</tbody>
</table>

Table 1-2  tpacall

<table>
<thead>
<tr>
<th>tpacall()</th>
<th>Parameter</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>flags</td>
<td>TPNOREPLY</td>
<td>false</td>
<td>The last data is sent with a CMSEND with send_type set to CMSEND_AND_PREP_TO_RECEIVE. This changes the state of the conversation to receive and a CMRCV is issued to await the reply.</td>
</tr>
</tbody>
</table>

true  Since no reply is expected, a CMDEAL deallocates the conversation after all data has been received.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPNOTRAN</td>
<td>Not part of a transaction</td>
<td></td>
</tr>
<tr>
<td>TPNOBLOCK</td>
<td>N/A</td>
<td>Local</td>
</tr>
<tr>
<td>TPNOTIME</td>
<td>N/A</td>
<td>Local</td>
</tr>
<tr>
<td>TPSTEOF</td>
<td>N/A</td>
<td>Local</td>
</tr>
</tbody>
</table>

Table 1-3  tpgetrply
### Table 1-3 tpgetrply

<table>
<thead>
<tr>
<th>tpgetrply() Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>flags</td>
<td>TPGETANY</td>
<td>If true, data is returned from any conversation. If false, data is returned from conversation associated with the cd</td>
</tr>
<tr>
<td></td>
<td>TPNOCHANGE</td>
<td>Local to the requestor</td>
</tr>
<tr>
<td></td>
<td>TPNOBLOCK</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>TPNOTIME</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>TPS1GRSTRT</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 1-4 tpservice

<table>
<thead>
<tr>
<th>tpservice() Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>svcinfo</td>
<td>Service information and data</td>
<td>User Data captured from a CMRCV populates the TPSVCINFO structure user data area. Service characteristics are obtained from the service attributes in the DMCONFIG and UBBCONFIG files.</td>
</tr>
<tr>
<td>name</td>
<td>Service name</td>
<td>The service name associated with the 8 character RNAME sent from CICS.</td>
</tr>
<tr>
<td>data</td>
<td>User data</td>
<td>Data captured from CMRCV.</td>
</tr>
<tr>
<td>len</td>
<td>Length of user data</td>
<td></td>
</tr>
<tr>
<td>cd</td>
<td>call descriptor</td>
<td>The call descriptor associated with the CONVID returned by the CMINIT when the LU6.2 was initiated.</td>
</tr>
<tr>
<td>appkey</td>
<td>32-bit key (if used)</td>
<td>For security.</td>
</tr>
<tr>
<td>cltid</td>
<td>set by Oracle Tuxedo</td>
<td>For security.</td>
</tr>
</tbody>
</table>
**Table 1-4 tpdsn
tpservice**

<table>
<thead>
<tr>
<th>tpservice() Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>flags TPCONV</td>
<td>If true, service is conversational.</td>
<td></td>
</tr>
<tr>
<td>TPTRAN</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>TPNOREPLY</td>
<td>If true, requestor not expecting a reply.</td>
<td>The conversation is terminated with a CMDEAL normal.</td>
</tr>
<tr>
<td>TPSENDONLY</td>
<td>N/A</td>
<td>If set, the CPIC conversation in CICS should be in receive state. If not set, the CICS CPIC conversation state will be in send state.</td>
</tr>
<tr>
<td>TPRECVONLY</td>
<td>N/A</td>
<td>If set, the CPIC conversation in CICS remains in send state.</td>
</tr>
</tbody>
</table>

**Table 1-5 tpdsn
tpreturn**

<table>
<thead>
<tr>
<th>ttpreturn() Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>rval</td>
<td>TPSUCCESS</td>
<td>Set to TPSUCCESS when conversation terminates with a normal deallocation.</td>
</tr>
<tr>
<td></td>
<td>TPSVCERR</td>
<td>Set to TPSVCERR when the conversation has terminated with a non-normal deallocation type or other error.</td>
</tr>
<tr>
<td>rcode</td>
<td>Set by the application</td>
<td>N/A</td>
</tr>
<tr>
<td>data</td>
<td>User data</td>
<td>Data is returned to the CICS transaction from a successful CMRCV with data received set to CM_DATA_COMPLETE and return code of CM_DEALLOCATE_NORMAL. If the service fails, no data is returned to the caller and the conversation is deallocated abnormally.</td>
</tr>
<tr>
<td>len</td>
<td>Length of data returned</td>
<td>0 &lt; data &lt;= 32K</td>
</tr>
<tr>
<td>flags</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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### Table 1-6  tpcancel

<table>
<thead>
<tr>
<th>tpcancel()</th>
<th>Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>cd</td>
<td>The connection descriptor on which a <code>tpgetreply()</code> is waiting.</td>
<td>CMDEAL abnormal is issued on the conversation with CONVID mapped from call descriptor.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 1-7  tpconnect

<table>
<thead>
<tr>
<th>tpconnect()</th>
<th>Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>svc</td>
<td>The local service name representing the service to be invoked. in CICS</td>
<td>The name is used to find the RNAME. The RNAME should match the TPName in CICS and will be used by CMINIT and CMALLC to initiate and allocate the conversation.</td>
<td></td>
</tr>
<tr>
<td>data</td>
<td>User data</td>
<td>This data is sent in CMSENDs until completely transmitted.</td>
<td></td>
</tr>
<tr>
<td>len</td>
<td>Length of User data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>flags</td>
<td>TPNOTRAN</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TPSENDONLY</td>
<td>If true, the conversation stays in or changes to send state</td>
<td>The conversation remains in send state. This is the default.</td>
</tr>
<tr>
<td></td>
<td>TPRECVONLY</td>
<td>If true, the conversation stays in or changes to receive state</td>
<td>Immediately after the allocate Oracle Tuxedo sends a CMSEND with no data and send_type set to CM_SEND_AND_PREP_TO_RECEIVE.</td>
</tr>
<tr>
<td></td>
<td>TPNBLOCK</td>
<td>N/A</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>TPNOTIME</td>
<td>N/A</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>TPSIGRSTR</td>
<td>N/A</td>
<td>Local</td>
</tr>
</tbody>
</table>
### Table 1-8 tpsend

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>cd</td>
<td>The connection descriptor</td>
<td>This locally assigned connection descriptor has been mapped to the CONVID returned in the CMINIT and CMALLC on behalf of the tpconnect().</td>
</tr>
<tr>
<td>data</td>
<td>User data</td>
<td>ASCII/EBCDIC conversion may be required before sending to CICS.</td>
</tr>
<tr>
<td>len</td>
<td>Length of User data</td>
<td></td>
</tr>
<tr>
<td>flags</td>
<td>TPRECVONLY</td>
<td>If true, the conversation changes to receive state. The state of the conversation changes from send to receive. A CMSEND is sent with send_type set to CM_SEND_AND_PREP_TO_RECEIVE.</td>
</tr>
<tr>
<td></td>
<td>TPNOBLOCK</td>
<td>N/A Local</td>
</tr>
<tr>
<td></td>
<td>TINOTIME</td>
<td>N/A Local</td>
</tr>
<tr>
<td></td>
<td>TPSIGRSTRT</td>
<td>N/A Local</td>
</tr>
<tr>
<td>revent</td>
<td>TPEV_DISCONIMM</td>
<td>If set, the LU6.2 conversation has been terminated abnormally. If the return code from a CMRCV is deallocate_abnormal, the conversation is terminated. A disconnect event is sent to the sending process.</td>
</tr>
<tr>
<td></td>
<td>TPEV_SVCERR</td>
<td>If set, the LU6.2 conversation has been terminated abnormally. Any return code other than CM_OK or CM_DEALLOCATE_NORMAL is treated as a TPEV_SVCERR.</td>
</tr>
<tr>
<td></td>
<td>TPEV_SVCFAIL</td>
<td>If set, the LU6.2 conversation has been terminated abnormally. If the return code from CMRCV is CM_TP_NOT_AVAIL_NO_RETRY or CM_TP_RESOURCE_FAILURE_NO_RETRY, revent is set to TPEV_SVCFAIL.</td>
</tr>
<tr>
<td>tprecv()</td>
<td>Parameters</td>
<td>Contents</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td>cd</td>
<td>The connection descriptor</td>
<td>This locally assigned connection descriptor has been mapped to the CONVID returned in the CMINIT and CMALLC issued by the initiator of this conversation.</td>
</tr>
<tr>
<td>data</td>
<td>User data</td>
<td>Date to be received using a CMRCV_immediate and returned to the Oracle Tuxedo service.</td>
</tr>
<tr>
<td>len</td>
<td>Length of User data</td>
<td></td>
</tr>
<tr>
<td>flags</td>
<td>TPNOCHANGE</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>TPNOBLOCK</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>TPNOTIME</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>TPSIGRSTRT</td>
<td>N/A</td>
</tr>
<tr>
<td>revent</td>
<td>TPEV_DISCONIMM</td>
<td>If set, the LU6.2 conversation has been terminated abnormally.</td>
</tr>
<tr>
<td></td>
<td>TPEV_SENDONLY</td>
<td>If set, the LU6.2 conversation changes to send if partner allows it.</td>
</tr>
<tr>
<td></td>
<td>TPEV_SVCERR</td>
<td>If set, the LU6.2 conversation has been terminated abnormally.</td>
</tr>
<tr>
<td></td>
<td>TPEV_SVCFAIL</td>
<td>If the return code from CMRCV is CM_TP_NOT_AVAIL_NO_RETRY or CM_TP_RESOURCE_FAILURE_NO_RETRY, revent is set to TPEV_SVCFAIL.</td>
</tr>
<tr>
<td></td>
<td>TPEV_SVCSUCC</td>
<td>If set, the conversation has completed normally.</td>
</tr>
</tbody>
</table>

The return code from CMRCV was set to CM_DEALLOCATE_NORMAL. This indicates that the sending TP has completed and deallocated the conversation normally.
### Table 1-10  tpdiscon

<table>
<thead>
<tr>
<th>tpdiscon()</th>
<th>Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>cd</td>
<td></td>
<td>The connection descriptor</td>
<td>This connection descriptor in mapped to the CONVID returned from CMINIT or CMACCP to the originator of the conversation.</td>
</tr>
</tbody>
</table>

### Table 1-11  tpforward

<table>
<thead>
<tr>
<th>tpforward()</th>
<th>Parameters</th>
<th>Contents</th>
<th>CPIC Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>svc</td>
<td>Service name</td>
<td>tpforward() is treated as if it were a tpacall(). A CMINIT and subsequent CMALLC are issued to initialize and allocate a session for a conversation. ClientID must be propagated to the CICS transaction in a TPSVCINFO record.</td>
<td></td>
</tr>
<tr>
<td>data</td>
<td>User data</td>
<td>Data is sent using CMSEND. The last CMSEND is sent with send_type of deallocate_normal.</td>
<td></td>
</tr>
<tr>
<td>len</td>
<td>Length of data returned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>flags</td>
<td>Refer to tpacall()</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This section provides the following transaction scenarios for the programming environments supported by Oracle Tuxedo Mainframe Adapter for SNA:

- “Distributed Program Link (DPL) Examples”
- “Distributed Transaction Processing (DTP) Examples”
- “CPI-C Programming Examples”
- “CICS/ESA Mirror Transaction Examples”

Caution: The scenarios in this section demonstrate how ATMI calls relate to CICS/ESA programming structures. They are not intended for use in developing application code, or for the replacement of existing application code. The use of any of these examples in actual situations may have unpredictable results.

Each example provides a graphical illustration of the scenario followed by a description of each step of the scenario.

**Distributed Program Link (DPL) Examples**

The examples in this section represent a few of the many programming scenarios available for using DPL and ATMI service invocations. These examples employ the most natural and efficient approaches.
ATMI Client Request/Response to CICS/ESA DPL

1. ATMI client invokes `toupsrv` service.

2. The `toupsrv` service issues `tpcall` for `SIMPDPL`, which is advertised in the `DMREMOTE_SERVICES` section of the `DMCONFIG` file.

3. Host mirror transaction starts `TOUPDPLS` program and passes `idata` buffer contents for processing.

4. The `TOUPDPLS` program processes data.

5. The CICS/ESA server returns the `commarea` into the client's `odata` buffer.

DMCONFIG File Entry

```
DM_REMOTE SERVICES
SIMPDPL RNAME=TOUPDPLS FUNCTION=DPL CONV=N
```
ATMI Client Asynchronous Request/Response to CICS/ESA DPL

1. ATMI client invokes toupsrv service.

2. The toupsrv service issues tpacall for SIMPDPL, which is advertised in the DM_REMOTE_SERVICES section of DMCONFIG file.

3. Host mirror transaction starts TOUPDPLS program and passes idata buffer contents for processing.

4. The TOUPDPLS program processes data.

DMCONFIG File Entry

```
DM_REMOTE_SERVICES
SIMPDPL RNAME=TOUPDPLS FUNCTION=DPL CONV=N
```

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5. The CICS/ESA system returns the commarea into the client’s tpgetreply odata buffer.

**ATMI Client Asynchronous Request/Response with No Reply to CICS/ESA DPL**

```
1. ATMI client invokes toupsrv service.

   toupsrv
   {
     cd tpacall
     ("SIMPDPL",
      idata
      ilen
      TPNOREPLY);
   }
```

**DMCONFIG File Entry**

```
DM_REMOTE_SERVICES
SIMPDPL RNAME=TOUPDPLS FUNCTION=DPL CONV=N
```

1. ATMI client invokes toupsrv service.

2. The toupsrv service issues tpacall for SIMPDPL, which is advertised in the DM_REMOTE_SERVICES section of DMCONFIG file. The toupsrv service uses TPNOREPLY to specify that no reply is expected.
3. Host mirror transaction starts TOUPDPLS program and passes idata buffer contents for processing.

4. The TOUPDPLS program processes data.

CICS/ESA DPL to ATMI Request/Response Server

**ATMI**

**ATMI Service MIRROR**

```c
MIRROR (TPSVCINFO* tpsvcinfo) {
  ...
  ...(manipulate tpsvcinfo data)...
  tpreturn (TPSUCCESS, 0, tpsvcinfo->data tpsvcinfo->len);
}
```

**CICS**

**User Transaction HOPL**

```c
MIRRDPLC PROGRAM .
.
.
EXEC CICS LINK PROGRAM ("MIRRDPLS") COMMAREA (COMM-AREA)
DATALength (COMM-LEN)
LENGTH (COMM-LEN)
SYNCONRETURN
```

**DMCONFIG File Entry**

```
DM_LOCAL_SERVICES
MIRROR RNAME=MIRRDPLS CONV=N
```

1. User-entered HOPL invokes MIRRDPLC program.

2. The EXEC CICS LINK command causes the advertised service mapped to MIRRDPLS (in the DM_LOCAL_SERVICES section of the DMCONFIG file) to execute.

3. The MIRROR service processes the data received in the service TPSVCINFO data buffer from the EXEC CICS LINK.
4. The `tpreturn` call returns the data into the `COMM-AREA` buffer.

### CICS/ESA DPL to ATMI Request/Response Server, Service in Autonomous Transaction

**DMCONFIG File Entry**

```plaintext
DM_LOCAL_SERVICES
MIRROR RNAME=MIRRDPLC CONV=N
```

1. User-entered `H0PL` invokes `MIRRDPLC` program.
2. The `EXEC CICS LINK` command causes the advertised service mapped to `MIRRDPLS` (in the `DM_LOCAL_SERVICES` section of the `DMCONFIG` file) to execute. The `SYNCONRETURN` option indicates that the invoked service will not participate in the CICS/ESA transaction.

3. The `MIRROR` service request `tpbegin` incorporates all further operations in a transaction.

4. The `MIRROR` service processes the data.

5. The `tpcommit` indicates the end of the transaction; all updates performed within the service transaction are to be committed.

6. The `tpreturn` call returns the data into the `commarea` buffer.

7. The `EXEC CICS SYNCPOINT` is an explicit commit request. All updated resources in the CICS/ESA transaction are committed.
ATMI Client Request/Response to CICS/ESA DPL, Autonomous Transaction

1. ATMI client invokes toupsrv service.
2. The toupsrv service issues tpbegin to start the transaction.

DMCONFIG File Entry

DM_REMOTE_SERVICES

SIMPDPL RNAME=TOUDPPLS FUNCTION=DPL CONV=N

1. ATMI client invokes toupsrv service.
2. The toupsrv service issues tpbegin to start the transaction.
3. The `toupsrv` service issues `tpcall` for SIMPDPL, which is advertised in the DMREMOTE_SERVICES section of the DMCONFIG file. The TPNOTRAN parameter indicates the CICS/ESA application does not participate in the service transaction.

4. Host mirror transaction starts TOUPDPLS program and passes idata buffer contents for processing.

5. The TOUPDPLS program processes data.

6. The EXEC CICS SYCPOINT is an explicit commit request. All updated resources in the CICS/ESA transaction are committed.

7. The CICS/ESA server returns the commarea into the client’s odata buffer.

8. The `toupsrv` service `tpcommit` request signals the successful completion of the transaction, causing a commit of its own updated resources.
Transactional ATMI Client Multiple Requests/Responses to CICS/ESA DPL

1. ATMI client invokes `toupsrv` service.

2. The `toupsrv` service issues `tpbegin` to start the transaction.

DMCONFIG File Entry

```
DM_REMOTE_SERVICES
SIMPDDL RNAME=TOUPDPLS FUNCTION=DPL CONV=N
```

1. ATMI client invokes `toupsrv` service.

2. The `toupsrv` service issues `tpbegin` to start the transaction.
3. The toupsrv service issues tpcall for SIMPDPL, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file. The tpcall is requested multiple times within the same transaction.

4. Host mirror transaction starts TOUPDPLS program and passes idata buffer contents for processing. The host mirror transaction remains as a long-running task to service all further requests on the transaction.

5. The TOUPDPLS program processes data.

6. The CICS/ESA system returns the commarea into the client’s odata buffer.

7. Step 3 through Step 6 are repeated until the toupsrv service loop end conditions are met.

8. The tpcommit request indicates the successful completion of the transaction, causing a commit of its own resources and the resources held by the host mirror transaction.
**Transactional CICS/ESA DPL to ATMI Request/Response Server**

**DMCONFIG File Entry**

```
DM_LOCAL_SERVICES
  MIRROR RNAME=MIRRORSERV CONV=N
```

1. **User-entered H2PL invokes MIRRDPLC program.**
2. The **EXEC CICS LINK** command causes the advertised service mapped to **MIRRDPPLS** (in the DM_LOCAL_SERVICES section of the DMCONFIG file) to execute. The invoked service participates in the CICS/ESA transaction.

3. The **MIRROR** service processes the data.

4. The **tpreturn** call returns the data into the **commarea** buffer.

5. The **EXEC CICS SYNCPOINT** is an explicit commit request indicating a successful end of the conversation. All updated resources in the transaction are committed.
CICS/ESA DPL to ATMI Requests/Responses Server for Channel /Container

**ATMI**

**ATMI Service**  
**CHAN1**

\[
\text{Fget32(channel\_name)} \\
\text{for(i=0; i<Foccurs32(); i++) { } } \\
\text{Fget32(container\_name)} \\
\text{Fget32(container\_data)} \\
\text{process data} \\
\text{Fchg32(container\_data)} \\
\text{tpreturn}
\]

**CICS**

**CICS Transaction**  
**KNC1**

\[
\text{PUT container1} \\
\text{PUT container2} \\
\text{PUT container3} \\
\text{LINK CHANCONS at remote} \\
\text{GET container3} \\
\text{GET container2} \\
\text{GET container1}
\]

**DMCONFIG File Entry**

\[
\text{*DM\_LOCAL\_SERVICES} \\
\text{CHAN1} \\
\text{CONV=N} \\
\text{RNAME="KNC1:CHANCONS"} \\
\text{INBUFTYPE="FML32"} \\
\text{OUTBUFTYPE="FML32"}
\]

1. User-entered KNC1 invokes CHANCONC program.
2. Three containers are put in a channel.

3. The EXEC CICS LINK command causes the advertised service mapped to CHANCONS to execute.

4. The CHAN1 service gets all containers from the channel, processes data of them, and puts them back to channel.

5. The tpreturn call returns the data into the commarea buffer.

6. The CHANCONC gets all containers from the channel and CICS RETRUN.

**Distributed Transaction Processing (DTP) Examples**

The following examples represent programming scenarios for using DTP and ATMI service invocations.

Although it is most suited for the DPL environment, the tpcall is usually used for the DPL environment, it can also be used for a request/response to a DTP server.

The examples in this section represent some of the programming scenarios available for using DTP and ATMI service invocations. These examples employ the most natural and efficient approaches.
1. ATMI client invokes `toupsrv` service.
2. The `toupsrv` service issues `tpcall` for `SIMPDT`, which is advertised in the `DM_REMOTE_SERVICES` section of `DMCONFIG` file.
3. User transaction `DTPS` starts `TOUPDTPS` program.

```
toupsrv
  ...
  tpcall ("SIMPDT",
    idata
    ilen
    odata,
    olen
    0)
  ...
}
```

```
DMCONFIG File Entry

DM_REMOTE_SERVICES
  SIMPDT RNAME=DTPS FUNCTION=APPC CONV=N
```

```
EXEC CICS RECEIVE
  CONVID (CONV-ID)
  INTO (IN-BUFFER)
  FLENGTH (IN-LEN)
  ...
  ...(process data)...
  ...
EXEC CICS SEND
  FROM (OUT-BUFFER)
  FLENGTH (OUT-LENGTH)
  CONVID (CONV-ID)
  LAST WAIT
```
4. It is recommended you save the eibtrmid to a program variable. This value may be used to identify the specific conversation in your CICS/ESA APPC verbs.

5. The EXEC CICS RECEIVE command receives the idata buffer contents for processing.

6. The TOUPDTPS program processes data.

7. The EXEC CICS SEND command returns the OUT-BUFFER contents into the clients odata buffer. LAST indicates the conversation is finished. WAIT suspends processing until the data has successfully been received.
ATMI Client Asynchronous Request/Response to CICS/ESA DTP

1. ATMI client invokes `toupsrv` service.

2. The `toupsrv` service issues `tpacall` for `SIMPDTP`, which is advertised in the `DM_REMOTE_SERVICES` section of the DMCONFIG file.

```
dmconfig File Entry

DM_REMOTE_SERVICES
SIMPDT P RNAME=DTPS FUNCTION=APPC CONV=N
```

```
toupsrv
{
  ...
  cd=tpacall
  ("SIMPDTP",
   idata,
   ilen,
   0);
  ...
  tpgetreply (cd,
    odata,
    olen,
    0);
}
```

```
CICS

User Transaction
DTPS

TOUPDTPS
PROGRAM
...
...(move EIBTRMID to CONV-ID)...

EXEC CICS RECEIVE
  CONVID (CONV-ID)
  INTO (IN-BUFFER)
  FLENGTH (IN-LEN)
  ...
  ...(process data)...
  ...
EXEC CICS SEND
  FROM (OUT-BUFFER)
  FLENGTH (OUT_LENGTH)
  CONVID (CONV-ID)
  LAST WAIT
EXEC CICS RETURN
```

```
ATMI

ATMI Service
toupclt

1
2
3
4
5
6
7
```

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3. User transaction DTPS starts TOUPDTPS program.

4. It is recommended you save the EIBTRMID to a program variable. This value may be used to identify the specific conversation in your CICS/ESA APPC verbs.

5. The EXEC CICS RECEIVE command receives the idata buffer contents for processing.

6. The TOUPDTPS program processes data.

7. The EXEC CICS SEND command returns the OUT-BUFFER contents into the clients tpgetreply odata buffer. LAST indicates the conversation is finished. WAIT suspends processing until the data has successfully been received.
ATMI Client Asynchronous Request/Response with No Reply to CICS/ESA DTP

1. ATMI client invokes `toupsrv` service.
2. The `toupsrv` service issues `tpacall` with a `TPNOREPLY` request for `SIMPDTP`, which is advertised in the `DM_REMOTE_SERVICES` section of `DMCONFIG` file.
3. User transaction DTPS starts `TOUPDTPS` program.
4. It is recommended you save the `EIBTRMID` to a program variable. This value may be used to identify the specific conversation on your CICS/ESA APPC verbs.

```
toupsrv
{
    ...
    cd=tpacall
    ("SIMPDTP",
     idata,
     idlen,
     TPNOREPLY);
}
```

```
DMCONFIG File Entry

DM_REMOTE_SERVICES

SIMPDTP RNAME=DTPS FUNCTION=APPC CONV=N
```

```
User Transaction
DTPS

TOUPDTPS
PROGRAM
    ...
    ...(move EIBTRMID to CONV-ID)...
    EXEC CICS RECEIVE
    CONVID (CONV-ID)
    INTO (IN-BUFFER)
    FLENGTH (IN-LEN)
    ...
    ...(process data)...
    ...
    EXEC CICS RETURN
```
5. The `EXEC CICS RECEIVE` command receives the `idata` buffer contents for processing.

6. The `TOUPDTPS` program processes data.

**ATMI Conversational Client to CICS/ESA DTP, Server Gets Control**

```
DMCONFIG File Entry

DM_REMOTE_SERVICES
SIMPDTTP RNAME=DTPS FUNCTION=APPC CONV=Y
```

```
toupsrv
{
  ...
  cd=tpconnect
  ("SIMPDTTP",
   idata,
   ilen,
   TPRECVONLY);
  ...
  tprecv (cd,
          odata,
          olen,
          0,
          revent);
}
```

```
User Transaction
DTPS

EXEC CICS RECEIVE
  CONVID (CONV-ID)
  INTO (IN-BUFFER)
  FLENGTH (IN-LEN)
...
...(process data)...

EXEC CICS SEND
  FROM (OUT-BUFFER)
  FLENGTH (OUT-LEN)
  WAIT LAST

EXEC CICS RETURN
```
1. ATMI client invokes **toupsrv** service.

2. The **toupsrv** service issues **tpconnect** for SIMPDTP, which is advertised in the `DM_REMOTE_SERVICES` section of DMCONFIG file. The `TPRECVONLY` flag indicates the server gets control and the first conversation verb **toupsrv** can issue is **tprecv**. Data is sent on the **tpconnect** in the **idata** buffer.

3. User transaction DTPS starts **TOUPDTPS** program.

4. It is recommended you save the **EIBTRMID** to a program variable. This value may be used to identify the specific conversation on your CICS/ESA APPC verbs.

5. The **EXEC CICS RECEIVE** command receives the **idata** buffer contents for processing.

6. The **TOUPDTPS** program processes data.

7. The **EXEC CICS SEND** command returns the **OUT-BUFFER** contents into the clients **tprecv odata** buffer. **WAIT** suspends processing in **TOUPDTPS** until the data has successfully been received. **LAST** indicates the conversation is finished and is communicated to the **tprecv** as **TPEV_SVCSUCC**.
ATMI Conversational Client to CICS/ESA DTP, Client Sends/Receives Data

1. ATMI client invokes `toupsrv` service.

```c
atmi client invokes toupsrv service.

ATMI CICS

ATMI Service toupsrv

{ .
  .
  .
  .
  .
  cd=tpconnect
  ("SIMPDTP",
   idata,
   ilen,
   TPSENDONLY);
  .
  .
  tpsend (cd,
         idata,
         ilen,
         0,
         TPRECVONLY);
  tprecv (cd,
          odata,
          olen,
          o,
          revent);
  tpreturn();
}

DMCONFIG File Entry

DM_REMOTE_SERVICES
  SIMPDTP RNAME=DTPS FUNCTION=APPC CONV=Y

User Transaction DTPS

TOUPDTPS
  PROGRAM
  .
  ...(move sibtrmid to conv-id)... EXEC CICS RECEIVE
  CONVID (CONV-ID)
  INTO (IN-BUFFER)
  FLENGTH (IN-LEN)
  .
  ...(process data)... EXEC CICS RECEIVE
  CONVID (CONV-ID)
  INTO (IN-BUFFER)
  FLENGTH (IN-LEN)
  .
  ...(process data)... EXEC CICS SEND
  CONVID (CONV-ID) WAIT LAST
  FROM (OUT-BUFFER)
  FLENGTH (OUT-LENGTH)
  EXEC CICS RETURN

1. ATMI client invokes `toupsrv` service.
2. The toupsrv service issues tpconnect for SIMPDTP, which is advertised in the DM_REMOTE_SERVICES section of DMCONFIG file. The TPSENDONLY indicates the client retains control and continues to send data. Data is sent on the tpconnect in the idata buffer.

3. User transaction DTPS starts TOUPDTPS program.

4. It is recommended you save the EIBTRMID to a program variable. This value may be used to identify the specific conversation on your CICS/ESA APPC verbs.

5. The EXEC CICS RECEIVE command receives the tpconnect idata buffer contents for processing.

6. The TOUPDTPS program processes data.

7. The EXEC CICS RECEIVE command receives the tpsend idata contents into the server’s IN-BUFFER.

8. The server processes the data.

9. The EXEC CICS SEND WAIT LAST returns OUT-BUFFER data in the tprecv odata buffer, along with notification that the conversation is over.
ATMI Conversational Client to CICS/ESA DTP, Client Grants Control

1. ATMI client invokes `toupsrv` service.

```c
1. ATMI Service toupsrv
   ...
   cd=tptconnect
   ("SIMPDTP",
    NULL,
    0,
    TPRECVONLY);
   tprecv (cd,
          odata
          olen,
          0,
          revent)
   ...
   tpsend (cd,
            idata,
            ilen,
            0,
            TPRECVONLY);
   tprecv (cd,
            dummy,
            dumlen
            0,
            reevent);
   tpreturn();
}
```

DMCONFIG File Entry

```
DM_REMOTE_SERVICES
SIMPDTP RNAME=DTPS FUNCTION=APPC CONV=Y
```

2. CICS User Transaction DTPS

3. `TOUPDTPS`

4. `PROGRAM` ...

5. `(move EIBTRMID to CONV-ID)...

6. EXEC CICS RECEIVE

```c
EXEC CICS RECEIVE
CONVID (CONV-ID)
INTO (IN-BUFFER)
FLENGTH (IN-LEN)
```

7. EXEC CICS SEND

```c
EXEC CICS SEND
FROM (OUT-BUFFER)
FLENGTH (OUT-LEN)
INVITE
```

8. EXEC CICS RETURN
2. The toupsrv service issues tpconnect for SIMPDT for SIMPDT, which is advertised in the DM_REMOTE_SERVICES section of DMCONFIG file. The TPRECVONLY indicates the server gets control and the first conversation verb toupsrv can issue is tprecv.

3. User transaction DTPS starts TOUPDTPS program.

4. It is recommended you save the EIBTRMID to a program variable. This value may be used to identify the specific conversation on your CICS/ESA APPC verbs.

5. The EXEC CICS RECEIVE command receives a send state indicator from the tpconnect TPRECVONLY flag. No data is received into the INBUFFER.

6. The EXEC CICS SEND command returns the OUT-BUFFER contents into the clients tprecv odata buffer. The EXEC CICS SEND command relinquishes control to the client by using the INVITE option. This is communicated to the tprecv as TPEV_SENDONLY.

7. The EXEC CICS RECEIVE command receives the tpsend idata contents into the server’s IN-BUFFER, along with notification that the server has relinquished control.

8. The EXEC CICS RETURN ends the conversation, communicated to the tprecv as TPEV_SVCSUCC.
CICS/ESA DTP to ATMI Conversational Server, Client Retains Control

1. User-entered H0TP invokes MIRRDTPC program.

2. The EXEC CICS ALLOCATE acquires a session to the remote Tuxedo domain.

DMCONFIG File Entry

DM_LOCAL_SERVICES
MIRROR RNAME=MIRRORSERV CONV=Y

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3. Save the conversation ID returned in EIBRSRCE to a program variable. This value is used to identify the specific conversation in your CICS/ESA APPC verbs.

4. The EXEC CICS CONNECT PROCESS command initiates the advertised service mapped to MIRROR in the DM_LOCAL_SERVICES section of the DMCONFIG file.

5. Execute the EXEC CICS SEND command to send the contents of the OUT-BUFFER to the Tuxedo service in the tpsvcinfo->data buffer. The contents might be sent immediately.

6. The EXEC CICS SEND INVITE WAIT command sends out-buff contents into the tprecv odata buffer. The INVITE parameter relinquishes control of the conversation, seen as a TPEV_SENDONLY in the reevent parameter on the tprecv command. The data is sent immediately, along with the data from the previous SEND operation.

7. The Tuxedo service processes data.

8. The CICS/ESA server processes data.

9. The ATMI tpreturn data returns data to the EXEC CICS RECEIVE, along with notification that the conversation completed successfully.
CICS/ESA DTP to ATMI Conversational Server, Client Relinquishes Control

DMCONFIG File Entry

```
DM_LOCAL_SERVICES
  MIRROR RNAME=MIRRORSERV CONV=Y
```

1. User-entered HOTP invokes MIRRDTPC program.

2. The EXEC CICS ALLOCATE acquires a session to the remote Tuxedo domain.
3. Save the conversation ID returned in EIBRSRCE to a program variable. This value is used to identify the specific conversation in your CICS/ESA APPC verbs.

4. The `EXEC CICS CONNECT PROCESS` command initiates the advertised service mapped to MIRROR in the DM_LOCAL_SERVICES section of the DMCONFIG file.

5. The `EXEC CICS SEND` command relinquishes control with the INVITE WAIT option.

6. The `EXEC CICS RECEIVE` command receives the tpsend idata buffer contents into the IN-BUFFER.

7. The `tpreturn` request tears down the conversation and indicates on the `EXEC CICS RECEIVE` that the conversation is over.
**Transactional ATMI Client Request/Response to CICS/ESA DTP**

**DMCONFIG File Entry**

```plaintext
DM_REMOTE_SERVICES

SIMPDT DTPS RNAME=DTPS FUNCTION=APPC CONV=N
```

**Note:** This is not the recommended method of performing a DTP transactional service. Please refer to the transactional DPL using request/response for the recommended method.
1. ATMI client toupclt invokes toupsrv service. (Note that each tpcall made in the program must be bookended with a tpbegin and a tpcommit.)

2. The service issues tpbegin to start a transaction.

3. The toupsrv service issues tpcall for SIMPDTP, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file.

4. User transaction DTPS starts TOUPDTPS program.

5. Save the EIBTRMID to a program variable. This value is used to identify the specific conversation on your CICS/ESA APPC verbs.

6. The EXEC CICS RECEIVE command receives the idata buffer contents for processing.

7. The TOUPDTPS program processes data.

8. The EXEC CICS SEND command returns the OUT-BUFFER contents into the clients odata buffer. CONFIRM indicates the conversation is finished. INVITE allows the client to respond with a COMMIT request.

9. The toupsrv service issues tpcommit to end the transaction. The COMMIT is received on the EXEC CICS RECEIVE verb and the server issues EXEC CICS RETURN to commit the resources, terminate the transaction, and free the outstanding conversation.
Transactional ATMI Conversational Client to CICS/ESA DTP, Server Gets Control

1. ATMI client invokes `toupsrv` service.
2. The `toupsrv` service issues `tpbegin` to start the transaction.

DMCONFIG File Entry

```
DM_REMOTE_SERVICES
SIMPDTTP RNAME=DTPS FUNCTION=APPC CONV=Y
```

1. ATMI client invokes `toupsrv` service.
2. The `toupsrv` service issues `tpbegin` to start the transaction.
3. The toupsrv service issues tpconnect for SIMPDT, which is advertised in the DM_REMOTE_SERVICES section of DMCONFIG file. The TPRECVONLY indicates the server gains control and the first conversation verb toupsrv can issue is tprecv. Data is sent on the tpconnect in the idata buffer.

4. User transaction DTPS starts TOUPDTPS program.

5. It is recommended you save the EIBTRMID to a program variable. This value may be used to identify the specific conversation on your CICS/ESA APPC verbs.

6. The EXEC CICS RECEIVE command receives the idata buffer contents for processing.

7. The TOUPDTPS program processes data.

8. The EXEC CICS SEND command returns the OUT-BUFFER contents into the clients tprecv odata buffer. CONFIRM indicates that the conversation is finished and is communicated to the tprecv as TPEV_SVCSUCC. INVITE enables the client to respond with a COMMIT request.

9. The toupsrv service issues tpcommit to end the transaction. The COMMIT is received on the EXEC CICS RECEIVE verb and the server issues EXEC CICS RETURN to commit the resources, terminate the transaction, and free the outstanding conversation.
Transactional CICS/ESA DTP to ATMI Conversational Server, Host Client Relinquishes Control

1. User-entered H2TP invokes MIRRDTPC program.

2. The EXEC CICS ALLOCATE acquires a session to the remote Tuxedo domain.

DMCONFIG File Entry

DM_LOCAL_SERVICES
MIRROR RNAME=MIRRORSERV CONV=Y

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3. Save the conversation ID returned in EIBRSRCE to a program variable. This value is used to identify the specific conversation on your CICS/ESA APPC verbs.

4. The `EXEC CICS CONNECT PROCESS` command initiates the advertised service mapped to MIRRDTPS. The `SYNCELEVEL(2)` parameter indicates the inclusion of the ATMI service in the CICS/ESA transaction.

5. The `EXEC CICS SEND INVITE WAIT` command causes the client to immediately relinquish control to the Tuxedo server. This is communicated to the service in TPSVCINFO as TPSENDONLY. No data is sent to the server on this request.

6. The `EXEC CICS RECEIVE` command receives the `tpsend idata buffer` contents into the `IN-BUFFER`. The `EXEC CICS RECEIVE` command receives a confirm request indicating the conversation should be terminated.

7. The `EXEC CICS ISSUE CONFIRMATION` verb responds positively to the confirm request.

8. The `EXEC CICS SYNCPOINT` is an explicit commit request to end the conversation and update all resources in the transaction.

9. The `EXEC CICS FREE` verb explicitly frees the outstanding conversation.

### CPI-C Programming Examples

The examples in this section show the protocol exchanges between the local ATMI platform and remote host application program. The type of ATMI service request determines the nature of the client/server communication model. For requests initiated by the host application, the configuration information for the local service determines the protocol exchanges on the conversation.

Although it is most suited for the DPL environment, the `tpcall` is usually used in the DPL environment but can also be used for a request/response to an APPC server.

The examples in this section represent a few of the many programming scenarios available for using CPI-C and ATMI service invocations. These examples employ the most natural and efficient approaches.
ATMI Client Request/Response to Host CPI-C

1. ATMI client invokes `toupsrv` service.
2. The `toupsrv` service issues `tpcall` for `SIMPCPIC`, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file.

```
ATMI HOST

ATMI Service
toupsrv()
{
tpcall ("SIMPCPIC",
idata,
ilen,
odata,
olen,
0);
}

HOST Remote Service
tpname = TPNCPIC

TOUPCPIC
PROGRAM
main()
{
cmaccp(convid,rcode);
cmrcv(convid,ibuffer,..);
...(process data)...
cmsst(..);CM_SEND_AND_DEALLOCATE

cmsend(convid, obuffer);
.
.
}
```

DMCONFIG File Entry

```
DM_REMOTE_SERVICES
SIMPCPIC RNAME=TPNPCPIC FUNCTION=APPC CONV=N
```

1. ATMI client invokes `toupsrv` service.
2. The `toupsrv` service issues `tpcall` for `SIMPCPIC`, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file.
3. The remote service with the tpname TPNCPCIC invokes TOUPCPIC program.

4. The server accepts the conversation with the cmaccp call. The conversation id returned on the request in convid is used for all other requests on this conversation.

5. The cmrcv request receives the idata buffer contents for processing

6. The TOUPCPIC program processes data.

7. The cmssst request prepares the next send request by setting the send type to CM_SEND_AND_DEALLOCATE.

8. The cmssend request returns the obuffer contents into the client odata buffer. The buffer is flushed, and the conversation ended.
ATMI Client Asynchronous Request/Response to Host CPI-C

1. ATMI client invokes `toupsrv` service.
2. The `toupsrv` service issues `tpacall` for `SIMPCPIC`, which is advertised in the `DM_REMOTE_SERVICES` section of the `DMCONFIG` file.
3. The remote service with `tpname TPNCPPIC` invokes `TOUPCPIC` program.

---

**DMCONFIG File Entry**

```
DM_REMOTE_SERVICES

SIMPCPIC RNAME=TPNCPPIC FUNCTION=APPC CONV=N
```
4. The server accepts the conversation with the **cmaccp** call. The conversation id returned on the request in **convid** is used for all other requests on this conversation.

5. The **cmrcv** request receives the **idata** buffer contents for processing.

6. The **TOUPCPIC** program processes data.

7. The **cmsend** command returns the **obuffer** contents into the client **tpgetreply odata** buffer. The data may not be immediately sent to the **tpgetreply odata** buffer on this request.

8. The **cmdeal** flushes the data to the client, and indicates the conversation is finished.
ATMI Client Asynchronous Request/Response to Host CPI-C with No Reply

1. ATMI client invokes `toupsrv` service.

2. The `toupsrv` service issues `tpacall` with a `TPNOREPLY` request for `SIMPCPIC`, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file.

```c
ATMI HOST
toupsrv()
{ tpacall ("SIMPCPIC", idata, ilen, TPNOREPLY);
  ...}

DMCONFIG File Entry

DM_REMOTE_SERVICES
SIMPCPIC RNAME=TPNPCPIC FUNCTION=APPC CONV=N

1. ATMI client invokes `toupsrv` service.

2. The `toupsrv` service issues `tpacall` with a `TPNOREPLY` request for `SIMPCPIC`, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file.
3. The remote service with tname TPNCPI1 invokes TOUPCPI1 program.

4. The server accepts the conversation with the cmaccp call. The conversation id returned on the request in convid is used for all other requests on this conversation.

5. The cmrcv request receives the idata buffer contents for processing, and notification that the conversation has ended with the return code value of CM_DEALLOCATED_NORMAL.

6. The TOUPCPI1 program processes data.
ATMI Conversational Client to Host CPI-C, Server Gets Control

ATMI Service toupsrv

```
toupsrv() {
    cd = tpconnect
    ("SIMPCPIC",
     idata,
     ilen,
     TPRECVONLY);
    tprecv(cd,
            odata,
            olen,
            0
       revent);
}
```

DMCONFIG File Entry

```
DM_REMOTE_SERVICES

SIMPCPIC RNAME=TPNPCPIC FUNCTION=APPC CONV=Y
```

1. ATMI client invokes toupsrv service.
2. The toupsrv service issues tpconnect for SIMPCPIC, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file. The TPRECVONLY indicates the server gains control and the first conversation verb the toupsrv can issue is tprecv. Data is sent on the tpconnect in the idata buffer.

3. The remote service with tpname TPNCPIInvokes TOUPCPIC program.

4. The server accepts the conversation with the cmaccp call. The conversation ID returned on the request in convid is used for all other requests on this conversation.

5. The cmrcv request receives the idata buffer contents for processing.

6. The TOUPCPIC program processes data.

7. The cmsst request prepares the next send request by setting the send type to CM_SEND_AND_FLUSH.

8. The cmsend command returns the obuffer contents into the client tprecv odata buffer. The data is immediately flushed on the send request.

9. The cmdeal request ends the conversation.
ATMI Conversational Client To Host CPI-C, Client Retains Control

1. ATMI client invokes `toupsrv` service.

```
toupsrv()
{
    cd=tpconnect("SIMPCPIC", 0, 0, TPSENDONLY);
    tpsend(cd, odata, olen, 0TPRECVONLY);
    tprecv (cd, idata, iler, 0, revent);
    .
}
```

Remote Service

```
tpname = TPNCPIC
PROGRAM
main()
{
    cmaccp(convid,rcode);
    cmrcv(convid,ibuffer,..);
    ...(process data)...
    .
    .
    cmsend (convid, obuffer...)
    cmdeal (convid, rcode);
}
```

**DMCONFIG File Entry**

```
DM_REMOTE_SERVICES
SIMPCPIC RNAME=TPNCPIC FUNCTION=APPC CONV=Y
```

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2. The toupsrv service issues tpconnect for SIMPCPIC, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file. The TPSENDONLY indicates the client retains control and continues to send data. No data is sent with the tpconnect.

3. The remote service with tpname TPNCPCIC invokes TOUPCPCIC program.

4. The server accepts the conversation with the cmaccp call. The conversation id returned on the request in convid is used for all other requests on this conversation.

5. The cmrcv request receives the tpsend idata buffer contents for processing. The conversation is relinquished with the TPRECVONLY flag.

6. The TOUPCPCIC program processes data.

7. The cmsend returns a response in the tprecv idata buffer, along with notification from the cmdeal command that the conversation is over. The cmdeal flushes the data buffer and the tprecv reevent parameter is set to TPEV_SUCCESS.
ATMI Conversational Client to Host CPI-C, Client Grants/gets Control

ATMI client invokes toupsrv service.

DMCONFIG File Entry

DM_REMOTE_SERVICES

SIMPCPIC RNAME=TPNPCPIC FUNCTION=APPC CONV=Y

1. ATMI client invokes toupsrv service.
2. The toupsrv service issues tpconnect for SIMPCPIC, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file. The TPRECVONLY indicates the server gains control and the first conversation verb the toupsrv can issue is tprecv.

3. The remote service with tpname TPNCPPIC invokes TOUPCPIC program.

4. The server accepts the conversation with the cmaccp request. The conversation id returned on the request in convid is used for all other requests on this conversation.

5. The cmrcv requests receives the indicator that control has been granted to the server.

6. The cmssend request returns its obuffer contents into the first client tprecv odata buffer. The data may not immediately be sent.

7. The cmssend request returns its obuffer contents into the second client tprecv odata buffer. The data may not immediately be sent.

8. The cmpttr request flushes the data to the client, and grants control to the client.

9. The cmrcv request receives the tspend idata buffer contents for processing. The TPRECVONLY is passed to the tprecv, relinquishing control of the conversation.

10. The cmdeal indicates a successful completion of the conversation to the tprecv; no data is passed.
Host CPI-C to ATMI Asynchronous Request/Response Server with No Reply

1. The CPI-C application program MIRRCPIC is invoked using environment start-up specifications.

```c
ATMI HOST

ATMI Service
MIRROR

MIRROR()
(TPSVCINFO* tpsvcinfo)
{  
tpsvcinfo->flags == TPNOREPLY
   manipulate
tpsvcinfo->data
  tpreturn(TPSUCCESS, 0, NULL, 0, 0);
}

Environment

MIRRCPIC
PROGRAM
main()
{
  cmnit(convid,"MIRRSIDE", rcode);
  cmallc(convid,rcode);
  cmsend(convid, obuffer, ...
  cmdeal(convid, rcode);  
}

DMCONFIG File Entry

DM_LOCAL_SERVICES
MIRROR RNAME=MIRRORSERV CONV=N
```
2. The **MIRRCPIC** client requests **cminit** to establish conversation attributes and receive a conversation ID that will be used on all other requests on this conversation. The remote server and service are named in the CPI-C side information entry **MIRRSIDE**.

3. The **cmallc** request initiates the advertised service mapped to **MIRRSERV** in the **DM_LOCAL_SERVICES** section of the DMCONFIG file.

4. The **cmSend** request sends the contents of **obuffer** to the ATMI service in the **tpsvcinfo->data buffer**.

5. The **cmdeal** request flushes the data, and indicates the conversation is finished with the **TPNOREPLY** in the **tpsvcinfo->flag field**.

6. The service completes with the **tpreturn**.
Host CPI-C to ATMI Server Request/Response

1. The CPI-C application program MIRRCPIC is invoked using environment start-up specifications.

```
MIRRCPIC
PROGRAM
main()
{
cminit(convid,"MIRRSIDE", rcode);
cmalloc(convid, rcode);
cmsst(...)CM_SEND_PREP_TO_RECEIVE

cmsend(convid, obuffer, ...
);
cmrrecv(convid, ibuffer...);
}

DMCONFIG File Entry

DM_LOCAL_SERVICES
MIRROR RNAME=MIRRORSERV CONV=N

1. The CPI-C application program MIRRCPIC is invoked using environment start-up specifications.
2. The MIRRCPIC client requests cminit to establish conversation attributes and receive a conversation id that will be used on all other requests on this conversation. The remote server and service are named in the CPI-C side information entry MIRRSIDE.

3. The cmallc request initiates the advertised service mapped to MIRRORSERV in the DM_LOCAL_SERVICES section of the DMCONFIG file.

4. The cmsst request prepares the next send request by setting the send type to CM_SEND_AND_PREP_TO_RECEIVE.

5. The cmsend request immediately sends the contents of obuffer to the ATMI service in the tpsvcinfo->data buffer and relinquishes control to the mirrorserv service.

6. The cmrcv request receives the contents of the odata returned on the ATMI tpreturn service, and notification that the conversation has ended with the return code value of CM_DEALLOATED_NORMAL.
Host CPI-C to ATMI Conversational Service, Client Retains Control

1. The CPI-C application program MIRRCPIC is invoked using environment start-up specifications.

```c
ATMI HOST

MIRRCPIC
PROGRAM
main()
{
cminit(convid,"MIRRSIDE", rcode);
cmallc(convid,rcode);
cmsend(convid, obuffer, ...
...);
cmdeal(convid, rcode);
}
```

DMCONFIG File Entry

```
DM_LOCAL_SERVICES

MIRROR RNAME=MIRRORSERV CONV=N
```

1. The CPI-C application program MIRRCPIC is invoked using environment start-up specifications.
2. The `MIRRCPIC` client requests `cminit` to establish conversation attributes and receive a conversation id that will be used on all other requests on this conversation. The remote server and service are named in the CPI-C side information entry `MIRRSIDE`.

3. The `cmalloc` request initiates the advertised service mapped to `MIRRORSERV` in the `DM_LOCAL_SERVICES` section of the `DMCONFIG` file.

4. The `cmSend` request sends the contents of `obuffer` to the ATMI service in the `tpsvcinfo->data` buffer.

5. The `cmdeal` request flushes the data and ends the conversation, as indicated by `TPNOREPLY` in the `tpsvcinfo->flag` field.
Host CPI-C ATMI to Conversational Service, Client Grants Control

DMCONFIG File Entry

DM_LOCAL_SERVICES
MIRROR RNAME=MIRRORSERV CONV=Y

1. The CPI-C application program MIRRCPIC is invoked using environment start-up specifications.
2. The MIRRCPIC client requests cmInit to establish conversation attributes and receive a conversation ID that will be used on all other requests on this conversation. The remote server and service are named in the CPI-C side information entry MIRRSIDE.

3. The cmallc request initiates the advertised service mapped to MIRROR in the DM_LOCAL_SERVICES section of the DMCONFIG file.

4. The cmptr relinquishes control of the conversation to the ATMI service indicated as TPSENDONLY in the tpsvcinfo->flag field. No data is passed in the tpsvcinfo->data field.

5. The cmrcv receives the contents of the tpsend odata into the ibuffer. The end of the conversation is passed from the tpsvcinfo service as return code value CM_DEALLOCATED_NORMAL.
Transactional ATMI Client Request/Response to Host CPI-C

1. ATMI client invokes `toupsrv` service.
2. The `toupsrv` service issues `tpbegin` to start the transaction.

DMCONFIG File Entry

```
DM_REMOTE SERVICES
SIMPCPIC RNAME=TPNPCPIC FUNCTION=APPC CONV=N
```

**1.** ATMI client invokes `toupsrv` service.

**2.** The `toupsrv` service issues `tpbegin` to start the transaction.
3. The toupsrv service issues tpcall for SIMPCPIC, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file. Data is sent from the idata buffer on the tpconnect.

4. The remote service with tpname TPNCPIC invokes TOUPCPIC program.

5. The server accepts the conversation with the cmaccp call. The conversation ID returned on the request in convid is used for all other requests during this conversation.

6. The cmrcv request receives the idata buffer contents for processing.

7. The cmsst and cmsptr prepare the next send request by setting the send type to CM_SEND_AND_PREP_TO_RECEIVE and by setting the prepare-to-receive type to CM_PREP_TO_RECEIVE_CONFIRM.

8. The cmssend request immediately returns the obuffer contents into the client’s odata buffer. The server relinquishes control to the server and indicates the end of the conversation with the CONFIRM request.

9. The toupsrv issues the tpccommit to successfully complete the transaction and commit all updated resources. The cmrcv request receives the commit request, and responds explicitly to the request with the SAA Resource/Recovery commit call srrcmit. The conversation is ended after the successful commit exchange.
Transactional ATMI Conversational Client to Host CPI-C, Server Gets Control

**ATMI**

1. ATMI client invokes `toupsrv` service.

2. The `toupsrv` service issues `tpbegin` to start the transaction.

**HOST**

3. The `toupsrv` service issues `tpbegin` to start the transaction.

4. Remote Service `tpname = TPNCPIC`

5. Program `main()`

6. `cmaccp (convid,rcode);`

7. `cmrecv(convid, ibuffer...)`

8. `(process data)...`

9. `cmsend(convid, obuffer...)` `cmsgptr(convid, CM_PREP_TO_RECEIVE_CONFIRM);`

10. `cmsgptr(convid,...);`

DMCONFIG File Entry

```
DM_REMOTE_SERVICES

SIMPCPIC RNAME=TPNCPIC FUNCTION=APPC CONV=Y
```

1. ATMI client invokes `toupsrv` service.

2. The `toupsrv` service issues `tpbegin` to start the transaction.
3. The toupsrv service issues a tpconnect service request for SIMPCPIC, which is advertised in the DM_REMOTE_SERVICES section of the DMCONFIG file. Data is sent in the idata buffer on the tpconnect.

4. The remote service with tpname TPNCPIC invokes TOUPCPIC program.

5. The server accepts the conversation with the cmaccp call. The conversation ID returned on the request in convid is used for all other requests during this conversation.

6. The cmrcv request receives the idata buffer contents sent on the tpconnect for processing.

7. The TOUPCPIC program processes the data.

8. The cmsend returns the obuffer contents into the client’s tprecv odata buffer. The buffer contents may not be sent immediately.

9. The cmsptr prepares the prepare-to-receive request with CM_PREP_TO_RECEIVE_CONFIRM. The cmptr request with CONFIRM indicates that the conversation is finished and is communicated to the tprecv as TPEV_SVCSUCC.

10. The toupsrv issues the tpcommit to successfully complete the transaction and commit all updated resources. The cmrcv request receives the commit request and responds explicitly to the request with the SAA Resource/Recovery commit call srrcmit. The conversation is ended after the successful commit exchange.
Transactional Host CPI-C to ATMI Conversational Server, Client Grants Control

ATMI

ATMI Service
MIRROR

MIRROR
(TPSVCINFO* tpsvcinfo);
{ 
tpsend(tpsvcinfo->cd, 
 odata, 
 olen, 
 0, 
 reevent);
tpreturn (TPSUCCESS, 
 (chart)NULL, 
 0, 
 0);
}

HOST

Environment

MIRRCPIC
Program
main()
{
cinit(convid, 
 "MIRRISIDE", 
 rcode);
cmssl(convid, 
 CM_SYNCPOINT,...);
cmallc(convid,rcode)
cmsptr(convid, 
 CM_PREP_TO_RECEIVE_FLUSH,..);
cmptr(convid,rcode);
cmrcv(convid, 
 ibuffer...);
cmcfmd(confid,rcode)
cmdeal(convid,rcode)
srccmit(rrcode);
}

DMCONFIG File Entry

DM_LOCAL_SERVICES
MIRROR RNAME=MIRRORSERV CONV=Y

1. The CPI-C application program MIRRCPIC is invoked using environment start-up specifications.
2. The MIRRCPIC client requests `cminit` to establish conversation attributes and receive a conversation ID that will be used on all other requests on this conversation. The remote server and service are named in the CPI-C side information entry `MIRRSIDE`.

3. The `cmssl` sets the conversation attributes to sync-level 2 with `CM_SYNCPOINT`. This allows the ATMI service to participate in the transaction.

4. The `cmallc` request initiates the advertised service mapped to `MIRRORSERV` in the `DM_LOCAL_SERVICES` section of the `DMCONFIG` file.

5. The MIRRCPIC causes the client to relinquish control to the ATMI server with a prepare-to-receive request. The `cmsptr` sets the prepare-to-receive type to `CM_RECEIVE_AND_FLUSH`. The `cmptr` request immediately relinquishes control.

6. The `MIRROR` service sends the data contents of the `odata` buffer to the `cmrcv` `ibuffer`. The `cmrcv` receives a confirm request from the server indicating the conversation should be terminated.

7. The client replies positively to the confirm request with `cmcfmd`.

8. The MIRRCPIC client prepares to free the conversation with the `cmdeal` request. The conversation in `CM DEALLOCATE_SYNC_LEVEL` commits all updated resources in the transaction and waits for the SAA resource recovery verb, `srrcmit`. After the commit sequence has completed, the conversation terminates.

### CICS/ESA Mirror Transaction Examples

- Implicit Attachment of TRANSID (Outbound Requests Only)
- Explicit Attachment of TRANSID for Outbound Requests
- Explicit Attachment of TRANSID for Inbound Requests
Implicit Attachment of TRANSID (Outbound Requests Only)

Figure 2-1 Implicit Attachment of TRANSID (Outbound Requests Only)

The following list describes the process for implicit attachment as illustrated in Figure 2-1:

1. The ATMI service makes a request to the service TRN1DATA, which is advertised as a remote service in the DMCONFIG file. It is a DPL request to a program named SVC1 in the CICS/ESA region.

2. The first four characters of the remote service tag name (TRN1) are extracted and passed to the CICS/ESA region as the invoking TRANSID. No CICS/ESA resource definition for the TRANSID is required in the region.

3. The mirror transaction CSMI is attached in the CICS/ESA region, starting the mirror program DFHMIRS. The program performs the DTP requests for the service.
4. The mirror program now attaches the invoking TRANSID (TRN1) and then invokes the application service program SVC1. The program can interrogate the EIBTRNID field to find this value.

**Explicit Attachment of TRANSID for Outbound Requests**

*Figure 2-2* Explicit Attachment of TRANSID for Outbound Requests

The following list describes the process for explicit attachment as illustrated in *Figure 2-2*:

1. The ATMI program makes a service request for SERVICE1, which is advertised as a remote service in the DMCONFIG file. The FUNCTION option indicates the remote service is invoked as a DPL.

2. The request extracts TRN1 as an alternate mirror transaction ID for the remote region, along with the remote program name SERVICE1.
3. The TRN1 ID is attached instead of the default mirror transaction, CSMI or CVMI. The TRN1 ID must be defined as a transaction resource in the remote region and must point to the mirror transaction program DFHMIRS.

4. The mirror program DFMMIRS calls the server application program, passing the TRN1 ID in the EIBTRNID field.

**Explicit Attachment of TRANSID for Inbound Requests**

**Figure 2-3 Explicit Attachment of TRANSID for Inbound Requests**

The following list describes the process for implicit attachment as illustrated in Figure 2-3:

1. The CICS/ESA program makes a request to INSVC1, which is a local ATMI service. The SYSID and PROGRAM values in the request identify the local system and the name of the local service. The TRANSID option indicates the mirror transaction to be initiated.
2. The **PROGRAM** and mirror **TRANSID** are extracted from the DPL request and are used to find an exact **RNAME** match in the **DM_LOCAL_SERVICES** section of the **DMCONFIG** file.

3. The service **SERVICE1**, which is advertised locally in the ATMI platform application, is initiated.

**Additional Information**

Additional information about CICS/ESA Intersystem Communications may be found in the following IBM publications:

- **CICS/ESA Intercommunication Guide**, IBM publication No. SC33-0657
- **CICS/ESA Distributed Transaction Programming Guide**, IBM publication No. SC33-00783
- **CICS/ESA Recovery and Restart Guide**, IBM publication No. SC33-0658