

IBM Informix

**Version 11.50**

# IBM Informix Change Data Capture API Programmer's Guide



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**Version 11.50**

# IBM Informix Change Data Capture API Programmer's Guide

**Note**

Before using this information and the product it supports, read the information in "Notices" on page B-1.

This edition replaces SC23-9814-00.

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# Introduction

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## About this publication

This publication describes the IBM® Informix® Change Data Capture API and the concepts of capturing changes to data. This publication describes how to use the Change Data Capture API to write an application that captures changed data for external processing.

This publication describes features that are not available for all Dynamic Server editions. For details on the differences between editions, see the following Web site: <http://www.ibm.com/software/data/informix/ids/ids-ed-choice/>.

## Types of users

This publication is for database application programmers.

To understand this publication, you need to have the following background:

- A working knowledge of your computer, your operating system, and the utilities that your operating system provides
- Some experience working with relational databases or exposure to database concepts
- Some experience with computer programming in the C or Java™ programming language

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## What's new in the IBM Informix Change Data Capture API, Version 11.50

This publication includes information about new features and changes in existing functionality.

The following changes and enhancements are relevant to this publication. For a comprehensive list of all new features for this release, see the *IBM Informix Dynamic Server Getting Started Guide*.

| Table 1. What's New in IBM Informix Change Data Capture Programmer's Guide for version 11.50.xC4.

Overview	Reference
Monitor Change Data Capture Sessions	Chapter 6, "onstat -g cdc," on page 6-1
You can now monitor the sessions involved in change data capture by using the new <b>onstat -g cdc</b> command. Use the options to display information about the captured tables, the buffers being used by sessions, the configuration of sessions, or the data capture activity.	
View Change Data Capture Error Message Text	"The cdc_errortext() function" on page 2-4
You can now view the error message text corresponding to an error name by using the new cdc_errortext() function.	

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## Documentation Conventions

Special conventions are used in the product documentation for IBM Informix Dynamic Server.

### Technical Changes

Technical changes to the text are indicated by special characters depending on the format of the documentation.

#### HTML documentation

New or changed information is surrounded by blue  $\gg$  and  $\ll$  characters.

#### PDF documentation

A plus sign (+) is shown to the left of the current changes. A vertical bar (|) is shown to the left of changes made in earlier shipments.

### Feature, Product, and Platform Markup

Feature, product, and platform markup identifies paragraphs that contain feature-specific, product-specific, or platform-specific information.

Some examples of this markup follow:

**Dynamic Server only:** Identifies information that is specific to IBM Informix Dynamic Server

**Windows only:** Identifies information that is specific to the Windows® operating system

This markup can apply to one or more paragraphs within a section. When an entire section applies to a particular product or platform, this is noted as part of the heading text, for example:

**Table Sorting (Windows)**

### Example Code Conventions

Examples of SQL code occur throughout this publication. Except as noted, the code is not specific to any single IBM Informix application development tool.

If only SQL statements are listed in the example, they are not delimited by semicolons. For instance, you might see the code in the following example:

```
CONNECT TO stores_demo
...

DELETE FROM customer
  WHERE customer_num = 121
...

COMMIT WORK
DISCONNECT CURRENT
```

To use this SQL code for a specific product, you must apply the syntax rules for that product. For example, if you are using an SQL API, you must use EXEC SQL at the start of each statement and a semicolon (or other appropriate delimiter) at the end of the statement. If you are using DB–Access, you must delimit multiple statements with semicolons.



**Tip:** Ellipsis points in a code example indicate that more code would be added in a full application, but it is not necessary to show it to describe the concept being discussed.

For detailed directions on using SQL statements for a particular application development tool or SQL API, see the documentation for your product.

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## Additional Documentation

Documentation about IBM Informix products is available in various formats.

You can view, search, and print all of the product documentation from the IBM Informix Dynamic Server information center on the Web at <http://publib.boulder.ibm.com/infocenter/idshelp/v115/index.jsp>.

For additional documentation about IBM Informix Dynamic Server and related products, including release notes, machine notes, and documentation notes, go to the online product library page at <http://www.ibm.com/software/data/informix/pubs/library/>. Alternatively, you can access or install the product documentation from the Quick Start CD that is shipped with the product.

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## Compliance with Industry Standards

IBM Informix products are compliant with various standards.

IBM Informix SQL-based products are fully compliant with SQL-92 Entry Level (published as ANSI X3.135-1992), which is identical to ISO 9075:1992. In addition, many features of IBM Informix database servers comply with the SQL-92 Intermediate and Full Level and X/Open SQL Common Applications Environment (CAE) standards.

The IBM Informix Geodetic DataBlade® Module supports a subset of the data types from the *Spatial Data Transfer Standard (SDTS)—Federal Information Processing Standard 173*, as referenced by the document *Content Standard for Geospatial Metadata*, Federal Geographic Data Committee, June 8, 1994 (FGDC Metadata Standard).

IBM Informix Dynamic Server (IDS) Enterprise Edition, Version 11.50 is certified under the Common Criteria. For more information, refer to *Common Criteria Certification: Requirements for IBM Informix Dynamic Server*, which is available at <http://www.ibm.com/support/docview.wss?uid=swg27015363>.

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## Syntax Diagrams

Syntax diagrams use special components to describe the syntax for statements and commands.

Table 2. Syntax Diagram Components







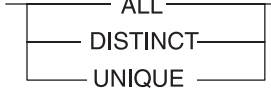
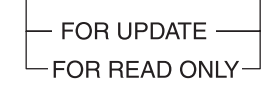
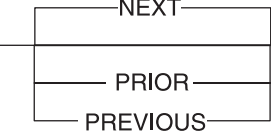
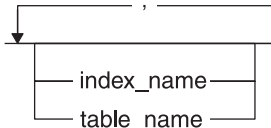

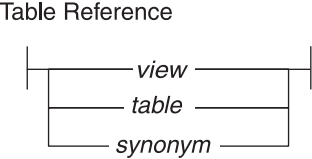
Component represented in PDF	Component represented in HTML	Meaning
	<code>&gt;&gt;-----</code>	Statement begins.
	<code>-----&gt;</code>	Statement continues on next line.

Table 2. Syntax Diagram Components (continued)

Component represented in PDF	Component represented in HTML	Meaning
	<code>&gt;-----</code>	Statement continues from previous line.
	<code>-----&gt;&lt;</code>	Statement ends.
	<code>-----SELECT-----</code>	Required item.
	<code>--+-----+-- '-----LOCAL-----'</code>	Optional item.
	<code>---+-----ALL-----+--- +---DISTINCT-----+ '---UNIQUE-----'</code>	Required item with choice. One and only one item must be present.
	<code>---+-----+--- +---FOR UPDATE-----+ '---FOR READ ONLY--'</code>	Optional items with choice are shown below the main line, one of which you might specify.
	<code>.---NEXT-----. ---+-----+--- +---PRIOR-----+ '---PREVIOUS-----'</code>	The values below the main line are optional, one of which you might specify. If you do not specify an item, the value above the line will be used as the default.
	<code>.-----,----- v +-----+--- '---index_name---+ '---table_name---'</code>	Optional items. Several items are allowed; a comma must precede each repetition.
	<code>&gt;&gt;-   Table Reference   -&gt;&lt;</code>	Reference to a syntax segment.
	<code>Table Reference  ---+-----view-----+---  +-----table-----+ '-----synonym-----'</code>	Syntax segment.

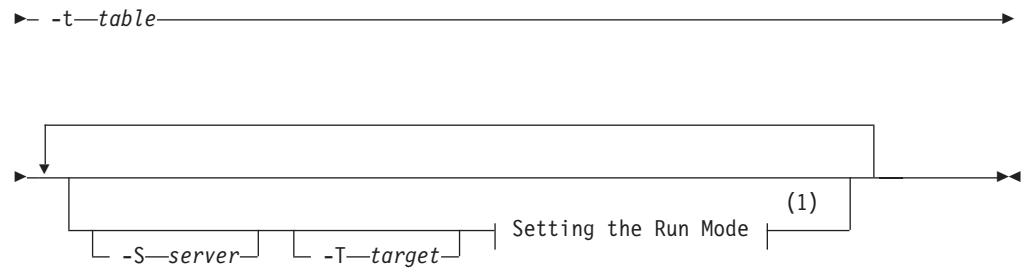
## How to Read a Command-Line Syntax Diagram

Command-line syntax diagrams use similar elements to those of other syntax diagrams.

Some of the elements are listed in the table in Syntax Diagrams.

### Creating a No-Conversion Job

`>>-onpladm create job—job—  
                                  └ -p—project ┘ -n -d—device— -D—database—>`

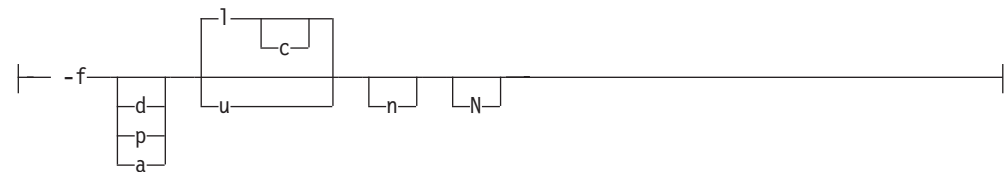


#### Notes:

1 See page Z-1

This diagram has a segment named “Setting the Run Mode,” which according to the diagram footnote is on page Z-1. If this was an actual cross-reference, you would find this segment in on the first page of Appendix Z. Instead, this segment is shown in the following segment diagram. Notice that the diagram uses segment start and end components.

#### Setting the Run Mode:



To see how to construct a command correctly, start at the top left of the main diagram. Follow the diagram to the right, including the elements that you want. The elements in this diagram are case sensitive because they illustrate utility syntax. Other types of syntax, such as SQL, are not case sensitive.

The Creating a No-Conversion Job diagram illustrates the following steps:

1. Type **onpladm create job** and then the name of the job.
2. Optionally, type **-p** and then the name of the project.
3. Type the following required elements:
  - **-n**
  - **-d** and the name of the device
  - **-D** and the name of the database
  - **-t** and the name of the table
4. Optionally, you can choose one or more of the following elements and repeat them an arbitrary number of times:
  - **-S** and the server name
  - **-T** and the target server name
  - The run mode. To set the run mode, follow the Setting the Run Mode segment diagram to type **-f**, optionally type **d**, **p**, or **a**, and then optionally type **l** or **u**.
5. Follow the diagram to the terminator.

## Keywords and Punctuation

Keywords are words reserved for statements and all commands except system-level commands.

When a keyword appears in a syntax diagram, it is shown in uppercase letters. When you use a keyword in a command, you can write it in uppercase or lowercase letters, but you must spell the keyword exactly as it appears in the syntax diagram.

You must also use any punctuation in your statements and commands exactly as shown in the syntax diagrams.

## Identifiers and Names

Variables serve as placeholders for identifiers and names in the syntax diagrams and examples.

You can replace a variable with an arbitrary name, identifier, or literal, depending on the context. Variables are also used to represent complex syntax elements that are expanded in additional syntax diagrams. When a variable appears in a syntax diagram, an example, or text, it is shown in *lowercase italic*.

The following syntax diagram uses variables to illustrate the general form of a simple SELECT statement.

►►—SELECT—*column\_name*—FROM—*table\_name*—►►

When you write a SELECT statement of this form, you replace the variables *column\_name* and *table\_name* with the name of a specific column and table.

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## How to Provide Documentation Feedback

You are encouraged to send your comments about IBM Informix user documentation.

Use one of the following methods:

- Send e-mail to [docinf@us.ibm.com](mailto:docinf@us.ibm.com).
- Go to the information center at <http://publib.boulder.ibm.com/infocenter/idshelp/v115/index.jsp> and open the topic that you want to comment on. Click the feedback link at the bottom of the page, fill out the form, and submit your feedback.

Feedback from both methods is monitored by those who maintain the user documentation. The feedback methods are reserved for reporting errors and omissions in our documentation. For immediate help with a technical problem, contact IBM Technical Support. For instructions, see the IBM Informix Technical Support Web site at <http://www.ibm.com/planetwide/>.

We appreciate your suggestions.

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# Chapter 1. Getting started with the Change Data Capture API

These topics describe the Change Data Capture API and how to use it.

---

## The Change Data Capture API

The Change Data Capture API allows external client applications to capture transactional data from an IBM Informix Dynamic Server database.

The Change Data Capture API provides functions to capture transactional data. You can use a variety of clients to run these functions, such as, JDBC, ODBC, ESQ/L/C, and DB-Access. Information about functions and their return values are contained in the **syscdc** system database. The data is returned as CDC records by standard Informix smart large object read functions. How the captured data is processed depends on your application. For example, you could write an application to replicate data from an IBM Informix Dynamic Server database to another, heterogeneous, database.

The following types of operations are captured:

- INSERT
- DELETE
- UPDATE
- TRUNCATE

The Change Data Capture API starts capturing transactions from the current logical log and processes all transactions sequentially. The first time you start capturing data for a particular table, data capture starts at the current log position. If you later stop capture and the restart it, you can restart at the point in the logical logs where data capture was stopped. You cannot go backwards in time through the logical logs to capture the history of the table or perform random seeking in the logical logs.

At the beginning of data capture for a table, the Change Data Capture API provides the table schema information that you can use in your application to create a target table. However, any changes to the table schema after data capture begins are not captured by the Change Data Capture API.

The Change Data Capture API can only provide data as that data is changing; it does not provide an initial snapshot of the contents of the table. If you need a populated target table, you can externally load the existing data to the target table. Alternatively, you can create dummy updates to the table for each row so that the Change Data Capture API can capture those updates and populate the target table.

The Change Data Capture API does not capture changes to table schemas or any other database changes.

The Change Data Capture API can capture data only from databases that have logging enabled.

## Change Data Capture API components

The Change Data Capture API consists of functions, a system database, CDC records, and error codes.

### Functions

Change Data Capture functions are built-in SQL functions that you run by using the EXECUTE FUNCTION statement. You use these functions to control data capture. The **cdc\_opensess()** function returns the CDC session ID, which is a smart large object file descriptor that you use to retrieve captured data. The **cdc\_startcapture()** function specifies the table from which to capture data. Other functions specify to start or end data capture.

You must call Change Data Capture functions from a client application. You cannot call this function from a user-defined routine that runs within the database server.

### System database

The **syscdc** system database contains the Change Data Capture functions and system tables. The system tables store information about Change Data Capture API error codes and record types, the API version number, the current data capture sessions, and the tables whose data is currently being captured. You can query the information in the **syscdc** tables to provide input for your application and to monitor the status of the data capture process.

### Error codes

The Change Data Capture API functions return error codes. Most of the functions return an error code both if they succeed or fail. The Change Data Capture API error codes are listed in the **syscdcerrorcodes** table of the **syscdc** database. You can query the **syscdcerrorcodes** table to determine whether the function failed and if so, why it failed.

### Smart large object read functions

You use smart large object read functions to read the captured data, by passing the smart large object file descriptor provided by the **cdc\_opensess()** function. Smart large object read functions are not part of the Change Data Capture API; you can use smart large object read functions such as **mi\_lo\_read()** or **ifx\_lo\_read()**.

### CDC Records

The Change Data Capture (CDC) records are returned by smart large object read functions and provide information about the transaction currently being captured as well as the actual captured data.

## Smart large object read functions

You use smart large object read functions to transfer captured data to a buffer where your application can access it.

You can use any of the smart large object read functions listed in the following table, depending on your application language. You must use the same smart large object read function for all read calls during a particular session. Using different functions in the same session could result in incomplete delivery of captured data.

Table 1-1. Smart large object read functions

Read function	Arguments	Informix API	Application Language
mi_lo_read()	A pointer to a connection descriptor  A smart large object file descriptor  A data buffer  The maximum number of bytes to read	DataBlade API	Use in a C language application.
ifx_lo_read()	A smart large object file descriptor  A data buffer	ODBC	Use in an ODBC application.
ifx_lo_read()	A smart large object file descriptor  A data buffer  The maximum number of bytes to read  A pointer to an error code	ESQL/C	Use in a C language application.
IfxLoRead()	A smart large object file descriptor  A data buffer  The maximum number of bytes to read	JDBC	Use in a Java application.
IfxBlob.Read()	A data buffer	.NET	Use in a .NET application.

## Read timeout

If no captured data is available to retrieve, the read call waits for data for the timeout period specified by the **cdc\_opensess()** function. If the timeout period is exceeded, a CDC\_REC\_TIMEOUT record is returned to the read call. The read call passes the CDC\_REC\_TIMEOUT record into the data buffer and returns successfully.

## Read buffer size

The size of the buffer specified in the read call should be at least 128 bytes. The maximum size of a read buffer is 2 GB. You can calculate the approximate minimum size of the buffer for your application by calculating the largest possible

CDC record size, for example, a CDC\_REC\_INSERT record, and multiplying that value times the maximum number of records to return per read call that you specify in the `cdc_opensess()` function.

The amount of data returned by a read call is the lesser of the size of the buffer specified in the read call and the maximum number of records to return. No more than the maximum number of records is returned by one read call, even if the number of bytes contained in those records is less than the maximum number of bytes allowed by the read call. However, no more than the maximum number of bytes allowed by the read call will be returned, even if the number of records returned is less than the maximum number allowed. If a record does not fit into a buffer, as much of the record as can fit is returned, and subsequent read calls return the rest.

### Smart large object file descriptor

The value for the smart large object file descriptor argument in the read functions is the CDC session ID returned by the `cdc_opensess()` function.

### Smart large object read function for the Informix .NET Provider

The smart large object read function for .NET works differently than for other client APIs. The following pseudo code illustrates the basic structure for reading smart large objects with .NET:

```
conn = new IfxConnection(..)// to SYSCDC database
execute function informix.cdc_opensess() // on the same connection
IfxBlob( IfxConnection connection )// construct it using the same connection
IfxBlob.Open(ReadOnly) // open it
IfxBlob.Read(char[] buff)
```

## CDC record sequence numbers

Most Change Data Capture (CDC) records returned to the client contain a sequence number.

The sequence number associated with a CDC record is a BIGINT data type.

The CDC record sequence number is not necessarily the same as the LSN of the IDS logical log that is being captured.

You can compare sequence numbers for CDC records that are returned for the same transaction. Within a transaction, the sequence numbers of CDC records returned increase over time. A lower sequence number indicates that the CDC record was returned earlier than a CDC record with a higher sequence number.

You can compare the sequence numbers of CDC\_REC\_BEGINIX records or the sequence numbers of CDC\_REC\_COMMTX records for different transactions. Each committed transaction has one CDC\_REC\_BEGINIX record and one CDC\_REC\_COMMTX record. The sequence numbers for the CDC\_REC\_BEGINIX and CDC\_REC\_COMMTX records are in monotonic order. A lower sequence number indicates that the associated transaction was begun or committed earlier than a transaction associated with a higher sequence number.

## Data for capture

You can capture most IDS data types. You can specify the data to capture at the column level.



The following data types are not supported for data capture:

- Simple large objects (TEXT and BYTE data types)
- User-defined data types
- Collection data types (SET, MULTISSET, LIST, and ROW data types)

## Specifying what data to capture

You specify a table and which columns from that table to capture with the **cdc\_startcapture()** function. You need to run the **cdc\_startcapture()** function once for each table that you want to capture. For information about which tables and columns are currently being captured, look in the **syscdctabs** table.

## Ending capture of a table

To stop data capture of a specific table, run the **cdc\_stopcapture()** function. After you run **cdc\_stopcapture()** function, information about that table is removed from the **syscdctabs** table.

---

## Preparing to use the Change Data Capture API

Before you can start using the Change Data Capture API, you must prepare the database and the database server.

Perform the following tasks to prepare for using the Change Data Capture API:

1. Turn on logging for all databases from which you intend to capture data changes. For information about logging, see the *IBM Informix Guide to SQL: Syntax*.
2. Run the following script as user **informix** from the **\$INFORMIXDIR/etc** directory: **syscdcv1.sql**
3. Verify that the **syscdcv1** database exists by creating a connection to it, as user **informix**. For example, you could use DB-Access to connect to the **syscdcv1** database.
4. Set the **DB\_LOCALE** environment variable to be the same as the locale of the database from which you want to capture data.

### Related tasks

“Writing an application to capture data changes”

---

## Writing an application to capture data changes

Use the Change Data Capture functions to control the data capture process. Process CDC records to extract the data. Query **syscdc** tables to retrieve the symbolic names and descriptions of CDC records and errors.

Complete the prerequisite tasks to prepare for using the Change Data Capture API.

Your application should contain the following structures and functions:

- A structure to store table schema information. You use the table schema to parse the column data.
- A function to interpret the table schema information and populate the table schema structure. You can obtain the table schema information from the **CDC\_REC\_TABSCHEMA** record.
- A function to retrieve and parse the column values from the data buffer.

- A function to handle errors. You can query the **syscdccerrcodes** table to determine the symbolic name and description of the error code.

Include the following tasks in your application to capture data changes:

1. As user **informix**, connect to the **syscdcv1** database on the database server to which the client is currently connected.
2. Open a capture session by running the **cdc\_opensess()** function. The **cdc\_opensess()** function returns a session ID.
3. Enable full-row logging for each table from which you want to capture data by running the **cdc\_set\_fullrowlogging()** function.
4. Specify which data to capture by running the **cdc\_startcapture()** function. Run this function for each table from which you want to capture data.
5. Start the capture process by running the **cdc\_activatesess()** function. CDC records, including those that contain captured data, are returned to the application.
6. Read the CDC records containing captured data with a smart large object read function such as **mi\_lo\_read()** by passing the session ID as the large object file descriptor. Use the same smart large object read function for all read calls.
7. Parse the data by column values.
8. Stop capturing data by running the **cdc\_stopcapture()** function for each table.
9. Stop capturing all data for the session by running the **cdc\_deactivatesess()** function.
10. Disable full-row logging by running the **cdc\_set\_fullrowlogging()** function for each table. Make sure that no other applications or processes are dependent on full-row logging before you disable it.
11. Close the capture session by running the **cdc\_closesess()** function.

#### Related concepts

Chapter 2, “Change Data Capture functions,” on page 2-1

#### Related tasks

“Preparing to use the Change Data Capture API” on page 1-5

#### Related reference

Chapter 7, “Change Data Capture sample program,” on page 7-1

## Handling errors

To process errors that are returned by Change Data Capture functions, reference error numbers by looking up their symbolic names in the **syscdccerrcodes** table.

Add code to your application to handle possible error conditions.

1. Declare error code variables for the types of errors that you intend to process separately.
2. Query the **syscdccerrcodes** table to find the error number corresponding to each of the symbolic names of the Change Data Capture error codes.
3. Set the error code variables to the Change Data Capture error numbers.
4. Add code to handle each error condition.

You can use the **cdc\_errortext()** function to return the error text for a specified symbolic name.

### Related reference

Chapter 5, “Change Data Capture error codes,” on page 5-1

---

## Restarting data capture

You can restart data capture where the last data capture session ended.

The restart position is the sequence number of a CDC record that was returned in the previous data capture session. You could choose to use the sequence number of the last CDC record processed in the previous data capture session. However, to preserve transactional integrity, you should determine last transaction for which a commit or rollback operation was not processed and restart capture at the beginning of that transaction. In this case, the restart position is the lowest sequence number of the CDC\_REC\_BEGINTX records for incomplete transactions. To avoid reprocessing already committed transactions, you should also determine the largest sequence number of the CDC\_REC\_COMMTX record that you have already processed in a previous data capture session.

To restart data capture:

1. Determine the restart position. To preserve transactional integrity:
  - a. Find all captured transactions that did not return a CDC\_REC\_COMMTX or CDC\_REC\_RBTX record.
  - b. Compare the sequence numbers of the CDC\_REC\_BEGINTX records for the incomplete transactions. The lowest sequence number is the restart position.
2. Open a new capture session by running the **cdc\_opensess()** function.
3. Run the **cdc\_startcapture()** function for the table on which you want to restart capturing data.
4. Active the session by running the **cdc\_activatesess()** function. Pass the appropriate sequence number as the *position* argument. Data capture restarts for the table at the last transaction that was processed.
5. Discard any transactions whose CDC\_REC\_COMMTX sequence number is less than that of the CDC\_REC\_COMMTX record with the largest sequence number that you processed in the previous data capture session.

### Related reference

“The **cdc\_activatesess()** function” on page 2-1

---

## Monitoring data capture

You can monitor the status of data capture by running the **onstat -g cdc** command.

To view the current status of a data capture session, run the **onstat -g cdc** command. For this command, and all other **onstat -g cdc** command options, you can specify a single session or view information about all current sessions.

To view the status of session buffers, run the **onstat -g cdc bufm** command.

To view information about session configuration, run the **onstat -g cdc config** command.

To view information about tables currently being captured, run the **onstat -g cdc table** command. You can provide a single table name or view information for all tables.

**Related reference**

Chapter 6, “onstat -g cdc,” on page 6-1

---

## Chapter 2. Change Data Capture functions

These topics describe the Change Data Capture functions.

### Related tasks

“Writing an application to capture data changes” on page 1-5

---

### The `cdc_activatesess()` function

For an open capture session, starts capturing data from the specified log and log position.

The `syscdcsess` table is updated when the session is activated.

### Syntax

►► `cdc_activatesess`—(*—session\_ID—*, *—position—*)—►►

### Function arguments

Table 2-1. `cdc_activatesess()` arguments

Argument	Data Type	Description
<i>session_ID</i>	INTEGER	The session ID of the open capture session for which to start capturing data.
<i>position</i>	BIGINT	Must be 0 or the restart position.

### Usage

After you open a session with the `cdc_opensess()` function, you use the `cdc_activatesess()` function to start capturing data at the specified log position. If you are starting data capture on a table for the first time, the *position* must be 0. If you have previously performed data capture, you can restart data capture where it left off by specifying a sequence number of a CDC record returned in the previous capture session.

You must call this function from a client application. You cannot call this function from a user-defined routine that runs within the database server.

### Return values

If successful, returns 0.

If unsuccessful, returns an integer corresponding to an error code and updates the `syscdcsess` table with the error information.

#### Related tasks

“Restarting data capture” on page 1-7

#### Related reference

“The syscdcsess table” on page 4-2

---

## The cdc\_closesess() function

Closes a capture session that is associated with the specified session ID.

Any resources used by the capture session are released. The rows in the **syscdctabs** and **syscdcsess** tables containing the specified session ID are deleted.

### Syntax

►► cdc\_closesess (—session\_ID—) ◀◀

### Function argument

Table 2-2. cdc\_closesess() argument

Argument	Data Type	Description
session_ID	INTEGER	The session ID of the capture session that you want to close.

### Usage

Use the **cdc\_closesess()** function to close a capture session that you no longer need. If the capture session was active, all data capture is immediately stopped when the session is closed.

You must call this function from a client application. You cannot call this function from a user-defined routine that runs within the database server.

### Return values

If successful, returns 0.

If unsuccessful, returns an integer corresponding to an error code and updates the **syscdcsess** table with the error information.

#### Related reference

“The syscdcsess table” on page 4-2

---

## The cdc\_deactivatesess() function

Stops capturing data for an active capture session.

The **syscdcsess** table is update to show that the capture session is not active.

### Syntax

►► cdc\_deactivatesess (—session\_ID—) ◀◀

## Function argument

Table 2-3. **cdc\_deactivatesess()** argument

Argument	Data Type	Description
<i>session_ID</i>	INTEGER	The session ID of the capture session that you want to deactivate.

## Usage

Use the **cdc\_deactivatesess()** function to stop capturing data for a specific capture session.

You must call this function from a client application. You cannot call this function from a user-defined routine that runs within the database server.

## Return values

If successful, returns 0.

If unsuccessful, returns an integer corresponding to an error code and updates the **syscdcsess** table with the error information.

### Related reference

"The **syscdcsess** table" on page 4-2

---

## The **cdc\_endcapture()** function

Ends capture for a specified table.

The row in the **syscdctabs** table associated with the specified session ID and table is deleted.

## Purpose

►►—cdc\_endcapture—(—*session\_ID*—,—*MBZ*—,—"database@owner.table\_name"—)—►◄

## Function arguments

Table 2-4. **cdc\_endcapture()** arguments

Argument	Data Type	Description
<i>session_ID</i>	INTEGER	The session ID of an open capture session.
<i>MBZ</i>	BIGINT	Must be 0. Reserved.

Table 2-4. **cdc\_endcapture()** arguments (continued)

Argument	Data Type	Description
<i>database@owner.table_name</i>	LVARCHAR	<p>The qualified name of the table from which to capture data. The qualified name includes the following elements:</p> <ul style="list-style-type: none"> <li>• <i>database</i>: The name of the database in which the table resides.</li> <li>• <i>owner</i>: The name of the owner of the table.</li> <li>• <i>table</i>: the name of the table</li> </ul>

## Usage

Use the **cdc\_endcapture()** function to stop capturing data from a specific table. This function does not affect the session status; the session remains open and active.

You must call this function from a client application. You cannot call this function from a user-defined routine that runs within the database server.

## Return values

If successful, returns 0.

If unsuccessful, returns an integer corresponding to an error code and updates the **syscdsess** table with the error information.

### Related reference

"The syscdctabs table" on page 4-3

## The cdc\_errortext() function

Returns the error message text corresponding to the specified symbolic error name.

Symbolic error names are listed in the **syscdcerrcodes** table in the **syscdc** database.

## Syntax

►► cdc\_errortext(—'—error\_name—'—, —'—locale\_name—'—) —————►►

## Function arguments

Table 2-5. **cdc\_errortext()** arguments

Argument	Data Type	Description
<i>error_name</i>	LVARCHAR	The symbolic name of the error.



Table 2-5. *cdc\_errortext()* arguments (continued)

Argument	Data Type	Description
<i>locale_name</i>	LVARCHAR	The name of the locale in which to display the error text. If locale name parameter is SQL NULL or a string of 0 length (""), the default locale is used.

## Usage

Use the **cdc\_errortext()** function to return the error text for an error that you received from another CDC function. Not all error texts are available in all locales. If the **cdc\_errortext()** function does not return the text in the locale you specified, try to run the function again with a different locale, such as 'en\_us.819' or 'en\_us.033'.

## Return values

If successful, returns SQLCODE 0 and the error message text.

If unsuccessful, returns with a nonzero SQLCODE:

- 23109: Invalid locale specification.  
The locale name is not correct or the specified locale was not found.
- 1824: Message cannot be found.  
The locale is valid but the message was not found in the message file for that locale. Specify a different locale, such as **en\_us.033**.
- Other SQLCODES represent internal errors.

## Example

The following example returns the error text for the error CDC\_E\_LOGPAGESEQ in the **en\_us.033** locale:

```
> select cdc_errortext('CDC_E_LOGPAGESEQ', 'en_us.033') from syscdcvrs;
```

```
(expression) Internal error. CDC received out-of-sequence logical log page data.
```

```
1 row(s) retrieved.
```

## Related reference

Chapter 5, “Change Data Capture error codes,” on page 5-1

## The cdc\_opensess() function

Opens a capture session and creates a session ID.

A row is inserted into the **syscdcsess** table for the session.

## Syntax

```
►► cdc_opensess(—“—server_name—”,—session_ID—,—timeout—,——————►
```

►*max\_recs*—,—*major\_version*—,—*minor\_version*—)—————►

## Function arguments

Table 2-6. **cdc\_opensess()** arguments

Argument	Data Type	Description
<i>server_name</i>	LVARCHAR	The name of the server. Must be the server to which the client application that is calling the <b>cdc_opensess()</b> function is connected.
<i>session_ID</i>	INTEGER	Must be 0.
<i>timeout</i>	INTEGER	Specifies the timeout behavior of a read call on the captured data:  <div> <b>&lt;0</b>      Do not timeout.  <b>0</b>        Return immediately if no data is available.    <b>1 or more</b>              The number of seconds a to wait for data before timing out. </div>
<i>max_recs</i>	INTEGER	The maximum number of CDC records to return per read function call. This value takes precedence over the maximum number of bytes to return that is specified in the smart large object read function.
<i>major_version</i>	INTEGER	The major version number of the Change Data Capture API. Must be 1.
<i>minor_version</i>	INTEGER	The minor version number of the Change Data Capture API. Must be 0.

## Usage

Use the **cdc\_opensess()** function to open a communication session between the client application and the database server. The session ID returned by the **cdc\_opensess()** is the smart large object file descriptor you supply to the smart large object read function. To start capturing data, you must then use the **cdc\_activatesess()** function and the **cdc\_startcapture()** function.

You must call this function from a client application. You cannot call this function from a user-defined routine that runs within the database server.

## Return values

If successful, returns an integer that is the session ID.

If unsuccessful, returns an integer corresponding to an error code.

## Related reference

“The syscdcsess table” on page 4-2

---

## The cdc\_recboundary() function

Restarts data capture from the beginning of the CDC record currently being returned.

## Syntax

►► cdc\_recboundary(—session\_ID—) ◀◀

## Function argument

Table 2-7. **cdc\_recboundary()** argument

Argument	Data Type	Description
session_ID	INTEGER	The session ID of the open capture session.

## Usage

Use the **cdc\_recboundary()** function if you need to restart capture from the beginning of the current log record.

You must call this function from a client application. You cannot call this function from a user-defined routine that runs within the database server.

## Return values

If successful, returns a positive integer representing the number of complete or partial log records that were captured but skipped during the current session.

If unsuccessful, returns an integer corresponding to an error code and updates the **syscdcsess** table with the error information.

---

## The cdc\_set\_fullrowlogging() function

Enables or disables full-row logging for a table.

## Purpose

You must run this function to enable full-row logging on a table before you can start capturing data from it.

The **DB\_LOCALE** environment variable must be set to the same locale as the database locale when you run this function.

►►cdc\_set\_fullrowlogging(—"database@owner.table\_name"—,—logging—)◄◄

## Function arguments

Table 2-8. **cdc\_set\_fullrowlogging()** arguments

Argument	Data Type	Description
<i>database@owner.table_name</i>	LVARCHAR	The qualified name of the table. The qualified name includes the following elements: <ul style="list-style-type: none"><li>• <i>database</i>: The name of the database in which the table resides.</li><li>• <i>owner</i>: The name of the owner of the table.</li><li>• <i>table</i>: the name of the table</li></ul>
<i>logging</i>	INTEGER	<ul style="list-style-type: none"><li>• 0 Disable full-row logging</li><li>• 1 Enable full-row logging</li></ul>

## Usage

Use the **cdc\_set\_fullrowlogging()** function to enable full-row logging on a table from which you intend to perform data capture. This function must be run as user **informix**. After you stop capturing data from a table, you can disable full-row logging.

You must call this function from a client application. You cannot call this function from a user-defined routine that runs within the database server.

## Return values

If successful, returns 0.

If unsuccessful, returns an integer corresponding to an error code and updates the **syscdcsess** table with the error information.

---

## The **cdc\_startcapture()** function

Specifies the data to start capturing from a table.

If the capture session is both open and active (you have run the **cdc\_activatesess()** function), data capture starts immediately on the specified columns in the specified table. Otherwise, data capture starts when you activate the open capture session.

The **DB\_LOCALE** environment variable must be set to the same locale as the database locale when you run this function.

A row is added in the **syscdctabs** table associated with the specified session ID and table.

## Syntax

```

➤➤cdc_startcapture(—session_ID—,—MBZ—,——————➤➤
                                     ,
➤➤"database@owner.table_name",—"column_name"—,—,—user_data—)————➤➤

```

## Function arguments

Table 2-9. **cdc\_startcapture()** arguments

Argument	Data Type	Description
<i>session_ID</i>	INTEGER	The session ID of an open capture session.
<i>MBZ</i>	BIGNIT	Must be 0. Reserved.
<i>database@owner.table_name</i>	LVARCHAR	The qualified name of the table from which to capture data. The qualified name includes the following elements: <ul style="list-style-type: none"> <li>• <i>database</i>: The name of the database in which the table resides.</li> <li>• <i>owner</i>: The name of the owner of the table.</li> <li>• <i>table</i>: the name of the table</li> </ul>
<i>column_name</i>	LVARCHAR	A comma-separated list of column names in the specified table, from which to capture data.
<i>user_data</i>	INTEGER	The table identifier.

## Usage

Use the **cdc\_startcapture()** function to specify a table and columns within that table from which to start capturing data. You cannot include columns with simple large objects, user-defined data types, or collection data types.

The table identifier is a number you use in your application to uniquely identify each table that will participate in data capture.

You must call this function from a client application. You cannot call this function from a user-defined routine that runs within the database server.

## Return values

If successful, returns 0.

If unsuccessful, returns an integer corresponding to an error code and updates the **syscdsess** table with the error information.

### Related reference

"The syscdctabs table" on page 4-3



---

## Chapter 3. Change Data Capture records

These topics describe the CDC records returned from calls to read functions from an open capture session.

---

### Format of CDC records

The Change Data Capture (CDC) records contain a header that is common to all records, followed by a specific header for the type of CDC record.

The CDC\_REC\_INSERT, CDC\_REC\_DELETE, CDC\_REC\_UPDBEF, and CDC\_REC\_UPDAFT records also contain column data.

The header common to all CDC records describes the size and type of the CDC record.

*Table 3-1. The header common to all CDC records*

Section	Size	Description
Header size	4 bytes	The number of bytes in the common and CDC record-specific headers.
Payload size	4 bytes	The number of bytes of data in the record after the common and CDC record-specific headers.
Packet scheme	4 bytes	The packetization scheme number of one of the packetization schemes contained in the <b>syscdcpacketschemes</b> table. The only packetization scheme is 66, CDC_PKTScheme_LRECBINARY.
Record number	4 bytes	The record number of one of the CDC records contained in the <b>syscdcrectypes</b> table.

#### Related reference

“The CDC\_REC\_BEGINTX record”  
“The CDC\_REC\_COMMTX record”  
“The CDC\_REC\_DELETE record” on page 3-3  
“The CDC\_REC\_DISCARD record” on page 3-4  
“The CDC\_REC\_ERROR record” on page 3-4  
“The CDC\_REC\_INSERT record” on page 3-5  
“The CDC\_REC\_RBTX record” on page 3-6  
“The CDC\_REC\_TABSCHEMA record” on page 3-6  
“The CDC\_REC\_TIMEOUT record” on page 3-7  
“The CDC\_REC\_TRUNCATE record” on page 3-8  
“The CDC\_REC\_UPDAFT record” on page 3-8  
“The CDC\_REC\_UPDBEF record” on page 3-9

---

## The CDC\_REC\_BEGINTX record

Indicates the beginning of a transaction.

The header for the CDC\_REC\_BEGINTX record follows the common header. No data follows the headers; the payload size in the common header is 0.

*Table 3-2. Format of the CDC\_REC\_BEGINTX record*

Section	Size	Description
Sequence number	8 bytes	The sequence number of the record.
Transaction ID	4 bytes	The transaction ID.
Start time	8 bytes	The UTC time at which the transaction began, in time_t format.
User ID	4 bytes	The operating system user ID of the user who started the transaction.

#### Related reference

“Format of CDC records” on page 3-1  
“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_COMMTX record

Indicates that a transaction has been committed.

The header for the CDC\_REC\_COMMTX record follows the common header. No data follows the headers; the payload size in the common header is 0.

*Table 3-3. Format of the CDC\_REC\_COMMTX record*

Section	Size	Description
Sequence number	8 bytes	The sequence number of the record.
Transaction ID	4 bytes	The transaction ID.



Table 3-3. Format of the CDC\_REC\_COMMTX record (continued)

Section	Size	Description
Commit time	8 bytes	The UTC time at which the transaction was committed, in time_t format.

#### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_DELETE record

Provides the row that was removed as a result of a DELETE operation.

The CDC\_REC\_DELETE record consists of these fields:

- The common header.
- The record-specific header.
- Fields listing the size of each variable-length column in the row, if any.
- Column data for each fixed-length column, if any.
- Column data for each variable-length column, if any.

The value in the header size field in the common header represents the number of bytes occupied by the combination of the common header, the record-specific header, and the fields listing the size of variable-length columns.

The value in the payload size field in the common header represents the number of bytes of the column data for both fixed-length and variable length columns.

### The record-specific header

The header specific to the CDC\_REC\_DELETE record follows the common header.

Table 3-4. The CDC\_REC\_DELETE record header

Section	Size	Description
Sequence number	8 bytes	The sequence number associated with the DELETE operation.
Transaction ID	4 bytes	The transaction ID.
User data	4 bytes	The table identifier passed to the <code>cdc_startcapture()</code> function and stored in the <code>syscdtabs</code> table.
Flags	4 bytes	Reserved.

### Variable-length column size fields

If there are variable-length columns in the row being deleted, a 4-byte field for each of those columns appears containing the column size. The order of the column size fields is the same as the order of the columns in the CDC\_REC\_TABSCHEMA record.

## Fixed-length column data

The data from the fixed-length columns, if any, appears in the order that the corresponding columns are listed in the CDC\_REC\_TABSCHEMA record.

## Variable-length column data

The data from the variable-length columns, if any, appears in the order that the corresponding columns are listed in the CDC\_REC\_TABSCHEMA record.

### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_DISCARD record

Indicates that some operations of the transaction should be discarded.

CDC records for the same transaction that follow this record should be discarded.

The header specific to the CDC\_REC\_DISCARD record follows the common header. No data follows the headers; the payload size in the common header is 0.

*Table 3-5. Format of the CDC\_REC\_DISCARD record*

Section	Size	Description
Sequence number	8 bytes	The sequence number of the record. Any CDC records that have the same transaction ID value and that have a sequence number greater than or equal to this sequence number should be discarded.
Transaction ID	4 bytes	The transaction ID.

### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_ERROR record

Indicates that an error occurred and the session is no longer valid.

The header specific to the CDC\_REC\_ERROR record follows the common header. No data follows the headers; the payload size in the common header is 0.

*Table 3-6. Format of the CDC\_REC\_ERROR record*

Section	Size	Description
Flags	4 bytes	Hexadecimal flag: <ul style="list-style-type: none"><li>• 0x1 indicates that the capture session is no longer valid and the only valid operation is to run the <code>cdc_closesess()</code> function to close the session.</li><li>• any other value indicates that the session is still valid.</li></ul>
Error code	4 bytes	The error code.

#### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_INSERT record

Provides the row that resulted from an INSERT operation.

The CDC\_REC\_INSERT record consists of these fields:

- The common header.
- The record-specific header.
- Fields listing the size of each variable-length column in the row, if any.
- Column data for each fixed-length column, if any.
- Column data for each variable-length column, if any.

The value in the header size field in the common header represents the number of bytes occupied by the combination of the common header, the record-specific header, and the fields listing the size of variable-length columns.

The value in the payload size field in the common header represents the number of bytes of the column data for both fixed-length and variable length columns.

### The record-specific header

The header specific to the CDC\_REC\_INSERT record follows the common header.

*Table 3-7. The CDC\_REC\_INSERT record header*

Section	Size	Description
Sequence number	8 bytes	The sequence number associated with the INSERT operation.
Transaction ID	4 bytes	The transaction ID.

Table 3-7. The CDC\_REC\_INSERT record header (continued)

Section	Size	Description
User data	4 bytes	The table identifier passed to the <code>cdc_startcapture()</code> function and stored in the <code>syscdtabs</code> table.
Flags	4 bytes	Reserved.

### Variable-length column size fields

If there are variable-length columns in the row being inserted, a 4-byte field for each of those columns appears containing the column size. The order of the column size fields is the same as the order of the columns in the CDC\_REC\_TABSCHEMA record.

### Fixed-length column data

The data from the fixed-length columns, if any, appears in the order that the corresponding columns are listed in the CDC\_REC\_TABSCHEMA record.

### Variable-length column data

The data from the variable-length columns, if any, appears in the order that the corresponding columns are listed in the CDC\_REC\_TABSCHEMA record.

#### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_RBTX record

Indicates that the transaction has been rolled back.

The header specific to the CDC\_REC\_RBTX record follows the common header. No data follows the headers; the payload size in the common header is 0.

Table 3-8. Format of the CDC\_REC\_RBTX record

Section	Size	Description
Sequence number	8 bytes	The sequence number associated with the ROLLBACK operation.
Transaction ID	4 bytes	The transaction ID.

#### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_TABSCHEMA record

Describes the table from which data is being captured.

The value in the payload size field in the common header represents the number of bytes occupied by the column name and data type list.

The header specific to the CDC\_REC\_TABSCHEMA record follows the common header.

*Table 3-9. Format of the CDC\_REC\_TABSCHEMA record*

Section	Size	Description
User data	4 bytes	The table identifier that was specified in the <b>cdc_startcapture()</b> function for the table being captured.
Flags	4 bytes	Must be 0.
Fixed-length size	4 bytes	The number of bytes of data in fixed-length columns in the table.
Fixed-length columns	4 bytes	The number of fixed-length columns in the table being captured.  A 0 indicates that there are no fixed-length columns.
Variable-length columns	4 bytes	The number of variable-length columns in the table being captured.  A 0 indicates that there are no variable-length columns.
Column names and data types	variable byte length	A comma-separated list of column names and data types in UTF-8 format. The column list conforms to the syntax of the column list in a CREATE TABLE statement.  Names of any fixed-length columns appear before names of any variable-length columns.  The number of columns equals the number of fixed-length columns plus the number of variable-length columns.

#### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_TIMEOUT record

Indicates that the read call did not return data before the timeout period specified in the **cdc\_opensess()** function.

The header specific to the CDC\_REC\_TIMEOUT record follows the common header. No data follows the headers; the payload size in the common header is 0.

Table 3-10. Format of the CDC\_REC\_TIMEOUT record

Section	Size	Description
Sequence number	8 bytes	The sequence number of the last data retrieved from the source database.

#### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_TRUNCATE record

Indicates that a TRUNCATE operation was performed on a table.

The header specific to the CDC\_REC\_TRUNCATE record follows the common header. No data follows the headers; the payload size in the common header is 0.

Table 3-11. Format of the CDC\_REC\_TRUNCATE record

Section	Size	Description
Sequence number	8 bytes	The sequence number associated with the TRUNCATE operation.
Transaction ID	4 bytes	The transaction ID.
User data	4 bytes	The table identifier passed to the <code>cdc_startcapture()</code> function and stored in the <code>syscdtabs</code> table.

#### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_UPDAFT record

Provides the image of a row prior to an UPDATE operation.

The CDC\_REC\_UPDAFT record consists of these fields:

- The common header.
- The record-specific header.
- Fields listing the size of each variable-length column in the row, if any.
- Column data for each fixed-length column, if any.
- Column data for each variable-length column, if any.

The value in the header size field in the common header represents the number of bytes occupied by the combination of the common header, the record-specific header, and the fields listing the size of variable-length columns.

The value in the payload size field in the common header represents the number of bytes of the column data for both fixed-length and variable length columns.

## The record-specific header

The header specific to the CDC\_REC\_UPDAFT record follows the common header.

Table 3-12. The CDC\_REC\_UPDAFT record header

Section	Size	Description
Sequence number	8 bytes	The sequence number associated with the UPDATE operation.
Transaction ID	4 bytes	The transaction ID.
User data	4 bytes	The table identifier passed to the <code>cdc_startcapture()</code> function and stored in the <code>syscdtabs</code> table.
Flags	4 bytes	Reserved.

## Variable-length column size fields

If there are variable-length columns in the row being updated, a 4-byte field for each of those columns appears containing the column size. The order of the column size fields is the same as the order of the columns in the CDC\_REC\_TABSCHEMA record.

## Fixed-length column data

The data from the fixed-length columns, if any, appears in the order that the corresponding columns are listed in the CDC\_REC\_TABSCHEMA record.

## Variable-length column data

The data from the variable-length columns, if any, appears in the order that the corresponding columns are listed in the CDC\_REC\_TABSCHEMA record.

### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1

---

## The CDC\_REC\_UPDBEF record

Provides the image of a row after an UPDATE operation.

The CDC\_REC\_UPDBEF record consists of these fields:

- The common header.
- The record-specific header.
- Fields listing the size of each variable-length column in the row, if any.
- Column data for each fixed-length column, if any.
- Column data for each variable-length column, if any.

The value in the header size field in the common header represents the number of bytes occupied by the combination of the common header, the record-specific header, and the fields listing the size of variable-length columns.

The value in the payload size field in the common header represents the number of bytes of the column data for both fixed-length and variable length columns.

## The record-specific header

The header specific to the CDC\_REC\_UPDBEF record follows the common header.

*Table 3-13. The CDC\_REC\_UPDBEF record header*

Section	Size	Description
Sequence number	8 bytes	The sequence number associated with the UPDATE operation.
Transaction ID	4 bytes	The transaction ID.
User data	4 bytes	The table identifier passed to the <code>cdc_startcapture()</code> function and stored in the <code>syscdtabs</code> table.
Flags	4 bytes	Reserved.

## Variable-length column size fields

If there are variable-length columns in the row being updated, a 4-byte field for each of those columns appears containing the column size. The order of the column size fields is the same as the order of the columns in the CDC\_REC\_TABSCHEMA record.

## Fixed-length column data

The data from the fixed-length columns, if any, appears in the order that the corresponding columns are listed in the CDC\_REC\_TABSCHEMA record.

## Variable-length column data

The data from the variable-length columns, if any, appears in the order that the corresponding columns are listed in the CDC\_REC\_TABSCHEMA record.

### Related reference

“Format of CDC records” on page 3-1

“The syscdcrectypes table” on page 4-1



---

## Chapter 4. The syscdc system database

The **syscdc** system database contains tables that store information about the Change Data Capture API and data capture sessions.

The **syscdc** database can only be accessed or connected to by the user **informix**. It uses the UTF-8 locale. You cannot alter the tables in the **syscdc** database; you can only query them.

---

### The syscdccerrcodes table

Contains the error codes used by the Change Data Capture API.

Use this table to look up the symbolic name and description that correspond to an error code.

*Table 4-1. The **syscdccerrcodes** table*

Column	Data Type	Description
errcode	INTEGER	Numeric value of the error.
errname	VARCHAR(16)	Symbolic name of the error.
errdesc	VARCHAR(127)	Error description.

#### Related reference

Chapter 5, “Change Data Capture error codes,” on page 5-1

---

### The syscdcpacketschemes table

Contains the packetization schemes used by the Change Data Capture API.

Use this table to look up the symbolic name and description that correspond to a packetization scheme.

The only packetization scheme is 66, CDC\_PKTScheme\_LRECBINARY, which represents a binary data format.

*Table 4-2. The **syscdcpacketschemes** table*

Column	Data Type	Description
schemenum	INTEGER	Numeric value of the packetization scheme.
schemename	VARCHAR(16)	Symbolic name of the packetization scheme.
schemedesc	VARCHAR(127)	Description of the packetization scheme.

---

### The syscdcrectypes table

Contains the record types used by the Change Data Capture API.

Use this table to look up the symbolic name and description that correspond to a record code.

*Table 4-3. The **syscdcrectypes** table*

Column	Data Type	Description
recnum	INTEGER	Numeric value of the record type.
recname	VARCHAR(16)	Symbolic name of the record type.
recdesc	VARCHAR(127)	Record type description.

#### **Related reference**

"The CDC\_REC\_BEGINTX record" on page 3-2

"The CDC\_REC\_COMMTX record" on page 3-2

"The CDC\_REC\_DELETE record" on page 3-3

"The CDC\_REC\_DISCARD record" on page 3-4

"The CDC\_REC\_ERROR record" on page 3-4

"The CDC\_REC\_INSERT record" on page 3-5

"The CDC\_REC\_RBTX record" on page 3-6

"The CDC\_REC\_TABSCHEMA record" on page 3-6

"The CDC\_REC\_TIMEOUT record" on page 3-7

"The CDC\_REC\_TRUNCATE record" on page 3-8

"The CDC\_REC\_UPDAFT record" on page 3-8

"The CDC\_REC\_UPDBEF record" on page 3-9

---

## **The syscdcscsess table**

Contains information about open data capture sessions.

Rows are added when a session is opened with the **cdc\_opensess()** function. Rows are updated as error codes are returned. Rows are deleted when a session is closed with the **cdc\_closesess()** function.

Use this table to monitor data capture.

*Table 4-4. The **syscdcscsess** table*

Column	Data Type	Description
sessid	INTEGER	The session ID of an open capture session.
majvers	INTEGER	Major version of the Change Data Capture API.
minvers	INTEGER	Minor version of the Change Data Capture API.
seqnum	BIGINT	Reserved.
timeout	INTEGER	The number of seconds allowed for read calls.
createtime	BIGINT	UTC time when the session was created.
flags	INTEGER	Reserved.

Table 4-4. The **syscdcsess** table (continued)

Column	Data Type	Description
status	INTEGER	Reserved.
errcode	INTEGER	The most recent error code.
errutc	BIGINT	UTC time when the error was generated.

#### Related reference

“The cdc\_activatesess() function” on page 2-1

“The cdc\_closesess() function” on page 2-2

“The cdc\_deactivatesess() function” on page 2-2

“The cdc\_opensess() function” on page 2-5

## The syscdctabs table

Contains information about every table whose data is currently being captured.

A row is added when a table is specified by the **cdc\_startcapture()** function. A row is deleted when a table is no longer being captured after the **cdc\_endcapture()** function is run.

Use this table to monitor the data capture process of a table.

Table 4-5. The **syscdctabs** table

Column	Data Type	Description
sessid	INTEGER	The session ID of an open capture session.
dbname	VARCHAR(128)	The name of the database.
tablename	VARCHAR(128)	The name of the table being captured.
owner	CHAR(32)	The name of the owner of the table.
seqnum	BIGINT	Reserved.
startutc	BIGINT	The UTC time at which capture started.
userdata	INTEGER	The table identifier.
fixedbytes	INTEGER	The number of bytes of data in fixed-sized columns in the table.
numfixed	INTEGER	The number of fixed-sized columns in the table.
fixedcols	LVARCHAR(16000)	The names of the fixed-sized columns in the table.
numvar	INTEGER	The number of variable-sized columns in the table.
varcols	LVARCHAR(16000)	The names of the variable-sized columns in the table.
flags	INTEGER	Reserved.

Table 4-5. The **syscdctabs** table (continued)

Column	Data Type	Description
status	INTEGER	Reserved.

**Related reference**

“The cdc\_endcapture() function” on page 2-3

“The cdc\_startcapture() function” on page 2-8

---

## The syscdcvers table

Stores the current version number of the Change Data Capture API in the database server.

Use this table to ensure that the version of the Change Data Capture API your application supports is the same as the version you have installed.

Table 4-6. The **syscdcvers** table

Column	Data Type	Description
majvers	INTEGER	Major version of the Change Data Capture API.
minvers	INTEGER	Minor version of the Change Data Capture API.

---

## Chapter 5. Change Data Capture error codes

If a Change Data Capture function encounters a problem, it returns an error code. Most functions return 0 if they succeed.

Error numbers are not guaranteed to remain the same in subsequent releases. Always use the symbolic names in your application code. You can view the error message text corresponding to a symbolic error name by using the **cdc\_errortext()** function.

*Table 5-1. Change Data Capture error codes*

Symbolic Name	Description
CDC_E_OK	Operation succeeded.
CDC_E_NOCDCDB	The <b>syscdc</b> database does not exist.
CDC_E_APIVERS	The requested CDC API behavior version is not valid or is unsupported.
CDC_E_NODB	The specified database does not exist.
CDC_E_DBNOTLOGGED	The specified database is not logged.
CDC_E_NOTAB	The specified table does not exist.
CDC_E_TABPROPERTIES	The table properties do not support capture: it is a temporary table, a view, or otherwise not logged.
CDC_E_NOCOL	The specified column does not exist.
CDC_E_NOSES	The specified CDC session does not exist.
CDC_E_NOREOPEN	The CDC session cannot be reopened.
CDC_E_TABCAPTURED	The specified table is already being captured by the CDC session.
CDC_E_TABNOTCAPTURED	The specified table is not being captured by the CDC session.
CDC_E_ARGNULL	An argument to the function has the SQL NULL value, which is not allowed.
CDC_E_LSN	Data at the requested log sequence number is not available for capture.
CDC_E_DUPLSESS	A CDC session is already active.
CDC_E_ARG	A parameter passed to the function is not valid.
CDC_E_ARG1	The first parameter passed to the function is not valid.
CDC_E_ARG2	The second parameter passed to the function is not valid.
CDC_E_ARG3	The third parameter passed to the function is not valid.
CDC_E_ARG4	The fourth parameter passed to the function is not valid.
CDC_E_ARG5	The fifth parameter passed to the function is not valid.

*Table 5-1. Change Data Capture error codes (continued)*

Symbolic Name	Description
CDC_E_ARG6	The sixth parameter passed to the function is not valid.
CDC_E_INTERNAL	Internal error. Contact IBM Support.
CDC_E_NOMEM	Memory allocation failed.
CDC_E_MUSTCLOSE	The CDC capture session cannot continue and must be closed.
CDC_E_BADSTATE	The resource state does not allow the attempted operation.
CDC_E_BADCHAR	A byte sequence that is not a valid character in the character code set was encountered.
CDC_E_INTERRUPT	The CDC session was interrupted.
CDC_E_UNIMPL	Unimplemented feature.
CDC_E_LOCALEMISMATCH	The locale setting in the environment does not match the locale of the database.

**Related tasks**

“Handling errors” on page 1-6

**Related reference**

“The sysdcerrcodes table” on page 4-1

“The cdc\_errortext() function” on page 2-4

## Chapter 6. onstat -g cdc

Monitors the sessions involved in change data capture.

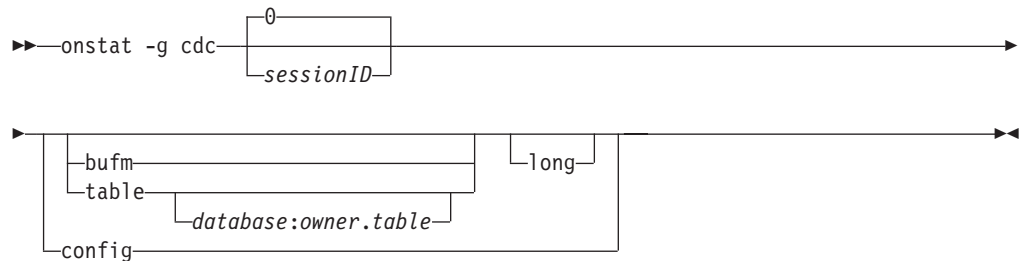


Table 6-1. onstat -g cdc syntax elements

Element	Purpose
<b>bufm</b>	Displays information about the buffers being used by the session, including: <ul style="list-style-type: none"> <li>The highest number of buffers used by the session.</li> <li>The number of buffers currently being used by the session.</li> <li>With the <b>long</b> option, the address of each allocated buffer.</li> </ul>
<b>config</b>	Displays information about the session configuration, including: <ul style="list-style-type: none"> <li>The read timeout setting for the session, in seconds.</li> <li>The maximum number of records returned by a read call.</li> </ul>
<i>database:owner.table</i>	The fully-qualified name of the table for which to display information. The qualified name includes the following elements: <ul style="list-style-type: none"> <li><i>database</i>: The name of the database in which the table resides.</li> <li><i>owner</i>: The name of the owner of the table.</li> <li><i>table</i>: the name of the table.</li> </ul>
<b>long</b>	Provides additional detail for sessions, the <b>bufm</b> option, or the <b>table</b> option.
<i>sessionID</i>	Displays information for the specified session ID: <ul style="list-style-type: none"> <li>The associated SQL session ID.</li> <li>The number of tables being captured by the session.</li> <li>With the <b>long</b> option, information about the number of records processed by the session.</li> </ul> <p>If you do not specify a session ID, or if you specify a session ID of 0, information for all sessions is displayed.</p>

Table 6-1. **onstat -g cdc** syntax elements (continued)

Element	Purpose
<b>table</b>	<p>Displays information about the tables being captured, including:</p> <ul style="list-style-type: none"> <li>• The number of tables being captured in a session.</li> <li>• The full name of each table being captured.</li> <li>• The time when data capture on each table started.</li> <li>• With the <b>long</b> option, information about the captured columns for each table.</li> </ul> <p>If you specify a fully-qualified table name, only the information for that table is displayed. If you do not specify a table name, information for all tables is displayed.</p>

## Examples

The following examples display sample output of the **onstat -g cdc** command with some of its options.

### Example 1: Detailed session information

The following command generates output that shows detailed information about the session 159383591:

```
onstat -g cdc 159383591 long

IBM Informix Dynamic Server Version 11.50.FC4    -- On-Line -- Up 00:18:05 --
295932 Kbytes
CDC subsystem structure at 0x44252318
  CDC session structure at 0x4d8e0d00
    CDC session id: 159383591 (0x9800027)
    Associated SQL session id: 304
    Number of tables captured: 1
    State: ACTIVATED (0x50534555)
    Create time: 1238530254 (Tue Mar 31 15:10:54 2009)
    Open time: 1238530254 (Tue Mar 31 15:10:54 2009)
    Activate time: 1238530256 (Tue Mar 31 15:10:56 2009)
    Activate Sequence Number: 0x0
    Total client read calls: 9
    Last client read time: 1238530321 (Tue Mar 31 15:12:01 2009)
    Last Sequence Number returned to client: 0x150004b774
    Total number records examined: 4385
    Total number records kept (approximate): 1937
    Total number I/U/D records examined: 1046
    Total number I/U/D records kept (approximate): 582
    Client required to close: NO
    Read exit error code: 0
```

### Example 2: Configuration information

The following command generates output that shows information about the configuration of open sessions:

```
onstat -g cdc config

IBM Informix Dynamic Server Version 11.50.FC4    -- On-Line -- Up 00:21:14 --
295932 Kbytes
CDC subsystem structure at 0x44252318
  CDC session structure at 0x4dba3d00
    CDC session id: 160432167 (0x9900027)
    Read Timeout (seconds): 3
```



```
Maximum buffers per read call: 4
Survive DATALOSS errors: NO
```

```
CDC session structure at 0x4d8e0d00
CDC session id: 159383591 (0x9800027)
Read Timeout (seconds): 3
Maximum buffers per read call: 4
Survive DATALOSS errors: NO
```

```
CDC session structure at 0x4c022d00
CDC session id: 158335015 (0x9700027)
Read Timeout (seconds): 3
Maximum buffers per read call: 4
Survive DATALOSS errors: NO
```

### Example 3: Buffer information

The following command generates output that shows information about the buffers being used by currently open sessions:

```
onstat -g cdc 0 bufm
```

```
IBM Informix Dynamic Server Version 11.50.FC4      -- On-Line -- Up 00:25:58 --
295932 Kbytes
```

```
CDC subsystem structure at 0x44252318
CDC session structure at 0x4dba3d00
CDC session id: 160432167 (0x9900027)
```

```
Buffer Manager at 0x4dba5028
Number of allocated buffers high watermark: 268
Number of currently allocated buffers: 267
Minimum prepend for allocated buffers: 172
```

```
CDC session structure at 0x4d8e0d00
CDC session id: 159383591 (0x9800027)
```

```
Buffer Manager at 0x4d8e2028
Number of allocated buffers high watermark: 271
Number of currently allocated buffers: 270
Minimum prepend for allocated buffers: 172
```

```
CDC session structure at 0x4c022d00
CDC session id: 158335015 (0x9700027)
```

```
Buffer Manager at 0x4c6e5028
Number of allocated buffers high watermark: 269
Number of currently allocated buffers: 267
Minimum prepend for allocated buffers: 172
```

### Example 4: Table information

The following command generates output that shows information about the session 158335015 for the table named **account**:

```
onstat -g cdc 158335015 table bank:pinch.account
```

```
IBM Informix Dynamic Server Version 11.50.FC4      -- On-Line -- Up 00:40:20 --
295932 Kbytes
```

```
CDC subsystem structure at 0x44252318
CDC session structure at 0x4c022d00
CDC session id: 158335015 (0x9700027)
Captured Table Manager found at 0x4c048b20
Number of tables captured: 1
```

```
Captured Table structure at 0x4c6e5160
```

Full Table Name: bank:pinch.account  
Version Sequence Number: 0xe00238388  
Time capture started: 1238530249 (Tue Mar 31 15:10:49 2009)

**Related tasks**

“Monitoring data capture” on page 1-7

---

## Chapter 7. Change Data Capture sample program

Provides an example of using the Change Data Capture API to capture data and then processing that data.

The following sample program creates an application that captures data from multiple tables. The program runs Change Data Capture functions, reads CDC records, and displays the column values of the captured data to stdout. The program also queries the **syscdc** system tables to display information about CDC records and error messages. The program terminates when it encounters an error or a CDC\_REC\_TIMEOUT record.

The program has a command line interface that allows the user to enter the database name, the table name, column names, and the timeout value.

This program requires that the **getopt** and **getsubopt** parser functions are implemented on your computer.

```
/*
 *
 * Licensed Materials - Property of IBM
 *
 * Restricted Materials of IBM
 *
 * IBM Informix Dynamic Server
 * (c) Copyright IBM Corp. 2008, 2009 All rights reserved.
 *
 * Title:          cdcapi.ec
 *
 * Description:
 *
 *      Client program to use the Informix Change Data Capture API.
 *
 *      This program, cdcapi, starts capture on one or more tables.
 *      Command line options are:
 *          -D <database name where table resides>
 *          -T <Table name in this format: owner.table_name>
 *          -C <Column names in this format: "column1, column2,...">
 *          -t <timeout in seconds>
 *
 *      for example:
 *          cdcapi -D db1 -T t1 -C "a,b" -T t2 -C "a,c"
 *
 *      Program terminates when timeout record is received.
 *
 * To compile:
 * On Unix:
 *     esql -g -static -o cdcapi
 *     cdcapi.ec $INFORMIXDIR/lib/dmi/libdmi.a
 * On Windows:
 * Implement the getopt fn before compiling on windows.
 *     esql -g -static -o cdcapi.exe
 *     cdcapi.ec %INFORMIXDIR%\lib\dmi\libthdmi.lib
 *
 */

#include <stdio.h>
#include <stdarg.h>
#include <string.h>
#include <stdlib.h>
```

```

#include <memory.h>
#include <ctype.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <time.h>
#ifdef _WIN32
#include <unistd.h>
#endif

#define CDC_PKTScheme_LRECBINARY ((int4) 66)

EXEC SQL include    sqlca.h ;
EXEC SQL include    sqltypes;
EXEC SQL include    sqlca;
EXEC SQL include    sqlda;
EXEC SQL include    decimal;

#ifdef SQLINFXBIGINT
#define SQLINFXBIGINT  SQLBIGINT
#endif

/* List of CDC records this program processes */
typedef enum {
    CDC_REC_BEGINIX=0,
    CDC_REC_COMMTX,
    CDC_REC_RBTX,
    CDC_REC_INSERT,
    CDC_REC_DELETE,
    CDC_REC_UPDBEF,
    CDC_REC_UPDAFT,
    CDC_REC_DISCARD,
    CDC_REC_TRUNCATE,
    CDC_REC_TABSCHEMA,
    CDC_REC_TIMEOUT,
    CDC_REC_ERROR,
    CDC_REC_MAXLOGREC
} cdc_log_type_t;

struct cdc_logrec
{
    cdc_log_type_t rectype;
    char recname[17];
} ;

typedef struct cdc_logrec cdc_logrec_t;

/* Table of the CDC_record types and their symbolic names as
 * published in the Programmer's Guide
 */
cdc_logrec_t logrectab[CDC_REC_MAXLOGREC] =
{
    {CDC_REC_BEGINIX, "CDC_REC_BEGINIX"},
    {CDC_REC_COMMTX, "CDC_REC_COMMTX"},
    {CDC_REC_RBTX, "CDC_REC_RBTX"},
    {CDC_REC_INSERT, "CDC_REC_INSERT"},
    {CDC_REC_DELETE, "CDC_REC_DELETE"},
    {CDC_REC_UPDBEF, "CDC_REC_UPDBEF"},
    {CDC_REC_UPDAFT, "CDC_REC_UPDAFT"},
    {CDC_REC_DISCARD, "CDC_REC_DISCARD"},
    {CDC_REC_TRUNCATE, "CDC_REC_TRUNCATE"},
    {CDC_REC_TABSCHEMA, "CDC_REC_TABSCHEM"},
    {CDC_REC_TIMEOUT, "CDC_REC_TIMEOUT"},
    {CDC_REC_ERROR, "CDC_REC_ERROR"}
};

/* Structures to represent and store data from syscdcrectype table */

```

```

struct _syscdcrectypes
{
    int recnum;
    char recname[17];
    char recdesc[128];
};

typedef struct _syscdcrectypes syscdcrectypes_t;
syscdcrectypes_t *syscdcrectypes_tab;
int num_cdc_log_recs;

/* Structures to represent and store data from syscdcerrcode table */
struct _syscdcerrcode
{
    int errcode;
    char errname[17];
    char errdesc[128];
};

typedef struct _syscdcerrcode syscdcerrcode_t;
syscdcerrcode_t *syscdcerrcode_tab;
int num_cdc_err_recs;

char    outfile[512]={0};
FILE    *outfilefp = NULL;
int     schema_fix_bytes=0;
int     schema_no_fix_cols=0;
int     schema_no_var_cols=0;

void get_cdc_rectype_name(int recnum, char* recsymb, char* recdesc);
cdc_log_type_t get_cdc_log_type(char* recsymb);
void get_cdc_error_info(int cdcerr, char* cdcerrsymb, char* cdcerrdesc);
void loadSyscdcrectypes(void);
void loadSyscdcerrcodes(void);

int num_of_var_col(int);
void get_col_types(int, char *);
void get_col_values(int, char *);
void set_num_of_var_col(int, int);
void close_session(int);
void dump_hex(char *, char *, int);
void sw_CheckSQLCode(char *, char *, int);
void sw_SQLExecImmed(char *, char *, int);
void get_lob_data(char* dbuf);
void printStdoutAndFile(char* msg, ...);

/* Common Header size of a CDC record */
typedef struct
{
    int4 ch_size_hdr;
    int4 ch_size_payload;
    int4 ch_payload_type;
} common_header_t;

#define CMNHDR_SIZE (sizeof(common_header_t))

/* Structres for getting column type information for the captured tables */
typedef struct column_obj {
    int coltype;
    int colxid;
    int colsize;
    char *colname;
} column_obj_t;

#define MAXCOL 50

```

```

typedef struct column_desc {
    int    num_of_columns;
    int    num_of_vchar;
    column_obj_t colobj[MAXCOL];
} column_des_t;

#define MAXTAB 5
column_des_t    g_coldesc[MAXTAB];

/* Use full macros */
#define CHK_SQL_CODE(message) \
    sw_CheckSQLCode(message, __FILE__, __LINE__)

#define SQL_EXEC_I(command) \
    sw_SQLExecImmed(command, __FILE__, __LINE__)

#define CHK_CDC_RETVAL(message,cdenum) \
    sw_checkCDCRetval(message,cdenum, __FILE__, __LINE__)

#ifndef MAX
#define MAX(a,b) (((a) > (b)) ? (a) : (b))
#endif
#ifndef MIN
#define MIN(a,b) (((a) < (b)) ? (a) : (b))
#endif

/* Rest of the Global variables */
int nodebug=1;

EXEC SQL begin declare section;
EXEC SQL Define NAMELEN 100;
EXEC SQL Define MAXARGSIZE 512;
char dbname[NAMELEN];
char svrname[NAMELEN];
char arg1[MAXARGSIZE];
char arg2[MAXARGSIZE];
int sessionid = 0;
int timeout = 300;
bigint lsn;
EXEC SQL end declare section;

int    reminderBytes = 0;

void
Usage(char *progrname)
{
    fprintf(stdout,"%s -D <db> [-t <timeout>] [-L <start lsn>] [-f outfile] \n",
        progrname);
    fprintf(stdout,"\t list of tables and col list -T <tab1> -C <col list> \n");
    fprintf(stdout,"\nCommand Line Options are :\n");
    fprintf(stdout,"\t-D <database_name where table is resides>\n");
    fprintf(stdout,"\t-t <timeout in second>\n");
    fprintf(stdout,"\t\tDefault: 300 sec\n");
    fprintf(stdout,"\t-L <LSN to start capture. Format \"<uniq id>:0x<pos>\">\n" );
    fprintf(stdout,"\t\tDefault: current LSN\n");
    fprintf(stdout,"\t-T <Name of the table to be captured>\n");
    fprintf(stdout,"\t-C <List of Columns to be captured in format \"c1,c2\" >\n");
    fprintf(stdout,"\t-f <Name of the file to dump the CDC log records>\n");
    fprintf(stdout,"\nProgram Description\n");
    fprintf(stdout,"\tThis program starts capture on one or more tables.\n");
    fprintf(stdout,"\tProgram terminates when timeout record is received.\n");
    fprintf(stdout,"\n\tExample:\n");
    fprintf(stdout,"\t %s -D db1 -T t1 -C \"a,b\" -T t2 -C \"a,c\" \n",progrname);
    exit(0);
}

```

```

int
num_of_var_column(int tabid)
{
    return g_colDESC[tabid].num_of_vchar;
}

void
set_num_of_var_col(int tabid, int no)
{
    g_colDESC[tabid].num_of_vchar = no;
}

void
sw_SQLExecImmed(command, fname, lnum)
EXEC SQL begin declare section;
char    *command;
EXEC SQL end declare section;
int     lnum;
char    *fname;
{
    if (nodebug != 1)
        printf("%s at %s:%d\n", command, fname, lnum);
    EXEC SQL execute immediate :command;
    sw_CheckSQLCode(command, fname, lnum);
}

void
sw_CheckSQLCode(char *msgptr, char *fname, int lnum)
{
    if (SQLCODE < 0)
    {
        printf("\nStatement %s Failed at %s:%d. SQLCODE = %d ISAM = %d",
            msgptr, fname, lnum, SQLCODE, (long)sqlca.sqlerrd[1]);

        close_session(0);
    }
}

void
sw_checkCDCRetval(char *msgptr, int cdcenum, char *fname, int lnum)
{
    char cdcerrdesc[128];
    char cdcerrcode[17];

    if (cdcenum < 0)
    {
        get_cdc_error_info(cdcenum, cdcerrcode, cdcerrdesc);
        printf("\nCDC API '%s' Failed at %s:%d. \n"
            "\tCDCAPI_RETVAL = %d, CDC_ERRORCODE = %s",
            msgptr, fname, lnum, cdcenum, cdcerrcode);
        printf("\nCDC Error Description is \n\t%s\n", cdcerrdesc);
    }
    sw_CheckSQLCode(msgptr, fname, lnum);
}

EXEC SQL Define SQL_STMT_LEN 8192;
EXEC SQL DEFINE IDS_MAX_LEN 1024;

void
get_col_values(int tabid, char *databuf)
{
    int    col, len, total_len, host_len, nullflag, maxlen;
    short  c_smallint;
    int    c_integer;
    float  c_float;
    double c_double;

```

```

    dec_t    c_decimal;
    dtime_t  c_datetime;
    char    dec_str[32], data_ptr[32];
    char    vlen;
    ifx_sqlvar_t *colp;
    int      vcharcols = 0;
    int      *vcharlen, collen;
    column_des_t coldesc = g_coldesc[tabid];
    bigint   c_bigint;
    ifx_int8_t c_int8;

    /* Part of the initial data which holds size of variable length col */
    vcharlen = (int *) (databuf - coldesc.num_of_vchar * 4);

    for (col=0; col < coldesc.num_of_columns; col++)
    {
        switch (MASKNONULL (coldesc.colobj[col].coltype)) {
            case SQLINT8 :
                case SQLSERIAL8:
                    c_int8.sign = (*(short *) (databuf));
                    c_int8.data[0] = ldlong(databuf+2);
                    c_int8.data[1] = ldlong(databuf+6);
                    ifx_int8toasc(&c_int8, data_ptr, 31);
                    data_ptr[31] = '\0';
                    printStdoutAndFile("\tColumn Value = %s\n", data_ptr);
                    break;
                case SQLSERIAL :
                case SQLDATE :
                case SQLINT :
                    c_integer = ldlong(databuf);
                    printStdoutAndFile("\tColumn Value = %d\n", c_integer);
                    break;
                case SQLCHAR :
                    maxlen = MIN(coldesc.colobj[col].colsize, 31);
                    memcpy(data_ptr, databuf, maxlen);
                    data_ptr[maxlen] = '\0';
                    printStdoutAndFile("\tColumn Value = '%s'\n", data_ptr);
                    break;
                case SQLNVCHAR :
                case SQLVCHAR :
                    collen = vcharlen[vcharcols]-1;
                    maxlen = MIN(collen, 31);
                    memcpy(data_ptr, databuf+1, maxlen);
                    data_ptr[maxlen] = '\0';
                    printStdoutAndFile("\tColumn Value = '%s'\n", data_ptr);
                    databuf += (vcharlen[vcharcols] - coldesc.colobj[col].colsize);
                    vcharcols++;
                    break;
                case SQLINFXBIGINT :
                    ldbigint(&c_bigint, databuf);
                    printStdoutAndFile("\tColumn Value = %lld\n", c_bigint);
                    break;
                case SQLFLOAT :
                    stdbl(*(double *)databuf, &c_double);
                    printStdoutAndFile("\tColumn Value = %lf\n", c_double);
                    break;
                case SQLSMFLOAT :
                    stffloat(*(float *)databuf, &c_float);
                    printStdoutAndFile("\tColumn Value = %f\n", c_float);
                    break;
                case SQLSMINT :
                    c_smallint = (*(short *) (databuf));
                    printStdoutAndFile("\tColumn Value = %hd\n", c_smallint);
                    break;
                case SQLMONEY :
                case SQLDECIMAL :
                    lddecimal(databuf, coldesc.colobj[col].colsize, &c_decimal);

```



```

    dectodasc(&c_decimal, data_ptr,
    31, coldesc.colobj[col].colsize);
    printStdoutAndFile("\tColumn Value = %s\n", data_ptr);
    break;
    case SQLDTIME:
    case SQLINTERVAL:
    lddecimal(databuf, coldesc.colobj[col].colsize,
    &(c_datetime.dt_dec));
    memset(dec_str, 0, 32);
    dectodasc(&c_datetime.dt_dec, data_ptr, 31,
    coldesc.colobj[col].colsize);
    printStdoutAndFile("\tColumn Value = %s\n", data_ptr);
    break;
    case SQLLVARCHAR :
    collen = vcharlen[vcharcols]-2;
    maxlen = MIN(collen, 31);
    memcpy(data_ptr, databuf+3, maxlen);
    data_ptr[maxlen] = '\0';
    printStdoutAndFile("\tColumn Value = '%s'\n", data_ptr);
    databuf += (vcharlen[vcharcols] - coldesc.colobj[col].colsize);
    vcharcols++;
    break;
    case SQLUDTFIXED :
    if ((coldesc.colobj[col].colxid == 10) ||
    (coldesc.colobj[col].colxid == 11))
    {
    get_lob_data(databuf);
    databuf +=4;
    }
    else
    printf("Could not find data type %d xid %d\n",
    coldesc.colobj[col].coltype,
    coldesc.colobj[col].colxid);
    break;

    default:
    printf("Could not find data type %d\n",
    coldesc.colobj[col].coltype);
    break;
    }
    databuf += coldesc.colobj[col].colsize;
}

}

void
get_col_types(int tabid, char *colstring)
{
    $char    sql_stm[SQL_STMT_LEN];
    char    tabname[IDS_MAX_LEN];
    ifx_sqlda_t    *sqlda;
    int    col, colsize;
    column_des_t    coldesc;

    sprintf(tabname, "apitest%d", tabid, getpid());
    sprintf(sql_stm, "create temp table %s( %s )",
    tabname, colstring);
    SQL_EXEC_I(sql_stm);

    sprintf(sql_stm, "select * from %s", tabname);
    $prepare select_id from $sql_stm;
    CHK_SQL_CODE(sql_stm);

    $describe select_id into sqlda;
    CHK_SQL_CODE("Describe");

    for (col = 0; col < sqlda->sqlid; col++)

```

```

{
    colsize = rtypesize(sqlda->sqlvar[col].sqltype,
        sqlda->sqlvar[col].sqlllen);
    printStdoutAndFile("\tColumn %d is %s, type = %d, size = %d\n", col,
        sqlda->sqlvar[col].sqlname, sqlda->sqlvar[col].sqltype, colsize);

    coldesc.colobj[col].coltype = sqlda->sqlvar[col].sqltype;
    coldesc.colobj[col].colsize = colsize;
    coldesc.colobj[col].colxid = sqlda->sqlvar[col].sqlxid;
    coldesc.colobj[col].colname =
        malloc(strlen(sqlda->sqlvar[col].sqlname)+1);
    strcpy(coldesc.colobj[col].colname, sqlda->sqlvar[col].sqlname);
}

    coldesc.num_of_columns = col;

    g_coldesc[tabid] = coldesc;

    sprintf(sql_stm, "drop table %s", tabname);
    SQL_EXEC_I(sql_stm);
}

void
close_session(int return_from_fun)
{
    $integer retval;

    if (sessionid > 0)
    {
        fprintf(stdout, "\nCDC_CLOSESESS on session %d\n", sessionid);
        $execute function informix.cdc_closesess(:sessionid)
            into :retval;
        CHK_CDC_RETVAL("cdc_closesess",retval);
    }

    if(return_from_fun)
    return;
    else
    {
        if (outfilefp)
            fclose(outfilefp);
        exit(0);
    }
}

void
process_truncate(char *databuf, int size)
{
    bigint a_bigint;
    int lsn_lo;
    int lsn_hi;
    int txid;
    int usedbytes = 0;
    char *insertdata;
    int tabid = 0;

    usedbytes = 0;
    lsn_hi = ldlong(databuf + usedbytes);
    usedbytes += 4;
    lsn_lo = ldlong(databuf + usedbytes);
    usedbytes += 4;
    printf("LSN = %d:0x%x. ", lsn_hi, lsn_lo);
    txid = ldlong(databuf + usedbytes);
    usedbytes += 4;
    printf("TXID = %d\n", txid);
    tabid = ldlong(databuf + usedbytes);
}

```

```

        printf("tabid = %d\n", tabid);
    }

void
process_tabschema(char *databuf)
{
    char *coldesc;
    int fixed_col_width;
    int no_of_fixed_col;
    int no_of_var_col;
    int tabid = 0;

    /* First 4 bytes are userdata */
    tabid = ldlong(databuf);
    printf("\tTabID : %d\n", tabid);

    /* The 4 bytes following first 8 bytes is total size of fixed column */
    fixed_col_width = ldlong(databuf+8);
    printf("\tFixed length column size (total) : %d\n", fixed_col_width);

    /* Next 4 bytes is no. of fixed length columns */
    no_of_fixed_col = ldlong(databuf + 12);
    printf("\tNumber of fixed length column is %d\n", no_of_fixed_col);

    /* Next 4 bytes is no. of variable length columns */
    no_of_var_col = ldlong(databuf + 16);
    printf("\tNumber of variable length column is %d\n", no_of_var_col);

    /* Rest is column description string */
    coldesc = databuf + 20;
    printStdoutAndFile("\tSchema for Table is: '%s'\n", coldesc);

    get_col_types(tabid, coldesc);
    set_num_of_var_col(tabid, no_of_var_col);
}

char *
FmtUTCTime(char *buf, time_t t)
{
    struct tm *ltime = localtime(&t);

    sprintf(buf, "%04u-%02u-%02u %02u:%02u:%02u",
            (1900 + ltime->tm_year)%10000, ltime->tm_mon + 1, ltime->tm_mday,
            ltime->tm_hour, ltime->tm_min, ltime->tm_sec);
    return buf;
}

void
process_TXN_Records(char *databuf, int size)
{
    bigint a_bigint;
    int lsn_lo;
    int lsn_hi;
    int txid;
    int longtime;
    int usedbytes = 0;
    char *insertdata;
    int tabid = 0;
    char timebuf[512];

    usedbytes = 0;
    lsn_hi = ldlong(databuf + usedbytes);
    usedbytes += 4;

```

```

        lsn_lo = ldlong(databuf + usedbytes);
        usedbytes += 4;
        printf("LSN = %d:0x%x. ", lsn_hi, lsn_lo);
        txid = ldlong(databuf + usedbytes);
        usedbytes += 4;
        printf("TXID = %d\n", txid);
        tabid = ldlong(databuf + usedbytes);
        usedbytes += 4;
        longtime = ldlong(databuf + usedbytes);
        FmtUTCTime(timebuf, (time_t)longtime);
        printf("\tTime = %s\n", timebuf);
        dump_hex("Raw Data: ", databuf, size);
    }

void
process_discard(char *databuf, int size)
{
    bigint a_bigint;
    int lsn_lo;
    int lsn_hi;
    int txid;
    int usedbytes = 0;
    char *insertdata;
    int tabid = 0;

    dump_hex("Raw Data: ", databuf, 3);
    usedbytes = 0;
    printf("\tTotal record size = %d\n", size);
    lsn_hi = ldlong(databuf + usedbytes);
    usedbytes += 4;
    lsn_lo = ldlong(databuf + usedbytes);
    usedbytes += 4;
    printf("\tLSN = %d:0x%x\n", lsn_hi, lsn_lo);
    txid = ldlong(databuf + usedbytes);
    usedbytes += 4;
    printf("\tTXID = %d\n", txid);
    tabid = ldlong(databuf + usedbytes);
    dump_hex("Raw Data: ", databuf, size);
}

void
process_IUD_Records(char *databuf, int size)
{
    bigint a_bigint;
    int lsn_lo;
    int lsn_hi;
    int txid;
    int usedbytes = 0;
    char *insertdata;
    int tabid = 0;

    usedbytes = 0;
    lsn_hi = ldlong(databuf + usedbytes);
    usedbytes += 4;
    lsn_lo = ldlong(databuf + usedbytes);
    usedbytes += 4;
    printf("LSN = %d:0x%x. ", lsn_hi, lsn_lo);
    txid = ldlong(databuf + usedbytes);
    usedbytes += 4;
    printf("TXID = %d\n", txid);
    tabid = ldlong(databuf + usedbytes);
    usedbytes += 4;
    printf("\tTabID = %d\n", tabid);
    /* Ignore 4 bytes for flag */
    usedbytes += 4;

```

```

        /* For every variable length column there is 4 bytes for length */
        usedbytes += (num_of_var_column(tabid) * 4);
        insertdata = &databuf[usedbytes];
        dump_hex("Raw IUD Data: ", insertdata, size);

    /* Now we are pointing to the beginning of the column values
     * Extract values for each of the columns and print them after
     * formatting to the correct type
     */
    get_col_values(tabid, insertdata);
}

int
isIUDRecord(cdc_log_type_t logrec)
{
    switch(logrec)
    {
        case CDC_REC_INSERT:
        case CDC_REC_DELETE:
        case CDC_REC_UPDBEF:
        case CDC_REC_UPDAFT:
            return 1;
        break;
        default:
            return 0;
    }
}

cdc_log_type_t  cur_logrec_type;
char  *cur_record_ptr;
common_header_t  cur_log_header;

mint
process_databuf(char *databuf, int bytesread)
{
    int  logrectype, size;
    char recsymb[17], recdesc[128];

    if (remainderBytes <= 0)
    {
        /* Get the common header information from the CDC packet*/
        cur_log_header.ch_size_hdr = ldlong(databuf);
        cur_log_header.ch_size_payload = ldlong(databuf+4);
        cur_log_header.ch_payload_type = ldlong(databuf+8);

        /* Check if the correct CDC packet was obtained */
        if (cur_log_header.ch_payload_type != CDC_PKTSCHEME_LRECBINARY)
        {
            fprintf(stderr, "Unknown packet type.\n");
            return -1;
        }

        /*
         * The 4 bytes following the common header are the log record type.
         */
        logrectype = ldlong(databuf + CMNHDR_SIZE);

        /*
         * Set cur_record_ptr to point to immediately after the packet type
         */
        cur_record_ptr = databuf + (CMNHDR_SIZE + 4);

        /* Get the symbolic name and description for this log rec type */
        get_cdc_rectype_name(logrectype, recsymb, recdesc);
        printf(stdout, "Got Record type %17s. Size = %4d ",
            recsymb, cur_log_header.ch_size_payload);
    }
}

```

```

/* Map the logrectype to the type that this program is interested in */
cur_logrec_type = get_cdc_log_type(recsympb);

/* check if this type of record had more data pending to be read */
if (isIUDRecord(cur_logrec_type))
    reminderBytes = (cur_log_header.ch_size_hdr +
        cur_log_header.ch_size_payload) -
        bytesread;
}
else
    reminderBytes -= bytesread;

/* If this record has more data, then read again */
if (reminderBytes > 0)
    return 1;

reminderBytes = 0;

/*
 * Now switch on the record type and extract data from it.
 */
switch (cur_logrec_type)
{
    case CDC_REC_BEGINIX:
    case CDC_REC_COMMTX:
    case CDC_REC_RBTX:
        process_TXN_Records(cur_record_ptr,
            cur_log_header.ch_size_payload);
        break;

    case CDC_REC_INSERT:
    case CDC_REC_UPDBEF:
    case CDC_REC_UPDAFT:
    case CDC_REC_DELETE:
        process_IUD_Records(cur_record_ptr,
            cur_log_header.ch_size_payload);
        break;

    case CDC_REC_DISCARD:
        process_discard(cur_record_ptr,
            cur_log_header.ch_size_payload);
        break;
    case CDC_REC_TRUNCATE:
        /* Not handling this record in this program */
        break;
    case CDC_REC_TABSCHEMA:
        process_tabschema(cur_record_ptr);
        break;
    case CDC_REC_TIMEOUT:
        return 2;
        break;

    case CDC_REC_ERROR:
        /* Not handling this record in this program */
        break;

    case CDC_REC_MAXLOGREC:
    default:
        break;
}
return 0;
}

#define MAXTAB 5

int no_of_tab = -1;
char dbname[NAMELEN];

```

```

char dbname[MAXTAB][NAMELEN];
char columns[MAXTAB][10*NAMELEN];
char tab_schema[MAXTAB][NAMELEN];

void
init_default(char *programe)
{
    strcpy(dbname, "foo");
    strcpy(tabname[0], "t1");
    strcpy(columns[0], "aa,bb");
    lsn = 0LL;
}

void
ProcessOption(int ac, char *av[])
{
    int          opt, lsn1, lsn2;
    int          ignore_err;
    char lsn_string[1024];
    char*        token;

    if (ac <= 1)
        Usage(av[0]);

    init_default(av[0]);

    while ((opt = getopt(ac, av, "C:D:L:t:T:h:n:f:")) != EOF)
        switch(opt) {
            case 'C' :
                strncpy(columns[no_of_tab], optarg, 10*NAMELEN);
                break;
            case 'D' :
                strncpy(dbname, optarg, NAMELEN);
                break;
            case 'L' :
                strncpy(lsn_string, optarg, 1024);
                sscanf(lsn_string, "%d:%x", &lsn1, &lsn2);
                lsn = (((bigint)lsn1 << 32) | (bigint)lsn2);
                printf("LSN to start snoop(%d:0x%x = %lld\n",
                    lsn1, lsn2, lsn);
                break;
            case 't':
                timeout = atoi(optarg);
                break;
            case 'T' :
                no_of_tab++;
                strncpy(tabname[no_of_tab], optarg, NAMELEN);
                break;
            case 'n' :
                nodebug = 0;
                break;
            case 'f' :
                strncpy(outfile, optarg, NAMELEN);
                outfilefp = fopen(outfile, "w");
                if (!outfilefp)
                {
                    printf("file %s open failed\n", outfile);
                    exit(-1);
                }
                break;
            case '?' :
            case 'h' :
                Usage(av[0]);
                break;
        }
}

```

```

}

int
main(int argc, char **argv)
{
    char *progrname;
    char databuf[4096*2];
    char *databufptr=databuf;
    int capture_started = 0;
    int i, endofread=0;
    char *servername;
    int status;
    $integer retval, tabid;

    progrname = argv[0];

    /* Process the arguments passed to this program */
    ProcessOption(argc, argv);
    if(no_of_tab < 0)
no_of_tab = 0;

    /* Setup the connection to syscdcv1 database against the
     * current IDS instance
     */
    servername = getenv("INFORMIXSERVER");
    if(servername != NULL)
        sprintf(arg1, servername);
    else
    {
        fprintf(stderr, "INFORMIXSERVER env variable not set.\n");
        exit (-1);
    }

    $connect to "syscdcv1";
    CHK_SQL_CODE("connect to syscdcv1");
    fprintf(stdout, "Connected to syscdcv1@%s\n", servername);

    retval = 0;

    /* Load the syscdcrectypes and syscdcerrcodes table rows */
    loadSyscdcrectypes();
    loadSyscdcerrcodes();

    /* Start a CDC session */
    fprintf(stdout, "CDC_OPENSESS for server %s with Timeout %d\n",
arg1, timeout);
    $execute function informix.cdc_opensess(:arg1, 0,
:timeout, 1, 1, 0) into :retval;
    CHK_CDC_RETVAL("cdc_opensess", retval);

    /* Save the CDC session id */
    sessionid = retval;

    if (retval < 0)
        goto done;

    for(i=0; i <= no_of_tab; i++)
    {
        sprintf(arg1, "%s:%s", dbname, tablename[i]);

        /* Enable FULL ROW LOGGING for the table */
        fprintf(stdout, "Enable for full row logging on Table '%s'\n", arg1);
        $execute function informix.cdc_set_fullrowlogging(:arg1, 1) into :retval;
        CHK_CDC_RETVAL("cdc_set_fullrowlogging", retval);
        if (retval < 0)
            goto done;
    }
}

```



```

/* Start the capture of the table */
fprintf(stdout, "CDC_STARTCAPTURE of %s on session %d\n", arg1, sessionid);
sprintf(arg2, "%s", columns[i]);
tabid = i;
$execute function informix.cdc_startcapture(:sessionid, :lsn,
      :arg1, :arg2, :tabid)
      into :retval;
CHK_CDC_RETVAL("cdc_startcapture", retval);
if (retval < 0)
    goto done;
capture_started = 1;
}

/* Activate the CDC session */
fprintf(stdout, "CDC_ACTIVATESESS on %d \n", sessionid);
$execute function informix.cdc_activatesess(:sessionid, :lsn)
      into :retval;
CHK_CDC_RETVAL("cdc_activatesess", retval);
if (retval < 0)
    goto done;

fprintf(stdout, "Start Reading the log records...\n");

while (!endofread )
{
    int bytesread;
    int loreaderr = 0;

    bytesread = ifx_lo_read(sessionid, databufptr, 4096, &loreaderr);
if (nodebug != 1)
    fprintf(stdout, "bytesread is %d loreaderr is %d SQLCODE %d\n",
        bytesread, loreaderr, SQLCODE);

    if(loreaderr < 0)
        goto done;

if (bytesread > 0)
{
    status = process_databuf(databuf, bytesread);
        if (status == -1 )
            break;
    else if (status == 1)
    {
        if (nodebug != 1)
            fprintf(stdout,
"longrow, need to read %d more bytes to get complete row buffer\n",
        reminderBytes);

        databufptr = databufptr + bytesread;
        continue;
    }
    else if (status == 2)
        endofread = 1;

        databufptr = databuf;
    }
}

fprintf(stdout, "\nGoing to end the CDC session....\n");

done:
if (capture_started)
{
    for(i=0; i <= no_of_tab; i++)
    {
        sprintf(arg1, "%s:%s", dbname, tablename[i]);

```

```

        fprintf(stdout, "CDC_ENDCAPTURE of '%s' on session %d\n",
        arg1,sessionid);
        $execute function informix.cdc_endcapture(:sessionid, 0,
:arg1)
        into :retval;
        CHK_CDC_RETVAL("cdc_endcapture",retval);

        fprintf(stdout, "Disable full row logging on table %s\n", arg1);
        $execute function informix.cdc_set_fullrowlogging(:arg1, 0)
        into :retval;

        CHK_CDC_RETVAL("cdc_endcapture",retval);
    }
    }
    if (sessionid > 0)
    {
        fprintf(stdout, "cdc_closesess on session %d\n", sessionid);
        $execute function informix.cdc_closesess(:sessionid)
        into :retval;
        CHK_CDC_RETVAL("cdc_closesess",retval);
    }

    exit(0);
} /* main() */

#define PRINTABLE(c) (isprint(c) ? (c) : '.')

void
dump_hex (char *str, char *rec, int len)
{
    int i, j;

    if (nodebug==1) return;

    printStdoutAndFile ("%s (%d/0x%x bytes at address 0x%x)\n", str, len, len, rec);

    if (rec == NULL || len < 1)
        return;

    for (i = 0; i < len; i += 16)
    {
        for (j = i; j < i + 16; j++)
        {
            if (j < len)
                printStdoutAndFile("%02x ", rec[j] & 0xff);
            else
                printStdoutAndFile (" ");
        }
        for (j = i; j < i + 16; j++)
            if (j < len)
                printStdoutAndFile ("%c", PRINTABLE(rec[j] & 0xff));
        printStdoutAndFile ("\n");
    }
}

/* Extract the BLOB and CLOB data from the LO Header information of record*/
void
get_lob_data(char* dbuf)
{
    int err;
    ifx_lo_t LO={0};
    $int lofd;
    $ifx_lo_stat_t *stats;
    $ifx_int8_t size;
    int isize;
    char *lobuff ;

```

```

do {
    memcpy((char*)&LO, dbuf+4, sizeof(ifx_lo_t));

    $set lock mode to wait;

    lofd = ifx_lo_open(&LO, LO_RDONLY, &err);
    if (lofd < 0)
    {
        printStdoutAndFile("\tSBLOB Data is NULL\n");
        break;
    }
    if(ifx_lo_stat(lofd, &stats) < 0)
    {
        printStdoutAndFile("\tSBLOB Data is NULL\n");
        break;
    }
    if((ifx_lo_stat_size(stats, &size)) < 0)
        isize = 0;
    else if(ifx_int8toint(&size, &isize) != 0)
    {
        fprintf(stdout, "\nFailed to convert size");
        isize = 0;
        break;
    }
    printStdoutAndFile("\tSBLOB size is %d\n", isize);

    lobuff = malloc(isize);

    isize = ifx_lo_read(lofd, lobuff, isize, &err);
    if (isize < 0)
    {
        fprintf(stdout, "\t cant read LO %d\n", err);
        CHK_SQL_CODE("cant read LO");
        break;
    }

    printStdoutAndFile("\t ifx_lo_read output size=%d \n", isize);
    dump_hex("SBLOB Data:", lobuff, isize);
} while(0);

/* Close smart large object */
ifx_lo_close(lofd);
}

void
printStdoutAndFile(char* msg, ...)
{
    va_list ap;

    va_start(ap, msg);

    if (outfilefp)
    {
        fprintf(outfilefp, msg, ap);
    }
    fprintf(stdout, msg, ap);

    va_end(ap);

    if (outfilefp)
        fflush(outfilefp);
    return;
}

/* For a given CDC record type that was returned, find the symbolic name

```

```

    * and the description
    */
void
get_cdc_rectype_name(int i_recnum, char* o_recsymb, char* o_recdesc)
{
    int i ;
    for (i=0; i < num_cdc_log_recs; i++)
    {
        if (syscdcrectypes_tab[i].recnum == i_recnum)
        {
            if (o_recsymb)
                strcpy(o_recsymb, syscdcrectypes_tab[i].recname);
            if (o_recdesc)
                strcpy(o_recdesc, syscdcrectypes_tab[i].recdesc);
            return;
        }
    }

    if (o_recsymb)
        strcpy(o_recsymb, "UNKNOWN");
    if (o_recdesc)
        strcpy(o_recdesc, "Unknown/UnDocumented Log record");
}

/* For a given symbolic name of the CDC record find the record type
 * that this program defined
 */
cdc_log_type_t
get_cdc_log_type(char* i_recname)
{
    int i;
    for (i=0; i < CDC_REC_MAXLOGREC; i++)
    {
        if (strcmp(i_recname, logrectab[i].recname) == 0)
            return logrectab[i].rectype;
    }

    printf("Error: Did not find value for %s log rec symbol table\n", i_recname);
    return CDC_REC_MAXLOGREC;
}

/* Find detailed CDC error message and CDC error symbolic name for a given
 * error code returned by the CDC APIs
 */
void
get_cdc_error_info(int i_cdcerr, char* o_cdcerrsym, char* o_cdcerrdesc)
{
    int i ;
    for (i=0; i < num_cdc_err_recs; i++)
    {
        if (syscdcerrcode_tab[i].errcode == i_cdcerr)
        {
            if (o_cdcerrsym)
                strcpy(o_cdcerrsym, syscdcerrcode_tab[i].errname);
            if (o_cdcerrdesc)
                strcpy(o_cdcerrdesc, syscdcerrcode_tab[i].errdesc);
            return;
        }
    }

    if (o_cdcerrsym)
        strcpy(o_cdcerrsym, "UNKNOWN");
    if (o_cdcerrdesc)
        strcpy(o_cdcerrdesc, "Unknown/UnDocumented CDC API Error");
}

```

```

/* Query the syscdcrectypes and store it in an in-memory table */
void
loadSyscdcrectypes(void)
{
    $int sys_recnum;
    $varchar sys_recname[17];
    $varchar sys_recdesc[128];
    $int numrec=0;
    int i=0;

    EXEC SQL select count(*) into :numrec from syscdcrectypes;

    if (numrec <= 0)
    {
        num_cdc_log_recs=0;
        return;
    }

    syscdcrectypes_tab = (syscdcrectypes_t*) malloc(numrec *
        sizeof(syscdcrectypes_t));

    num_cdc_log_recs=numrec;
    EXEC SQL DECLARE rectype_cur CURSOR FOR
        SELECT recnum, recname, recdesc
            INTO :sys_recnum, :sys_recname, :sys_recdesc
            FROM syscdcrectypes
            WHERE recname LIKE "CDC%"
            FOR READ ONLY;

    EXEC SQL OPEN rectype_cur;

    while(SQLCODE == 0)
    {
        EXEC SQL FETCH rectype_cur;
        if(SQLCODE == 0)
        {
            sys_recname[16]='\0';
            sys_recdesc[127]='\0';
            syscdcrectypes_tab[i].recnum = sys_recnum;
            strcpy(syscdcrectypes_tab[i].recname, sys_recname);
            strcpy(syscdcrectypes_tab[i].recdesc, sys_recdesc);
            i++;
        }
    }

    EXEC SQL CLOSE rectype_cur;
}

/* Query the syscdcerrcodes and store it in an in-memory table */
void
loadSyscdcerrcodes(void)
{
    $int sys_errcode;
    $varchar sys_errname[16];
    $varchar sys_errdesc[128];
    $int enumrec=0;
    int i=0;

    EXEC SQL select count(*) into :enumrec from syscdcerrcodes;

    if (enumrec <= 0)
    {
        num_cdc_err_recs=0;
        return;
    }

```

```

syscdcerrcode_tab = (syscdcerrcode_t*) malloc(enumrec *
    sizeof(syscdcerrcode_t));

num_cdc_err_recs=enumrec;
EXEC SQL DECLARE errcode_cur CURSOR FOR
    SELECT errcode, errname, errdesc
        INTO :sys_errcode, :sys_errname, :sys_errdesc
        FROM syscdcerrcodes
        FOR READ ONLY;

EXEC SQL OPEN errcode_cur;

while(SQLCODE == 0)
{
    EXEC SQL FETCH errcode_cur;
    if(SQLCODE == 0)
    {
        syscdcerrcode_tab[i].errcode = sys_errcode;
        strcpy(syscdcerrcode_tab[i].errname, sys_errname);
        strcpy(syscdcerrcode_tab[i].errdesc, sys_errdesc);
        i++;
    }
}

EXEC SQL CLOSE errcode_cur;
}

```

The following sample output illustrates this program.

```

/u/informix> ./cdcapl -D test -T informix.tl -t 30 -C "col1,col2,col3" -f x.out
Connected to syscdcvl@new1
CDC_OPENSESS for server new1 with Timeout 30
Enable for full row logging on Table 'test:informix.tl'
CDC_STARTCAPTURE of test:informix.tl on session 39
CDC_ACTIVATESESS on 39
Start Reading the log records...
Got Record type CDC_REC_TABSCHEM. Size = 37 TabID : 0
    Fixed length column size (total) : 15
    Number of fixed length column is 3
    Number of variable length column is 0
    Schema for Table is: 'col1 serial, col2 char(1), col3 int8'
    Column 0 is col1, type = 6, size = 4
    Column 1 is col2, type = 0, size = 1
    Column 2 is col3, type = 17, size = 10
Got Record type CDC_REC_BEGINIX. Size = 0 LSN = 47:0x5e018. TXID = 24
    Time = 2008-10-23 19:01:51
Got Record type CDC_REC_INSERT. Size = 15 LSN = 47:0x5e04c. TXID = 24
    TabID = 0
    Column Value = 1
    Column Value = 'a'
    Column Value = 1000
Got Record type CDC_REC_COMMTX. Size = 0 LSN = 47:0x5e09c. TXID = 24
    Time = 2008-10-23 19:01:51
...
...

Got Record type CDC_REC_TIMEOUT. Size = 0
Going to End the CDC session....
CDC_ENDCAPTURE of 'test:informix.tl' on session 39
Disable full row logging on Table test:informix.tl
cdc_closesess on session 39

```

### Related tasks

“Writing an application to capture data changes” on page 1-5

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## Appendix. Accessibility

IBM strives to provide products with usable access for everyone, regardless of age or ability.

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### Accessibility features for IBM Informix Dynamic Server

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use information technology products successfully.

#### Accessibility Features

The following list includes the major accessibility features in IBM Informix Dynamic Server. These features support:

- Keyboard-only operation.
- Interfaces that are commonly used by screen readers.
- The attachment of alternative input and output devices.

**Tip:** The IBM Informix Dynamic Server Information Center and its related publications are accessibility-enabled for the IBM Home Page Reader. You can operate all features using the keyboard instead of the mouse.

#### Keyboard Navigation

This product uses standard Microsoft® Windows navigation keys.

#### Related Accessibility Information

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You can view the publications for IBM Informix 4GL in Adobe® Portable Document Format (PDF) using the Adobe Acrobat Reader.

#### IBM and Accessibility

See the *IBM Accessibility Center* at <http://www.ibm.com/able> for more information about the commitment that IBM has to accessibility.

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### Dotted Decimal Syntax Diagrams

The syntax diagrams in our publications are available in dotted decimal format, which is an accessible format that is available only if you are using a screen reader.

In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), the elements can appear on the same line, because they can be considered as a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that your screen reader is set to read punctuation. All syntax elements that have the same dotted decimal number (for example, all syntax elements that have the number 3.1) are mutually exclusive

alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.

Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, the word or symbol is preceded by the backslash (\) character. The \* symbol can be used next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element \*FILE with dotted decimal number 3 is read as 3 \\* FILE. Format 3\* FILE indicates that syntax element FILE repeats. Format 3\* \\* FILE indicates that syntax element \* FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol that provides information about the syntax elements. For example, the lines 5.1\*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, that element is defined elsewhere. The string following the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you should refer to a separate syntax fragment OP1.

The following words and symbols are used next to the dotted decimal numbers:

- ? Specifies an optional syntax element. A dotted decimal number followed by the ? symbol indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element (for example, 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are optional. For example, if you hear the lines 5 ?, 5 NOTIFY, and 5 UPDATE, you know that syntax elements NOTIFY and UPDATE are optional; that is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.
- ! Specifies a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicates that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the same dotted decimal number can specify a ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the default option for the FILE keyword. In this example, if you include the FILE keyword but do not specify an option, default option KEEP is applied. A default option also applies to the next higher dotted decimal number. In



this example, if the FILE keyword is omitted, default FILE(KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1.1! (KEEP), and 2.1.1 (DELETE), the default option KEEP only applies to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to 2? FILE. Nothing is used if the keyword FILE is omitted.

- \* Specifies a syntax element that can be repeated zero or more times. A dotted decimal number followed by the \* symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1\* data-area, you know that you can include more than one data area or you can include none. If you hear the lines 3\*, 3 HOST, and 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

**Notes:**

1. If a dotted decimal number has an asterisk (\*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.
  2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you could write HOST STATE, but you could not write HOST HOST.
  3. The \* symbol is equivalent to a loop-back line in a railroad syntax diagram.
- + Specifies a syntax element that must be included one or more times. A dotted decimal number followed by the + symbol indicates that this syntax element must be included one or more times. For example, if you hear the line 6.1+ data-area, you must include at least one data area. If you hear the lines 2+, 2 HOST, and 2 STATE, you know that you must include HOST, STATE, or both. As for the \* symbol, you can only repeat a particular item if it is the only item with that dotted decimal number. The + symbol, like the \* symbol, is equivalent to a loop-back line in a railroad syntax diagram.



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