# IBM Software Group
# Taking RI Relationships from Passive to Active

*Ernie Mancill – IBM Sr Certified Consulting IT Specialist*

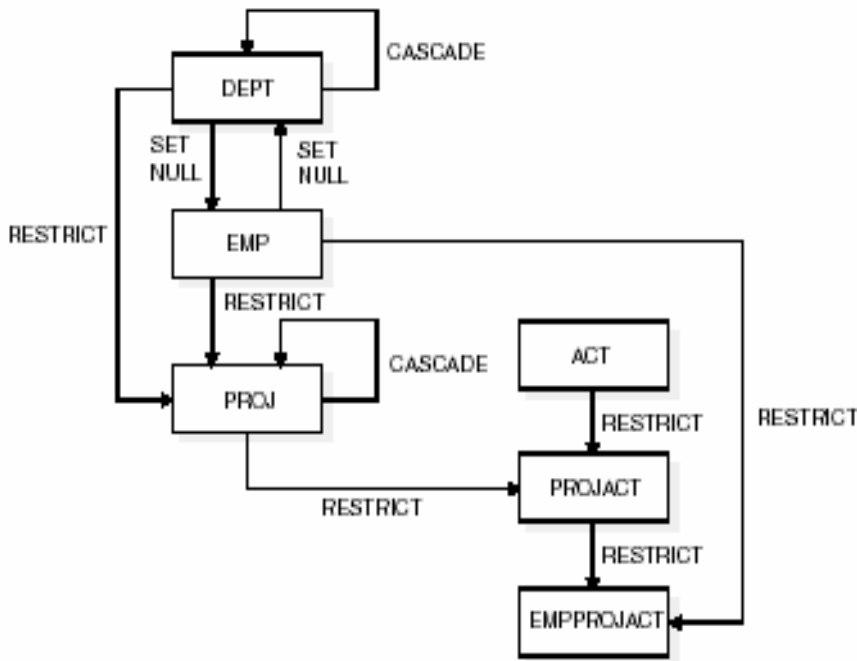*Barry Davis – Product Specialist Rocket Software*

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# Session Agenda

- RI Terminology and Overview

- DB2 Grouper Overview, Architecture, and Terminology

- DB2 Grouper – Product Usage

- DB2 Recovery Expert

- Wrap-up and Questions

# Sample DB2 Table - Relationships



For example in the DB2 sample table shown to the left:

EMP is a Dependent table (child) of DEPT. The DDL (references clause) will look something like:

"Primary Key (EMPNO)

Foreign Key RED (WORKDEPT)

References DSN8510.DEPT on Delete Set Null"

Example of relationships among tables, arrows point from parents to dependents

# DB2 Enforced Relationships - Terminology

- Parent Table - A table with a primary key. In the sample application, the employee table serves that purpose for employees.

- Parent Key - The table should have one column or a set of columns that provides a unique identifier for the rows of the table. This column (or set of columns) is called the parent key of the table. Also known as a Primary Key.

- Unique Index - To ensure that the parent key does not contain duplicate values, you must create a unique index on the column or columns that constitute the parent key.

# DB2 Enforced Relationships – Terminology cont.

- Foreign Key  - can refer to either a unique or a primary key of the parent table. The column names you specify identify the columns of the parent key.

- Child Table – A table which references the Parent table with the Foreign Key clause.

- Referential Constraint – Composed of three elements:

  ▶ Constraint name

  ▶ Columns comprising the foreign key

  ▶ References clause (which includes the constraint rule)

# DB2 V8 – Informational Referential Constraints

- An informational referential constraint is a referential constraint that is not enforced by DB2 during normal operations

  ▶ DB2 ignores informational referential constraints during insert, update, and delete operations.

  ▶ Some utilities ignore these constraints; other utilities recognize them. For example, CHECK DATA and LOAD ignore these constraints. QUIESCE TABLESPACESET recognizes these constraints by quiescing all table spaces related to the specified table space.

- Informational referential constraints are often useful, especially in a data warehouse environment, for several reasons:

  ▶ To avoid the overhead of enforcement by DB2.

  ▶ To allow more queries to qualify for automatic query rewrite.

- To define an informational referential constraint, use the NOT ENFORCED option of the referential constraint definition in a CREATE TABLE or ALTER TABLE statement.

- Note: You should use this type of referential constraint only when an application process verifies the data in a referential integrity relationship.
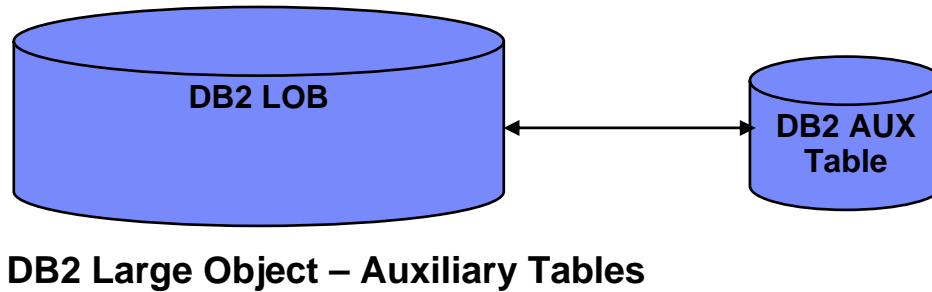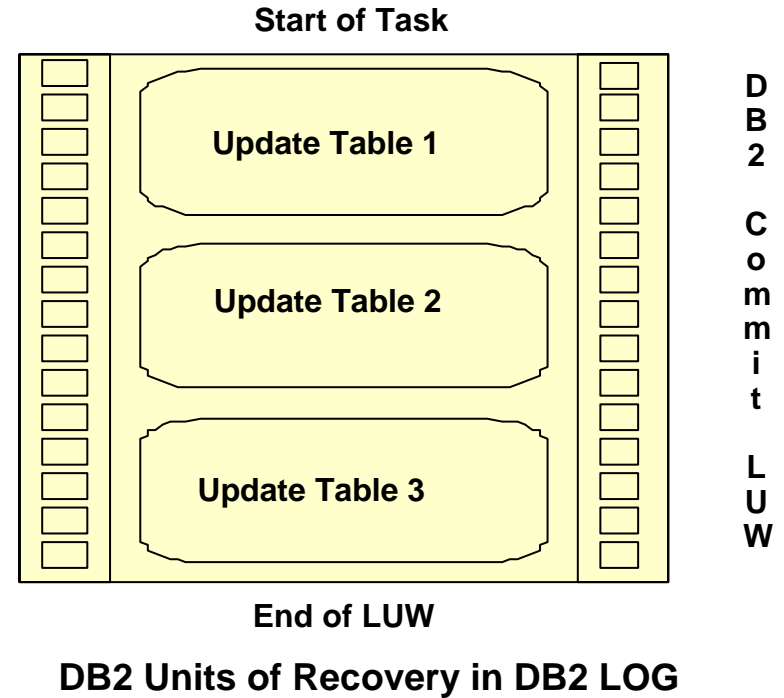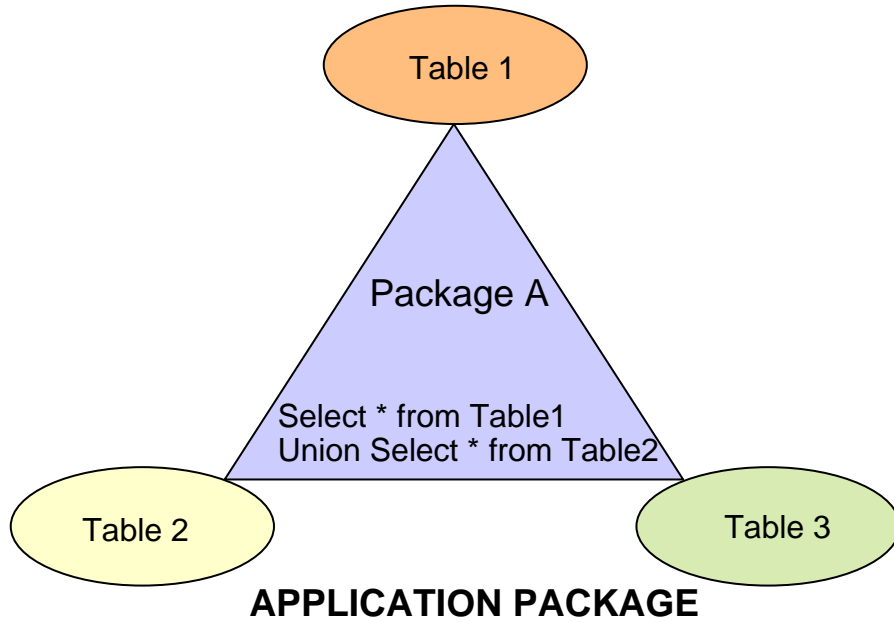
# Application Enforcement

- Non-enforced referential constraint when an application process verifies the data in a referential integrity relationship. For example, when inserting a row in a dependent table, the application will verify that a foreign key exists as a primary or unique key in the parent table.

- Advantages
  - ▸ Performance by avoiding enforcement overhead in DB2
  - ▸ Simplistic data model not requiring referential integrity

- Disadvantages
  - ▸ Strict adherence required by all applications updating tables involved these relationships (everyone must play by the same rules).
  - ▸ Hard to keep track (over time) of the relationships and enforcement embedded in the application (until now).

# DB2 Relationships - Others

Table 1

Package A

Select * from Table1
Union Select * from Table2

Table 2

Table 3

**APPLICATION PACKAGE**

**Start of Task**

Update Table 1

Update Table 2

Update Table 3

**End of LUW**

**D B 2  C o m m i t  L U W**

**DB2 Units of Recovery in DB2 LOG**

DB2 LOB

DB2 AUX Table

**DB2 Large Object – Auxiliary Tables**

# Where to look for relationship information

- DB2 Catalog (V7 for enforced RI, V8 for enforced and non-enforced RI)
  - ▶ Can be discovered using catalog navigation tools such as DB2 Administration Tool
- OEM DB2 Data Modeling Tools (Rational, Bachman, ERWIN, etc.)
  - ▶ Dependent on how the model is maintained
- Application Programs
  - ▶ Hard to decipher and only useful if application program adheres to relationship model.
- Application Software Vendor documentation
  - ▶ Not always updated and some designs are proprietary
- Application design documentation
  - ▶ Value of information directly related to effort spent to keep updated and tends to age rapidly
- And now…..
  - ▶ DB2 Grouper Metadata

# Usages for RI Information

- The information about relationships can be used for various kinds of administration activities, such as:

  - ▶ Planning effective backup and recovery strategies

  - ▶ Archiving and Relocation of data

  - ▶ Replicating data

  - ▶ Test Data generation

  - ▶ Planning capacity and analyzing performance

  - ▶ Application object change management, migration and alteration

# Additional Usages

- **Recovery Expert:**

  ▸ Grouper responds to the need to recover data to a specific point in time, with related data recovered to that same point in time.

  ▸ Grouper component aids in determining the set of related objects that need to be recovered simultaneously.

- **Test Database Generator**

  ▸ Understand what constitutes a intact and complete set of test data from a related tables standpoint and manage the extracting of this subset of data from the operational data store.

- **General Data Administration/Understanding**

  ▸ There is a need to understand relationships between various tables.

  ▸ Much of information is in the catalog, but there is a need to retrieve it and view it in a coherent manner.

# Problem Statement

- There are many relationships between the various DB2 objects, such as tables, in a business application. Some of these relationships can be discovered easily, while others cannot be easily found.

- As the complexity of data relationships increases, it becomes increasingly difficult to discover and keep track of this information.

- These relationships can be "dynamic" or "transient", causing difficulties in managing business applications efficiently.

- Finding these relationships can be critical to treating portions of application data in a coherent manner.

# What is Grouper?

- DB2 Grouper – 5799-GXQ.  A component of the below indicated tools, with it's own PID but cannot be ordered as a separate, standalone product.

- Grouper is a client-server component that can be used to group tables for a single DB2 for z/OS subsystem.

- Grouper can discover, record, allow administration for, and provide group relationship information to other IBM DB2 tools as a basis for database administration activities.

# What is Grouper?

- These activities can be performed manually by the user or by tools that work with Grouper – 5799-GXQ:

  ▸ DB2 Data Archive Expert for z/OS – 5655-I95

  ▸ DB2 Test Database Generator for z/OS – 5697-I02

  ▸ DB2 Test Database Generator for MP – 5724-E4

  ▸ DB2 Recovery Expert for z/OS – 5697-H74

- And more to come later…..

# DB2 Grouper Components

- Grouper Administration

  ▶ Schedule and execute the Grouper Functions via the use of the Client UI

  ▶ Create specifications which control Group Discovery

  ▶ Administration of the group contents

  ▶ Define non DB2-enforced relationships

- Unit of Work Discovery

  ▶ Searches archived DB2 log records on the server for relationships. A group of tables are group of tables are suggested as being related if they were all updated in the same unit of work.

- Group Discovery

  ▶ A stored procedure that runs in the server database and discovers the relationships between tables in the database

- Group View

  ▶ An SQL view that provides information to examine the various groups

# DB2 Grouper Prerequisites

- **DB2 Grouper Client UI**
  - ▶ Runs on Windows XP or similar
  - ▶ Pentium III class machine
  - ▶ Memory of 256MB or Greater
  - ▶ Requires DB2 Connect 7.2 FP 10 or greater
- **DB2 Grouper Metadata**
- **DB2 Grouper Stored Procedures**
  - ▶ DB2 V7 with UQ73301
  - ▶ OS/390 2.10 or Greater with:
    - USS
    - WLM in GOAL Mode
    - RRS
    - Java JRE 1.3.1 +

# Grouper - Terminology

| NDCDB202 - testprojectempact - NEWVERSION_1 - Group_1 | | | |
|---|---|---|---|
| Table name | Creator Name | Tablespace | Boundary |
| ACT | DEMO18 | DSN8S51P | N |
| DEPT | DEMO18 | DSN8S51D | N |
| EMP | DEMO18 | DSN8S51E | N |
| EMPPROJACT | DEMO18 | DSN8S51P | N |
| PROJ | DEMO18 | DSN8S51P | N |
| PROJACT | DEMO18 | DSN8S51P | N |

Tree:
- NDCDB202
  - CATALOGWIDE
  - testproj
  - testprojectempact
    - NEWVERSION_1
      - Group_1
  - DEMOFORFIELDTELECO
  - NEWSET1
  - NEWSET2 Unit of Recovery Discovery
  - dnet072a1
  - GRPSPACE
  - GRPSPACE2
  - dnet329a
  - BDOB ARCHIVE1
  - BDB1DEMO

**The sets appear in date of creation sequence**

▪Group - A collection of related tables (Group_1 in the above)
▪Version - A collection of groups (NEWVERSION_1 shown above)
▪Set - A collection of one or more versions (testprojectempact)
▪Starting point tables - Tables that the user specifies in the group discovery options to limit the scope of the group discovery (DEMO18.PROJ) in the above

# DB2 Grouper CUI Choices



**DB2 Grouper Launchpad**

POPO - VERSION1

(Optional inputs for all sets)

Define non-enforced RI

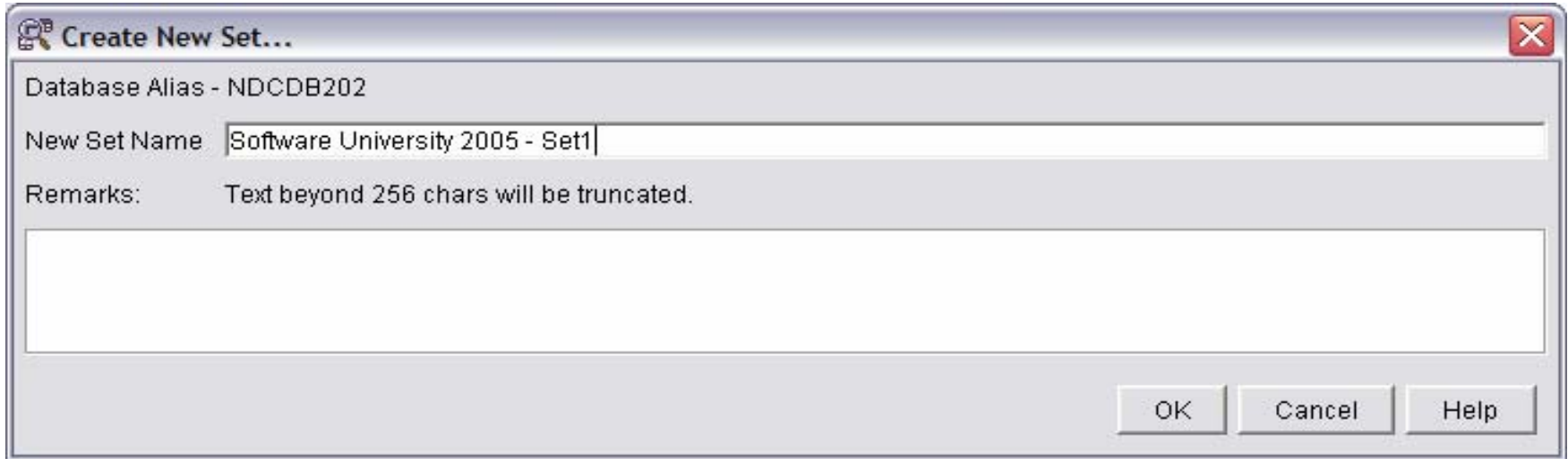Run a Unit of Work Discovery

Check the status of a UOW Discovery

Submit a job to be run on the targeted server that will search the DB2 logs for Unit of Work relationships. These UOW relationships are used globally as input for all subsequent Group Discoveries. If you want to have UOW relationships considered, then run this job before the Group Discovery job, as this job provides input to Group Discovery.

To perform this task from the Grouper tree view, select Run Unit of Work Discovery in the main menu.

Preparing for a Group Discovery

Create a set to hold groups

Name a version of the set

Select starting points

Select boundary objects

Select relationships to ignore

Add relationships

Discovering Groups

Run a Group Discovery

Check the status of a Group Discovery

Close launchpad and view the results

Global inputs    Context inputs    Group Discovery

DSNB

Unit of Work relationships

VERSION1
POPO

☐ Do not show the launchpad again when DB2 Grouper opens.

You have a choice of CUI "look and feel's"

Launchpad

Started up by default at product initiation

Provides a "step by step" prompting through various Grouper activities. Intended for first time users…a hand holding UI.

Can be turned off  This is an optional screen and can be disabled by clicking on the radio button on the bottom of the Panel.

# Example one - Set Creation with RI

**Click on the "Create a set to hold groups" button from the launchpad.**

# DB2 Grouper – Set Creation

Create New Set...

Database Alias - NDCDB202
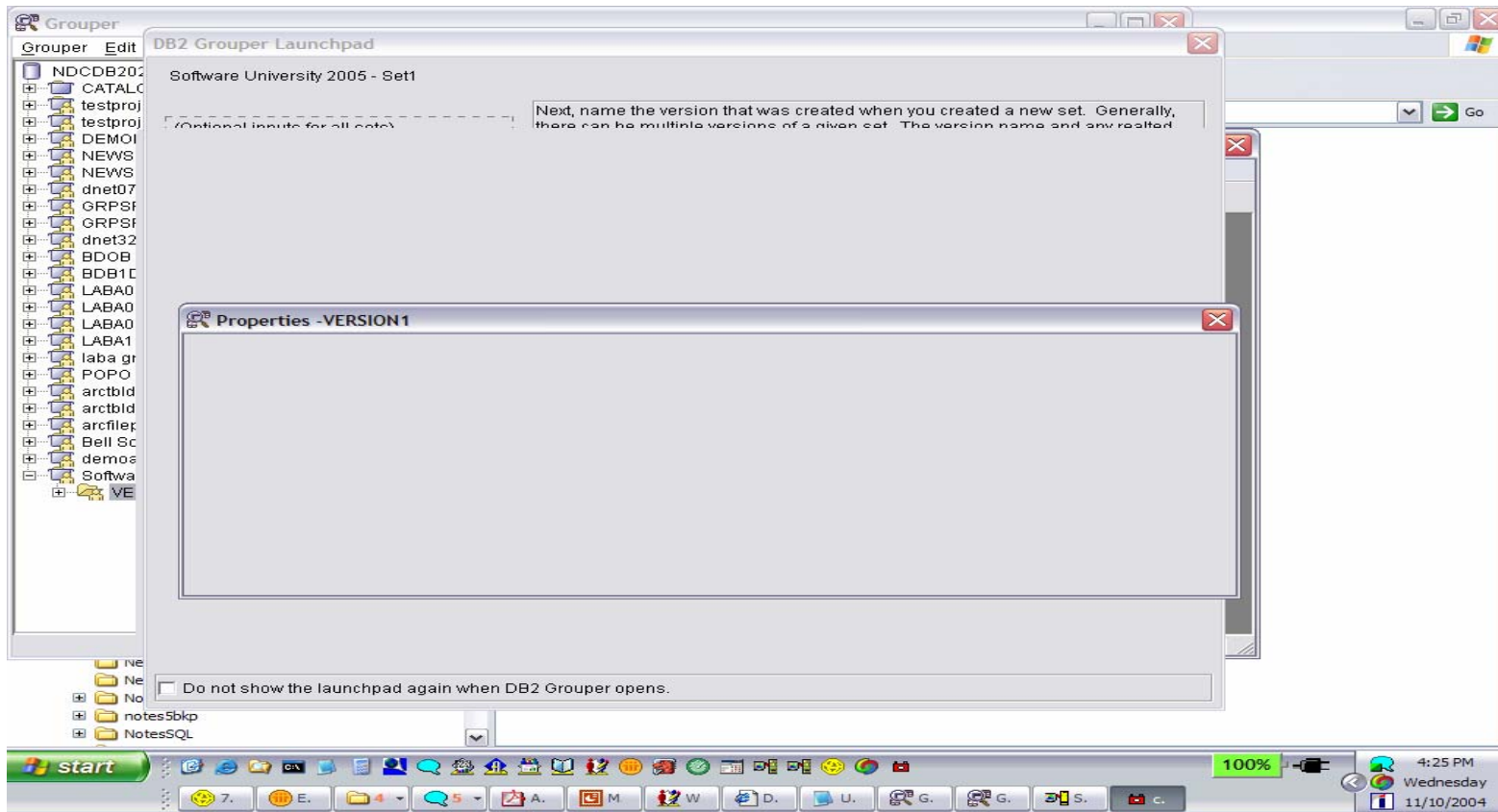
New Set Name  Software University 2005 - Set1

Remarks:        Text beyond 256 chars will be truncated.

OK      Cancel      Help

**Provide a meaningful Set name, and an optional description in the remarks field.  Note: all of the enterable fields are case sensitive so any object name will be stored in the metadata in mixed case format**

# DB2 Grouper – Create Version



**In our example, we'll default the version name to VERSION1**

# DB2 Grouper – Group creation

**Configure Group Discovery Options**

Database Alias - NDCDB202 , Set - Software University 2005 - Set1 , Versi...

**Starting Point Tables** | Boundary Objects | Ignored Relationships | Additional Relationships

Specify key tables within a subset to limit the scope of the Group Discovery.

| Table Name | Schema Name | Type |
|---|---|---|
| | | |

Add Table

Remove

**Select this radio button for only look for RI relationships**

Relationship Types Used For Grouping

○ All Relationship Types ● Referential Integrity Relationships Only

OK     Cancel     Help

**Next, we'll specify the group by selecting a starting point table. Also notice that we've selected the RI option only**

# DB2 Grouper – Add table to Group

**Add Tables**

Creator Name (use '*' as wildcard character)

`DEMO06`

Table Name (use '*' as wildcard character)

`PROJ`

◉ Select from search list

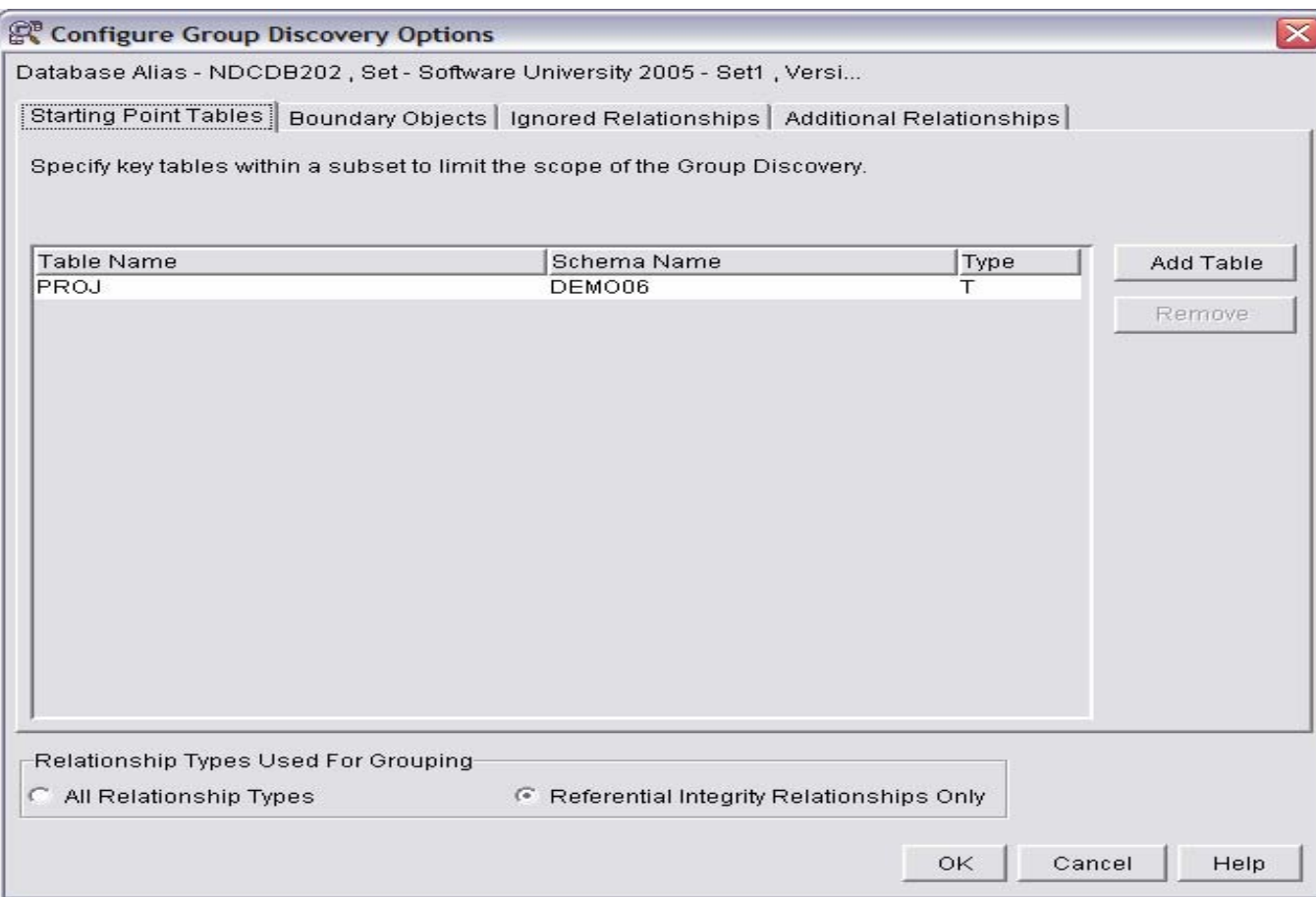○ Directly add named table

[ OK ]  [ Cancel ]  [ Help ]

**For this drop-down you can specify a complete or partial owner and table name. For large catalogs, better performance will result with a fully qualified table name and selecting the "Directly add named table" radio button will cause an equal clause to be used instead of LIKE.**

# DB2 Grouper – Add table to Group
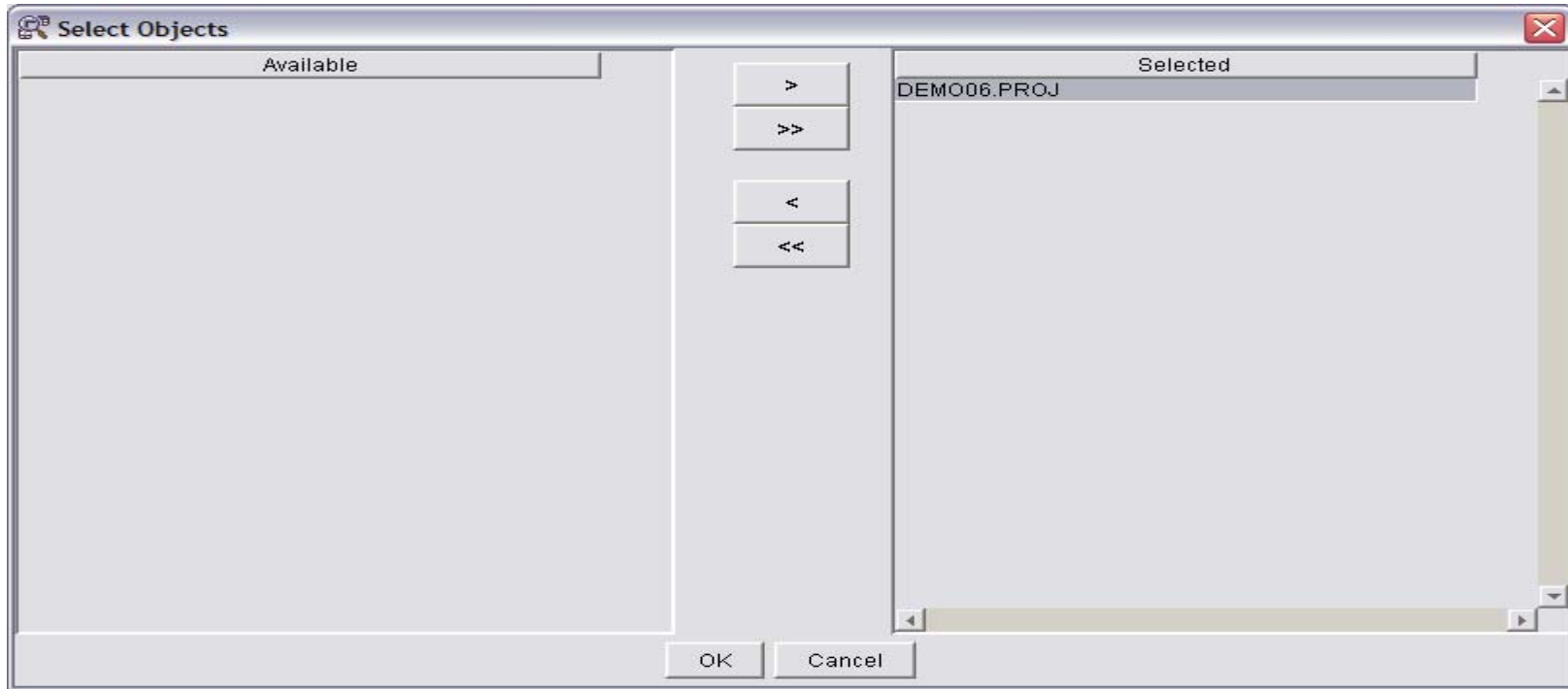


**The results will be presented in a select window, select one of the available column objects and press the ">" arrow to move it to the selected column**

# DB2 Grouper – Starting point table panel

**Configure Group Discovery Options**

Database Alias - NDCDB202 , Set - Software University 2005 - Set1 , Versi...

Starting Point Tables | Boundary Objects | Ignored Relationships | Additional Relationships

Specify key tables within a subset to limit the scope of the Group Discovery.

| Table Name | Schema Name | Type |
|---|---|---|
| PROJ | DEMO06 | T |

Add Table

Remove

Relationship Types Used For Grouping
- ☐ All Relationship Types
- ☑ Referential Integrity Relationships Only

OK    Cancel    Help

Additional tables can be added …there can be more than 1 starting point table, for this definition there is only one starting point table.

A special point…..for DAE there is only one Starting point table.

# DB2 Grouper – Boundary Objects Panel



**Configure Group Discovery Options**

Database Alias - NDCDB202 , Set - Software University 2005 - Set1 , Versi...

Starting Point Tables | Boundary Objects | Ignored Relationships | Additional Relationships

Add a related object to the Boundary Objects list to have that relationship disregarded during a Group Discovery.

| Object Name | Schema Name |
|---|---|
| | |

Add Table
Add Package
Add Unit of Work ID
Remove

Relationship Types Used For Grouping
○ All Relationship Types    ● Referential Integrity Relationships Only

OK    Cancel    Help

A boundary object directs the group discovery to include the object in the group, but not to consider it as a source for drawing additional tables into that group.

If you specify starting points *a, b*, and *c*; and if *b* is related to *c*, they'll be in the same group and the version will result in 2 groups (one with *a* and its related tables, another with *b, c*, and their related tables).

# DB2 Grouper – Ignored Relationships Panel

**Configure Group Discovery Options**

Database Alias - NDCDB202 , Set - Software University 2005 - Set1 , Versi...

| Starting Point Tables | Boundary Objects | Ignored Relationships | Additional Relationships |

Add a relationship to the Ignored Relationships list that can draw an unwanted table into a group during a Group Discovery.

| Object Name 1 | Schema Name 1 | Object Name 2 |
| --- | --- | --- |

Add Relationship

Add Non-enforced RI

Add UOW Relationship

Remove Relationship

Relationship Types Used For Grouping
○ All Relationship Types      ⊙ Referential Integrity Relationships Only

OK      Cancel      Help

If a relationship will draw an unwanted table into a group, you can exclude it for that discovery by adding it to the Ignored Relationships list. In this case, during a group discovery, the unwanted table would not be drawn into a group (unless it is drawn in as a result of other relationships)

# DB2 Grouper – Additional Relationships Panel
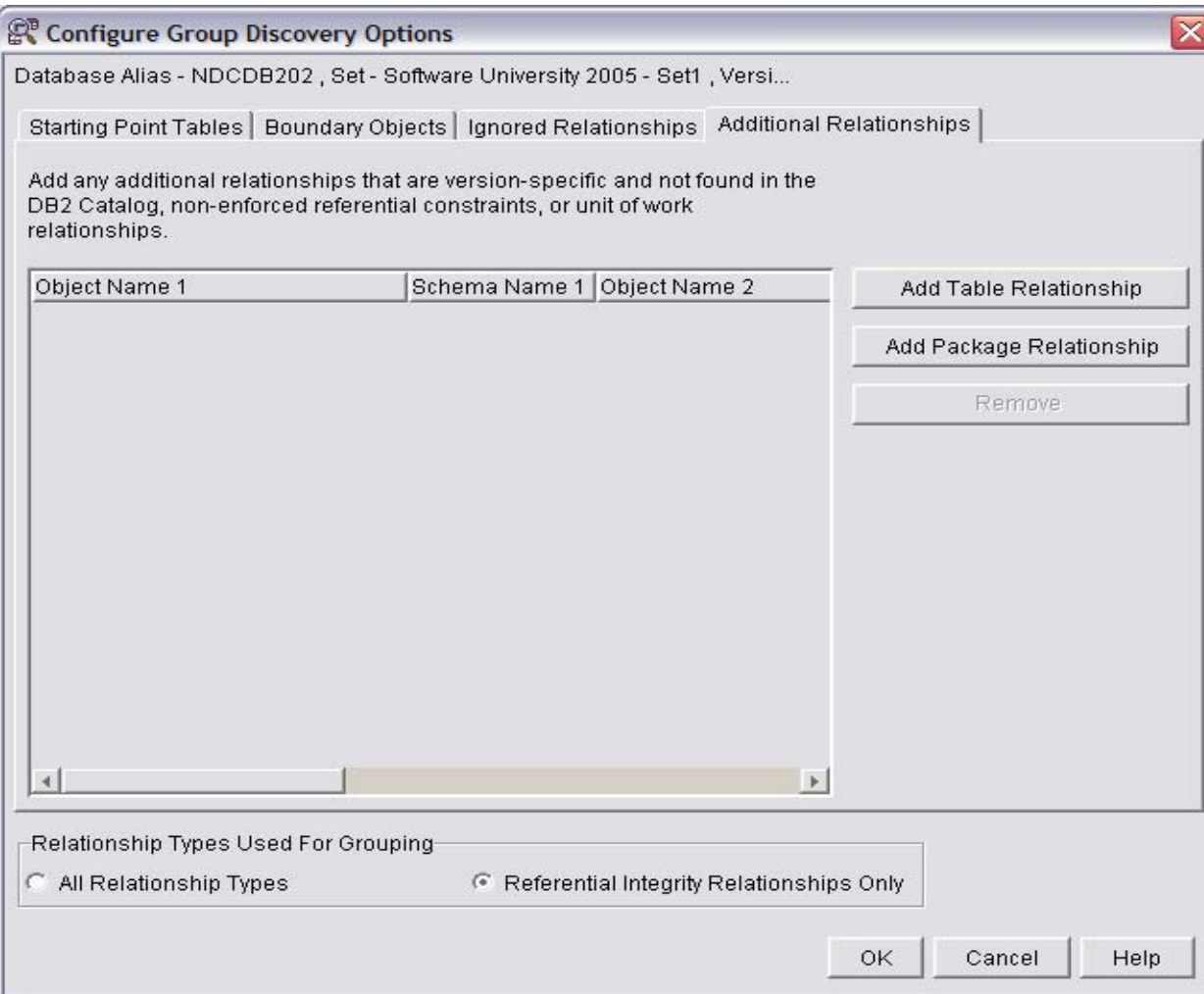


If during a group discovery, you want to have a specific relationship such as a table or package relationship considered that you do not believe will be found in the DB2 catalog, non-enforced referential constraints, or unit of work relationships, you can add that relationship to the Additional Version-Specific Relationships list

# DB2 Grouper – Launchpad "Run a Group Discovery"



**DB2 Grouper Launchpad**

Software University 2005 - Set1 - VERSION1 - 11-10-2004

(Optional inputs for all sets)

Define non-enforced RI

Run a Unit of Work Discovery

Check the status of a UOW Discovery

Submit a job to be run on the targeted server that will search the DB2 logs for Unit of Work relationships. These UOW relationships are used globally as input for all subsequent Group Discoveries. If you want to have UOW relationships considered, then run this job before the Group Discovery job, as this job provides input to Group Discovery.

To perform this task from the Grouper tree view, select Run Unit of Work Discovery in the main menu.

Preparing for a Group Discovery

Create a set to hold groups

Name a version of the set

Select starting points

Select boundary objects

Select relationships to ignore

Add relationships

Discovering Groups

Run a Group Discovery

Check the status of a Group Discovery

Close launchpad and view the results

Global inputs | Context inputs | Group Discovery

DSNB

Unit of Work relationships

VERSION1 - 11-10-
Software University 20

Do not show the launchpad again when DB2 Grouper opens.

As defined earlier, This component (Group Discovery) is a stored procedure that runs in the server database and discovers the relationships between tables in the database. It then groups the tables based on these relationships.

# DB2 Grouper – Group Discovery

**Run Group Discovery**

Database Alias - NDCDB202 , Set - Software University 2005 - ...

Version - VERSION1 - 11-10-2004

**Version-specific settings**

These inputs only affect Group Discovery for this version

| | |
|---|---|
| Starting points: | 1 |
| Boundary objects: | 0 |
| Ignored Relationships: | 0 |
| Additional relationships: | 0 |

Edit

**Global relationship inputs**

These inputs affect Group Discovery on all versions

Non-enforced RI

| | |
|---|---|
| Last edited: | 2004-09-09 06:07 |
| Total number of relationships: | 3 |

Unit of Work relationships

| | |
|---|---|
| Last run: | 2004-08-24 09:46 |
| Total number of relationships: | 19 |

OK    Cancel    Help
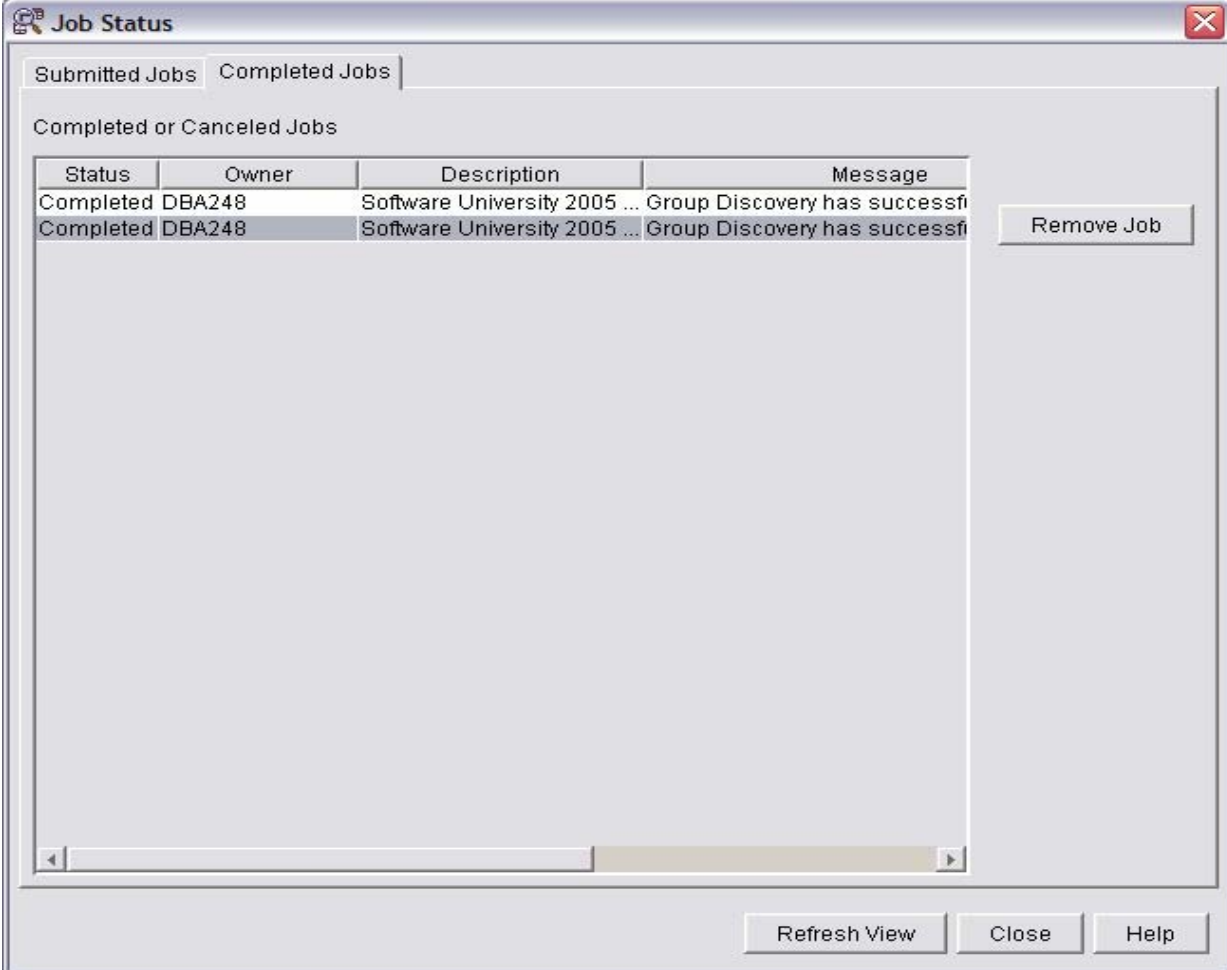
Version specific settings are only for this Version/Set and were previously defined

Global relationships are created from prior UOW and manually entered RI and can potentially affect all Group Discovery runs

This popup is informational and recaps the settings which will influence this Group Discovery run

# DB2 Grouper Discovery Job Status

Monitor job execution
Either using ISPF and
Jobnumber from CLP or
From the Job Status
window

# DB2 Grouper – Display Discovery Results



From the taskbar dropdown, select View Group Discovery Results

Note: You need to Highlight the Group Version that you wish to review

# DB2 Grouper – Group/Version/Set Tree View



Note: The view will contain a group icon upon completion of a Group Discovery Run. Note: there could be more than one group in a version

# DB2 Grouper – Discovered group relationships



Once you expand the group within the version, you will see all of the related tables found from Group Discovery. In this example, these are all DB2 RI enforcements.

# DB2 Data Archive Expert

```
┌──────── Search for related Tables? ────────┐
│                                             │
│                                             │
│ Find related tables? ==> Y (Yes/No)         │
│                                             │
│ Starting point table: PROJ                  │
│ Creator . . . . . . : DEMO06                │
│ Database name . . . : DEMO06                │
│ DB2 system  . . . . : DSNB                  │
│                                             │
│                                             │
│                                             │
│                                             │
│ Command ==> _____ │
│                                             │
└─────────────────────────────────────────────┘
```

Specify "Y" to call Grouper for discovery

```
AHXV11 -------------- Select Related Tables --------------- Row 1 to 5 of 5

Archive Specification  : newone
  Starting point table : PROJ
  Creator . . . . . .  : DEMO06
  DB2 system  . . . .  : DSNB


Line commands are:
 S - Select table for archive unit  S* - Select all tables
 D - Deselect table  D* - Deselect all tables

Cmd * Table name           Creator   Database Table space
--- - ----------------     --------  -------- ----------------------
__      ACT                DEMO06    DEMO06   DSN8S51P
__      DEPT               DEMO06    DEMO06   DSN8S51D
__      EMP                DEMO06    DEMO06   DSN8S51E
__      EMPPROJACT         DEMO06    DEMO06   DSN8S51P
__      PROJACT            DEMO06    DEMO06   DSN8S51P
********************************* Bottom of data **********************************
```

Tables related to PROJ as discovered

# Second Example – Un-enforced Relationships



**Result is a dropdown selection list for the dependent table**
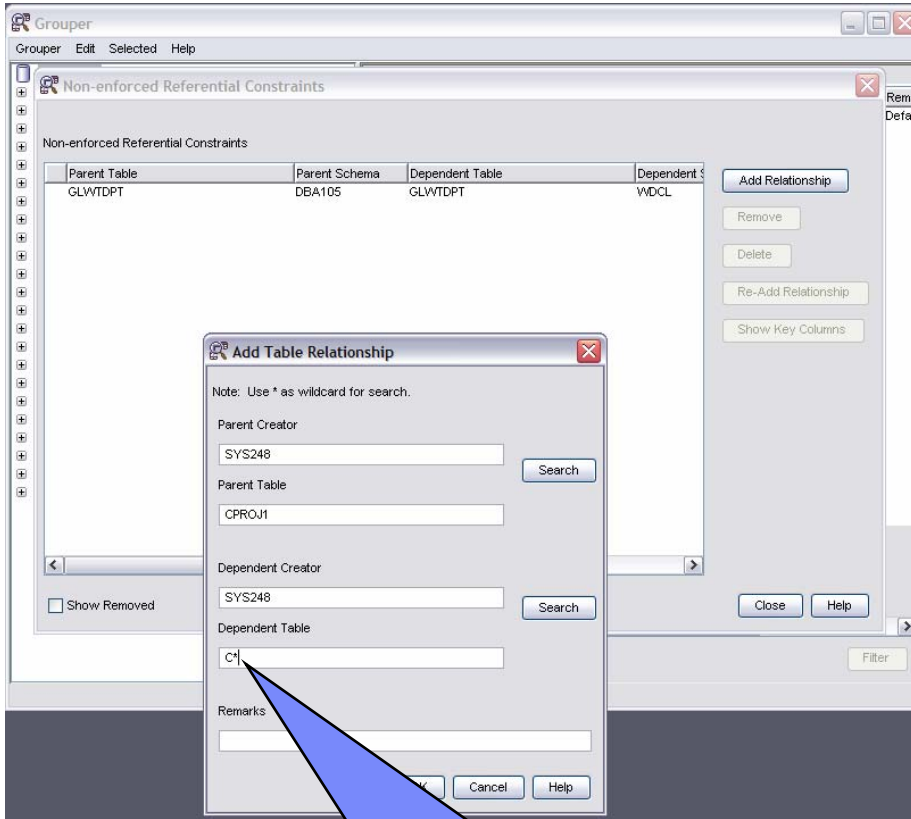
**Specific qualified parent table but wildcard for dependents**
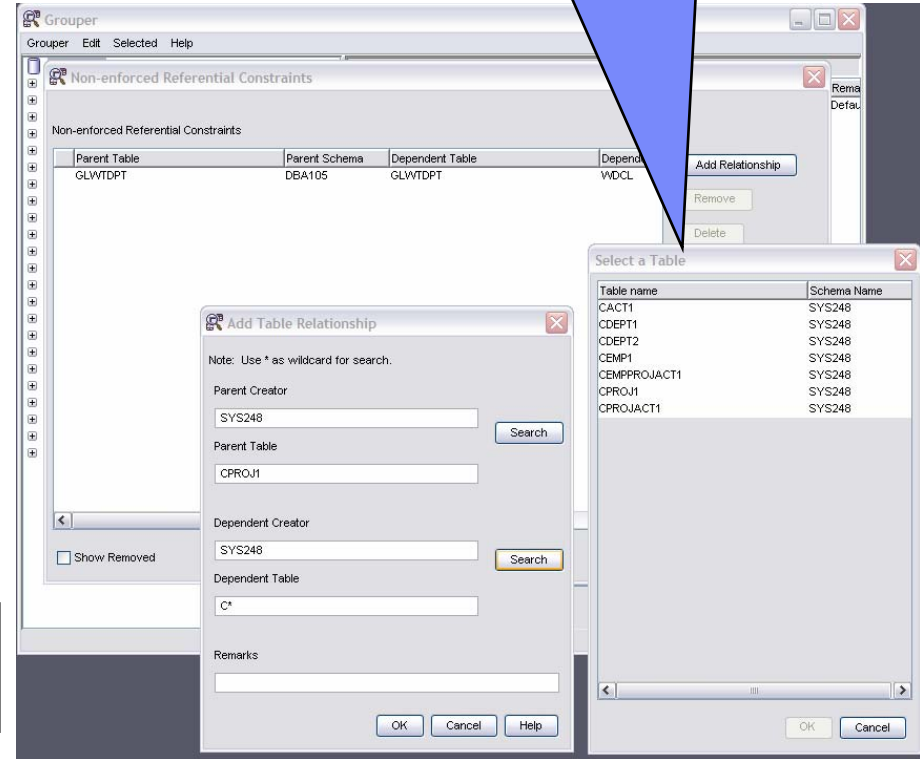
# Un-enforced relationship – Link Key Columns



**Linked dependent table columns from list**
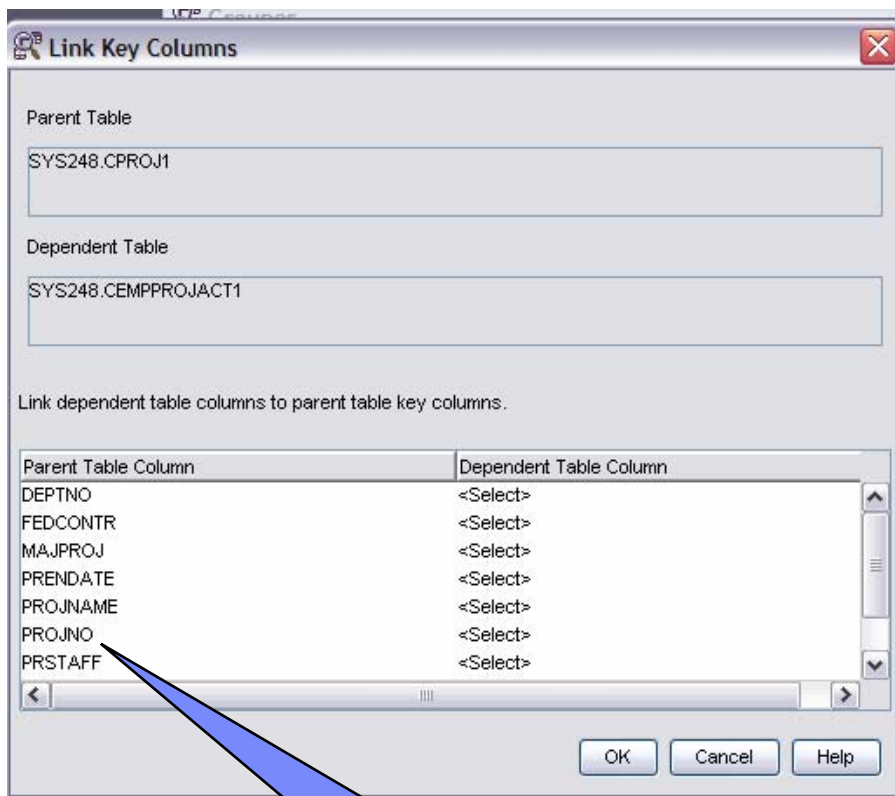
**Columns of the starting point (parent) table**
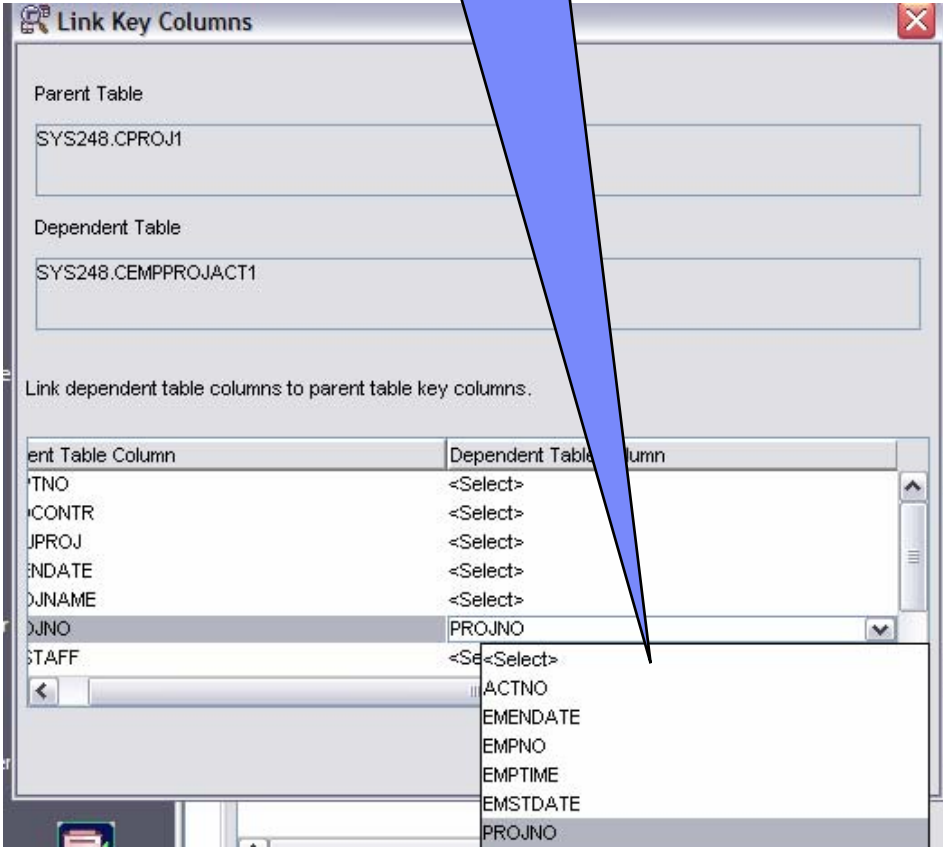
# Un-enforced Relationship – A second table

# Un-enforced Relationships – Group Discovery



**From pulldown run group discovery as seen before**

**Group discovery options are defined here**

# Un-enforced Relationships – Result



**Result group including starting point and dependent children**
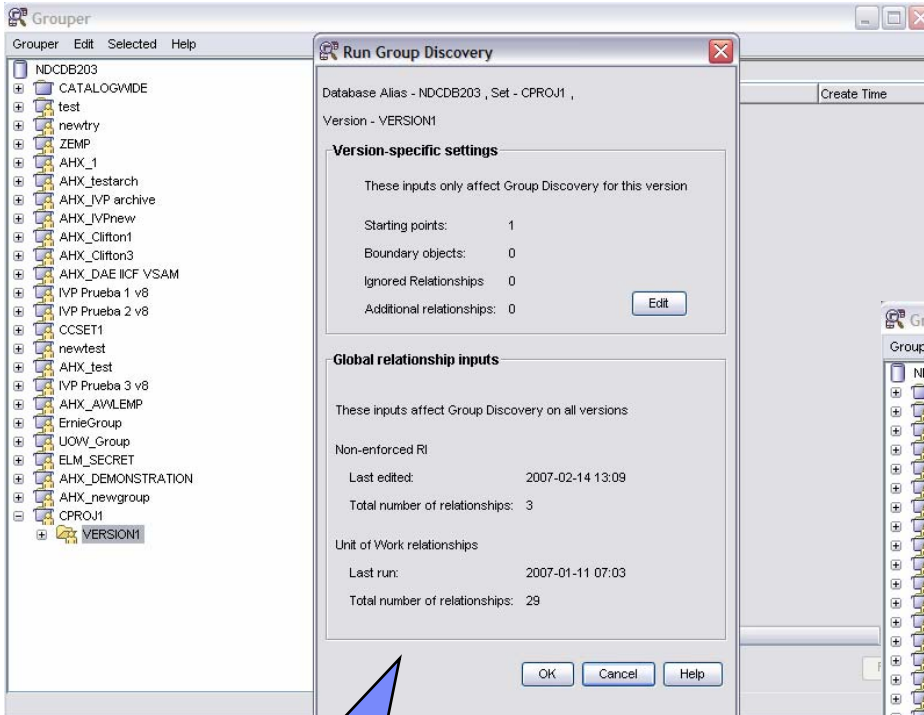
**Options in effect for this group discovery**
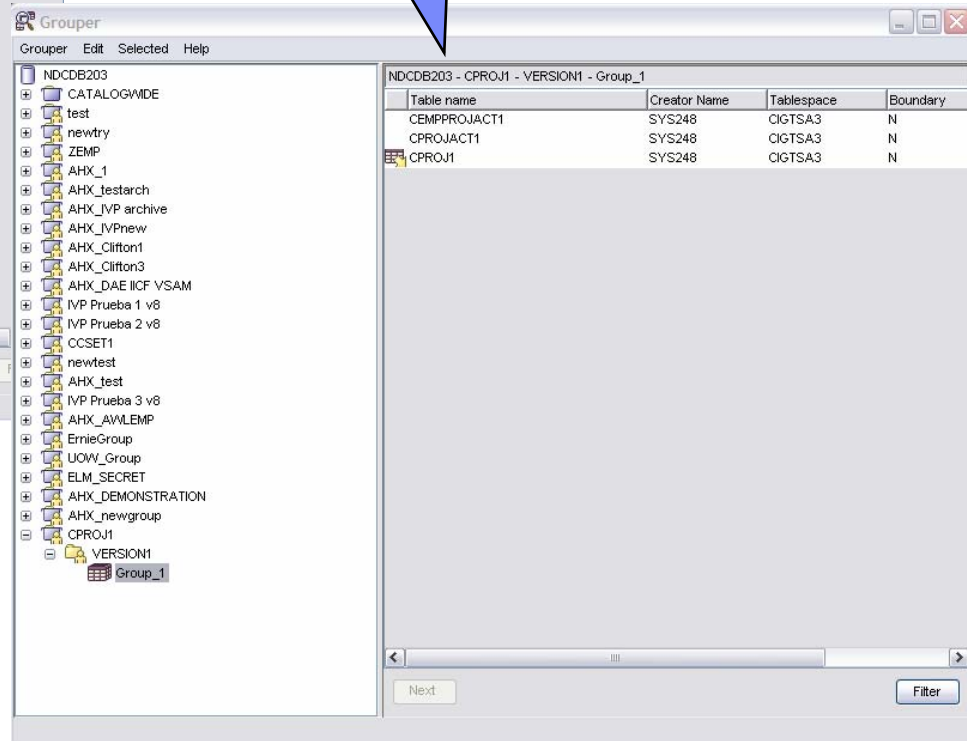
# DB2 Recovery Expert for z/OS

- Provide Expert assist for performing many types of DB2 recoveries

- DB2 Recovery Expert analyses the requested recovery
  - Providing a selection of possible recovery plans
    - Selecting for you, the needed recovery assets and utilities
    - Assists in selecting recovery points
    - Builds required JCL

# Select objects to recovery

- Selecting Groups of Objects to Recover
  - Recovery Expert provides 4 ways to specify a group of objects to be recovered
    - Explicit selection (one by one)
    - By pattern
    - **Via RI relationships (Grouper and catalog RI)**
      - **Grouper groups can be selected in the object tree**
    - If Automation Tool is available, via Automation Tool object profiles
      - Automation Tool profiles can be selected in the object tree

# Recover Points

- **Specifying a recovery point**
  - ▶ Recover to current
  - ▶ Recover to a timestamp
    - Can be selected from
      - – Object version
      - – Recovery history events
      - – Quiet points
  - ▶ Recover to an RBA/LRSN
    - Can be selected from
      - – Recovery history events
      - – Quiet points

# DB2 Recovery Expert for z/OS

- Recovery Expert provides
  - ▸ Application recovery
  - ▸ Drop recovery
  - ▸ Single or multiple objects
  - ▸ Dependency analysis
  - ▸ Quiet point analysis
  - ▸ SYSTEM RESTORE

- Provides DB2 Log Analysis services
  - ▸ undo or redo recoveries
  - ▸ Quite times

# DB2 Recovery Expert for z/OS

- **Recovery of a set of Grouper-related objects**

  ▸ A key feature is the ability to easily recover groups of objects which are related in some way

  ▸ DB2 Grouper is a key component of this support

  ▸ Recovery Expert uses the object relationship information provided by Grouper in two different ways:

    - allow user to browse existing Grouper sets, versions, and groups in order to make a selection

    - automatically augmenting the set of objects to be recovered with other objects in containing Grouper Sets

# RE z/OS starting screen

# Select Location



**Recovery Advisor**

1. Location
2. Objects
3. Point in Time
4. Recovery Plan

## Select the location that contains the objects you want to recover.

This advisor helps you recover data and dropped objects.
To start the recovery process, select a location. A location is a DB2 UDB for z/OS and OS/390 subsystem (or data sharing group).

**Locations**

- z/OS Subsystems
  - I71A
  - I71K
  - **I81A**
  - I81E
- z/OS Data Sharing Groups
- z/OS Systems
- z/OS Sysplexes

**Properties**

| Name | Value |
| --- | --- |
| Active? | true |
| DB2-established stored procedures addres... | I81ASPAS |
| Database services address space | I81ADBM1 |
| Distributed data facility address space | I81ADIST |
| Host name | rs01.rocketsoftware.com |
| IP address | 10.1.1.107 |
| Mode | NFM |
| Port number | 3800 |
| Resync port number | 3801 |
| Subsystem ID | I81A |
| System services address space | I81AMSTR |
| Version | DSN08015 |

**Status**

| Name | Value |
| --- | --- |
| DB2 restart RBA | 0000C5304000 |
| DB2 restart time | 18:33:01 JUN 15, 2006 |
| Last checkpoint | 10:09:08 JUN 16, 2006 |
| Log copy 1 | I81A.LOGCOPY1.DS03 IS 6% FULL |
| Log copy 2 | I81A.LOGCOPY2.DS03 IS 6% FULL |
| Log high offloaded RBA | 0000C586FFFF |

◄ Back    Next ►    Save...    Close    Help

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# Expand Grouper Sets from Object Tree

**Recovery Advisor**

1. Location
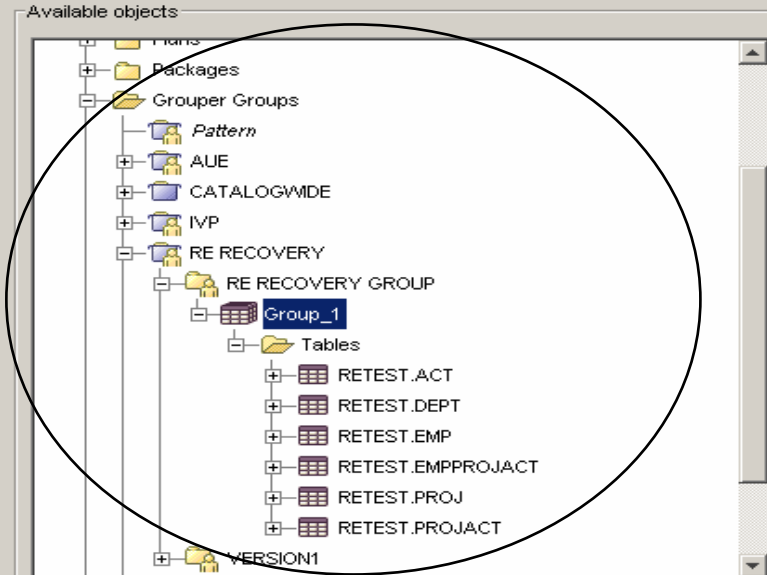2. Objects
3. Point in Time
4. Recovery Plan

## Select the objects that you want to recover.

Select the objects you wish to recover in the list of available objects, and click the right arrow to add them to the list of objects to recover. The list at the bottom of the window will help you by showing detailed properties for the objects you click on.

In order to define a pattern matching multiple objects, select the node labeled "Pattern" under the type of object you wish to select, then click the right arrow. A window will display where you can type the specific pattern values.

The objects you select, as well as objects related to them, will be recovered. For example, if you select a table space, the tables it contains will also be recovered. On the Recovery Plan page, you should carefully review the complete list of objects under Recovered Objects in the Recovery plans tree.

**Available objects**

- Plans
- Packages
- Grouper Groups
  - Pattern
  - AUE
  - CATALOGWIDE
  - IVP
  - RE RECOVERY
    - RE RECOVERY GROUP
      - Group_1
        - Tables
          - RETEST.ACT
          - RETEST.DEPT
          - RETEST.EMP
          - RETEST.EMPPROJACT
          - RETEST.PROJ
          - RETEST.PROJACT
  - VERSION1

**Selected objects**

**Properties**

| Name | Value |
|---|---|
| Created timestamp | 2007-02-15-09.02.40.347623 |
| Creator | PDDAVI |
| Group ID | 682 |
| Remarks | |
| Version ID | 186 |

◄ Back    Next ►    Save...    Close    Help

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# Select Objects from Object Tree

**Recovery Advisor**

1. Location
2. Objects
3. Point in Time
4. Recovery Plan

## Select the objects that you want to recover.

Select the objects you wish to recover in the list of available objects, and click the right arrow to add them to the list of objects to recover. The list at the bottom of the window will help you by showing detailed properties for the objects you click on.

In order to define a pattern matching multiple objects, select the node labeled "Pattern" under the type of object you wish to select, then click the right arrow. A window will display where you can type the specific pattern values.

The objects you select, as well as objects related to them, will be recovered. For example, if you select a table space, the tables it contains will also be recovered. On the Recovery Plan page, you should carefully review the complete list of objects under Recovered Objects in the Recovery plans tree.

**Available objects**

- Plans
- Packages
- Grouper Groups
  - Pattern
  - AUE
  - CATALOGWIDE
  - IVP
  - RE RECOVERY
    - RE RECOVERY GROUP
      - Group_1
        - Tables
          - RETEST.ACT
          - RETEST.DEPT
          - RETEST.EMP
          - RETEST.EMPPROJACT
          - RETEST.PROJ
          - RETEST.PROJACT
  - VERSION1

**Selected objects**

- Table RETEST.ACT
- Table RETEST.PROJACT
- Table RETEST.DEPT
- Table RETEST.EMP
- Table RETEST.EMPPROJACT
- Table RETEST.PROJ

**Properties**

| Name | Value |
|------|-------|
|      |       |

◄ Back    Next ►    Save...    Close    Help

# Select Point in time to recover to – current

**Recovery Advisor**

1. Location
2. Objects
3. Point in Time
4. Recovery Plan

## Select the point in time to which you want to recover.

Select one of the available options for the point in time to which to recover.

**Point in time**

◉ Current

Select this option when you want to recover data that is logically consistent, but has a physical error or other corruption in how it is stored.

○ Timestamp  `2006-06-19` ▼   `10.57.12`   `000000`   `...` (explicit)

Select this option when you want to recover previous versions of the selected objects, or when data has become logically inconsistent and you can identify a prior timestamp when the data was consistent.
Use the browse button for help in selecting the timestamp.

○ Log RBA   `0000C5E5B24A`   `...` (explicit)

Select this option when data has become logically inconsistent and you can identify a prior log RBA when the data was consistent.
Use the browse button for help in selecting the log RBA.

◀ Back    Next ▶    Save...    Close    Help

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# Or Timestamp and click on (explicit)

**Recovery Advisor**

1. Location
2. Objects
3. Point in Time
4. Recovery Plan

## Select the point in time to which you want to recover.

Select one of the available options for the point in time to which to recover.

Point in time

○ Current

Select this option when you want to recover data that is logically consistent, but has a physical error or other corruption in how it is stored.

◉ Timestamp   `2006-06-18` ▼   `17.53.12`   `000000`   `...`   (explicit)

Select this option when you want to recover previous versions of the selected objects, or when data has become logically inconsistent and you can identify a prior timestamp when the data was consistent.
Use the browse button for help in selecting the timestamp.

○ Log RBA   `0000C58E6288`   `...`   (explicit)

Select this option when data has become logically inconsistent and you can identify a prior log RBA when the data was consistent.
Use the browse button for help in selecting the log RBA.

◀ Back    Next ▶    Save...    Close    Help

# Click Refresh, select Quiet Time Timestamp, OK

**Select Point in Time**

**Select from**

○ Object definition levels　　○ Recovery history events　　◉ Quiet times

**Scanned ranges**

| Start Timestamp ▲ | End Timestamp |
|---|---|
| 2006-06-18-08.36.12.000000 | 2006-06-18-09.36.12.000000 |
| 2006-06-18-17.11.32.000000 | 2006-06-18-18.11.32.000000 |

Run New Report...

**Quiet times found**

| Start Timestamp ▲ | End Timestamp | Start LRSN | End LRSN |
|---|---|---|---|
| 2006-06-18-17.11.32.000000 | 2006-06-18-17.33.28.000000 | 0000C5A30A4C | 0000C5A95AC8 |
| 2006-06-18-17.33.36.000000 | 2006-06-18-17.35.23.000000 | 0000C5AD2750 | 0000C5B35539 |
| 2006-06-18-17.35.28.000000 | 2006-06-18-17.40.09.000000 | 0000C5B6E150 | 0000C5BD1539 |
| 2006-06-18-17.40.14.000000 | 2006-06-18-17.43.17.000000 | 0000C5C0D8D0 | 0000C5C378AB |
| 2006-06-18-17.43.17.000000 | 2006-06-18-17.46.18.000000 | 0000C5C39B79 | 0000C5C40448 |
| 2006-06-18-17.46.19.000000 | 2006-06-18-17.49.20.000000 | 0000C5C42831 | 0000C5C490C4 |
| 2006-06-18-17.49.20.000000 | 2006-06-18-18.11.32.000000 | 0000C5C4A388 | 0000C5C610FA |

Filter...　Refresh

OK　Cancel　Help

# or 'Recovery history events', refresh, select

**Select Point in Time**  ⊠

**Select from**

○ Object definition levels   ● Recovery history events   ○ Quiet times

**Events**

| Start RBA ▲ | Timestamp | Database | Space | Space Type | Type | Secondary Type | Share Level | DSNUM | File Sequence N |
|---|---|---|---|---|---|---|---|---|---|
| 0000C5CCABEC | 2006-06-18-18.48.43.100760 | DEMODB04 | DEMOTS04 | T | F | | R | 0 | 0 |
| 0000C5D0E000 | 2006-06-18-18.48.49.235404 | DEMODB04 | DEMOTS04 | T | I | | R | 0 | 0 |
| 0000C5D17646 | 2006-06-18-18.51.50.536655 | DEMODB04 | DEMOTS04 | T | Q | W | | 0 | 0 |

◄      ►

☐ Show events that are not points of consistency      [ Filter... ]   [ Refresh ]

[ OK ]   [ Cancel ]   [ Help ]

# Generate and Review chose of recovery plans

# Run or Export to z/OS file

## Recovery JCL

Recovery plan: Plan 1: Using DSN1COPY and RECOVER LOGONLY (cost = 24)

Statements

```
//DCPT0009 EXEC PGM=DSN1COPY,COND=(4,LT),
// PARM='CHECK,PAGESIZE(4K),FULLCOPY'
//STEPLIB  DD DISP=SHR,DSN=I81A.SDSNEXIT
//         DD DISP=SHR,DSN=RSRTE.DSN.V810.SDSNLOAD
//SYSUT1   DD DISP=SHR,DSN=PDDAVI.I81A.PROJ1V9W.D070215.T212641
//SYSUT2   DD DISP=SHR,DSN=I81A.DSNDBC.DSNDB04.PROJ1V9W.I0001.A001
//SYSPRINT DD   SYSOUT=*
//*
//RCVR0010 EXEC PGM=DSNUTILB,PARM=(I81A),COND=(4,LT)
//STEPLIB  DD DISP=SHR,DSN=I81A.SDSNEXIT
//         DD DISP=SHR,DSN=RSRTE.DSN.V810.SDSNLOAD
//SYSPRINT DD   SYSOUT=*
//SYSIN    DD   *

  RECOVER
    TABLESPACE DSNDB04.ACTA1X3Z
    TABLESPACE DSNDB04.DEPT
    TABLESPACE DSNDB04.EMPA1E2V
    TABLESPACE DSNDB04.EMPP1ZH1
    TABLESPACE DSNDB04.PROJ1R00
    TABLESPACE DSNDB04.PROJ1V9W
      LOGONLY

/*
//*
//RBLD0011 EXEC PGM=DSNUTILB,PARM=(I81A),COND=(4,LT)
//STEPLIB  DD DISP=SHR,DSN=I81A.SDSNEXIT
//         DD DISP=SHR,DSN=RSRTE.DSN.V810.SDSNLOAD
//SYSPRINT DD   SYSOUT=*
//UTPRINT  DD   SYSOUT=*
//SYSOUT   DD   UNIT=SYSALLDA,SPACE=(CYL,(1,1))
//SYSIN    DD   *
```

Run    Export...    Close    Help

copy data sets) are

OVER LOGONLY

View JCL...

Close    Help

# Example 2 – Select a single table, relationship unknown

# Example 2 – Allow Grouper to check relationships

**Recovery Advisor**

1. Location
2. Objects
3. Point in Time
4. Recovery Plan

## Generate and execute a plan to recover the selected objects.

Click Generate to generate one or more recovery plans for the selected objects.
After generating, you can select a plan to review its details.
If it has been some time since you generated the recovery plans, you can click Validate to check whether the external resources required by the plans (such as image copy data sets) are still available.
Finally, select the plan you wish to use for recovery, and click Run to run it. To instead view or edit the JCL generated to run the plan, click View JCL.

Recovery plans

Generate...

Plans

Properties

| Name | Value |
|------|-------|

**Recovery Plan Generation Options**

Restricted Objects | RECOVER Parameters | COPY Parameters | Grouper Parameters

Information from a DB2 Grouper set is used to determine additional tables related to those that are directly selected.

Grouper set Name  CATALOGWIDE

OK    Cancel    Help

Validate    Run    View JCL...

◀ Back    Next ▶    Save...    Close    Help

# RE added related tables from Grouper for recovery
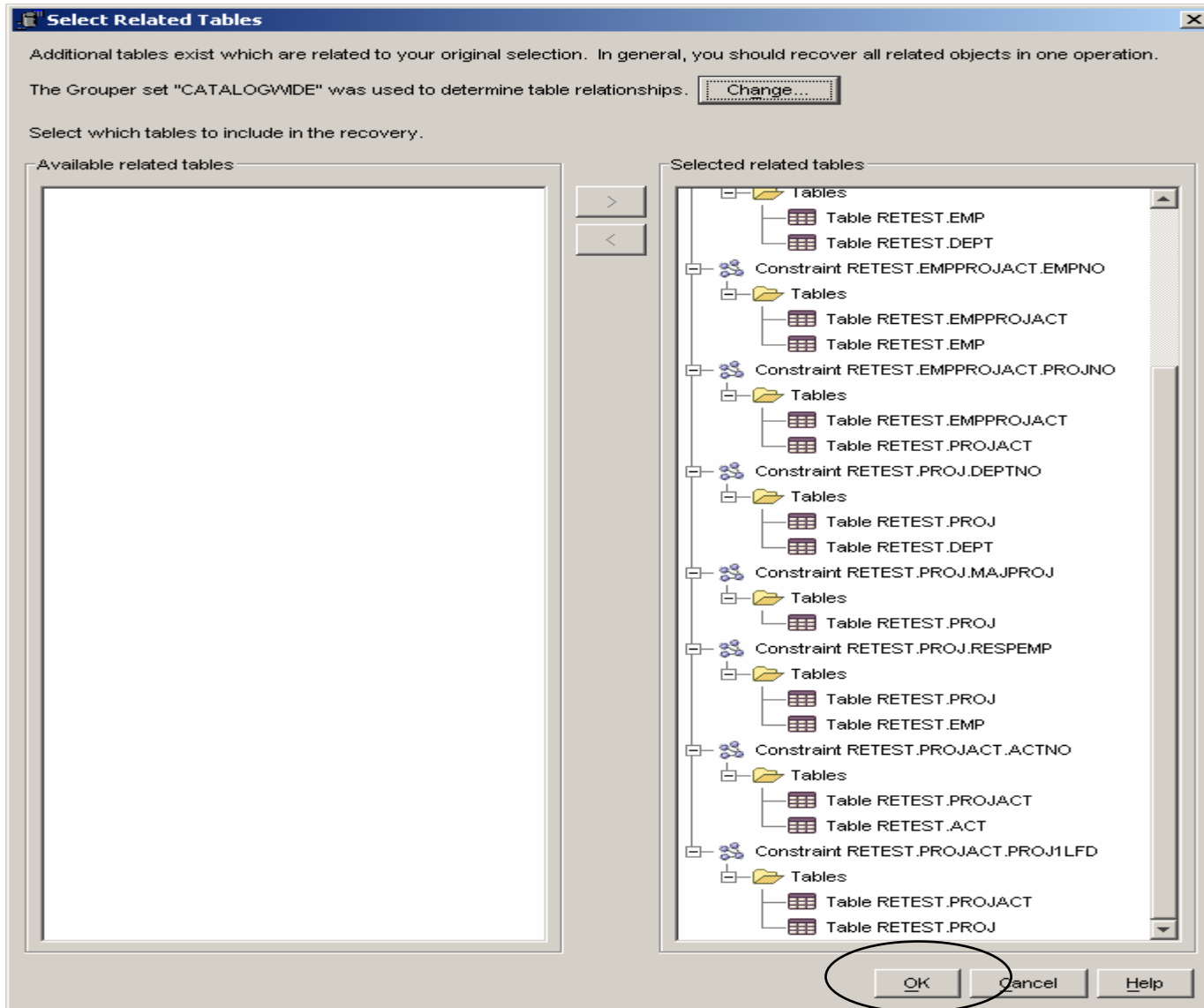
# recovery plans that automatically contain related objects

# DB2 Grouper – Publications

- **Redbooks**
  - ▸ IBM DB2 Data Archive Expert for z/OS, SG24-7080-00
  - ▸ DB2 for z/OS Stored Procedures: Through the CALL and Beyond, SG24-7083
  - ▸ Cross-Platform Stored Procedures: Building and Debugging, SG24-5485-01
- **Publications**
  - ▸ DB2 Data Archive Expert Program Directory, GI10-8511
  - ▸ DB2 Data Archive Expert User's Guide and Reference, SC18-7344
  - ▸ DB2 Grouper User's Guide, SC18-7409
  - ▸ DB2 Grouper Program Directory, GI10-8569-00
  - ▸ z/OS V1R4.0 MVS Planning Workload Management, SA22-7602
  - ▸ IBM DB2 Recovery Expert for z/OS User's Guide, SC18-9822-00