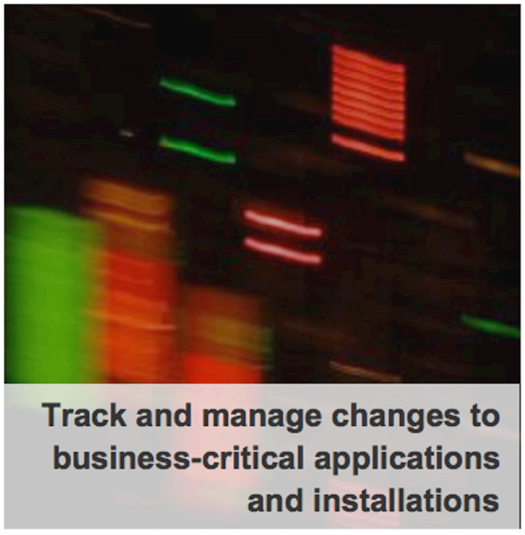
Treehouse SOFTWARE



N_2O

NATURAL Change Management with 3GL Support, Source Compare, and N2OSCAN

Product Overview

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Introduction to Change Management

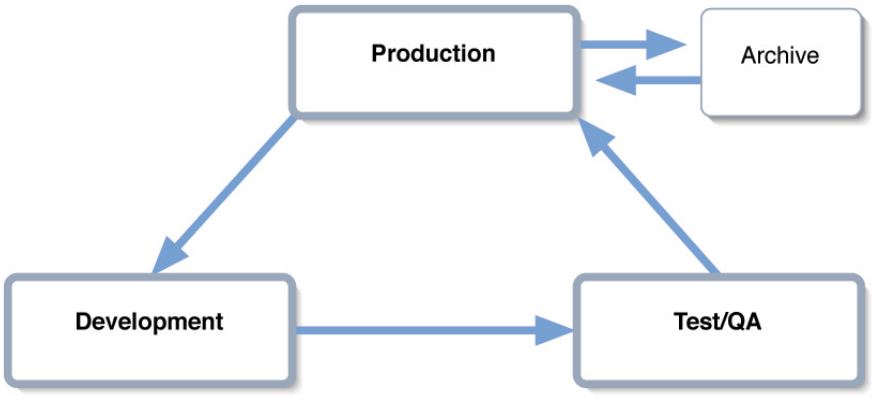
Definition

Change Management is a term used to describe the process of controlling the development, maintenance, and migration of software within a site's computing environment. Change Management ensures that programmers make software modifications in a controlled manner, and that these modifications are properly implemented into production environments. Change Management also includes the maintenance of proper audit trails, which track all change activity, and the production of reports of this activity on demand.

The Change Process

A typical change process begins with a change request, often made by an end user of the software. This request reaches the programming staff, which may prioritize and implement the change. To implement the change, programmers retrieve copies of the programs that require modification and place them in a **development** environment. In this development environment, the programs are modified and debugged. Once changed, the programs may be placed in a testing (or **quality assurance**) environment. Site personnel (including the application's end users) will examine the modified software. If the software is accepted, it is returned to the **production** environment. If the software is rejected, it is returned to the development environment, where further modifications are made. As the software is returned to the production environment, the previous version is archived.

The diagram below illustrates a typical change process:



Change Management Using N2O and N2O/3GL

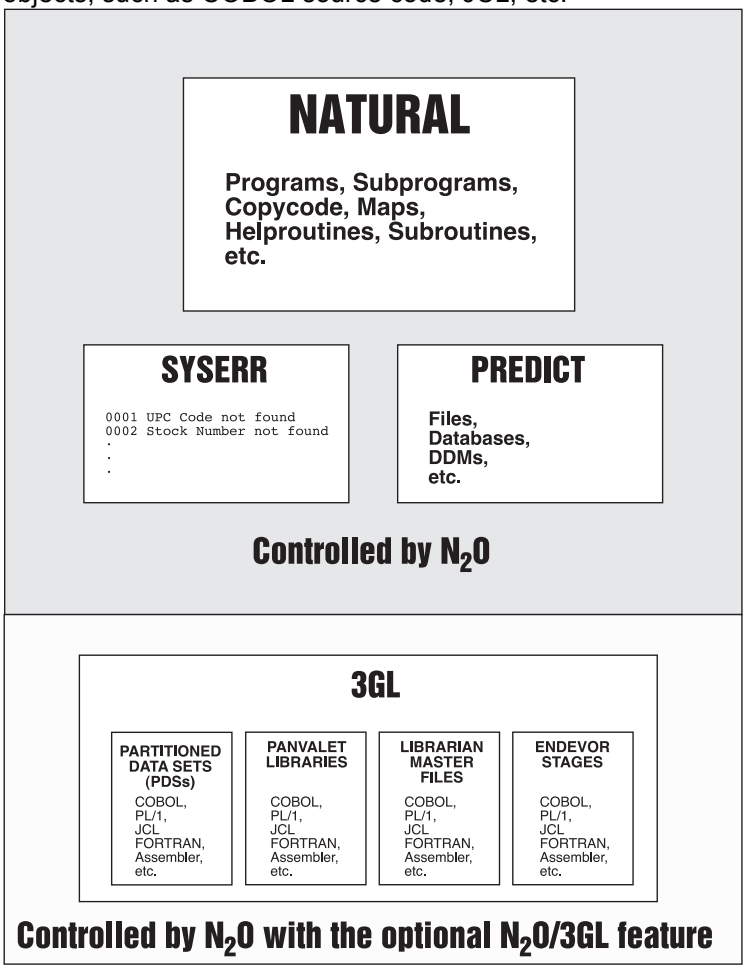
Realizing the importance of Change Management, and the need for tools to assist with Change Management, Treehouse Software developed N2O in 1989.

N2O

N2O **automates and tracks Change Management activity**. It eliminates paper trails and minimizes oversights, which can occur during the change process. N2O **adapts to a site's environment** and **enforces the site's Change Management rules** within that environment. The product provides many features that allow sites the flexibility of defining Change Management according to their needs.

N2O/3GL

The optional and separately-priced N2O/3GL feature was introduced in 1992. N2O/3GL **extends N2O Change Management capabilities** to non-NATURAL objects, such as COBOL source code, JCL, etc.



N2O Features

N2O offers a feature set which is **unmatched** by any other Change Management product:

N2OSCAN

The **N2OSCAN** utility processes the source of NATURAL objects, scanning for strings over the object/library range specified by the user, and reports on (and records for future lookup) all matches. In the past, this incredibly robust tool was the **missing piece in the Y2K "puzzle"** for many sites. However, it can be used for more than just date related conversions, and it will certainly be useful well beyond the year 2000.

Documentation Toolbox

The Documentation Toolbox provides utilities to print NATURAL objects, File Layouts, Descriptor X-Ref (Cross-Reference) Information, Object Flow Analysis, and Object X-Ref in local N2O environments.

Project Tracking Subsystem

The N2O Project Tracking Subsystem maintains information about organizational activities. It is designed to provide a framework for sites to use in developing the project information they require. The Project Tracking Subsystem can be used to **manage NATURAL and non-NATURAL application development projects**. Project Tracking can also manage hardware and software installations, documentation efforts, and other non-programming activities.

On-Line Request System

The N2O on-line request system makes Change Management **user-friendly for programmers and administrators**. The request system is used to create, modify, and authorize requests for the migration of objects from one environment to another. Programmers use the on-line system to create an "Event," which is a request to migrate objects from one location to another. Detailed information about Events is recorded automatically by N2O. An Event may involve the migration of any combination of the following objects: NATURAL objects, PREDICT objects, SYSERR messages, and 3GL objects.

Migrating NATURAL Objects

N2O migrates NATURAL objects, inlcuidng programs, subprograms, copycode, maps, subroutines, data areas, helproutines, and text.

Migrating PREDICT Objects

Many sites enhance their development efforts through the use of PREDICT, making the management of PREDICT objects an important issue. N2O allows the batch migration of PREDICT databases, files and DDMs, keywords, modules, program documentation, relationships, reports, systems, users, and verification rules.

Migrating SYSERR Messages

N2O migrates SYSERR messages, which many sites use in their applications.

Migrating 3GL/Other Objects

Applications often contain non-NATURAL components, such as COBOL or JCL. N2O/3GL, a separately-priced N2O feature, allows the batch migration of 3GL/Other objects stored in partitioned datasets, PANVALET libraries, LIBRARIAN master files, or ENDEVOR stages.

Batch Migration

The N2O Batch Migration process provides an alternative to the on-line migration process, allowing sites to **schedule migration activity** for specific times. Batch migration is required when migrating NATURAL objects between two environments which do not have network connections, when migrating PREDICT objects, or when migrating 3GL/Other objects. **Batch Events are created through the on-line system**, but the actual migration of objects occurs when the batch migration JCL is submitted.

Checkout/Checkin

When programmers share development tasks and libraries, it is very easy for them to accidentally overwrite each other's objects. Checkout/Checkin is a method of controlling and monitoring changes in the Application Life Cycle of an object. It **protects the integrity of a checked-out object** by allowing only the checkout user to migrate the Object. The N2O Administrator determines the number of concurrent checkouts allowed for parallel development. However, **N2O even prevents overwrites** in parallel development situations, where programmers share development libraries.

Emergency Recovery

The Emergency Recovery utility recovers the last archived version of an object from an N2O Archive file when N2O is unavailable. For example, a site has two databases, Database 1 and Database 2 and runs N2O on Database 1. Objects migrated to Database 2 by N2O are archived on Database 2. Database 1 crashes, rendering N2O temporarily unavailable. Then a problem is discovered in the code on Database 2, requiring the previous version to be retrieved. To retrieve archived objects from Database 2, the site uses the Emergency Recovery utility.

XREF Integration

It is not always easy to remember which objects in an application are related, especially with large, complex applications. Therefore, **N2O utilizes PREDICT cross-reference data** to provide the user with a list of related objects affected or invoked by a specified object. This list can be obtained for NATURAL objects and for 3GL/Other objects. XREF may be used to ensure that all objects necessary for development are migrated, or to ensure that related objects are successfully cataloged in the target environment.

Archiving/Recovery

Despite having all safeguards in place, execution errors may occur in production environments. When this happens, it may be necessary to restore a previous version of an object while the problem is being solved. For this reason, **N2O will optionally archive any number of previous versions** of NATURAL objects and SYSERR messages replaced during a migration. N2O/3GL will optionally archive 3GL/Other objects migrated to PDSs. **Archived objects may be recovered as needed** through a simple Event request**.** Currently, PREDICT objects are not archived.

Automated Compilation

Manual compilation of migrated programs can be a tedious and error-prone process. N2O can **facilitate the compilation of migrated NATURAL objects and 3GL objects** in the target environment. During automated compilation (Autocompile), XREF information may optionally be obtained on the target to determine related objects, which are to be included as part of a NATURAL compilation.

Static SQL Support for DB2

N2O automates processing tasks at NATURAL for DB2 sites. N2O can **automatically generate DBRMs** containing the Static SQL used in NATURAL for DB2 objects. N2O will then **BIND the DBRMs** into a DB2 Package or Plan.

Authorization

Sites often want to ensure that changes to important environments are properly authorized. For this reason, N2O provides the ability to **assign authorization levels to a migration path**. Routine migrations between development environments may occur without authorization. Migrations targeted for production or system test environments may require one or more levels of authorization. A **complete audit trail of authorizations** is provided through an on-line facility in N2O. N2O also enables sites to specify the order in which authorizers must approve an Event.

Program Locking Option

A Program Locking option is available to **prevent users from editing an object** once it has been selected for migration. Program Locking may occur when an Event is created, or when the Event is authorized for migration. The program is automatically unlocked after migration is completed.

Comparison Utilities

The Source Compare utility identifies differences between the source code of a pair of NATURAL objects located on an FUSER or an N2O Archive file local to N2O. **The ability to compare a single pair of objects, a range of objects or two complete NATURAL libraries is provided.**

Documentation Tools

The NATURAL Documentation Toolbox provides the user with a number of utilities that allow to **printout NATURAL source code** that goes **beyond the NATURAL LIST COMMAND**. It provides utilities to print NATURAL objects, File Layouts, Descriptor X-REF Information, Object Flow Analysis, and Object X-REF. The user may printout one Object or a Range of Objects. A number of options allow the user to select the amount of detail required.

Audit Trails / Reporting

Managers, auditors, and others must be able to determine the origin of program changes. As part of its function, N2O maintains a **complete audit trail of all migrations**. An **extensive selection of reports** is provided to assist auditors, the N2O Administrator, and programmers. Additionally, the Project Tracking Subsystem is available to document and report every change made to an application.

Integration with SECURITRE

N2O can be secured by its own security mechanism or by Treehouse Software's SECURITRE. Sites using **SECURITRE** (a separate product) can optionally use their System Security Facility (SSF) (i.e., RACF, ACF2, or TOP SECRET) to secure migrations and access to N2O and N2O/3GL functions. This reinforces the use of an SSF as **a single security rule base** for the site.

User-Friendly Interface

N2O is **menu-driven** and provides the ability to navigate through the system using direct commands or PF-keys. The **Direct Command line** may be used to execute NATURAL system commands within N2O. **On-line help screens** display information about the current function, or identify the data entry requirements for a field.

The N2O Environment Subsystem

After installing N2O, sites define the specific information which constitutes their "environment." **N2O adjusts to users' environments** and their Change Management procedures. **N2O uses a site's existing FUSER and FDIC files**, as well as databases, libraries, and naming conventions.

N2O/3GL uses a site's 3GL repositories for migrating 3GL objects and follows a site's 3GL naming conventions.

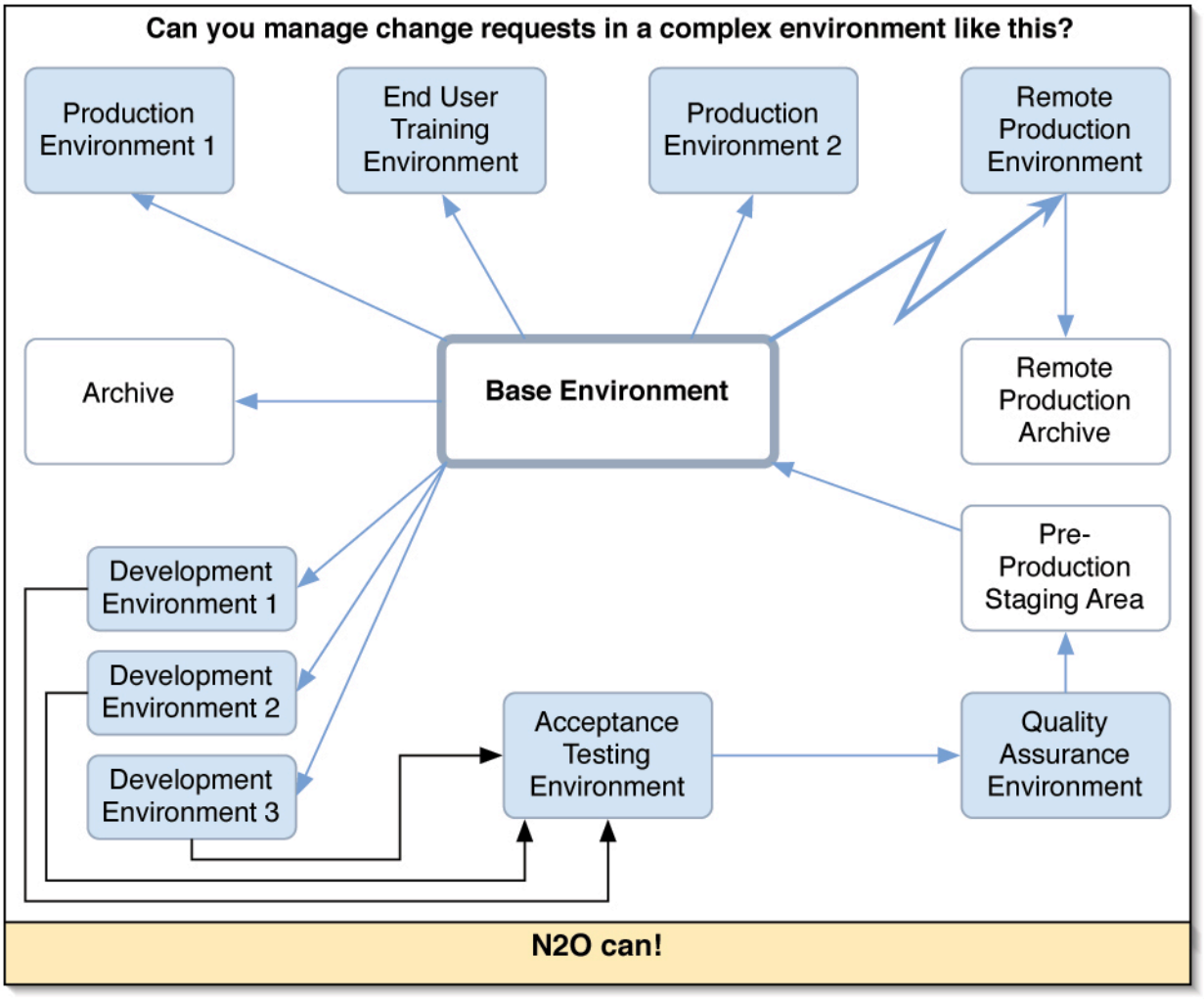
The N2O Environment Subsystem allows the DBA or N2O Administrator to specify the following information to N2O:

Environment Definitions — Environment Definitions represent NATURAL FUSER and FDIC files, PDSs, or a site's PANVALET/LIBRARIAN/ENDEVOR repositories. These definitions are given names, such as TEST, PROD, or DEV.

Migration Profiles — Migration Profiles represent the paths that Objects follow through the Application Life Cycle. Migration Profiles include a number of options to make migrations as flexible as possible. Migration Profiles determine whether the migration occurs in batch or on-line, whether it involves source code, cataloged objects, or both, whether it includes target compilation, and whether it requires authorization.

Master Events — All Migration requests in the N2O system are uniquely identified by a Master Event name, such as PAYROLL. This name represents parameters necessary to migrate objects from one environment to another environment, or environments (e.g., TEST-to-PROD).

Security Rules — Security for N2O is based on profiles that control who may access N2O functions and sub-functions, and who may migrate between various environments. Menus display only the functions that a particular user may access. Sites using Treehouse Software's SECURITRE product have the option of using a SSF (i.e., RACF, ACF2, or TOP SECRET) to control N2O use and migration activity.



The N2O Environment Subsystem is completely flexible. N2O can support any site's environment, including complex environments like the one shown above. N2O can support multiple development, test, production, and other environments. If a site's environment setup changes, N2O will change with it. New environments can be added quickly, and obsolete environments can be removed easily.

The N2O Migration Subsystem

The Migration Subsystem is the core of N2O, where migration requests are created and processed. Migration requests are labeled by an Event name, such as PAYROLL. For each Event, users may migrate NATURAL objects, PREDICT objects, SYSERR messages, and/or 3GL/Other objects.

All Events are recorded by N2O. They may be recalled at any later date, modified (if desired) to include additional objects, and submitted for migration. One Event may initiate a migration to a single environment or to **multiple target environments**. This is useful when the same NATURAL objects are used in multiple applications.

On-line Migration

The screen below is an example of a user adding the Event PAYROLL to migrate the selected programs from the library PAYPROD in the PROD environment to the library PAYTEST in the TEST environment.

```
Type A to Add Program to the Event, D to Delete.
01-12-31              N-2-O ADD AN EVENT                          TSI0373
11:38:00              Event: PAYROLL    Sequence: 30              TSI1

From Env: PROD  From Library: PAYPROD   To Env:  TEST  To Library: PAYTEST
                      Starting Program:  FEDDISP1
             Program                                 Program
S Program    Type        S/C  Message  S  Program    Type      S/C  Message
A FEDDISP1   MAP         S    REPLACE  _  FEDDISP2   MAP       S
A FEDTAXC    COPYCODE    S    REPLACE  _  FEDTAXL    LOCAL     S
_ FEDTAXS    SUB-RTN     S             A  FEDTAX1    PROGRAM   S   REPLACE
_ FEDTAX2    PROGRAM     S             A  LIFDISP1   MAP       S   ADD
_ LIFEINSC   COPYCODE    S             A  LIFEINS1   PROGRAM   S   REPLACE
_ LIFEINS2   PROGRAM     S

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      HELP  ALL   END   ----  ----  TOP   UP    DOWN  BOT   ----  ----  STOP
```

The **selection process** may be affected by these optional N2O features:

- Checkout/Checkin
- XREF
- Verification of the existence of PREDICT documentation
- Object code timestamp verification
- Verification of the existence of PREDICT XREF data

The **migration process** may be affected by these N2O features:

- Move or copy
- Batch or on-line
- Authorization levels and order of authorization
- Migration of source code, cataloged objects, or both
- Autocompile (automated compilation)
- Archiving

PREDICT Migration

These PREDICT objects are migrated by N2O:

KEYWORDS	RELATIONSHIPS
USERS	SYSTEMS
DATABASES	PROGRAMS
FILES, USERVIEWS	MODULES
VERIFICATION RULES	REPORTS

The migration of PREDICT objects is performed in batch mode only.

SYSERR Migration

N2O migrates user-supplied SYSERR error messages in short and/or extended format based on the language type of the message.

3GL Migration

With the optional N2O/3GL feature, an Event can also include 3GL/Other objects. This capability enables a site to have a **single point of control for all migration activity**.

The example screen below shows a user selecting COBOL programs as part of a migration request. The Event 3GL-MIG will migrate the selected objects from the PDS specified by TEST to the PANVALET library specified by PROD. N2O/3GL can also migrate 3GL/Other objects between PDSs, LIBRARIAN Master Files, and ENDEVOR Stages.

```
01-12-31                N-2-O ADD AN EVENT                          TSI0373
09:00:00                Event:  3GL-MIG  Sequence:  1              TSI1
        DSN Name:  COBOL.PAYROLL
From Env:  TEST             To Env:  PROD             Category:  COBOL
                     Starting Member:  COBOL-PGM
                  Member                              Member
   S  Member      Type     Message   S  Member      Type     Message
   A  COBOL-PGM   COBOL    REPLACE   A  COBOL-1     COBOL    ADD
   A  COBOL-2     COBOL    REPLACE   -  COBOL-3     COBOL
   _  COBOL-4     COBOL              -  COBOL-5     COBOL
   _  COBOL-6     COBOL




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9--PF10--PF11--PF12---
      HELP  ----  END   ----  ----  TOP   UP    DOWN  BOT  ----  ----  STOP
```

N2O with N2O/3GL migrates: ASSEMBLER, COBOL, FORTRAN, PL/I and RPG source code, as well as JCL and other data types.

N2O/3GL provides **Checkout/Checkin and audit trails for 3GL migrations,** which allow the N2O Administrator to effectively manage the changes in 3GL environments. The migration of 3GL/Other objects is performed in batch mode only.

The N2O Reporting Subsystem

The Reporting Subsystem gives a site **immediate access** to the details of an Event, the migration history of an object, Checkout/Checkin status, directory lists, user and approval profiles, and archived objects.

History of an Object

One of the many N2O reports is the History of an Object. The following report shows the history of the NATURAL program PAYPROG, indicating its migration between various development, test, and production environments.

```
Type X to display Event Details or Utility Details
01-12-31                  N-2-O OBJECT REPORTING                        TSI0373
11:38:00                  HISTORY OF AN OBJECT                          TSI1
                    Object:  PAYPROG

             Event/          From  To                Mig  Arch  Purg  Added
X  Date      Utility  Seq    Env   Env     Message    S/C  S/C   S/C   UserID
-  --------  -------- -----  ----  ----    --------   ---  ----  ----  --------
_  01-10-14  PAY-IN    17    TEST  PROD    REPLACE    S/C   S/C   S/C  TSI0744
_  01-10-13  PAY-TEST  25    DEV   TEST    REPLACE    S/C   ***   ***  TSI0744
_  01-10-12  REJECT          PROD  DEV     *******    ***   ***   ***  TSI1234
_  01-10-10  PAY-TEST  24    DEV   TEST    REPLACE    S/C   ***   ***  TSI0744
_  01-10-10  TRANSFER        PROD  DEV               ***   ***   ***  TSI0811
_  01-10-03  CHECKOUT        PROD  DEV               ***   ***   ***  TSI0811
_  01-09-30  CANCEL          PROD  DEV               ***   ***   ***  TSI0373
_  01-09-25  PAY-OUT   19    PROD  DEV     REPLACE    S     ***   ***  TSI0373
_  01-09-21  PAY-IN    16    TEST  PROD    REPLACE    S/C   S/C   S/C  TSI0921
_  01-09-20  PAY-TEST  23    DEV   TEST    REPLACE    S/C   ***   ***  TSI0921


Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      ----  ----  END   ----  ----  ----  ----  ----  ----  ----  ----  STOP
```

Events with Warning Messages

Another N2O report identifies Events that received a warning message. Warning messages include the following: OVERRIDE (objects in the Event were migrated without proper authorization), AC-ERROR (objects in the Event received compile errors during the Autocompile process), and RECOVERD (objects in the Event received compile errors during the Autocompile process and the Event was automatically recovered).

```
Valid Values: E - Event Details O - Object Details
 01-12-31               N-2-O EVENT REPORTING                          TSI0373
 11:38:00               EVENTS WITH WARNING MESSAGES                   TSI1
                                                                Page:  1

                  Change   From To   Event       ----- Closed ----
 S Event    Seq   Control  Env  Env  Type  Extr  Date     Time     Warning
 - -------- ----- -------- ---- ---- ----- ----  -------- -------- --------
 _ A-DEV    45    A12345   TEST DEV  N     NO    01-10-05 08:43:21 RECOVERD
 _ A-PROD   17    A12345   DEV  TEST N     NO    ******** ******** AC-ERROR
 _ A-TEST   30    A12345   PROD TEST N     NO    01-10-01 11:34:55 OVERRIDE
 _ A-TEST   38    A12345   PROD TEST N     NO    01-10-03 12:14:16 RECOVERD




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      ----  ----  END   ----  ----  ----  ----  ----  ----  ----  ----  STOP
```

Custom Reporting

File layouts are distributed with N2O to permit the site to create custom reports based on all of the information retained by N2O.

The N2O Toolbox Subsystem - Compare Utilities

The N2O Toolbox Subsystem provides **tools which can assist programmers in their development activities**. These tools include NATURAL object comparison, source code comparison, and source display.

Source Compare

The Source Compare utility identifies differences between the source code of a pair of NATURAL objects located on an FUSER or an N2O Archive file local to N2O. The ability to compare a single pair of objects, a range of objects or two complete NATURAL libraries is provided.

The following screen is displayed to show the differences found between a pair of objects.

```
01-01-15                 N-2-O SOURCE COMPARE UTILITY       Report Page:    1
14:08:00                         Source Code                Object Page:    1
Base >>>>: Env Def: D230 Library: LIB-ONE    PROGRAM : PGM-ONE  Mode: REPORT
>>>> Comp: Env Def: D230 Library: LIB-TWO    PROGRAM : PGM-TWO  Mode: REPORT
==== ==== ....+....1....+....2....+....3....+....4....+....5....+....6....+...
0010 0010 * THIS IS A PROGRAM IN THE PAYROLL SYSTEM WHICH
.... ....                      <<< MATCHING BLOCK >>>
0050 0050 MOVE 1 TO #INDEX

0060 ---- ADD 3 TO #TOTAL
0070 ---- IF #TAX-1 = #TAX-2
0080 ----     DO
0090 ----       WRITE 'THE FIGURES DO NOT MATCH' DOEND
---- 0060 ADD 2 TO #TOTAL


0100 0070 * CALCULATION ROUTINE
...  ...                    <<< MATCHING BLOCK >>>
0140 0110 SUBTRACT 1 FROM #REMAINDER

0150 ---- RESET #I #J

0160 0120 *
Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      ----  ----  END   INFO  ----  ----  ----  ----  ----  LEFT  RIGHT ----
```

Range Statistics include the total number of identical, changed, and total unique NATURAL objects (broken down by object type) compared for the range of objects; and the cumulative number of NATURAL source, comment, and total lines compared for the range of objects.

```
01-12-31                 N-2-O SOURCE COMPARE UTILITY       Report Page:    4
11:38:00                     Range Statistics               Object Page:    1

                Env  Dbid  Fnr   Library  Start Object End Object
                ---- ----- ----- -------- ------------ ----------
 Base   :       D230   230    54 LIB-ONE  PGM*
 Compare:       D230   230    54 LIB-TWO  BAK*
 ------------------------------------------------------------------------------
             Unique            Compared Objects             Total
             Objects       Identical Different Total        Objects
             -------       --------- --------- ------       -------
 Base    :       28             30         7       37            65
 Compare :        1                                             38
                                Compared Lines
                       Source      Comment     Total
                       ---------   ---------   ---------
 Base    :                  568 +       122 =       690
 Compare :                  568 +       122 =       690
   503 Lines match in both Libraries
  Options were as follows:  Ignore Comments - Y   Ignore Positions  - 123
                            Ignore Spacing  - Y   Ignore Identical Objects - Y
 Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
       ----  ----  END   ----  ----  ----  ----  ----  ----  ----  ----  ----
```

NATURAL Object Compare

The Object Compare displays information about two NATURAL objects and indicates whether they are identical or not. Information from the NATURAL directory record for the object is displayed, including the User-id of the person who last catalogued each object, the date and time of the catalogue, the version of NATURAL it was catalogued with, and the date, time and name of the GDA required by each object. The Object Compare utility will also indicate whether the generated code for the two catalogued objects matches or not.

```
01-12-31                    OBJECT COMPARE UTILITY                    TSI01
11:38:00                                                              TSI703

      PAYTEST  / PENSIONP    Type       :  PROGRAM      Structured Mode
      Library    :  PAYTEST  User-ID    :  TREE27   Jobname    :  TREE27
      Date Catalg:  19971027 Time Catalg:  09:55:39 Terminal-ID:  TSI703
      NATURAL Ver:  2.16                            GDA Name   :  PAYROLLG
      Size in user   area (USIZE) :  398   Bytes    GDA Date   :  19931201
      Size in buffer pool         :  1164  Bytes    GDA Time   :  14:04:55
      Size in source area (ESIZE) :  10    Bytes
      Number subroutines (PERFORM):  1                 LS= 80  PS= 23
 ------------------------------------------------------------------------------
      PAYPROD  / PENSIONP    Type       :  PROGRAM      Structured Mode
      Library    :  PAYPROD  User-ID    :  TREE11   Jobname    :  TREE11
      Date Catalg:  19961005 Time Catalg:  10:34:23 Terminal-ID:  TSI706
      NATURAL Ver:  2.16                            GDA Name   :  PAYROLLG
      Size in user   area (USIZE) :  390   Bytes    GDA Date   :  19941005
      Size in buffer pool         :  1120  Bytes    GDA Time   :  15:33:36
      Size in source area (ESIZE) :  10    Bytes
      Number subroutines (PERFORM):  1                 LS= 80  PS= 23
```

```
01-12-31                                          OBJECT   COMPARE   UTILITY
      TSI01
11:38:10                                                            TSI703


                         DBID   FNR    Object      Library
                         ----   ---    --------    --------

                Base   : 1     231    PENSIONP    PAYTEST
                ------------------------------------------

                Compare: 1     231    PENSIONP    PAYPROD


         The two object codes do not match.
```

The N2O Toolbox Subsystem – Documentation Tools

The Documentation Toolbox function provides utilities to display/print NATURAL Objects, File Layouts, Descriptor X-Ref (Cross-Reference) Information, Object Flow Analysis, and Object X-Ref in local N2O environments.

NATURAL Object Listing

The NATURAL Object Listing utility displays/prints NATURAL source code. A number of options are provided, including the ability to explode copycode and data areas in the listing of the source member, the ability to display/print maps and data areas as they appear in their respective editors, the ability to exclude specific object types in the printing of ranges, and the ability to display/print XREF data after the source listing.

```
+-------------------------------------------------------------------------------+
| Type  Date     Time     User-ID  Terminal  Ver     OS      TP Mon   Trans    |
| ---- -------- -------- -------- -------- ------ -------- -------- --------|
| Src: 01-12-31 11:38:00 TSI0373  TSI01D   2.1.6  CMS      VM/CMS   NT216    |
| Obj: 01-12-31 11:38:00 TSI0373  TSI01D   2.1.6  CMS      VM/CMS   NT216    |
+-------------------------------------------------------------------------------+
|   Source Size         : 452  Bytes                                            |
|   User Area   (USIZE) : 370  Bytes    Buffer Pool Size   : 1148  Bytes        |
|   Source Area (ESIZE) : 10   Bytes    Number Subroutines : 1                  |
+-------------------------------------------------------------------------------+
0010 * TAX PROGRAM FEDTAXP
0020 DEFINE DATA
0030   GLOBAL USING PAYROLLG
>   1 #TOTAL
0040 *
0050   LOCAL USING FEDTAXL
>   1 #SALARY
>   1 #TAX-RATE
>   1 #LAST-NAME
>   1 #FIRST-NAME
>   1 #MIDDLE-I
>   1 #SS
>   1 #DECISION
0060 END-DEFINE
0070 *
0080 REPEAT
0090 INPUT USING MAP 'FEDTAXM'
0100 WRITE 'TOTAL TAXES DUE FOR SOCIAL SECURITY #' #SS
0110 WRITE / 'FIRST NAME -' #FIRST-NAME
0120 WRITE   'MIDDLE     -' #MIDDLE-I
0130 WRITE   'LAST-NAME  -' #LAST-NAME
0140 INCLUDE FEDTAXC
> 0010 *
> 0020 * WILL CALCULATE THE TOTAL TAXES OWED
> 0030 *
> 0040 COMPUTE #TOTAL = #TAX-RATE * #SALARY
0150 PERFORM FEDTAXS
0160 *
0170 IF #DECISION = 'N'
0180    INPUT 'FUNCTION TERMINATED'
0190    ESCAPE BOTTOM
0200 END-IF
0210 END-REPEAT
0220 END
```

Map Listing The Map Listing utility displays/prints NATURAL maps as they appear in the NATURAL Map Editor. Maps may also be printed to include the field table, and the list of processing/verification rules.

Data Area Listing The Data Area Listing utility displays/prints NATURAL data areas as they appear in the NATURAL Data Area editor.

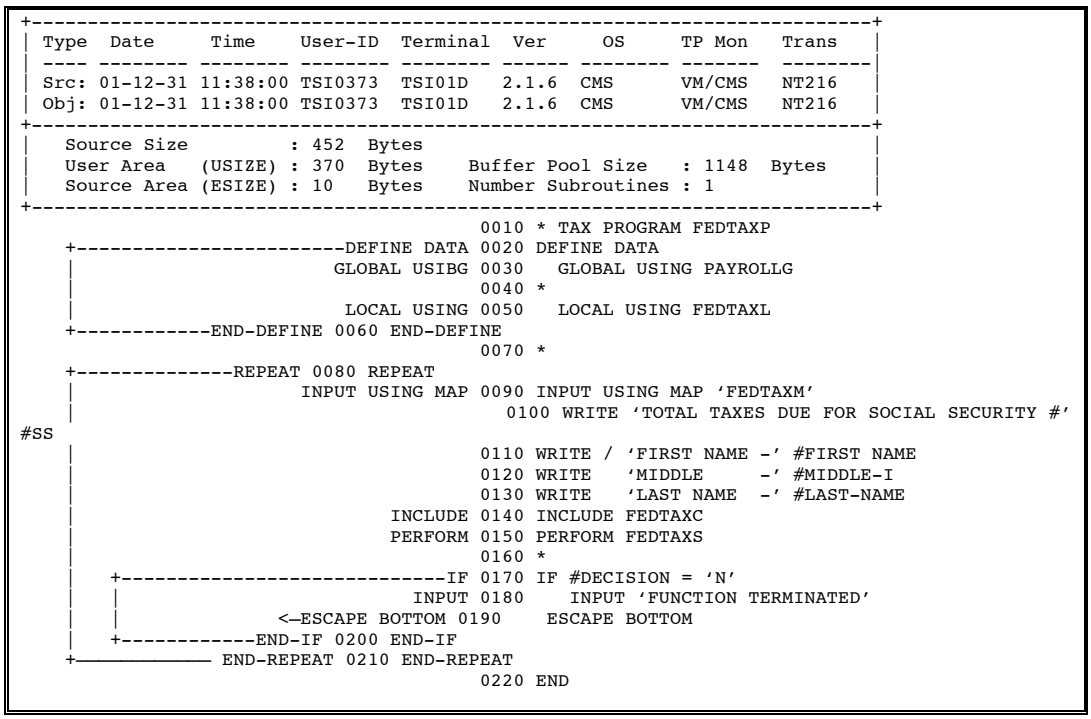
File Layouts The File Layouts utility displays/prints File Layouts using information from PREDICT or NATURAL DDMs. The amount of detail can be varied for the reports to show PREDICT extended descriptions, comments, keywords, and owners for files, and extended descriptions and comments for fields.

```
COMMENTS : CONTAINS UNIQUE DESCRIPTIONS
---------- OF EMPLOYEES OF AN INTERN.
           ENTERPRISE (COMPAR. TO SAG)
EXTENDED DESCRIPTION:
=======================
                      ======================================
                          FILE ADDITIONAL DESCRIPTION
                      ======================================
          *
          ****************************************************************
          DESCRIPTION OF OBJECTS (NOT FIELDS) CONTAINED IN THE FILE
          ****************************************************************
          *
          UNIQUE DESCRIPTION OF EMPLOYEES OF AN INTERN. ENTERPRISE
          *
          ****************************************************************
          FOR EACH OBJECT THE FOLLOWING INFORMATION IS STORED:
              1. PURPOSE DATA IS STORED FOR
              2. WHAT INFORMATION IS STORED (IN GENERAL)
              3. WHERE DO DATA COME FROM (IN GENERAL)
          ****************************************************************

FIELDS:
=========
            ------------------------------------------------------------------------------
----
            | Ty | L | DB | Name                          | Format | S | D | Comments
|
            ------------------------------------------------------------------------------
----
            |      | 1 | AA | PERSONNEL-ID                | A8       |     | D | CNNNNNNN
|
            |     |    |     |                             |          |    |    | C=COUNTRY
|
            |     |    |     |                           |          |    |    | HD=PERSONNEL/ID
|
            ------------------------------------------------------------------------------
----
```

Descriptor X-Ref Information The Descriptor X-Ref Information utility uses PREDICT cross-reference data to display/print a report on descriptor usage for NATURAL objects. The report shows the number of times a descriptor is used to delete, read, search, and update. It also shows the number of times a descriptor is used in a data area. Optionally the list of NATURAL objects that use the descriptor can be displayed.

Object Flow Analysis The Object Flow Analysis utility displays/prints NATURAL object(s) with connected processing loops and statement blocks for easy debugging.



```
+-------------------------------------------------------------------------+
| Type  Date     Time     User-ID  Terminal  Ver     OS      TP Mon   Trans  |
| ---- -------- -------- -------- -------- ------ -------- -------  -------|
| Src: 01-12-31 11:38:00 TSI0373  TSI01D   2.1.6  CMS      VM/CMS   NT216  |
| Obj: 01-12-31 11:38:00 TSI0373  TSI01D   2.1.6  CMS      VM/CMS   NT216  |
+-------------------------------------------------------------------------+
|   Source Size         : 452  Bytes                                      |
|   User Area   (USIZE) : 370  Bytes    Buffer Pool Size   : 1148  Bytes  |
|   Source Area (ESIZE) : 10   Bytes    Number Subroutines : 1            |
+-------------------------------------------------------------------------+
                                        0010 * TAX PROGRAM FEDTAXP
    +-----------------------DEFINE DATA 0020 DEFINE DATA
    |                       GLOBAL USIBG 0030   GLOBAL USING PAYROLLG
    |                                    0040 *
    |                        LOCAL USING 0050   LOCAL USING FEDTAXL
    +-----------END-DEFINE 0060 END-DEFINE
                                        0070 *
    +--------------REPEAT 0080 REPEAT
    |                    INPUT USING MAP 0090 INPUT USING MAP 'FEDTAXM'
    |                                      0100 WRITE 'TOTAL TAXES DUE FOR SOCIAL SECURITY #'
#SS
    |                                    0110 WRITE / 'FIRST NAME -' #FIRST NAME
    |                                    0120 WRITE   'MIDDLE     -' #MIDDLE-I
    |                                    0130 WRITE   'LAST NAME  -' #LAST-NAME
    |                              INCLUDE 0140 INCLUDE FEDTAXC
    |                              PERFORM 0150 PERFORM FEDTAXS
    |                                    0160 *
    |   +----------------------------IF 0170 IF #DECISION = 'N'
    |   |                          INPUT 0180    INPUT 'FUNCTION TERMINATED'
    |   |              <-ESCAPE BOTTOM 0190    ESCAPE BOTTOM
    |   +------------END-IF 0200 END-IF
    +-------------- END-REPEAT 0210 END-REPEAT
                                        0220 END
```

Object X-Ref The Object X-Ref utility displays/prints PREDICT cross-reference information for NATURAL object(s) identifying copycode, data areas, DDMs, files, programs, subroutines, subprograms, variables within data areas, and views referenced.

The N2O Toolbox Subsystem - The N2OSCAN Utility

N2OSCAN goes beyond the capabilities of the NATURAL SCAN utility to provide Programmers and Analysts with extensions and flexibility, which make searching for specific strings within NATURAL objects easier than ever. With N2OSCAN, not only can entire NATURAL libraries be searched, but also ranges of NATURAL objects and ranges of NATURAL libraries within a NATURAL FUSER. Absolute scans are supported to allow for searching of strings starting with or containing a specific set of characters. Because it is a character string search and the user specifies what to search for, it can search strings in any language, including English, French, and German.

Searches are not limited to a single string. Multiple search strings may be specified within a single pass of the NATURAL objects,. Additionally, to eliminate "false hits" from the scan output, the user may specify strings to exclude from the search. For example, this permits an absolute scan for the string "DATE" which excludes occurrences of the NATURAL statement "UPDATE".

Search parameters and strings are created and maintained using the NATURAL Editor. These parameters and strings, which are called Scan Parm Sets, are stored as NATURAL text objects, allowing them to be specified, modified, and used multiple times.

Results from a scan run include a detailed list of all “hits”, indicating the specific lines where strings were found, as well as summary data showing statistics at the object, library, and complete-run levels. All scan results are stored in an ADABAS file, allowing for further analysis and reporting. The results can be viewed either on-line or printed out in batch.

Environment Scan Utility

The Environment Scan Utility permits scans to be conducted on an entire Environment, a range of libraries, a single library, a range of objects, or a single object.

Library Scan Utility

The Library Scan Utility permits scans to be conducted on an entire library, a range of objects, or a single object.

Select Object Scan Output Set

The Select Object Scan Output Set function displays statistical information about the objects that were scanned.

```
 Valid Values: L=List strings found, S=Source View
01-12-31            N-2-O SELECT OBJECT SCAN OUTPUT SET                 TSI004
11:38:00                                                                TSI019
            User ID: TREE18     Environment: PROD
      Scan Parm Set: SAMPLE01   Start Library: PAYROLL  Start Object: PAY
                                End Library:            End Object: PAYPGM6
Start List at Object: ________

                  Obj   Lines  Lines  % Lns NonCom NonCom %NonC
       S Object   Type   Hit   Total   Hit  LnsHit LnsTot LnHit
       - -------- ------ ------ ------ ----- ------ ------ -----
       _ PAYCALC    N        10     49  20.4      9     48  18.8
       _ PAYPGM1    P        15    632   2.4     11    621   1.7
       _ PAYPGM2    M         1    111   0.9      1     98   1.0
       _ PAYPGM4    C        12     57  21.1     11     56  19.6
       _ PAYPGM5    N        26    391   6.6      8    385   2.1


Enter---PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12
        HELP  ----- END   ----- ----- ----- UP    DOWN  ----- >ZERO ----- ----
```

Statistics shown include the number of lines where any of the strings specified were found (Lines Hit), the total number of lines in the object (Lines Total), and the percentage of lines within the object which have any of the strings specified (% Lns Hit). N2OSCAN will also differentiate between comment and non-comment lines, showing the same statistics for non-comment lines (NonCom LnsHit, NonCom LnsTot, and %NonC LnsHit).

Object Source View

The Object Source View function displays the source code of a scanned object with found strings ("hits") highlighted. This scan was performed using the SAMPLE01 Scan Parm Set, delivered with N2OSCAN, as input.

```
> +  SUB-PGM   : PAYCALC   Lib: PAYROLL
      ...+....1....+....2....+....3....+....4....+....5....+...Mode: STRUCT
0010 DEFINE DATA
0020     PARAMETER
0030        01  #NAME   (A30)
0040     LOCAL USING EMPVIEW
0050     LOCAL
0060        01    #CURRENT-DATE   (A6)
0070        01    #LAST-YY   (A2)
0080 END DEFINE
0090 **
0100 MOVE EDITED *DATX (EM=YYMMDD) TO #CURRENT-DATE
0110 **
0120 FIND EMP-INFO BY KEY WHERE EMP-NAME = #NAME
0130   ACCEPT IF EMP-RAISE = 'Y'
0140   REJECT IF EMP-HIRE-DATE > #CURRENT-DATE
0150   IF #CURRENT-DATE GE EMP-RAISE-DATE
0160     COMPUTE EMP-SALARY = EMP-SALARY + EMP-SALARY * 0.05
0170     UPDATE
0180   ELSE
0190     INPUT WITH TEXT 'RAISE DATE FOR THIS EMPLOYEE NOT REACHED'
0200           USING MAP #INVALID-DATE-MAP
0210   END-IF
                         PF3-EXIT       PF4-UPDATE INFO
```

Scan Output Detail Function

The Scan Output Detail function displays strings found and the line numbers of the lines on which they were found in the object selected. However, if the object selected is a data area, lines will be numbered sequentially.

```
01-12-31            N-2-O SELECT OBJECT SCAN DETAIL                    TSI004
11:38:00                                                               TSI019
         User ID: TREE18     Environment: PROD
   Scan Parm Set: SCPRD1   Start Library: PAYROLL  Start Object: PAY
                             End Library:            End Object: PAYPGM6
        Library: PAYROLL
         Object: PAYCALC  Type: N
Line
 Nbr C String Found
---- - ------------------------------------------------------------------
0060   #CURRENT-DATE
0070   #LAST-YY
0100   #CURRENT-DATE
0100   *DATX
0140   EMP-HIRE-DATE
0140   #CURRENT-DATE
0150   #CURRENT-DATE
0150   EMP-RAISE-DATE
0190   DATE
0200   #INVALID-DATE-MAP
0220   #DATE
Enter---PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12
        HELP  ----- END   ----- ----- ----- UP    DOWN  ----- ----- ----- ----
```

Scan Output Maintenance

Whenever a user generates new scan output using the same parameters, N2OSCAN will automatically delete the old version of the output first. Functions are also provided to purge unwanted output from previous scan runs once they are no longer needed. One function allows the user to purge unwanted output from any of their previous scan runs. An administrative function is also provided to allow the N2O Administrator, or anyone designated through N2O Security, to delete any scan output generated by any user.

Batch Processing

N2OSCAN can be run in batch. Everything from running scans to generating hardcopy reports to purging unwanted scan output can be performed in batch.

A full environment scan could generate thousands of calls to the NATURAL FUSER. Running the scan in batch allows for this activity to occur at a priority which will not overwhelm the on-line system. This also provides for the activity to be scheduled overnight, or over the weekend, if necessary.

Source Display

The Source Display function will display a specific object that has been scanned and display any hits. When run in batch, the user is provided with the option of seeing the string in bold, if the printer being used supports it, or seeing the string underlined using a special character selected by the user. “PENSION” is the string searched for in this example.

```
LIBRARY: PAYTEST            N2OSCAN SOURCE LISTING            OBJECT: PENSIONP
PAGE:         1          REPORT DATE: 1999/12/31 11:38:00      TYPE:   PROGRAM
                      OBJECT SAVE DATE: 1997/09/15 16:38:24
================================================================================
 0010 *
 0020 DEFINE DATA
 0030   GLOBAL USING PAYROLLG
 0040 *
 0050   LOCAL USING PENSIONL
 0060 *
 0070   LOCAL
 0080   01 #RETIRE-DATE   (A8)
 0090   01 #RETIRE-AGE    (N3)
 0100   01 #EARLY-PENSION (L)
 0110 END-DEFINE
 0120 *
 0130 INPUT USING MAP 'PENSIONM'
 0140 WRITE 'PENSION FOR SOCIAL SECURITY NUMBER ' #SS
 0150 WRITE / 'NAME: ' #LAST-NAME #FIRST-NAME #MIDDLE-I
 0160 WRITE / 'SALARY: ' #SALARY
 0170 WRITE / 'YEARS OF WORK: ' #YEARS
 0180 *
 0190 INCLUDE PENSIONC
 0200 WRITE / 'PENSION RATE' #PENSION-RATE
 0210 *
 0220 PERFORM PENSIONS
 0230 *
 0240 END



                          ***** END OF LISTING *****
```

Standard Report Options are available to limit the statistics and the level of detail printed on the standard report. For example, an option is provided to inhibit the display of statistics for any objects without hits.

```
                                                                                                  Generated: 2001/12/31 11:38:00
                                                        N2OSCAN Output - Standard Report
                                                        ================================


*****************************************************************************************************************
******
Scan Output Set
---------------
      User ID: TREE24      Start Library: PAYTEST            Libraries Hit:           1          Pct Libraries Hit:
100.0
Scan Parm Set: PAYTSCAN      End Library:                Libraries Scanned:           1
  Environment: DB1          Start Object:                       Objects Hit:          22            Pct Objects Hit:
36.6
                             End Object:                  Objects Scanned:          60
                                                                Lines Hit:          39               Pct Lines Hit:
1.2
    Scan Completed: 1999/12/31 11:38:00                     Lines Scanned:       3,044
                                                     Non-comment Lines Hit:          38     Pct Non-comm Lines Hit:
1.3
                                                  Non-comment Lines Scanned:       2,770

*****************************************************************************************************************
       Library
       --------                Objects Hit:          22            Pct Objects Hit:  36.6
       PAYTEST             Objects Scanned:          60
                                  Lines Hit:          39              Pct Lines Hit:   1.2
                             Lines Scanned:       3,044
                     Non-comment Lines Hit:          38     Pct Non-comm Lines Hit:   1.3
                 Non-comment Lines Scanned:       2,770
                 ***************************************************************************************
                  Object  Type
                 -------- ----             Lines Hit:           2              Pct Lines Hit:   2.6
                 CITYTAXM  M           Lines Scanned:          76
                              Non-comment Lines Hit:           2     Pct Non-comm Lines Hit:   2.9
                           Non-comment Lines Scanned:          67

                 ***************************************************************************************
                  Object  Type
                 -------- ----             Lines Hit:           2              Pct Lines Hit:   2.6
                 FEDTAXM   M           Lines Scanned:          76
                              Non-comment Lines Hit:           2     Pct Non-comm Lines Hit:   2.9
                           Non-comment Lines Scanned:          67

                 ***************************************************************************************
                  Object  Type
                 -------- ----             Lines Hit:           2              Pct Lines Hit:   2.6
                 FICAM     M           Lines Scanned:          76
                              Non-comment Lines Hit:           2     Pct Non-comm Lines Hit:   2.9
                           Non-comment Lines Scanned:          67
```

String Found Report The Strings Found report will show the user all of the strings found during a scan run. The report, which is sorted by the string-found, displays the library, object, line number, and number of hits.

```
                                                                                                  Generated: 2001/12/31 11:38:00
                                                N2OSCAN Output - String-Found Report
                                                      <Sorted by String-Found>
                                                ====================================


*****************************************************************************************************************
******
Scan Output Set                                                                  Scan Output Set Statistics
---------------                                                 ------------------------------------------------------------
-----
     User ID: TREE24      Start Library: PAYTEST                Libraries Hit:         1         Pct Libraries Hit:
100.0
Scan Parm Set: PAYTSCAN     End Library:                    Libraries Scanned:         1
  Environment: DB1      Start Object:                              Objects Hit:        22           Pct Objects Hit:
36.6
                             End Object:                      Objects Scanned:        60
                                                                    Lines Hit:        39              Pct Lines Hit:
1.2
    Scan Completed: 1999/12/31 11:38:25                         Lines Scanned:     3,044
                                                          Non-comment Lines Hit:        38    Pct Non-comm Lines Hit:
1.3
                                                       Non-comment Lines Scanned:     2,770


                         Obj       Nbr
    Library   Object  Type Line Hits C String Found
    -------- -------- ---- ---- ---- - ---------------------------------------------------------------------------
------
    PAYTEST  KAH0100M  M   0015    1   *DATI
    PAYTEST  PAY0100M  M   0015    1
    PAYTEST  PAY0100T  M   0011    1
    PAYTEST  PAY0110M  M   0018    1
    PAYTEST  PAY0110T  M   0011    1
    PAYTEST  PAY0120M  M   0024    1
    PAYTEST  PAY0120T  M   0011    1
    PAYTEST  PAY0130M  M   0020    1
    PAYTEST  PAY0130T  M   0011    1
    PAYTEST  PAY0140M  M   0016    1
    PAYTEST  PAY0140T  M   0011    1

    PAYTEST  CITYTAXM  M   0022    1   *DATX
    PAYTEST  FEDTAXM   M   0022    1
    PAYTEST  FICAM     M   0022    1
    PAYTEST  LIFEINSM  M   0021    1
    PAYTEST  PENSIONM  M   0020    1
    PAYTEST  SALARYM   M   0018    1

    PAYTEST  CITYTAXM  M   0024    1   *TIMX
    PAYTEST  FEDTAXM   M   0024    1
    PAYTEST  FICAM     M   0024    1
    PAYTEST  KAH0100M  M   0019    1
    PAYTEST  LIFEINSM  M   0023    1
    PAYTEST  PAY0100M  M   0019    1
    PAYTEST  PAY0100T  M   0015    1
    PAYTEST  PAY0110M  M   0022    1
    PAYTEST  PAY0110T  M   0015    1
    PAYTEST  PAY0120M  M   0028    1
```

The N2O Project Tracking Subsystem

The Project Tracking Subsystem allows users to track a project from the moment it is proposed to its approval and use in production. The screen below shows a Project, PAYROLL, that has been defined to N2O:

Project Definition

```
01-12-31                    N2O PROJECT DEFINITION                      TSIO373
11:38:00                                                                TSI1

  Project   :  PAYROLL
  Updated   :  01-12-31  10:32:27  TSI0171
  Short Desc:  THIS IS A SAMPLE PROJECT

                                                    Priority      Impact
 Task Groups    Stages                              Values        Values
 ------------   -----------------------------      ----------    ----------
  1. BENEFITS    1. PRE-DESIGN  11.                 High A1       High H
  2. TAXES       2. INITIATED   12.                      A2            M
  3. INSURNCE    3. DEVELOPED   13.                      A3            L
  4. MISC        4. APPROVAL-1  14.
  5.             5. APPROVAL-2  15.
  6.             6. COMPLETED   16.
  7.             7.             17.
  8.             8.             18.
  9.             9.             19.
 10.            10.             20.                 Low           Low

Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      ----  ----  END   ----  ----  ----  ----  ----  ----  ----  ----  STOP
```

Task Information

Each project has certain tasks associated with it. Task groups are used to logically separate related tasks within a particular project. Stages relate to the logical progression of a task from beginning to end, such as milestones. Each task can have a priority value assigned to it, indicating its relative urgency. A task may also have an impact value associated with it, to indicate the impact of a particular task on the entire project.

User-Defined Values

The task groups, stages, priority values, and impact values are all user-defined values, allowing for complete flexibility. For example, one site may wish to have task groups that relate to a specific functional area, such as "Documentation," "Programming," or "Testing." Another site may wish to have task groups such as "Enhancements," "Maintenance," or "Training." One site may wish to have priority values that are numeric, such as 1 for low priority and 10 for high priority). Another site may wish to have mnemonic priority values, such as "H" for "High", "M" for "Medium", and "L" for "Low".

Reports

The Project Tracking Subsystem includes a number of reports that display project tracking information. For example, consider the History of a Task report shown below:

```
01-12-31              N-2-O PROJECT TRACKING REPORTS                  TSIO373
11:38:00              HISTORY OF A TASK  BENEFITS 000001              TSI1
                      Project:  PAYROLL                    Page: 1

Stage       Date      Time      User-ID   Comments
----------  --------  --------  --------  ------------------------------------
COMPLETED   01-01-25  18:35:25  TSI0171   TASK COMPLETED TO SPECIFICATIONS
APPROVAL-2  01-01-23  09:34:38  TSI0197   APPROVED BY SYSTEM MANAGER
APPROVAL-1  01-01-22  10:10:31  TSI0191   APPROVED BY DEPT. LEADER
DEVELOPED   01-01-20  14:05:54  TSI0174   ADJUSTED TO STANDARDS
REJECT      01-01-18  11:05:54  TSI0191   DID NOT MEET CODING STANDARDS
DEVELOPED   01-01-08  17:32:35  TSI0171   CODING COMPLETED FOR NEW BENEFITS
INITIATED   98-12-27  08:32:05  TSI0171   BEGAN CHANGES FOR NEW BENEFITS
DEFINED     98-11-21  15:07:20  TSI0171   ADD NEW BENEFITS TO PAYROLL APPL.




Enter-PF1---PF2---PF3---PF4---PF5---PF6---PF7---PF8---PF9---PF10--PF11--PF12---
      ----  ----  END   ----  ----  ----  ----  ----  ----  ----  ----  STOP
```

This report displays the progression of task number 000001 for the BENEFITS task group in the PAYROLL project. From the information in the Comments column, we see that this task relates to changes needed in the PAYROLL project to reflect the addition of new benefits. In this report, we see the history of this task from the moment it was defined on November 21, 1998, up to the point that it was officially completed on January 25, 1999.

The Project Tracking Subsystem is a feature not available in other NATURAL Change Management products.

Documentation and Installation

N2O documentation includes a User Manual and an Administrator Manual. These manuals contain sample screens along with complete descriptions. The manuals are fully indexed. All TSI documentation is available on our Web site at www.treehouse.com or on CD-ROM.

N2O Reference Cards are also available from Treehouse Software. These cards provide basic information needed by N2O users and administrators. **Any NATURAL site may request free N2O Reference Cards.**

N2O executes under all IBM and compatible operating systems that can run ADABAS and NATURAL, including OS/390 (MVS), VM, VSE, and BS2000. N2O/3GL currently interfaces with PANVALET, LIBRARIAN, and ENDEVOR, and migrates objects contained in OS/390 (MVS) PDSs. **Installation and setup are easy.**

Customer Support

Treehouse Software provides support for N2O and its other products from its headquarters in Sewickley, Pennsylvania and on the Web at www.treehouse.com. Treehouse affiliates provide first-level support for sites in their market areas refer customer problems to Treehouse Software as needed.

N2O users have **direct access to the product developers**. User questions are answered quickly, problems are discussed directly with developers, and change/enhancement requests are reviewed and implemented in a timely manner. Technical representatives are available to assist in the setup and operation of N2O during installation.

Free Trials

N2O is available under a no-obligation, **30-day free trial** agreement, and is available either on tape or for download from our Web site at www.treehouse.com. N2O is attractively priced. N2O/3GL, which is provided at a separate price, includes support for PDSs, PANVALET, ENDEVOR, and LIBRARIAN.

Please contact Treehouse Software to obtain reference names or the Treehouse Documentation CD, free of charge.

Change Management and N2O Evaluator Kit

To assist sites in evaluating N2O and other Change Management products, Treehouse Software developed an N2O Evaluator kit which is available on our Web site at www.treehouse.com. Evaluator kits for other products are also available.

Summary

- N2O provides comprehensive and flexible Change Management for NATURAL objects, PREDICT objects, and SYSERR messages. N2O/3GL provides Change Management for 3GL/Other objects stored in PDSs, PANVALET, LIBRARIAN, or ENDEVOR.
- The N2O features include a string search capability (N2OSCAN), documentation tools, on-line request system, on-line and batch migrations, checkout/checkin, PREDICT XREF integration, archiving and recovery, automated compilation, static SQL support for NATURAL/DB2, authorization, and many more.
- N2O provides complete project tracking capabilities that can be integrated with the migration request system.
- N2O provides complete audit trails and full reporting capabilities, including the option to produce custom reports.
- N2O is flexible, as it adjusts to a site's Change Management needs.
- N2O is continually being enhanced by a staff of full-time developers who are highly responsive to customer requests.
- N2O is installed easily, and it is operating system and TP system independent.

N2O is the ideal Change Management system for NATURAL objects, PREDICT objects, SYSERR messages, and 3GL/Other objects that has been available since 1989.

Visit Treehouse Software's web site at www.treehouse.com, or contact us at (412)741-1677.

NATURAL, NATURAL Security System, ADABAS, and PREDICT are products of Software AG. ENDEVOR, PANVALET, ACF2, TOP SECRET, and LIBRARIAN are products of Computer Associates. RACF and DB2 are products of IBM. The information used in the examples in this product overview is for illustrative purposes only.

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