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DMS-100 Family

Software Delivery

Software Delivery Planning and Provisioning

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Contents

About this document

Introduction

This publication provides planning and provisioning information on activities associated with a software upgrade in the DMS-100 Family of switches. It describes the major steps of the software delivery process from the telephone company perspective, beginning with the request for new feature packages through the major tasks before, during, and after the installation of the new software load into the telephone switch. The document also describes the intervals, timing constraints, and guidelines for software orders.

Using this document telephone or carrier company (telco) managers and planners will have an overview of the requirements for a scheduled software upgrade, and will be able to prepare for it successfully. The software delivery method selection depends upon the BCS level of upgrade and the size of the telco office.

- **One Night Process (ONP):** Software delivery method for smaller office upgrades to BCS 29 and higher which uses MOVEBCS or TABXFR (dump and restore function) and BCSUPDATE (application function) during one night.
- **Two Night Process (2NP):** Identical to ONP except for larger offices the process is interrupted at the end of the data transfer to allow continuation on the following night. This requires one day of restricted data changes with journal file.
- **Hybrid (and Conventional):** For upgrading larger offices to BCS 29 and higher, the Hybrid method includes merging the office-specific data into the new undatafilled software load (conventional dump and restore), and installing the new datafilled software on the night of the application. A site image and frozen data interval with journal file is required to allow NTI to perform a local dump and restore and ship the datafilled image to the telco. The primary difference between the Hybrid and Conventional methods is the software tools used for the application.

Software evolution

After BCS36 the DMS software architecture has changed. Northern Telecom will begin delivering Product Computing-Module Loads (PCLs) rather than custom-built BCS loads or USLs. In this manual the term "DMS Evolution" (or "DMSE") is used to identify the processes and or terminology that have changed to support PCL software delivery.

How this document is organized

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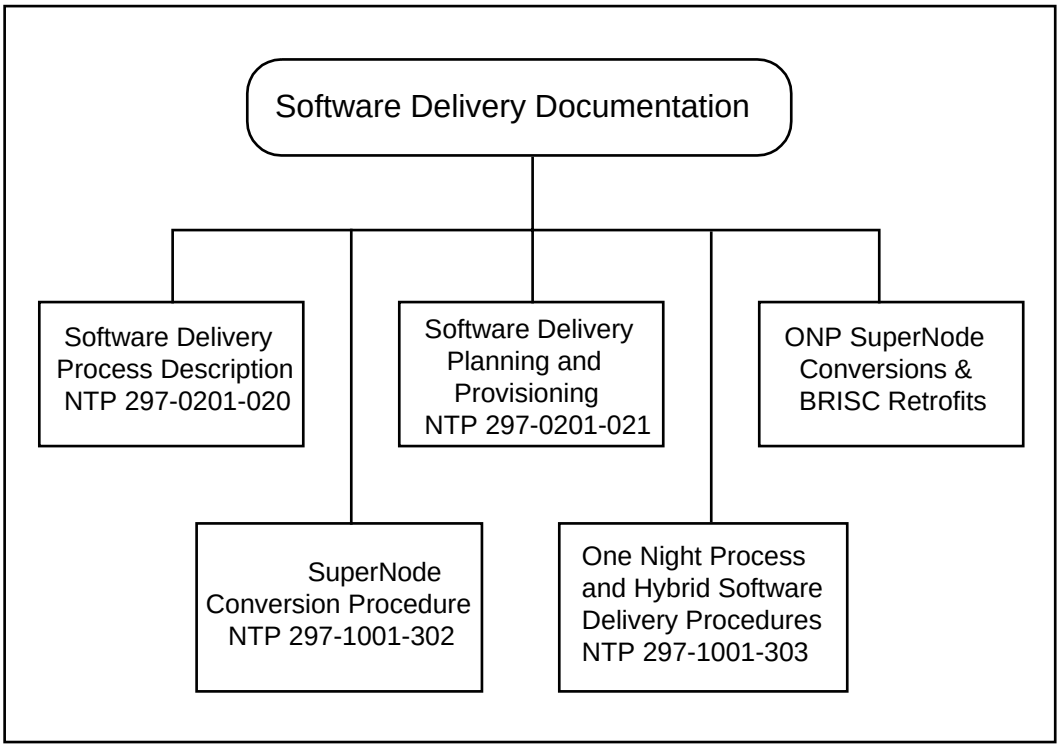
Major activities in a software upgrade from the telco's perspective, and the approximate time interval for completion	Schedule of Software Upgrade Activities, Chapter 5

Related documents

This document is part of a suite of documents that specifically address Northern Telecom software delivery. Figure 1 shows these documents.

Figure 1 Software Delivery Practices



NTP 297-8991-020, *Software Delivery Process Description*, describes the NTI software delivery process, beginning with the telephone company request for new software and ending with the installation of the new software into the DMS switch. It includes software delivery processes, intervals, policies, and interfaces.

NTP 297-8991-021, *Software Delivery Planning and Provisioning*, provides advanced planning information for telephone companies planning for software upgrades. It includes telephone company responsibilities and tasks required for the software delivery process, along with information on the impact to operation, administration, and maintenance activities.

NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*, consists of procedures needed to upgrade an in-service DMS switch to BCS 29 and following using the ONP for smaller offices, and the Hybrid process for larger offices. It includes information on preparing for the upgrade (including journal file for Hybrid method), installing the new software load, and performing follow-up testing procedures.

Listed below are additional documents that may be used as reference material in the software delivery process for the DMS-100 Family.

- Marketing Bulletins: Documents which include advance feature information, notification of new software release, and feature descriptions of new BCS releases.
- NT8620 Questionnaire: Structured manual order capture document for the customer to use when ordering from the DMS-100 Family of Host Switches.
- NT8620 Questionnaire Reference Document: Guide to completing the manual NT8620 Questionnaire.
- NT8630 Order Capture Document: Paper issue of the on-line NT-ACCESS order capture system for the DMS-100 Family of Host Switches.
- DMS-100F Host Provisioning Reference Guide: Guide to completing the on-line NT-ACCESS order capture system for the DMS-100 Family of Host Switches (NT8630).
- NT8602 Questionnaire: Structured manual order capture document for the customer to use when ordering from the DMS-100 Family of Remotes.
- NT8602 Questionnaire Reference Document: Guide to completing the manual NT8602 Questionnaire.
- NT8603 Order Capture Document: Paper issue of the on-line NT-ACCESS order capture system for the DMS-100 Family of Remote Switches.
- DMS-100F Remote Provisioning Reference Guide: Guide to completing the on-line NT-ACCESS order capture system for the DMS-100 Family of Remote Switches (NT8603).
- NT-ACCESS User Reference: Guide to using the NT-ACCESS on-line order capture system.
- NT-ACCESS Customer Procedures Manual: Guide to the functions of various engineers and groups within NTI and the telco as they relate to using the NT-ACCESS on-line order capture system.
- Office Parameters Reference Document, Practice 297-1001-455: Document providing information on the software office parameters.
- Peripheral Software Release Documents: Documents providing information on the PM and XPM software loads as well as BCS gating hardware.

Software delivery overview

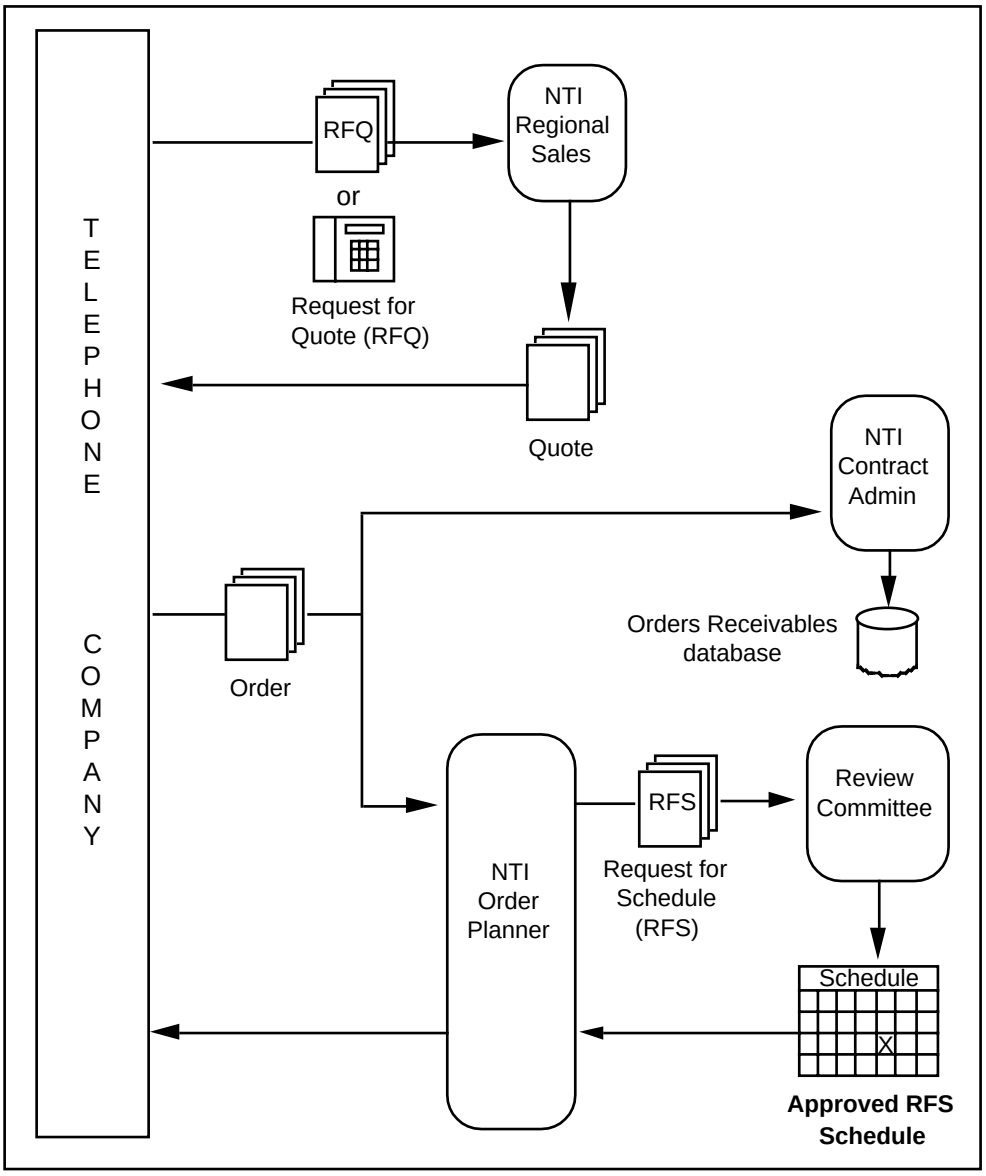
Introduction

In order to plan adequately for a BCS upgrade, the telephone company must be aware of the total process, from the initial quote and order to the final delivery of the software. This section provides an overview of the software delivery processes. For more detailed information, see NTP 297-8991-020, *Software Delivery Process Description*.

Quoting and ordering

The telco first requests a preliminary cost estimate, or a Request for Quote (RFQ). The NTI regional sales group generates the quote using existing office data and information on feature packages and materials required. After receiving the quote, the telco may then order a new software load through a letter of intent with an accompanying purchase order. See Figure 1-1.

Figure 1-1 Software Quote and Order



Provisioning

Scheduling

NTI develops and manages customer schedules based on both hardware and software parameters through the FORTUNE ordering system. First, a Request for Schedule (RFS) is generated which identifies several critical dates for events that must be performed at specific times to achieve successful software delivery. The RFS packages the product for both hardware and software to provide the customer with the total scheduling picture.

Order types

The following types of orders are considered in the development of an RFS:

- *Initial Order:* Order for software and hardware to equip a new DMS office.
- *Extension:* Order for an upgrade to an existing DMS office. An extension may be hardware only, or may include hardware and software.
- *SWE (Software-only Extension):* Order for a software upgrade to an existing DMS office. May include BCS gating hardware, but does not support feature gating hardware.

Each of the order types identified above begins with a **Base** order. The Central Office Equipment Order number (COEO) is assigned to the base order, and basic due dates are included. If software is included in any type of order (initial, extension, or SWE), an **S Suborder** is attached to the Base. The S Suborder has the same COEO as the Base, followed by a "dash S" (for example, H12345-S).

An office ordering a BCS upgrade that includes multiple levels (for example, from BCS 25 to BCS 31) has a Base order with two S Suborders attached. If the Base order is H12345, the suborders are H12345-S1 (for BCS 25 to 28) and H12345-S2 (for BCS 28 to 31). Figures 1-1 and 1-2 identify the dates and intervals for the various types of orders.

Figure 1-2 Scheduling Intervals for Initial orders.

Note : On initial software loads the standard interval is H +2 weeks.

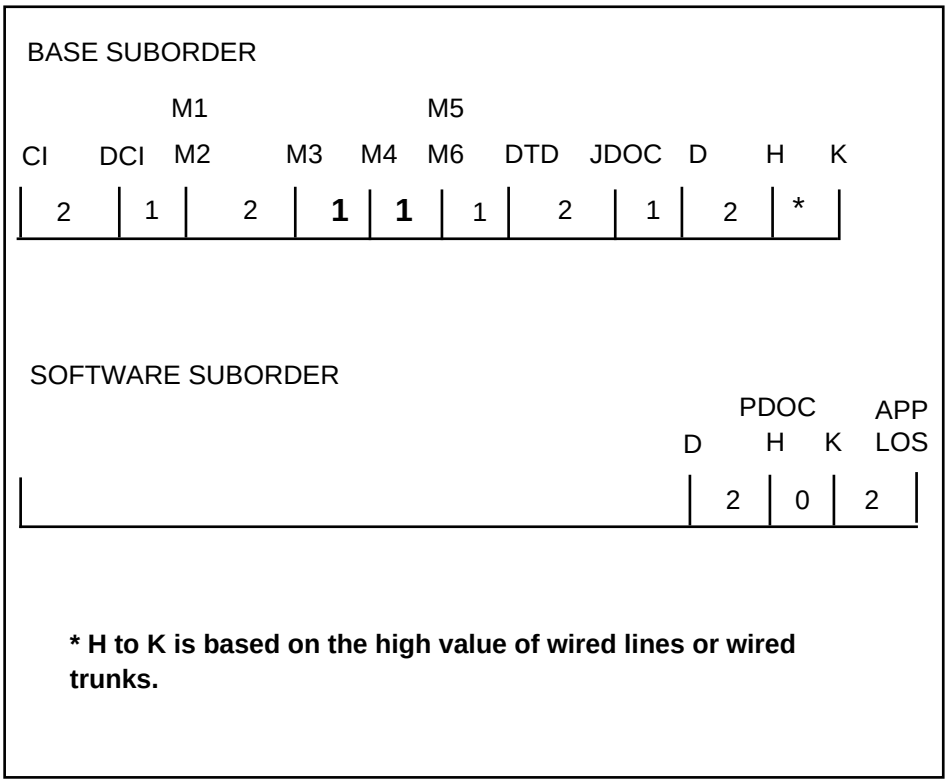


Figure 1-3a Scheduling Intervals for Extension Orders

Note: On extension order types, the standard interval is H +5 weeks.

Hardware extension package

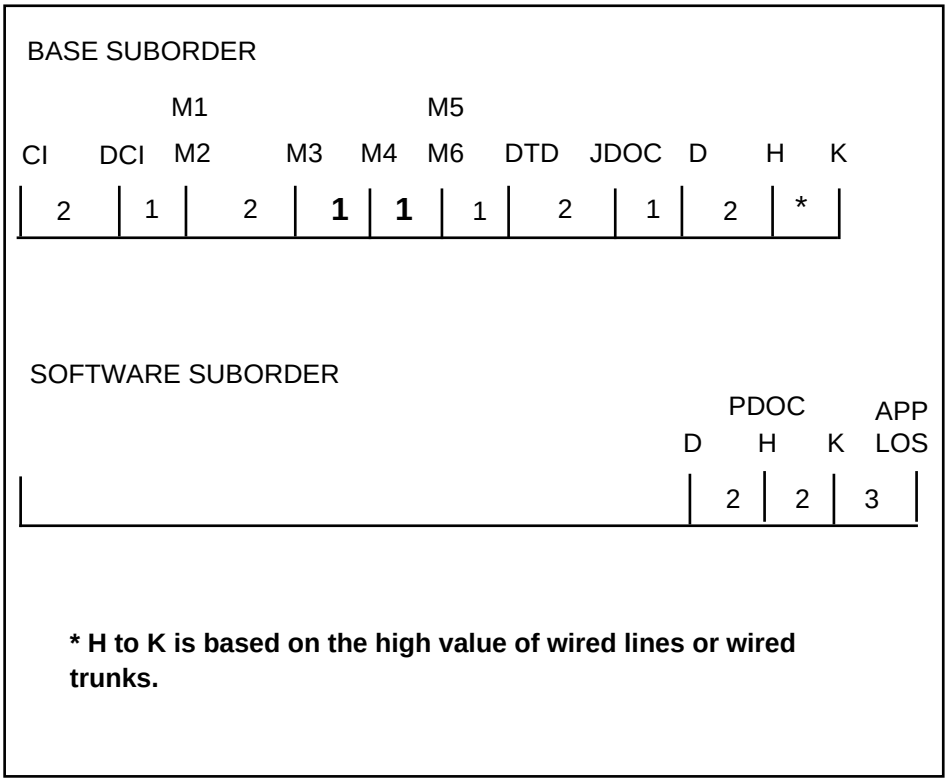
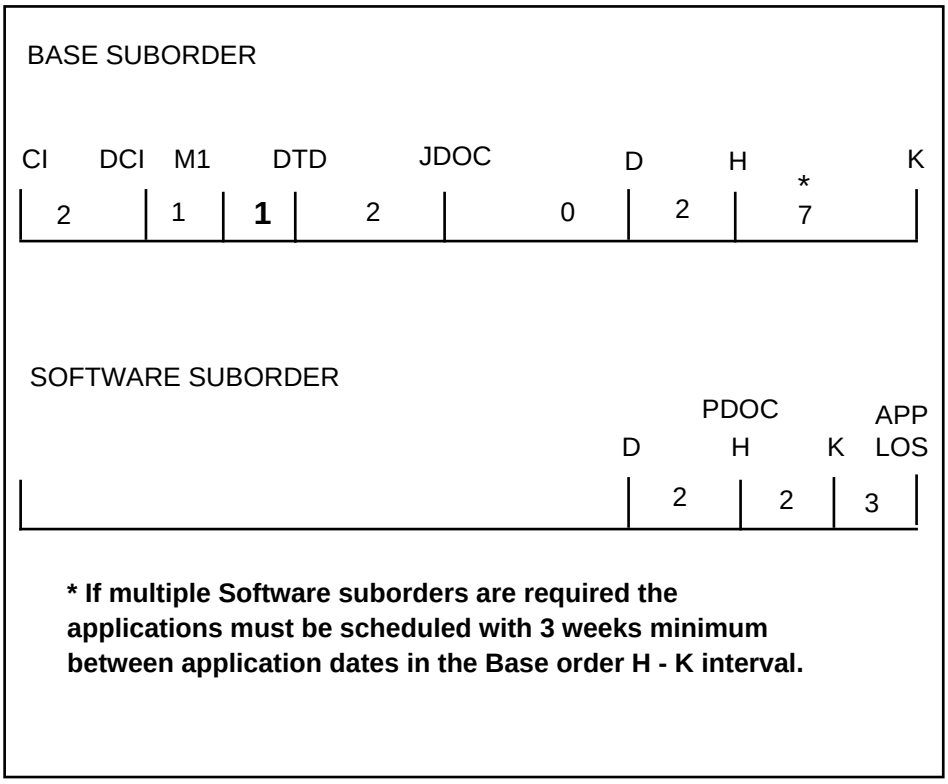


Figure 1-3b Scheduling Intervals for Extension Orders

Software extension package with BCS gating hardware



BCS gating hardware

BCS required hardware includes any hardware required in the DMS office prior to the software delivery date. Two types of BCS required hardware include:

- *BCS gating:* Required by the BCS software load. Without BCS gating hardware, the BCS load will experience problems. For example, if BCS 30 requires more memory than a switch currently needs for BCS 27, an upgrade to BCS 30 would require additional memory packs as BCS gating hardware. BCS gating hardware is scheduled by an S Suborder.
- *Feature gating:* Hardware required to support feature functionality. The absence of feature gating hardware does not affect the BCS load, but the specific software feature will not work.

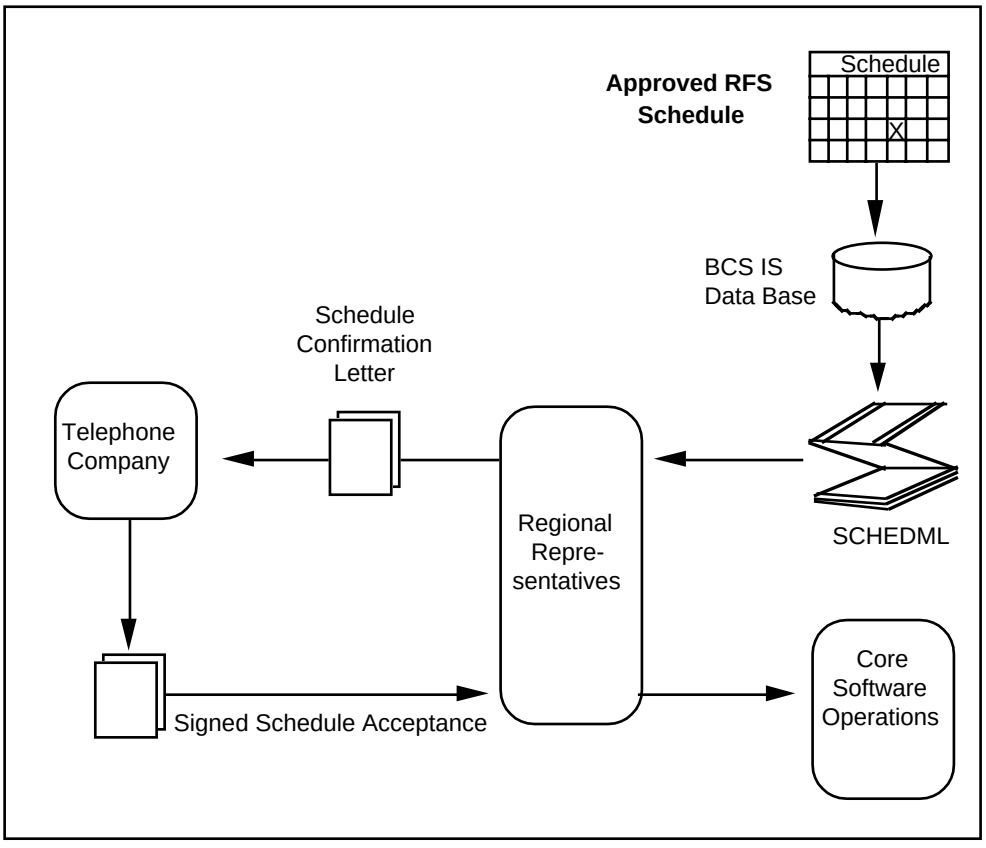
All BCS gating hardware must be ordered (either on an S Suborder or customer provided), shipped, and installed 12.5 days prior to the application date for the new software. This allows for sufficient hardware testing prior to the application and a sufficient interval to verify new hardware reliability.

Telco schedule acceptance

Once the software delivery dates have been confirmed through SCHEDML, the Regional Customer Service representative notifies the telephone company of the schedule, usually by telephone. After a verbal acceptance of the scheduled dates, the regional representative sends to the telco a confirmation letter identifying the dates and the scheduled sequence of events. This letter is sent at 7 to 4 weeks before the scheduled insertion date, depending upon the nature of the order.

As a final acceptance, the authorized telco representative signs the schedule and returns it to NTI. This ensures that both NTI and the telco have an agreed-upon schedule in writing. The following figure shows the process of sending scheduled software delivery dates to the telephone company for acceptance.

Figure 1-4 Software Delivery Schedule Acceptance



Engineering

The telco information required to build the software load is called customer input (CI). The CI is provided through Electronic 8630 questionnaire or through an on-line computerized questionnaire, NT-ACCESS.

Systems application engineering (SAE) ensures that the in-service DMS switch has been adequately provisioned for the requirements of the ordered feature packages. Using the office information collected from the customer, along with established NTI engineering rules and guidelines, the engineer prepares the office for the new BCS load.

The RFS identifies the DCI date (delivery of the CI) when the CI process must be complete and delivered to various NTI groups. The typical interval between CI and DCI is two weeks, depending upon the complexity of the job.

Memory provisioning

Using the Memcalc engineering software tool, the SAE calculates the DMS memory needed to accommodate a new software load. Memcalc calculates the program store (PS) and data store (DS) requirements for an office. An administrative 10 percent memory spare is included in the NT40 memory provisioning process. This memory spare accounts for Memcalc accuracy (+ or - 5 %), BCS dump and restore tools, and normal service order activity. A reliability spare is provisioned for the DMS SuperNode.

BCS Polling

Each office scheduled for a new BCS load is polled at approximately 7 weeks prior to the software delivery date. The BCS Polling group first contacts the customer to request permission to poll the office, and then dials into the switch to begin the session. Memory usage and correct BCS levels are verified on the switch. The results of the seven week polling session are submitted to the NTI RTPPOLL database. This information is used by various software production and delivery groups who build and deliver the new software loads.

Order changes

Telco changes to the software order must be included in an authorization letter to NTI detailing the change. In general, the customer is allowed to make changes to the software order until the Automail is returned 25 working days prior to dump and restore or application date. However, as changes are made closer to the actual building of the load, the delivery schedule may be impacted to accommodate processing the change order.

Gating hardware soak rule

All BCS gating hardware must be installed 12.5 days before the scheduled software upgrade (APP date). These 12.5 days are called the "soak period" during which the hardware is monitored for stability. Any hardware that becomes defective within the soak period is replaced and must operate a minimum of 72 hours without a fault prior to the software application. If there is insufficient time to allow for a 72 hour period (e.g., the fault occurred 24 hours before the application), the software job is re-scheduled by NTI.

The 12.5 day soak rule decreases the likelihood that the software upgrade will be impacted or unsuccessful due to faulty or unstable hardware in the office.

Pre-production activities

Pre-production activities are tasks performed immediately prior to building or producing the new software load. The following activities are required:

- Confirm the purchase order.
- Verify the job feature database (JFDB).
- Complete the BCS Checklist.
- Set the production flag for loadbuild.

In addition to the activities listed above which relate to producing the load, the following software delivery activities occur during the same time frame:

- Ship preliminary tapes and documents to site.
- Perform patching activities (I - 7 to - 2 weeks).

Preliminary tape and document shipment

Preliminary tapes and documents are shipped from NTI at approximately 35 days before the scheduled insertion date. The following items are included:

- Feature Description Manual
- Software Delivery MOP
- Peripheral Software Release Documents (regular PM [peripheral module] and XPM [extended multi-processor system based peripheral module])
- NPM (new peripheral module) software load tape
- XPM patch tape
- BCS tools tapes
- Blank tapes
- Software Transmittal Listings (hardcopy inventory listing of shipment, quantity of tapes and documents)

DMSE process

All DMS, PM, and Customer Non-Res software will be shipped on SLMII tape.

Preliminary tape and documentation shipments include:

- 1 SLMII tape containing all Series I & II peripheral loads supported by the ordered PCL

- 1 SLMII tape containing all Series III and various peripheral loads supported by the ordered PCL
- 1 XPM Patch tape
- 2 New blank scratch SLMII tapes
- 1 Feature Description Manual
- 1 Traffic and Maintenance Synopsis
- 1 Application MOP (Method of Procedure) specific to the scheduled application type

Patching activities (I - 7 to - 2 weeks)

Patches are software rewrites to existing software loads. Patches change only a small portion of a software package or piece of data in the switch as opposed to a software upgrade which changes all the system software. Two types of patches exist: CC patches are written for software in the central control; XPM patches are written for the software in the XPMs.

An XPM Patch tape is included in the preliminary tape and documentation shipment. Loading the new PM and XPM software loads and patching the new XPM software loads should be completed by the telco before the pre-application procedure (typically 10 days before the software application). Any additional XPM patches that are issued prior to the software upgrade but are not included on the patch tape will be downloaded into the DMS switch at various intervals before the upgrade.

Normally, a DMS office site is scheduled for patch downloading every 28 or 14 days, depending on the BCS level in the office. If the office is scheduled to receive a new software load, it is taken off the patch downloader queue 21 days before the software upgrade.

At 15 days prior to the scheduled software application, a patch propagation report is generated of all patches currently in the office that must be carried over to the new software load. Normally patches are temporary measures that are used until a more permanent fix is made in a higher BCS load; however, some issues require that the patches be carried over to a higher BCS. The patch propagation report identifies the patches carried over to the new software load based on the ordered software packages.

Producing the software load

Loadbuild

Loadbuild is a series of procedures that merge base level software (general software packages common to all offices) with optionally ordered features into a customized undatafilled software load.

The BCS loadbuild process has many steps that require activities on several different platforms. When a BCS Software Release is released for

production (RTM), NT assembles custom software loads for each scheduled software application. The custom content for each load to be built is stored in the JFDB (Job Feature Database). An office parameter template is then created for the subject office. This is made available to the Regional SSE (Software Systems Engineer). Local practices for completing the parameter template apply. (As an example, the Regional Engineer may fax a copy of the Parameter template to the appropriate department within a telco.) The specifics of the Parmmail process are described later.

When the parameters are returned from the Region, the loadbuild process is initiated. At I-12 the actual building of the customer software UDF (undafilled image) begins. Most of the assembly process resides on an HP workstation equipped with HPSOS which allows the workstation to run DMS SuperNode software. An IBM mainframe may also be utilized to perform the loadbuild. Briefly, the software loadbuild function consistes of the following:

- generation of an office feature package list (AUTOBILD)
- the execution of GENSC, GENPARM, and WSIMAGE
- determination of software base type for office
- generation of software configuration files
- sending files to the patch administration group for processing
- generation of D190 Reports
- generation of office parameter files to be applied (GENPARM)

The software configuration is generated and patches are calculated for that configuration. Based on job information in the database, the computer generates a list of all NTX codes for the software order. It then creates a file containing a list of the software modules corresponding to the feature packages ordered by the telco.

DMSE process

The Software Production process has changed completely for DMS Evolution. There is no longer the concept of NT "loadbuild" after BCS36. BNR will assemble and maintain in a Software Vault the PCLs (Product CM Loads), PM loads, PM Release Documents, MS loads, and Inform Lists for each defined PCL. BNR will patch the PCL and MS loads regularly.

With DMS Evolution software loads will not be custom-built. PCLs will be offered based on product and market. For example, initially available in the US LEC market are PCLs for US 100/200 offices, TOPS , 100/200/TOPS combos, and STP. PCLs offer the advantages of eliminating packaging issues.

NT Software Production will be characterized by a Software Distribution Center (SDC). When prompted by the schedule, the SDC clones the required tapes, and spools the required documentation to be printed. A Patcher/PRSM Inform Listing is provided with the PCL and MS images to identify the patches applied to the loads. The Inform is transferred to PATADM (later WISURD) to be processed for that unique order.

The Software Delivery department will perform scheduled functions as usual when prompted by output from the SDC. Because software loads are no longer custom-built, the processes that "customize" the load, such as setting the log message, the site-identifying patches in the inform, and application of parameter values, must be done later in the delivery process. These procedures have been transferred from the loadbuild process to the ONP application.

Patching activities

The appropriate CC (central control) patches are extracted from the patch database based on the software packages ordered. A tape of those patches is produced and loaded on the captive switch for patching the undatafilled software load.

During the automated loadbuild procedure, a copy of the inform list (list of software packages and patches) is sent to the Patch Administration group. Any patches that could not be applied are recorded on a Patch Exception Report and sent to Patch Administration for resolution prior to the software application.

Software parameters

Software parameters (parms) are identified in four software tables that the system software uses in normal switch operation:

- Table OFCENG (office engineering)
- Table OFCSTD (office standards)
- Table OFCOPT (office options)
- Table OFCVAR (office variables)

Thirty-five days prior to the software delivery, BCS Polling determines the current software parameters. These parameters are sent to the region via PARMmail, an electronic communication with the regional software system engineer (SSE). The SSE indicates any required changes to the parameters based on customer requests and data captured in the CI document.

Requests for parm changes received by NTI after the due date are processed on an emergency basis only. The request for change must come through the regional SSE manager by phone with a follow-up COCOS to a Dump and Restore manager (conventional and hybrid) or to a BCS Applications

manager (ONP). The appropriate manager determines if the change can be made without risk of service degradation. If the request is denied, the software delivery job is rescheduled to accommodate the parameter change later.

For more information on Office Parameters, refer to the *Office Parameters Reference Manual*, NTP 297-1001-455.

Software delivery

In order to plan adequately for a BCS upgrade, the telephone company must be aware of the various delivery processes. Currently, three methods exist for software delivery, depending upon office size, BCS level, and special requests. The method used for an upgrade is determined by Northern Telecom. The software delivery methods are identified below:

- **One Night Process (ONP):** Software delivery method for smaller office upgrades to BCS 29 and higher which uses MOVEBCS or TABXFR (dump and restore function) and BCSUPDATE (application function) during one night.
- **Two Night Process (2NP):** Identical to ONP except for larger offices the process is interrupted at the end of the data transfer to allow continuation on the following night. This requires one day of restricted data changes with journal file.
- **Hybrid (and Conventional):** For upgrading larger offices to BCS 29 and higher, the Hybrid method includes merging the office-specific data into the new undatafilled software load (conventional dump and restore), and installing the new datafilled software on the night of the application. A frozen data interval with journal files is required to allow NTI to perform the dump and restore process and ship tapes to the telco. The primary difference between the Hybrid and Conventional methods is the software tools used for the application.

These processes have many common elements identified below. Differences are indicated as they occur in the timeline of events. Figure 1-5 depicts the timeline similarities and differences among the delivery methods.

Patching activities

At I - 15 days, NTI Patch Administration performs an XPM audit on the customer switch to determine the readiness of the office to receive the new BCS software load relative to the XPMs loads and XPM patches. Any required XPM patches are downloaded into the switch at this time. At I - 14 days, the patches to be propagated into the new load are identified.

> ***Note:*** For Hybrid and Conventional methods, patches released since the load was built are applied to the new load when the data is moved at I - 7 days.

At I - 1 day, a final XPM audit is conducted to verify that the XPMs are loaded with the correct loads and have been patched. Any additional XPM patches are downloaded at this time.

On the day of application, the final patch audit is conducted, resulting in an APF report (list of downloaded patches). The application engineer applies the downloaded patches as part of the upgrade process.

Figure 1-5 Software Delivery Procedures

Procedure	ONP	Hybrid	Conventional
CI completed	- 16 W	- 16 W	- 16 W
BCS polling	- 7 W	- 7 W	- 8 W
Preliminary shipment of tapes and documentation	- 5 W	- 5 W	- 5 W
Parmmail sent	-28 calendar days	- 35 calendar days	-35 calendar days
Parmmail due	-17 calendar days	-24 calendar days	-24 calendar days
Load build completed	- 8 calendar days	- 15 calendar days	- 15 calendar days
Preliminary XPM Audit	- 15 D	- 15 D	- 15 D
Patch propagations identified	- 14 D	- 14 D	- 14 D
Pre-application process	- 12 D	- 12 D	- 12 D
Telco sends system image to NTI and prepares journal files	-----	- 10 D to - 8 D	- 10 D to - 8 D
Telco sends test image to NTI	- 10 D	-----	-----
Data transfer from old BCS to new BCS	0 MOVEBCS	- 7 D MOVEBCS >32 Dump/restore <31	- 7 D Dump/restore <28
Final office review	- 5 D to - 3 D	- 5 D to - 3 D	- 5 D to - 3 D
Final shipment of tapes and documents	- 3 D to - 1 D	- 3 D to - 1 D	- 3 D to - 1 D
Additional patches downloaded	- 1 D	- 1 D	- 1 D
Final patch audit	0	0	0
Application of new BCS load into telco switch	0 BCSUPDATE	0 BCSUPDATE	0 AutoApply 25-28 Manual <24
Monitor	+ 1 D	+ 1 D	+ 1 D

Pre-application engineering

At I - 10 days a pre-application engineer performs a series of verbal and automated pre-application office checks to ensure that an office is ready for a software upgrade. Through the pre-application procedure, various problems and issues which may prevent or impact the upgrade are identified and resolved. Unresolved problems are handed to the NTI region for resolution.

The automated checks consist of programs run on the switch to perform the following activities:

- Check DMS front-end memory.
- Verify front-end stability.
- Load program files and modules required for the ONP.
- Check office data and tables.
- Verify correct gating hardware and front-end cards for the new load.
- Negotiate a start time for the insertion.
- Review office site tasks and responsibilities.

At I - 2 days the final office review is conducted by the pre-application engineer. All issues and problems identified at the 10-day precheck must be resolved by the final office review.

Table checks

Typical prechecks also include translation table integrity checking (TABAUDIT). Because RTP performs test ONPs to verify data transfer, TABAUDIT is optional, but recommended, for RTP supported offices.

DMSE process

The pre-application process is not BCS (PCL) dependent, therefore DMSE will not require any changes to the current Pre-Application process. An automated tool to perform the pre-application checks is planned for the near future and is a tool that will be run by the customer on the customer's switch.

Moving data

The ONP software delivery can be divided into two major phases:

- data transfer (MOVEBCS or TABXFR)
- BCSUPDATE

This process involves moving the office-specific data from the old BCS load to the new load. The procedures vary depending upon the software delivery method used. With an ONP method the data transfer takes place on the night of the scheduled application. With the Hybrid method, this is done in advance at an NTI facility.

The loadmate procedure consists of loading the new undatafilled BCS image from magnetic tape into the DMS front-end mate (inactive) side. If the office is a SuperNode with a system load module (SLM) drive, the new datafilled or undatafilled BCS image arrives at the office on an SLM tape cartridge.

During the data transfer phase, office data from the old BCS load is used to datafill the new undatafilled BCS load. In the Hybrid (and Conventional) method this procedure is performed using the dump and restore procedures at approximately 7 to 10 days prior to the software application. Using the ONP method, it is performed the night of the delivery. MOVEBCS is used for upgrades to BCS 35 or TABXFR is used for upgrades from BCS35 and higher.

Applying the load

The BCSUPDATE phase controls the activation of the datafilled software load in the DMS switch.

This process involves installing the new BCS load, complete with office data, in the customer's switch. With the DMS in simplex (no sync), the new datafilled load is loaded on the inactive side of the switch. The application engineer then applies any required patches; applies journal file data (Hybrid and Conventional methods); compares tables and hardware states on both sides, makes requested parm changes (Hybrid and Conventional methods); and verifies that billing volumes are in the proper state for activation. The engineer then switches activity from the old BCS to the new.

The application of the load always occurs during low-traffic night hours for in-service switches.

Software applications with *DMSE*

The ONP application process is virtually the same with DMSE as it was for BCS. The same tools (TABXFR, PRESWACT, NORESTARTSWACT, and POSTSWACT) are used. Two procedures have been added to the ONP due to the changes in the Software Production process. These two procedures are required for: 1) installing site-identifying patches in the administration section of the Patcher/PRSM Inform List, and 2) the process for installing office parameter values.

The site-identifying patches are installed in the administration section of the Patcher/PRSM Inform List to identify the Inform List to PATADM (and later to WISURD). These patches are commonly referred to as "dummy patches" since they contain no data, merely a blank line. Their purpose is to install the name in the listing. The three patches are: the site CLLI, the PATADM SITE_KEY (for identification of that unique load to PATADM), and the SOLID LOAD_ID. The SOLID LOAD_ID is unique to that office upgrade. WISURD will use the SOLID LOAD_ID for identification. The SITEINFO file will be created by PATADM when it receives the BBIF created at the

time the Office Parameter Template is generated. After receiving the BBIF, PATADM assigns a SITE_KEY for that load. A simple exec is created that creates, installs, and erases all three patches.

The sequence of the ONP for DMSE is as follows:

(1) Drop synchronization in the switch.

(2) Loadmate the PCL image into the inactive CM. It is assumed that the correct MS load was loaded ahead-of-time according to the MOP. After the undatafilled PCL is installed on the inactive CM, the Applicator logs in on the inactive side and sets the date and time. The Header message identifying the software load is customized to include the COEO, the Office Name, and application date. The file SITEINFO is downloaded and read on the inactive load. When SITEINFO is read the Site CLLI, PATADM SITE_KEY, and SOLID LOAD_ID are patched into Patcher or PRSM (whichever is the applicable patch management utility).

(3) The switch translations are transferred to the undatafilled PCL on the inactive CM via the TABXFR tool. Tuple reformats are achieved on the new (inactive) side through table control. Prior to transfer of table data, SOC state information and status will be transferred to the new side. All previously ON options will be set ON. Options that are IDLE will remain IDLE. Office parameters will be set during the TABXFR process.

At RTP Office Parameters are currently applied to the undatafilled image during loadbuild. In DMSE PCLs will be cloned and shipped to site without being customized. This requires that RTP change its process for setting office parameters. The DMSE process will directly deposit a file in DMO format containing only changed, reformatted, or new office parameter values for the switch to be upgraded into a file known as the Applicator Package. The Applicator Package is part of the Applicator UNIX Workstation Tools. It contains files specific to a particular site upgrade. The parameter file will be downloaded to SFDEV on the target switch the night of the ONP and named FEATDATA. The Applicator will transfer the values present in the current load to the new DMSE load. The TABXFR process will then read the FEATDATA file in SFDEV to apply the changes, thus setting the office parameters to the approved values.

The Applicator will perform a delta between the old and new loads to verify parameters.

(4) After the inactive side is datafilled (via TABXFR) PRESWACT is run. PRESWACT is an increment of the BCSUPDATE utility. PRESWACT automates the collection of hardware states on the active, the setting of hardware states on the inactive, and the transfer of dynamic table data; then prepares for a switch of activity (swact) to the inactive new software load.

(5) SWACT is the increment of BCSUPDATE that verifies PRESWACT has been successfully completed. It then switches activity (swact) using NORESTARTSWACT (introduced in BCS36). NORESTARTSWACT will be the standard for all DMS 100, 200 and TOPS offices swacting from BCS36. NORESTARTSWACT provides vast improvements on the scheduled outage experienced over SW upgrades in the past. Office recovery is reduced to seconds rather than minutes.

(6) POSTSWACT is a clean-up phase of BCSUPDATE where conditions that were changed during the ONP specifically for purpose of the ONP are set back to their original status. It is during this phase that the craftsperson is performing test calls to validate the new software load.

(7) If the test calls are successfully completed and no service degradation is ensuing, the customer agrees to accept the new software load and the switch will be put back into synchronous operation.

Impact of a software upgrade

In order to plan successfully for a software upgrade, the telephone company must be aware of the impact the upgrade will have on the existing condition of the office and its daily operations. This section describes the impact on various areas. Most of the information is the same for any upgrade, regardless of the delivery method. When differences occur, however, the impact segment is subdivided according to the delivery methods identified below:

- One Night Process (ONP): Delivery method for smaller office upgrades to BCS 29 and higher which uses MOVEBCS (dump and restore function) and BCSUPDATE (application function) during one night.
- Hybrid: Delivery method for larger office upgrades to BCS 29 and higher which uses conventional dump and restore (BCS 29-31) or MOVEBCS (BCS 32 and higher) 7 days prior, and the BCSUPDATE application procedure.
- Conventional: Delivery method for upgrades through BCS 28 which uses conventional dump and restore procedure 7 days prior, and manual application (through BCS 24) or AutoApply application (BCS 25-28).

The following telco areas may be affected by an upgrade. When the impact differs according to the delivery method, the differences are indicated.

- hardware impact
- software impact

  - ONP

  - Hybrid and Conventional
- operational impact
- service impact
- network impact
- work force impact

  - ONP

  - Hybrid and Conventional

Hardware impact

Hardware impact refers to the existing hardware in the DMS switch and any additional hardware that might be needed in order to upgrade the office to a new software load. It also includes any hardware tests that are part of the software delivery process.

Identifying gating hardware

BCS required hardware includes any hardware required in the DMS office prior to the software delivery date. Two types of BCS required hardware include:

- *BCS gating:* Required by the BCS software load. Without BCS gating hardware, the BCS load will experience problems. For example, if BCS 30 requires more memory than a switch currently needs for BCS 27, an upgrade to BCS 30 would require additional memory packs as BCS gating hardware. BCS gating hardware is scheduled by an S Suborder.
- *Feature gating:* Required by an ordered feature package within the software load. The absence of feature gating hardware does not affect the success of the BCS load, but the specific software feature will not work. For example, the BCS 27 office in the example above may have ample memory for the BCS 30 upgrade, until they decide to order a BCS 30 feature package that requires additional memory. In this case, the additional memory packs required are considered feature gating hardware. Feature gating hardware is scheduled by the base order.

Each telephone company receives a customized software load consisting of the ordered feature packages; therefore, the feature package content for one office may differ from that of another office with the same software load level (e.g., BCS 28). Gating hardware requirements may also vary from office to office, depending upon the features ordered.

The regional NTI Systems Application Engineer (SAE) determines if additional hardware is needed to upgrade the software. This engineer examines the feature packages ordered, existing memory usage, and requirements, as well as the new BCS level.

Installing gating hardware

If gating hardware is required for the software order, NTI installation personnel will be on-site prior to the software application to install it (unless the hardware is installed by the telephone company).

All gating hardware must be installed 12.5 days before the scheduled insertion date. These 12.5 days are called the "soak period" during which the hardware is monitored for stability. Any hardware that becomes defective within the 12.5 day soak period must be replaced and must operate a minimum of 72 hours without a fault prior to the software application. If the

time remaining before the application is insufficient to allow for a 72 hour period (e.g., the fault occurred 24 hours before the application), the software job may be re-scheduled by Northern Telecom. In addition, if more than one hardware pack becomes defective within the 12.5 day period, the software job is re-scheduled.

These rules decrease the likelihood that the software upgrade will be impacted due to faulty or unstable hardware in the office. Telephone companies should direct any question or deviation from these rules to their NTI regional customer support representative.

Memory considerations

When engineering the memory needed for a software order, an additional 10 percent administrative memory spare is required for the NT40 data store (DS). Through BCS 27, the NTI regional software application engineer manually provisions the additional 10 percent memory. In BCS 28 and higher, the 10 percent spare is automatically calculated in the MEMCALC procedure.

In some DMS offices with the NT40 front-end, the maximum expandable memory range for data store has already been reached. For software orders in which a 10 percent administrative memory spare cannot be provisioned because of memory exhaustion, the following actions are taken:

- The telephone company is notified of the memory restraint condition.
- The telephone office is polled by NTI to obtain the actual switch software parameters. Using actual parameters to recalculate memory requirements provides a more exact calculation of the memory needs.

The subsequent actions that may be taken to alleviate the memory restraint issue include the following:

- Review software parameters and feature package content with the intent of reducing memory requirements. Then change software parameters that impact memory, or remove specified feature packages from the order.
- Consider converting from NT40 to SuperNode. The DMS SuperNode has different memory rules that allow for increased memory over the NT40.

Northern Telecom has established memory engineering rules for dealing with memory restricted offices. When the established memory engineering rules do not provide memory relief for data store restricted offices, an NTI Memory Restricted Escalation procedure exists to continue with the software order.

Restrictions on hardware changes

All memory, network and peripheral module (PM) extensions/re-grades must be complete prior to making the system image tape and 12.5 days before the scheduled software application date. No hardware change activities are supported after either event because the lack of associated software may result in service degradation during the upgrade. Any hardware change activity should be planned to complete prior to the software upgrade interval or to occur after the DMS switch has upgraded to the new software load.

Switch maintenance

Normal switch maintenance is the responsibility of the telephone company. No system faults should exist for an office planning a software upgrade. Unresolved hardware faults can complicate and possibly prevent a successful BCS application.

Additional hardware testing

Additional front-end hardware testing is performed on the DMS switch as part of the site preparation procedures in NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*. This testing detects faults in a DMS switch which might prevent a successful software application. The following required tests are performed by the telephone company prior to the software delivery:

- Memory retention test
- CC rex test
- CC stability test

Memory retentions tests

Memory retention testing identifies defective program store (NT40) memory cards. (The NT40 memory cards for data store are tested in the CC rex test.) In the SuperNode, all memory cards are tested since data store and program store are not separated. Defective card(s) should be replaced and the test re-run.

CC Rex tests

The CC rex test is the Central Control Routine EXercise test for the front-end hardware cards. The CC sync and activity states change during the rex test. The switch should be in sync when the test is started and out of sync during the test. If the rex test is executed successfully, the CCs are placed in sync.

The CC rex test involves a memory retention test of the data store memory. The CC rex test verifies the ability of the DMS to perform the following tasks:

- accept and drop activity
- activate and deactivate spare blocks of memory

- store data without error on a long-term basis
- detect mismatches

For the CC rex test, the following conditions should be present:

- DMS switch should be in sync when the "REXTST RETENTION" command is entered in order to run a full rex test. An out of sync switch at the time of the rex test command results in a partial test.
- Rex testing should not occur if an image tape is being made.
- The rex test should be run with the "retention" parameter so that the retention tests will be run.
- The rex test should be run during low traffic periods since sync is dropped during the testing procedure.

  Note: Some DMS commands will not run while the rex tests are running. A system response of "No action taken; Mate CC under test" may be output to some system commands.

CC stability tests

CC stability involves testing the stability of the central processing units (CPU). This is accomplished by dropping sync on the switch and performing warm, cold, and reload restarts on the inactive side. On an NT40 front-end, this test procedure includes microcode tests. On a SuperNode, the procedure includes Message Switch tests.

Checking DMS logs

The DMS switch logs should be checked for problem log messages starting at approximately 30 days prior to the software application. If the CC (central control) log and MISM (mismatch) log are present in an NT40, they should be examined daily to ensure there are no hardware problems on either of the CCs.

Problem messages found in any of the systems logs should be noted for their type and frequency. Any problems should be fixed prior to the night of the application. Failure to do so could result in an abort or re-schedule of the job. For more information on logs, see NTP 297-1001-510, the Log Report manual.

Additional Requirements

Tape drive

An operational tape drive is required in the telco to perform the following tasks:

All delivery methods

- Load PMs and XPMs with new software loads from tape (included in the preliminary tape and documentation shipment).
- Patch the new XPM loads with patches from the XPM patch tape (included in the preliminary tape and documentation shipment).
- Load the new software load (included in the final tape and documentation shipment) into the DMS switch on the night of the software application

  Note: The Peripheral Software Release Document for the new BCS provides procedures for loading the PM and XPMs with the new loads. This document is included with the preliminary tape and documentation at approximately 35 days before the upgrade.

DMSE process

Peripheral loads will be shipped on SLMII tapes. Any customer switches not equipped with SLMII hardware will need to upgrade prior to installing DMSE PM loads. A new "fast-list" feature is available on SLMII as of DMSE (has been patched back to BCS 35 and 36, offices at BCS34 will receive 9-track tapes). The fast-list feature is similar to the tape directory facility (TLIST) for 9-track tape.

Operational dial-ups in input/output controllers (IOCs)

Two operational dial-ups are required for the DMS switch. The dial-ups should be foreign exchange lines into IOC 0 and IOC 1. If the dial-ups are noisy, a backup dial-up line may be needed. Operational dial-ups allow access to the switch for the following purposes:

- polling to obtain memory "in use" and "total" counts, and inform lists
- BCS pre-application office check
- BCS software application

Foreign exchange voice lines

Two voice foreign exchange lines to the office should be equipped for communications between telco personnel, the BCS pre-application engineer, and the BCS application engineer during the software delivery process.

Logic pack combination

Some DMS switches with NT40 front-ends may have a mixture of slow and fast logic packs in the CPUs. This incorrect mixture can cause transient mismatch log messages or drop sync problems. As part of the BCS Pre-application procedure, a check is made to verify that a mixture of slow and fast logic packs does not exist in the office. The following three CPU packs are affected:

- NT1X44BB (Stack Card): Contains the high-speed store, a memory area used for frequently used data which contributes to the fast execution

speed of the CPU. For BCS 25, the NT1X44BB/BD is required on both sides to increase the RAM size from 1K bit words to 4K bit words.

- Slow logic: Releases below 59 and 5C
- Fast logic: Releases 59, 60-63 and higher

- NT1X45BB (Arithmetic and Logic Function): Provides all the arithmetic and logic functions necessary for data manipulation.
  - Slow logic: Releases 1K, 1L, and all releases below 1H
  - Fast logic: Releases 1H, 1J, 1M and higher
- NT1X47BB (Timing and Control): Provides CPU timing through controlling register gating and clocking, emergency timers, and interrupt logic.
  - Slow logic: Releases below 19
  - Fast logic: Releases 19 and higher

Any office site identified as having these packs with both fast and slow logic should contact the NTI regional customer support group. All packs currently shipped are fast logic.

Distributed processing peripheral modification

Offices equipped with the distributed processing peripheral (DPP) use it as the primary automatic message accounting (AMA) collection device (or parallel). Some BCS upgrades may require a modification to the DPP so that it will operate on the new software load.

Normally, if the DPP modification is needed, NTI installation performs the hardware modification according to an NTI Change Application Procedure. The DPP to be modified has each processor off-line during the procedure. Due to the DPP redundancy capability, the DMS input of data to the DPP disk is not affected. Precautionary measures are included to minimize the risk of data loss.

Note: Deferred AMA will be turned off prior to modifying the DPP, and will not work after this modification until the new load is applied.

The telco is responsible for loading the new DPP software. The DPP software arrives in the preliminary tape and document shipment, approximately thirty-five days before the switch software upgrade. Instructions for loading the software are included in the Peripheral Software Release Document.

Software impact (ONP method only)

The ONP software delivery provides only limited impact to existing DMS switch software, if any. This minimal impact is due to the elimination of the office data freeze requirement.

Dump and Restore test ONP

At I-10 days the customer is requested to ship an office image to the RTP Dump and Restore department. The dump and restore engineer uses the customer office image and the newly built UDF image received from Loadbuild to perform a test ONP. The test ONP is run on an HP workstation. The test ONP simulates the upcoming application, from drop-sync to the end of the table transfer (MOVEBCS or TABXFR). The Custom Calling Table transfer procedures in PRESWACT are also run. Any required Software Delivery Bulletins are performed. The testing objective is to find any issues with table data transfer. Datafill issues can be time consuming to resolve during the actual application. Any issues found are resolved, and any workarounds or information uncovered that will make the application go smoother are formatted into a report and sent to the Applicator Package for that application.

Service impact

Service impact refers to the switch activities that impact customer service during the software delivery process.

Call processing

During the application phase of the software delivery process, call processing is briefly suspended during the SWitch of ACTivity (SWACT) from the old software load to the new software load. Since AMA recording also does not occur for 2 to 3 minutes after the SWACT, the switch of activity is performed in the early hours of the morning, typically a low traffic period.

All 2-port stable calls (those calls already connected through the switch) are kept up, but three-port calls are dropped. The number of calls kept up can be determined by observing the PSVD (preserved) field in the CPSYS maintenance administration position (MAP) level. Call processing for new call originations ceases at the start of the SWACT and begins again 2 to 3 minutes after SWACT.

Custom calling features

All custom calling table changes which may be altered by residential and business subscribers (e.g., speed calling, remote call forwarding, and call forwarding) are carried over to the new software load. Subscribers may make valid custom calling changes up to the time when the new software load is activated. The custom calling feature lists are the same as on the old BCS load. No restrictions are imposed on business and residential customers

to make changes with these features up to the point of activating the new software load.

Hardware states

The new software load maintains the hardware status from the old load. Affected hardware includes peripheral modules (PMs), signaling terminals (ST), interperipheral message link (IPML), carrier, network, link and junctor, input/output controller, console, magnetic tape drive, and disk drive units. Hardware units in the manual busy (MANB) state or system busy (SYSB) state are returned to service (RTS) or off-line (OFFL) by the applicator before SWACT to the new software load. Hardware status discrepancies are checked between the old and new software loads.

Trunk states

Trunk states on the old software load are carried over to the new software load. Installation busy (INB), make busy (MB), and restricted idle (RES) trunks are restored to the same states on the new software load. A trunk in the lock-out state on the old software load may be in an idle state until a trunk audit is run which puts the trunk in a lock-out state on the new load.

Operational impact

Operational impact refers to the operating modes necessary for a software upgrade that normally are not encountered during day-to-day switch operation. Primarily, this is the time interval when the DMS switch is out-of-sync (simplex mode) to accommodate software delivery procedures and tests.

Administrative activities

The telco should notify the following operational, administrative, and maintenance centers connected to the DMS of an upcoming software upgrade:

- repair service bureaus
- operator services
- engineering and administrative data acquisition system
- billing collection center
- switching control center
- other support and special service centers

Approximately four weeks before the software upgrade, offices with centralized automatic message accounting (CAMA) or local automatic message accounting (LAMA) should arrange with the site billing center for the AMA validation test.

Before SWACT (SWitch of ACTivity) during ONP, the billing DIRP (device independent recording package) subsystem is rotated. Files are copied to tape or another disk volume, depending upon whether the recording device is disk, tape, billing media converter (BMC) or distributed processing peripheral (DPP). Offices with DPP or BMC that are actively collecting data should arrange for the billing collection center to poll the billing records prior to SWACT.

Automatic message accounting (AMA) verification test calls are performed by telco personnel on the night of the software upgrade after the SWACT has occurred. Using AMADUMP (resident in the software load), hardcopies of the AMA records are printed and compared for each verification test call. These test calls verify that all aspects of the AMA feature are operating properly. For details on the AMADUMP program, see NTP 297-1001-119.

Call testing

Approximately thirty-five days before the software delivery, the preliminary tape and documentation arrives at the telco. The documentation includes test call scripts that should be followed prior to the upgrade. Verifying call performance on the old side provides a delta for comparison when the same call tests are performed on the new load prior to syncing the switch.

Pre-application testing

Six days prior to the software application, telco personnel are instructed to perform memory retention tests in both CPUs. (For detailed procedures, refer to NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*.) This test requires that the switch is out-of-sync (simplex mode) for approximately 20 minutes, possibly longer in larger offices. Due to the nature of these tests, NTI recommends their performance during low traffic periods.

Five days prior to the software application, customer site personnel test the CC hardware cards (CC rex test). These tests require that the office drop sync (simplex mode) for approximately 10 minutes. Telco personnel also test the stability of the switch. The CC is out of sync during the CC stability tests, including warm, cold, and reload restarts, and the microcode test on the inactive CPU. Due to the nature of these tests, NTI recommends their performance during low traffic periods in the office.

Out-of-sync summary

This chart lists the times the office will be out-of-sync to accommodate the various activities required for a hybrid or conventional software upgrade.

ACTIVITY	WHEN	SWITCH IMPACT
Memory Retention Tests	I - 6 days	Out of sync approximately 45 minutes
CC REX Tests	I - 5 days	Out of sync approximately 10 minutes
CC Stability Tests	I - 5 days	Out of sync approximately 1 hour
Software application or ONP upgrade	Day of upgrade	Out of sync for 5 to 7 hours

Network impact

When a switch in a switching network is scheduled for a software upgrade, its arrangement and compatibility with other nodes in the network must be examined. Compatibility of the new BCS load with existing software levels in the other nodes is essential. If an incompatibility exists, each node must be upgraded in the proper order to avoid impacting the total network.

For example, in an Operator Centralization (OC) arrangement including both host and remote OCs, the host OC must be upgraded before the remote OC. If a remote OC is being scheduled for a software upgrade, the scheduling analyst must ensure that the host OC receives the upgrade first.

During the scheduling phase, the regional scheduling analyst examines each office to determine if the following network issues exist:

- If office is a TOPS network member, the proper host and remote OC software compatibility requirements must be met.
- If office is a Signal Transfer Point (STP), the STP pair must be scheduled in a comparable timeframe.
- If office is connected to Dynamic Network Controller (DNC), the new BCS level must be compatible with the Network Software Release (NSR) level.
- If office is connected to Voice Service Node (VSN), the new BCS level must be compatible with the VSN release.

- If office is a TOPS host switch, the associated Operator Service Center (OSC) and TOPS Position Controller (TPC) should be at the same BCS level as the host.

In the case of the TOPS host switch identified above, the following example illustrates the impact. Suppose a TOPS switch at BCS 28 is being upgraded to BCS 30 for ISDN services which have no interaction with the TOPS features. Having the TOPS switch and OSC TPC at different software levels can create the potential for service-affecting problems. The CI document has been upgraded to require new configuration information for an OS software extension.

Software upgrades in the OS service network must be completed in the following order:

1) Upgrade OSC TPCs with software compatible with the new BCS load.
2) Upgrade the TOPS host switch software.
3) Upgrade the remote switch software.

Work force impact

Site preparation

Thirty days prior to the conventional software application, Northern Telecom sends a preliminary tape and document shipment. Included in the shipment are the following items which require the telephone company's attention:

- Software transmittal listings (hardcopy inventory listing of shipment, quantity of tapes and documents)
- Feature Description Manual
- Peripheral Software Release Documents
- other applicable documentation
- NPM (new peripheral module) load tapes (2)
- XPM patch tape
- BCS tools tapes

Northern Telecom requests that the customer perform the following tasks prior to the software application (insertion) date:

- Review the appropriate document:

  - NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*

- Check CC logs. Each day for 30 days prior to the software application, the customer site personnel should check the switch logs for stability.
- Load peripheral modules (PMs) and extended multi-processor system based peripherals (XPM), if applicable with new software load. All PMs

should be loaded prior to the pre-application office check, which is performed 10 days before the software application date.

- Test all memory cards six days prior to the software application.
- Perform pre-insertion hardware checks (CC rex tests).
- Verify that dial-ups to switch are operational.
- *ONP method only*. Ten days before the upgrade, send an image tape (not frozen) to Dump and Restore for table testing.
- Verify CC stability by taking the CC out of sync and performing microcode tests, and warm, cold, and reload restarts on the inactive central processing unit (CPU).
- Send logs to tape 24 hours following hardware checks, and store tape at the site location for two weeks.
- Copy all patches in SFDEV to the new Patch tape 12 hours prior to the software application.
- Copy all useful telephone company store files (SFDEV) to tape and erase them from SFDEV. They will not be restored on the new software load.
- Minimize the number of users logged onto the switch to make the software application run faster.

Site personnel required

Pre-application procedure

The pre-application procedure includes both automated and manual checks. Telco personnel are required at the pre-application procedure which includes both automated and manual checks. When the pre-application check is scheduled, the telco representative is identified.

Software delivery

The telco should have personnel scheduled to be on-site the night of the software upgrade to assist NTI in tape loading, dropping sync, and performing verification testing and other activities.

Telco personnel perform call tests once the new software load has been loaded and is running on the DMS switch. They determine whether to accept or reject the new software based on the results of the call tests prior to syncing the switch on new load.

Planning for a software upgrade

Introduction

This section provides advance planning information for telephone companies with DMS switches scheduled for conventional software upgrades. Information is intended to assist telephone company managers, engineers, and planners in preparing for DMS software upgrades. Switch activities before, during, and after the software upgrade are described.

Planning information is provided for the following areas:

- patching
- dump and restore
- pre-application procedure
- software application (performed by NTI or telephone company)
- post-application activities

Software delivery methods

For conventional software upgrades, the telco has the choice of installing the new software load or having NTI install it through remote dial-ups. Both software delivery options use the same processes to install the software load.

The major difference between the two options is the performance of the pre-application and software application procedures. In a telco-administered upgrade, the telephone company performs both the pre-application procedure and the software application. In an NTI-administered upgrade, a BCS Pre-Application Engineer performs the pre-application procedure and a BCS Application Engineer performs the software application.

The most commonly-used delivery method at this time is NTI-administered; however, interest in telco-administered software upgrades is growing. Both procedures are identified below. In the rest of this section, however, the NTI-administered method is assumed. Differences that would occur in the telco-administered method are indicated within the section.

Telco-administered software upgrades

For telco-administered applications, the scheduling, provisioning, and production phases of software delivery remain primarily the same as the NTI-administered software applications.

Technical support is provided by NTI during the pre-check and application phases of the job. A hotline number available to the telephone company is answered by the same NTI personnel who perform software applications. Refer to NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*, for NTI contacts and telephone numbers for technical support.

Scheduling requirements

When the telephone company places an order for new software, they should decide who will apply the software. No matter who performs the upgrade, NTI schedules the application of the new software load. If the upgrade is NTI-administered, application time slots are reserved on the schedule; however, for a telco-administered upgrade, an application time slot is not reserved.

Documentation requirements

Telephone companies must use NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*, to perform the BCS pre-application and application procedures.

The NTI Software Delivery Bulletin System, available on C-SCAN, was designed to provide information to various user groups (both NTI and telco) concerning changes, alerts, additional information related to software delivery that may not yet be released or published in an NTP or other documentation. The telephone company should access the bulletin system to review any bulletins that impact the pre-application or application processes.

Training and certification requirements

Before the telephone company begins application of software loads, telephone company personnel must be certified by NTI. This process involves training on the software pre-application and application procedures for the DMS switch. The certification process involves the following activities for telephone company personnel:

- observing the software application process as NTI software application engineers apply software loads to in-service DMS switches
- participating in a software application training seminar conducted by NTI
- performing software applications while an NTI application engineer observes

In addition to certification by NTI, personnel should have DMS switch training and hands-on switch experience.

Patching requirements

Sites planning to apply their own software loads must also download their patches through C-SCAN one day before the scheduled software application. The timeframes and activities are the same as for NTI-administered upgrades.

The telephone company applying the software load must notify the NTI Patch administration group of an upcoming BCS application at least 15 days prior to the scheduled application. The patch group will perform a patch audit (including propagation report), run the NTI SITE calculator, propagate limited patches, and send a copy of the site inform file (SIF) containing a list of required patches to C-SCAN. A copy of the patch applicator report is available to the telephone company for action during the software application.

Dump and restore requirements

For telco-administered software applications, the RTP dump and restore method may also be used.

NTI-administered software upgrades

For an NTI-administered software application, an NTI application engineer dials into the switch on the application night. The applicator uses two dial-up data links: one for each side of the central control. In addition, a voice link with on-site telephone company personnel is maintained to discuss progress of the application and to coordinate specific tasks necessary for the application.

The pre-application procedure and software delivery phases of the process are performed by Northern Telecom.

Preliminary processes

BCS polling

At approximately 7 weeks prior to the scheduled dump and restore, the BCS Polling group requests permission from the telco to dial into the switch. In the polling session (approximately one hour), BCS polling group obtains the following information on the customer's switch:

- inform list
- office tables
- DS and PS areas
- DS and PS tables (NT40)
- memory information (SN)

Approximately 1 to 5 days after the upgrade, the BCS Polling group requests permission from the telco to perform a post-insertion polling session to

obtain switch information on the new BCS. The post-polling session follows the same process, and records the same type of switch information as that used in the first polling session. Because of the addition of new feature packages, the new BCS information may differ greatly from that of the old BCS. Changes from the old BCS load to the new BCS load impact memory usage and the inform list.

The results of both polling sessions are recorded in the NTI RTPPOLL database for use by other NTI groups in the BCS process.

Final memcalc

At approximately 6 weeks prior to the scheduled software upgrade, the final Memcalc procedure is run. Memcalc is a software tool used to calculate store requirements and capture switch information.

> ***Important:*** The success of the software upgrade depends upon having the correct parameters input to Memcalc. If the resulting C-report does not reflect the actual memory parameters for the customer switch, the software upgrade may have to be aborted.

Patching

Patches are software rewrites to existing software loads. They change only a small portion of a software package as opposed to a software upgrade which changes all the system software. Patches exist for two software areas of the DMS switch: in the XPM (Extended Multiprocessor System Based Peripheral Module) and in the CC (central control).

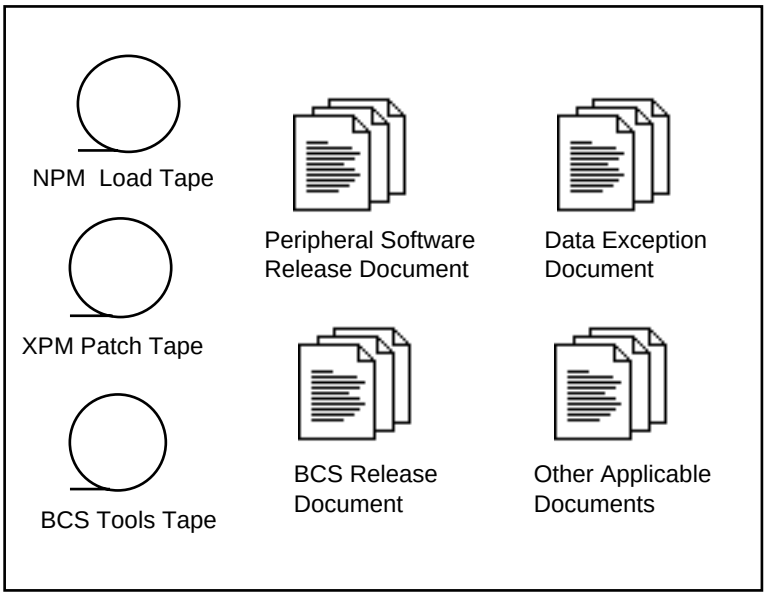
PM loads and XPM patches

At approximately 35 days prior to the scheduled software upgrade, the preliminary tape and documentation shipment is sent to the site (see Figure 3-1). Included in this shipment is the XPM patch tape and the NPM (new peripheral module) load tape. The Peripheral Software Release Document included in the shipment provides the procedures on how to load the PMs with the new software load.

> ***Note:*** Patching is not provided for a PM (Peripheral Module). The PM software is reloaded by the telephone company.

Loading the new PM software loads and patching the XPM software should be completed by the telco before the BCS 10-day preliminary precheck. Any additional XPM patches issued prior to the software upgrade that are not included on the patch tape are downloaded into the DMS switch 15 days before the upgrade. The final set of patches, both CC and XPM, will be downloaded one day prior to the upgrade. Once XPMs are loaded, normal patch administration policies should be maintained.

Figure 3-1 Preliminary Tape and Documentation Shipment



CC patches

In addition to patches identified specifically for the new software load, some patches from the old load may need to be propagated to the new load. For example, an issue that has been patched for BCS 26 may not be resolved until BCS 30. Therefore, an office going from BCS 26 to BCS 29 has the patch for BCS 26, and will also require it for BCS 29. At 14 days prior to the scheduled software application, a patch propagation report is generated to identify the patches currently in the office that are also required by the new software load.

Patching activities surrounding a software upgrade may involve several NTI groups, including the following:

- Loadbuild group
- Dump and Restore group
- Patch Administration group

The new software load is patched by the Loadbuild group at approximately 28 to 21 days before the software application. If for some reason a patch could not be applied, the Loadbuild group completes a patch exception report, which identifies any patch that does not apply. The patch exception report is then forwarded to the NTI patch administration group.

For the conventional software upgrade, the NTI Dump and Restore group then applies any patches that have been issued since the new software load was built. This occurs at approximately 1 week prior to the scheduled

application. Any patches that could not be applied to the new software load are again identified on a patch exception report which is forwarded to the NTI patch administration group for resolution.

At 15 days prior to the scheduled software upgrade, the XPM audit is performed. Site personnel are required to mount the XPM tape that was shipped to them from NTI (see Figure 3-2).

At 2 days prior to the scheduled software upgrade, the BCS pre-application engineer performs the final office review for the office. Patch-related information for the office site is forwarded to the patch administration group.

At one day prior to the scheduled software upgrade, the patch administration group has collected all the information regarding patching for the office. A "downloader" logs into the NTI Patch Downloader System and generates a list of patches to be downloaded to the office site scheduled for new software.

The downloader then establishes voice and data connections with the office site. Site personnel are informed that CC patches will be downloaded into store file for the upcoming software upgrade. XPM patches may also be downloaded into the DMS switch at this time.

The patch administration downloader verifies that sufficient space exists in data store, and downloads the patches. The downloader then informs site personnel that downloading is complete, and logs out of the DMS switch.

Figure 3-2 Patching in a conventional software upgrade

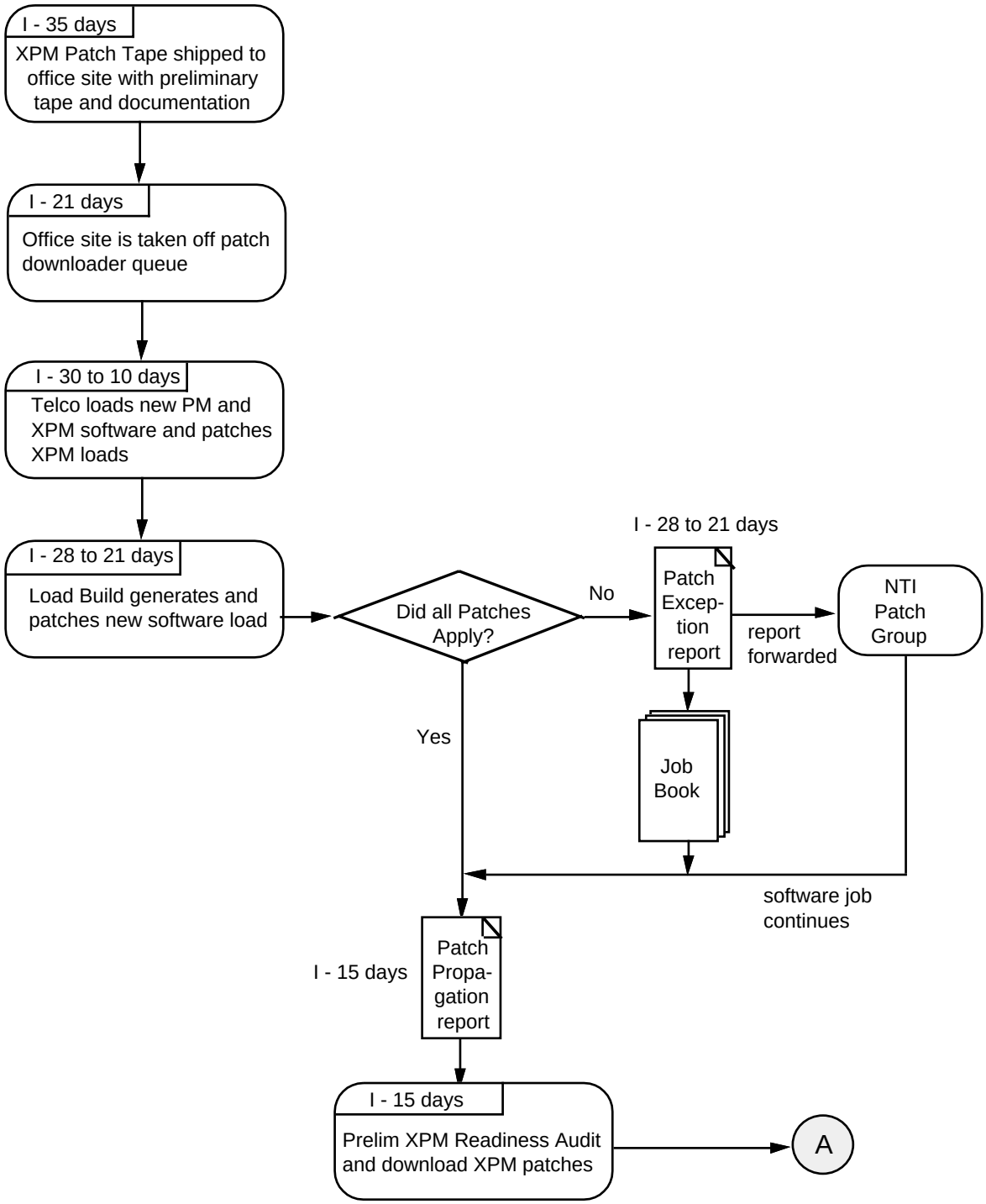
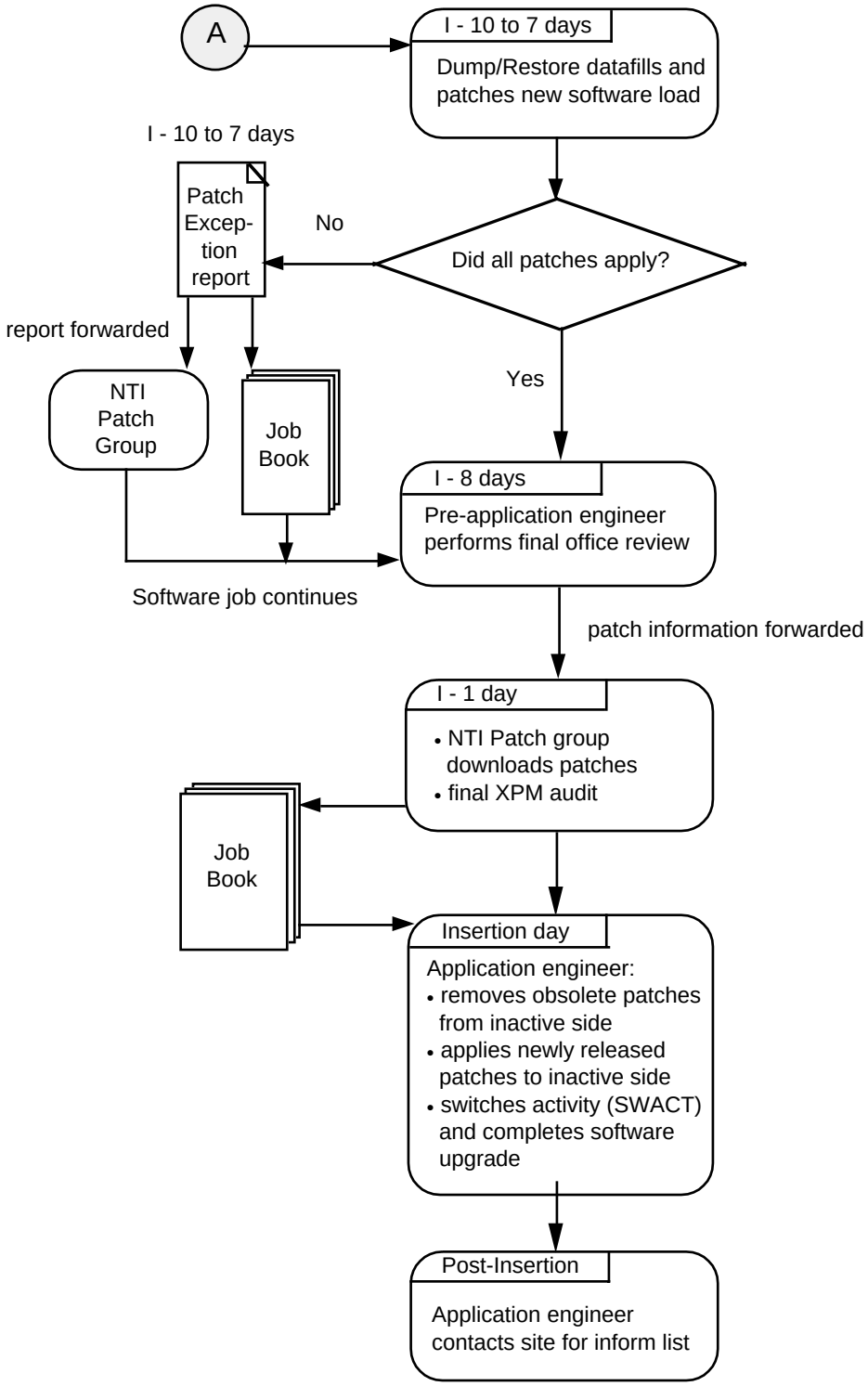


Figure 3-2 Patching in a conventional software upgrade (cont'd)



A hardcopy list of the patches downloaded into the DMS switch is available for the NTI application engineer who will be performing the software upgrade. On the day of the scheduled software application, the NTI patch administration group generates an APF report (patch application report) which lists the patches to be applied during the BCS upgrade. The report also lists any patches having the following categories:

- EMG: emergency
- OBS: obsolete
- OBE: obsolete emergency
- OBR: obsolete replacement

The APF is given to the applicator for action on the night of the software application. The OBE and OBS patches are removed from the inactive side of the DMS switch before the SWACT (SWitch of ACTivity). OBR patches are checked to ensure that their replacements are applied to the new load. EMG patches are checked to verify that they are applied.

After the application, the NTI patch downloader must dial into the site switch to retrieve an inform list, a list of patches and related information, including patch type, patch status, and feature packages (see Figure 3-3). It also includes a list of NTX packages. The inform list is used to verify feature package content, application of patches, and site information update in the NTI patch database.

Figure 3-3 Example of an inform list

```
PATCH ID INFOA  TP  MODULES        TYPE  DATE      TIME     CAT     T  AUTO  R    ST
-------- -----  --  -------        ----  ----      ----     ---     -  ----  -    --
RPG61A       Y  CC  DLTPRCI ES02 SRC   92/xx/xx  3:32:29  ACT OFF C  YES   UN   A
                    DTLPRCI ER02 SRC
                    LNALCZI EV01 SRC
                    XLALXZI EX02 SRC
SEE01A26     Y  CC                CMD   92/xx/xx  3:32:12  GEN     C  NO    UN   A
                    IBNLSUSI AE01SRC
CES98A26     Y  CC  CFXTRMZI DZ05SRC   92/xx/xx  3:32:07  GEN     C  YES   UN   A
-other CC patches are listed ....

NTX521AC05   N  CC                     92/xx/xx  02:19:09           NO    NR   A
NTX000AA12   N  CC                     92/xx/xx  02:19:00           NO    NR   A
NTX001AA20   N  CC                     92/xx/xx  02:18:55           NO    NR   A
NTX006AA04   N  CC                     92/xx/xx  02:18:52           NO    NR   A
NTX007AB02   N  CC                     92/xx/xx  02:18:51           NO    NR   A
NTX008AB02   N  CC                     92/xx/xx  02:18:40           NO    NR   A
-remaining NTX feature packages listed....
```

Planning for patching

For patching activities surrounding a software upgrade, telephone companies should plan for the following:

- Telco receives new PM and XPM loads along with an XPM patch tape provided in the preliminary tape and documentation shipment (shipped at approximately 35 days prior to the software application date).
- Telco loads the PM and XPM tapes, and patches the XPMs before the pre-application procedure (typically 10 days prior to the software application date). The Peripheral Software Release Documents are used to perform these activities.
- If the software upgrade is NTI-administered, NTI downloads patches not previously applied one day prior to the software application.
- If the software upgrade is telco-administered, the telco:
  - notifies NTI Patch Administration of upcoming software upgrade at least 15 days before the scheduled software application date
  - downloads from C-SCAN all patches not previously applied one day prior to the scheduled software application date.

Dump and restore

A dump and restore is a series of procedures performed on a DMS switch to transfer a copy of the telco's office data into the newly built software load (see Figure 3-4). The output of the dump and restore process is a new datafilled BCS image tape that can be loaded into the switch. The following tapes are required:

- office image tape from the telephone customer containing specific office data such as line, trunk, and feature assignments
- BCS D/R software tools tape used by NTI to perform the dump and restore

Northern Telecom provides the following methodfor the dump and restore process:

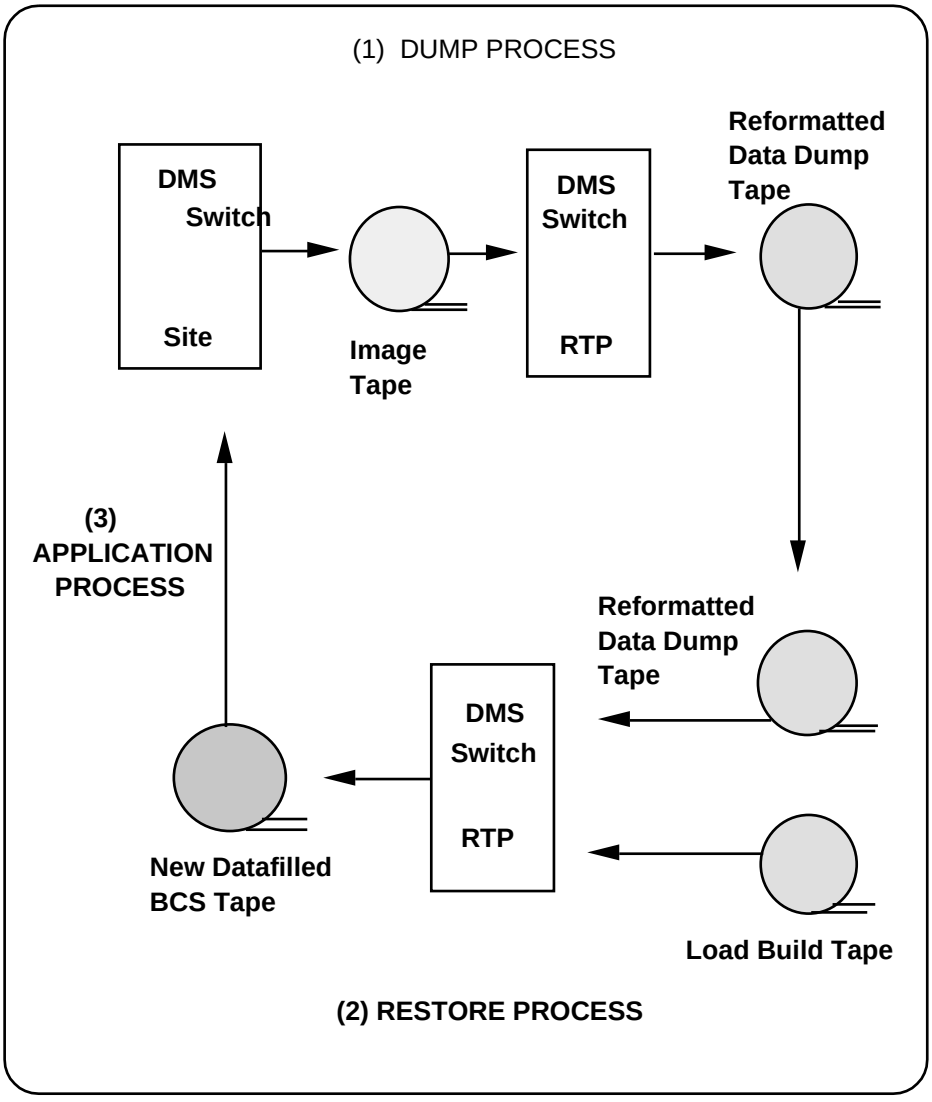
- RTP: Used for most conventional upgrades, NT40 and SuperNode.

RTP method

In the RTP dump and restore method (seven days before the application), the site makes the image tape and ships it to the Dump and Restore group. The image tape must be received at NTI no later than 3:00 pm on the day before the dump and restore. If the image is not received by this time, the job may be subject to reschedule. The site then prepares the journal file to capture all service orders occurring between the production of the image tape and the application. The remaining tasks are performed by NTI on a captive switch in simplex mode.

Using the RTP method, the processing is performed on an NTI captive switch in a lab environment, therefore providing minimal impact to the operation, administration, and maintenance of the site switch. NTI then sends two images of the new datafilled BCS load to the site for application.

Figure 3-4 Conventional dump and restore



Test ONP

At I-10 days the customer is requested to ship an office image to the RTP Dump and Restore department. The dump and restore engineer uses the customer office image and the newly built UDF image received from Loadbuild to perform a test ONP. The test ONP is run on an HP workstation. The test ONP simulates the upcoming application, from drop-sync to the end of the table transfer (MOVEBCS or TABXFR). The Custom Calling Table transfer procedures in PRESWACT are also run. Any required

Software Delivery Bulletins are performed. The testing objective is to find any issues with table data transfer. Datafill issues can be time consuming to resolve during the actual application. Any issues found are resolved, and any workarounds or information uncovered that will make the application go smoother are formatted into a report and sent to the Applicator Package for that application.

Pre-application procedure

The pre-application procedure is performed by the NTI Pre-application engineering group with a telephone company contact. It consists of a series of verbal and automated verifications with site personnel and the telephone company switch to ensure readiness for the software application. The pre-application procedure is conducted at 10 days before the software application.

Prior to the pre-application procedure, the telco loads into the switch any program files and modules not resident in the old BCS load that are needed for the pre-application and application procedures. These are loaded from the BCS tools tape included in the preliminary tape and documentation shipment.

One week prior to the scheduled pre-application procedure, NTI personnel may contact the telco to confirm various information, such as the following:

- date of the pre-application procedure
- start time of the pre-application procedure
- telephone company contact
- voice and data telephone numbers

The procedure is performed by a pre-application engineer communicating over a dial-up voice line with site personnel and through two data dial-ups into both sides of the DMS front-end. Telco personnel answer questions dealing with the following conditions:

- front-end CC stability
- front-end hardware, memory equipage, and baseline information
- DPP firmware
- starting time for the software application
- journal file activity since making of image tape
- memory and/or network extension completion prior to making image tape
- number of voice and data dial-ups and logins
- CPU pack stability (mixed logic packs, memory, etc.)

- PMs and XPM loaded with new software

When new BCS loads are introduced, the pre-application process and activities change as conditions to be checked are added, deleted, or altered.

Final office review

The final phase of the pre-application procedure is the final office review. At 2 days prior to the software application this review is conducted by the pre-application engineer to determine if the office is ready to proceed with a BCS software application.

All issues and problems identified in the pre-application check must be resolved at the final office review. For example, table errors identified by running TABCHK or TABAUDIT/CHECKTAB must be corrected by this time. The pre-application engineer works in conjunction with the NTI regional field service engineer and site personnel to resolve any issues.

The conditions checked in the final office review may vary from one software load to another. A typical review may include the following activities:

- Dump BCS monitoring data (BCSMON).
- Verify front-end stability.
- Verify that all software table errors are corrected.
- Verify that journal files have been handled according to procedures.
- Confirm the application start time.
- Ensure all problems are corrected and issues resolved.

After the final office review, the pre-application engineer completes parts of an pre-application report, supplying important information necessary for the BCS application. The pre-application report is forwarded to the assigned application engineer for the software application.

Telco-administered pre-application procedure

The pre-application procedure for a telco-administered software upgrade is the same as the procedure performed by NTI prior to an NTI-administered software application. The only difference is that telephone companies who elect to do their own software applications also perform the pre-application procedure.

The Pre-application Report form is included in the preliminary tape and documentation shipment. This report of the pre-application results must be sent back to NTI BCS Operations to verify critical items in the office, and also to serve as a reference in case NTI technical support is needed during the software application. This enables Northern Telecom to monitor the

progress of the telco-administered application and to provide the switch information and support if needed following the software application.

Planning for the pre-application procedure

To prepare for the pre-application procedure 10 days before the software upgrade, the following conditions should exist at the telephone company site:

- telephone company personnel on-site at the agreed-upon start time
- BCS tools tape unpacked and available for loading (arrived in preliminary tape and documentation shipment)
- PMs and XPMs loaded with new software, and XPMs patched
- operational dial-ups into both sides of DMS front-end
- operational tape drive

Post-software application activities

Monitor

Monitor refers to the phase of the software delivery during which Telco observes logs and switch performance. This phase begins when the software insertion is complete. If technical assistance is needed, site may call Northern Telecom TSC (Technical Service Center).

Customer service report (CSR)

Customer Service Reports (CSRs) identify problems detected in the DMS switch. The telephone company should retest CSRs opened on the previous software load. If the problem documented by the CSR still exists in the new software load, the CSR should be reopened on the new load within two weeks of the software application date. If the problem no longer exists on the new software load, the CSR may be closed.

Contingency plans

Contingency plans are used when an unexpected event occurs that prevents or has a potential negative impact on a successful software application. Contingency plans are used in only a small number of software jobs. The following definitions are used by Northern Telecom to describe unsuccessful software upgrade procedures:

- **Abort:** Condition in which a software application is terminated after sync was dropped due to an unrecoverable error or malfunction, or when directed by the operating company. In a service-affecting abort, normal telephone operations are interrupted.
- **Fail:** Condition of a software application in which the customer or any of its subscribers experience any type of service degradation as a result of the software application.

- **Re-schedule:** Condition in which a scheduled software application is cancelled due to an unexpected problem or issue that would have an impact on the success of the software application. This condition occurs after the production flag is set for the loadbuild process but before sync is dropped. The software application is then re-scheduled.

The following list includes some of the situations that may cause a software order to be re-scheduled:

- gating hardware not installed prior to making image tape
- insufficient memory installed or provisioned
- changes to the software order after the load is built
- Distributed Processing Peripheral (DPP) firmware and software not updated
- journal file mishandled
- hardware extensions added after making image tape
- data changes during frozen image interval through unsupported means
- unexpected technical and maintenance problems in the office
- shipping problems with tapes and documents

The abort recovery procedure varies, depending upon how far the software application has progressed (e.g., if the decision to abort occurs before or after the SWACT-SWitch of ACTivity). Refer to NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*, for more information.

BCS technical support (problem escalation and resolution)

Northern Telecom has established a problem escalation procedure called BCS technical support in the event that a problem arises during a software application. NTI senior engineers specially trained in software delivery and experienced with possible problems during a software application are present to support the NTI Application engineers during all software applications. This procedure ensures problem resolution in a timely manner while maintaining the highest level of service that is possible under a problem condition. The BCS technical support is provided in addition to the NTI TAS and Emergency Recovery groups.

In the event of a problem during an application, the following steps are taken:

1. Identify problem. Is it an E1 or E2 problem? (According to NTP 297-0201-019, E1 problems result in system degradation and/or outage, and E2 problems have the potential for system degradation and/or outage.)

   No. BCS technical support is contacted for assistance and resolution. Go to step 2.

Yes. Problem is escalated to BCS technical support immediately. In addition, Northern Telecom Emergency Recovery group is contacted for problem resolution. Emergency Recovery directs the problem resolution strategy with BCS technical support personnel assisting. The Emergency Recovery personnel and telephone company site personnel generate a customer service report (CSR) on the problem. The BCS operations manager is also notified of the E1 or E2 problem. Emergency Recovery personnel, BCS technical support, and telephone company site personnel will work the problem to resolution.

2. Is a recovery strategy available to resolve the problem within 10 minutes? Has an action plan been determined to resolve problem ?

   No. Go to Step 4.

   Yes. Go to Step 3

3. Is the problem resolved within 10 minutes?

   No. Go to Step 4.

   Yes. The problem is resolved. The steps taken to correct the problem are documented and all involved parties, telephone company and NTI personnel are notified that problem is resolved.

4. Contact next level of support for assistance. Go to Step 5.

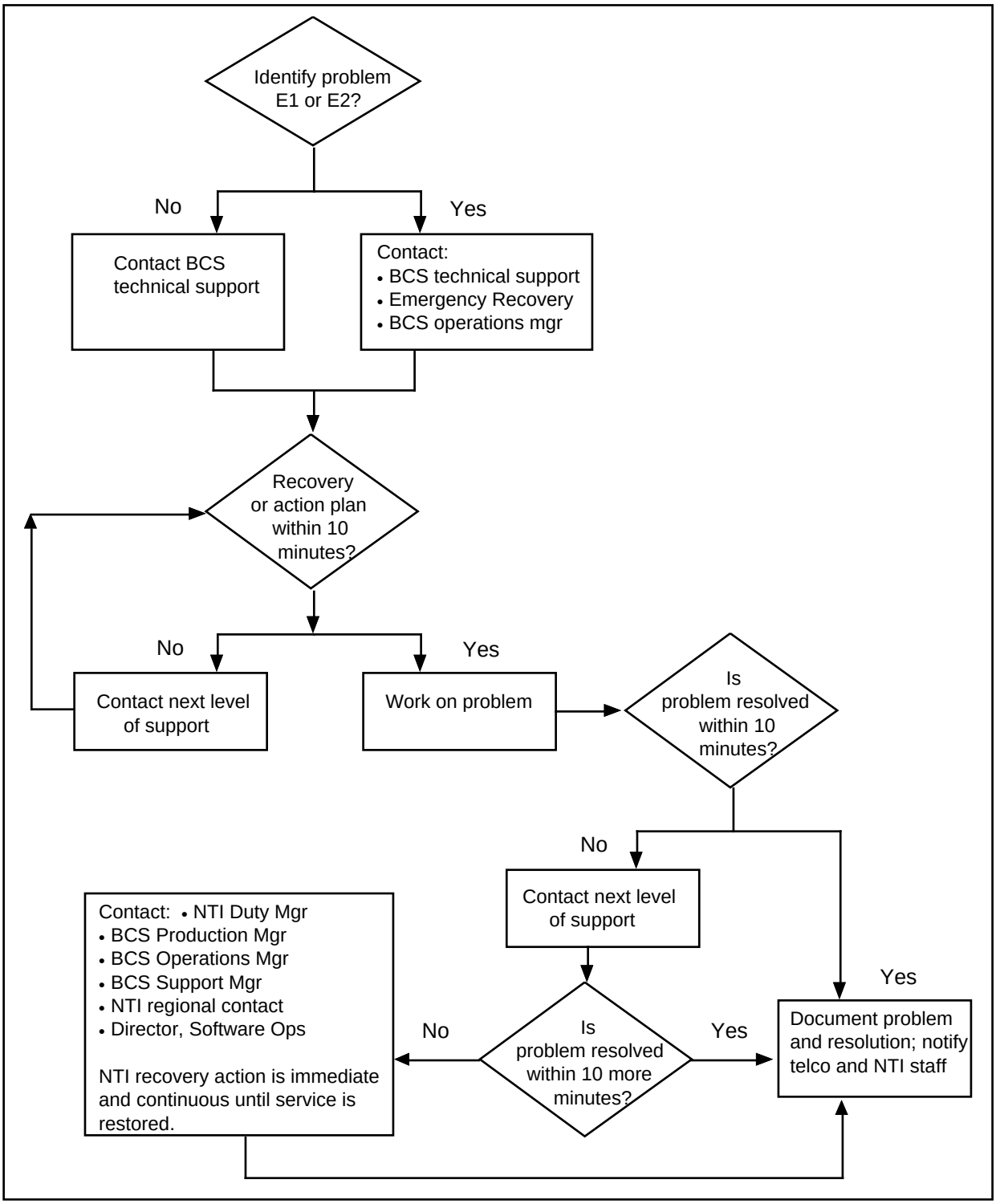
5. Is problem resolved within 10 more minutes?

   No. Escalate problem to NT duty manager and BCS Manager for further escalation. For all E1 conditions lasting more than 10 minutes, the BCS manager notifies the BCS Production Manager, BCS Operations Manager, BCS Support Manager, NTI regional contact, and Director of Software Operations for resolution and assistance from additional resources.

   Yes. The problem is resolved. The steps taken to correct the problem are documented and all involved parties, telephone company and NTI personnel are notified that problem is resolved.

For E1 and E2 type problems, recovery action by NTI is immediate and continuous until the service level is restored to the pre-incident operation.

Figure 3-5 Escalation Procedure



Telephone company's role

This section summarizes the responsibilities of the telephone operating company, and the tasks specifically performed by them. It includes the interval before, during, and after the delivery of a new software load in the DMS switch. More detailed information on each topic is available in previous sections of this manual, and in other NTPs identified in "About this document" at the beginning.

The following activities are performed by the telephone company:

- Request a quote for order of new software.
- Accept scheduled software delivery dates from NTI. Regional NTI Customer Service informs the telephone company of schedules and dates for new software installation. If the dates are rejected, further negotiation is conducted to accommodate both the telephone company and NTI.
- Supply detailed information regarding software order. The regional NTI Systems Application Engineer (SAE) captures customer-specific information for the software order. Telco representative should have the necessary NTI training courses and reference materials.
- Review software parameters (optional, depending upon telephone company or NTI regional practice). Ensure correct parameters input to Memcalc to avoid possible software upgrade abort due to memory deficiency.
- Maintain the DMS switch. Overall switch maintenance prior to, during, and after software upgrade is the responsibility of the telephone company.
- Review and perform tasks listed in documentation received in the preliminary and final tape and documentation shipment.
- Load new software into the PMs and XPMs (if applicable) prior to the preliminary precheck. Patch XPM loads, as required.
- Check the DMS tables and correct any software errors indicated
- Assist the NTI pre-application engineer in performing the pre-application procedure.
- Ensure two data dial-ups for preliminary precheck.

- *Hybrid Method Only:* Generate a system image tape and prepare journal file according to NTP 297-1001-303. JFFREEZE, if available, should be activated prior to making system image tape.
- Run CC rex and memory retention tests.
- Verify CC stability by dropping sync and performing warm, cold, and reload restarts on the inactive side.
- Check DMS switch logs for problem messages.
- *Hybrid Method Only:* Review inform list, D190 document, and data exception report (DER) or delta report received in the final tape and documentation shipment.
- *ONP Method Only:* Review inform list and D190 document received in the final tape and documentation shipment. Review the MOVEBCS report on the night of the delivery.
- Perform call tests and verifications prior to the software upgrade, and record results.
- Assist NTI Pre-application engineering in performing the Final Office Review.
- Schedule personnel to be on-site on the night of the software delivery.
- Perform call tests and verifications after the SWACT during the software delivery but prior to syncing the switch on the new load.
- Accept the software load once critical calls tests have passed.
- Retest customer service reports opened on the previous software load.

The telephone company's role in the software delivery process also depends upon whether the telephone company decides to apply its own software load. For telco upgrades, the pre-application and delivery phases of the software process are performed by the telephone company. Refer to the "Planning for a Conventional Software Upgrade" section, the "Planning for a Hybrid Software Upgrade" section, or the "Planning for a ONP Software Upgrade" section in this manual for more information.

Customer initial contact

The customer's initial contact regarding new software is with the NTI regional sales organization. This initial contact can be a request for quote (RFQ) on a new software load with a list of feature packages. Northern Telecom will provide a quote to the customer for the software extension. After receiving the quote, the customer may then place the order with NTI Sales.

Note: Any special telephone company requirements, such as a date the new software must be installed, should be made known to Northern Telecom at this time or earlier so that special considerations can be planned for and accommodated. Special requests for installation dates may be necessary because of commitments to business and residential telephone subscribers, or because of telephone company maintenance and site-personnel availability.

The next phase in the process involves the development of a schedule for the delivery of the new software load. NTI generates a schedule based on the company's current production capability. Consideration is also given to any telephone company special request(s) regarding the software order.

When accepting dates for the software extension, other switch activities in-progress or activities that will begin should be considered for possible conflict with the software delivery dates. Activities such as hardware extensions, re-grades and some data changes to the DMS are not supported during the data freeze period prior to the software application. All the hardware and software changes not supported during particular intervals of a software upgrade are listed in this section.

Schedule and date acceptance

The delivery of a schedule to the telco is performed by the NTI Regional Customer Support Representative via a telephone call. After acceptance of the dates, the regional NTI Customer Representative should follow up with a confirmation letter to the customer listing the dates and describing the related events and activities surrounding the software order and upgrade.

Capture of software order specific information

Manual method

Customer input regarding the software order is taken manually on the 8620 Questionnaire (DMS-100 Family of Switches) or the 8602 Questionnaire (DMS-100 Family of Remotes). The 8620 or 8602 Questionnaire is also called the Customer Information (CI) document. This document serves as the official interface document between Northern Telecom and the customer (telephone company/carrier). It lists questions that the telephone company/carrier answers with the assistance of the regional system application engineer (SAE), including desired features, hardware, configurations, as well as the names and telephone numbers of telco interfaces if consultation or further information is needed.

The telephone company representative completing the CI document with the SAE should have completed the NTI DMS 100/200 Engineering Course and/or the TOPS Engineering Course. Refer to the regional training consultants for NTI training information.

References are made throughout the CI document to Northern Telecom Practices and the DMS-100 Family Technical Specification. The telco representative completing the CI document should have access to these documents.

The questionnaire may be completed by the SAE in consultation with the customer via a telephone call or the SAE may visit the customer site and record the information in a meeting. The decision to handle the customer input phase with a telephone call or customer visit is determined by the complexity and nature of the order.

On-line method (NT-ACCESS)

The CI phase of the software delivery process can be completed using an on-line computerized questionnaire, NT-ACCESS. The need for specific data related to the order is the same regardless of which information capture method is used. Specific information regarding a software order is necessary to provision the office for the new software load. Contact the NTI Customer Support Representative for more information on the availability of CI methods.

Software parameters

Office parameters are stored in four DMS switch tables. The customer submits the required software parameters to NTI at the time of an initial order or extension. The following tables contain software parameters:

- Table OFCENG (office engineering): This table lists the office engineering parameters defined by the telco which will not require change before the end of the engineering interval. Some parameter types defined by OFCENG include the number of recording units in the office, call routing options, and the time diagnostics start running. These parameters are engineered per office and may require formulas or a procedure to determine a value. The values in this table may be changed by the telco through use of the Non-Resident Procedures.
- Table OFCSTD (office standards): This table lists switch parameters that may have a standard range of values with a default value specified. An example of an OFCSTD parameter is the length of delay between trunk seizure and the outpulsing of digits for outgoing and two-way immediate start trunks. The range of values could be a minimum of 80 ms to a maximum of 2.55 seconds with a default value of 15 milliseconds. The values of the parameters in this table can be changed by the telco at the time of an initial order or extension. The values are write-protected and require NTI intervention for change.
- Table OFCOPT (office options): This table defines optional parameters in the office. An optional parameter, for example, may define whether a trunk test position has the circuit locate feature. Options usually indicate whether an equipment unit, feature, operation has access to the optional

capability. The values of these options will be determined by NTI at the time of the initial order or an extension. These values are write-protected and require NTI intervention for change.

- Table OFCVAR (office variables): This table defines global office variables, such as the time interval between bursts of call waiting tone. The values of the parameters are submitted to Northern Telecom by the telephone company on the appropriate forms at the time of the initial order or an extension. At all other times, the telephone company can change values in the OFCVAR table by using the DMS table editor.

These tables contain hundreds of software parameters in the DMS switch that the system software uses in normal switch operation. Values of the software parameters may differ from one telco to the next.

In every new BCS software load, some existing software parameters will require change or deletion, and some new ones will be added. The regional NTI Software Systems Engineer (SSE) defines the software parameters for the new software load using the following:

- BCS Office Parameter Questionnaire
- NTI software tools and standards
- completed CI Document

Some office parameters are required only if the office has a specific software package or packages. A description of office parameters is provided in the Office Parameters Reference Manual, Practice 297-1001-455.

Requests for parm changes received by NTI after the due date are processed on an emergency basis only. The request for change must come through the regional SSE manager by phone with a follow-up COCOS to a Dump and Restore manager (conventional and hybrid) or to a BCS Applications manager (ONP). The appropriate manager determines if the change can be made without risk of service degradation. If the request is denied, the software delivery job is rescheduled to accommodate the parameter change(s) later.

Responsibilities before the upgrade

Switch maintenance

Overall switch maintenance is the responsibility of the telco during the software delivery process. No hardware faults should exist in the office prior to the software upgrade since unresolved hardware faults are a major source of complication during the delivery process. DMS logs should be examined for problem log messages and tests should be run prior to the software delivery as detailed in NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*.

Northern Telecom provides technical support for each BCS release by the Technical Assistance and Support (TAS) organization.

Documentation for software delivery

The telephone company should review and perform tasks outlined in the following software delivery documentation prior to the software upgrade:

- NTP 297-8991-020, *Software Delivery Process Description*, describes the NTI software delivery process, beginning with the telco request for new software and ending with the installation of the new software into the DMS switch. It includes processes, intervals, policies, and interfaces.
- NTP 297-8991-021, *Software Delivery Planning and Provisioning*, provides advanced planning information for telcos planning for software upgrades. It includes telephone company responsibilities and tasks required for the software delivery process, along with information on the impact to operation, administration, and maintenance activities.
- NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*, contains procedures needed to upgrade an in-service DMS switch (BCS 29 and following) using the One Night Process or Hybrid methods of software delivery. It describes preparing for and installing the new software load, and performing follow-up test procedures.

Preliminary tapes and documents are shipped from NTI at approximately 35 days before the scheduled insertion date. The site receives the following documents:

- Feature Description Manual
- Software Delivery MOP
- Peripheral Software Release Documents (PM and XPM)

The final shipment of tapes and documents arrives on-site 2 to 3 days prior to the schedule software delivery date. The site receives the following documents:

- Inform list
- D190 Document (office feature record, or similar document)
- customer survey

Loading PMs and XPMs

Loading new software into the peripheral modules (PMs) and XPMs should be performed once the preliminary tape and documentation is received at the office site. In conjunction with the loading process, XPM patches must be applied using procedures in the Peripheral Software Release Documents which are included in the preliminary tape and documentation shipment.

Checking the DMS tables

The telco should correct errors in the DMS tables found by running TABCHK (BCS 26 and lower), CHECKTAB (BCS 27 and higher), or TABAUDIT (BCS 35 and higher). Table errors detected by either of these programs should be corrected and the program re-run.

> ***Note:*** Access C-SCAN for any bulletins that apply to TABAUDIT or CHECKTAB.

Running CC rex and memory retention tests

The telephone company is responsible for running the CC rex and memory retention tests prior to the schedule software application date. Ten to five days prior to the scheduled software application date, the telephone company runs these tests. Due to the nature of the tests, both should be run during low traffic periods in the office.

Verifying CC stability

The stability of the central control in the DMS is verified by dropping sync and performing warm, cold, and reload restarts on the inactive side. This procedure is part of the site preparation procedure in NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*.

Checking DMS switch logs for problem messages

Starting 30 days prior to the scheduled software application date, the telephone company site personnel should check the DMS switch logs for problem messages which indicate a possible fault condition. Messages with key words such as fail, mismatch, parity, trap, failed, loss of, and trouble (TBL) are problem messages. For a complete list of problem log messages, refer to NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*.

Reviewing final documentation

The final tape and documentation shipment should arrive at the office site 2 to 3 days prior to the software application. In this shipment, the following documents are included:

- Inform list
- D190 Document (office feature record, or similar document)
- customer survey

Appropriate telco personnel should review these documents since they provide details on feature package content and office data details for the new software load. The customer survey should be completed after the upgrade and returned to the NTI Software Quality department.

Inform list

The inform list identifies the feature packages in the new software load along with any patches applied.

D190 document

The D190 document is a customized office feature record produced by automated processes in loadbuild. The telco should verify the contents of this document since it provides details on the feature packages in the new software load. It consists of the following:

- Section 1: Ordered packages
- Section 2: Delivered packages
- Section 3: Delivered features

Note: For the One Night Process (ONP) method, the MOVEBCS Report is provided on the night of the upgrade.

Call tests and verifications prior to application

The call tests are conducted 10 to 3 days prior to the scheduled software application. This procedure verifies the new BCS load and detects any issues in the old load that could create upgrade problems using the following tests:

- automatic message accounting (AMA) verification tests
- critical feature tests
- non-critical tests
- office specific tests

Results of the tests are recorded, and the same tests are re-run immediately after activation of the new load in the switch. For more information, see NTP 297-1001-303, *ONP/Hybrid Software Delivery Procedures*.

Personnel on-site for software application

Telco personnel must be on-site on the night of the software delivery. The following activities are performed by telco personnel during the upgrade:

- loading and unloading tapes
- dropping sync on the switch
- verifying performance of the DMS switch on the new software load by conducting call processing tests, AMA verification tests, and feature tests
- accepting the new software based on DMS switch performance and testing

Responsibilities after SWACT

Call tests and verifications

Call tests and verifications are performed by telephone company site personnel immediately after the SWitch of ACTivity (SWACT) during the software application but prior to syncing the switch on the new load. The tests are the same tests and verifications performed 10 to 3 days prior to the scheduled software application. Telephone company site personnel use these test call scripts to verify switch operation and performance.

Acceptance of new software load

Based on the call tests and verifications, telco personnel decide to accept or reject the new software load. If the new load is accepted, the NTI software application engineer syncs the switch on the new software. If the telco rejects the software load because of a problem, a switch to the inactive side of the DMS is made and the switch is synced on the old software load.

The possibility of returning to the old software disappears once the DMS is synced on the new load. For this reason, sufficient call testing and verifications must be conducted during the acceptance phase of the application.

Customer service report (CSR)

The telco should retest customer service reports (CSRs) opened on the previous software load. If the problem still exists in the new software load, the CSR should be reopened on the new load within two weeks of the software delivery. If the problem no longer exists on the new load, the CSR may be closed.

Summary of impacts with *DMSE*

With DMS Evolution most activities performed by the Telephone Company in preparation for the ONP will not change. There are however some *inputs* to the process that have changed. The impact of those changes are outlined below.

- Software loads will not be custom-built. PCLs will be offered based on product and market. Available in the US LEC market are PCLs for US 100/200 offices, TOPS , 100/200/TOPS combos, and STP.

  PCLs offer the advantages of eliminating packaging issues. The software is tested as a product. Same release upgrades are eliminated due to full software content.

- The Parm Variance Report is no longer available. Parameter engineering and template completion is still accomplished in the same manner as pre-DMSE. I-8 polling is not required. The Telephone Company can make parameter changes up to the night of the application. The completed Parmmail will be placed on CSCAN in lieu of the Parm Variance Report.

- The set of Office Parameters will be standard per PCL, the Regional SSE or Operating Company can request a preliminary Parmmail and pre-engineer parameters if desired.
- Site identifying patches will be applied during the ONP. This will not impact Telephone Company operations/processes.
- The D190 Document, at this time, will be replaced by a similar document generated by SOLID.
- Peripheral loads will be shipped on SLMII tapes. Any customer switches not equipped with SLMII hardware will need to upgrade prior to installing DMSE PM loads. A new "fast-list" feature is available on SLMII as of DMSE (has been patched back to BCS 35 and 36, offices at BCS34 will receive 9-track tapes). The fast-list feature is similar to the tape directory facility (TLIST) for 9-track tape.

Software upgrade schedule

This section identifies typical schedules for the conventional, hybrid, and ONP software upgrade methods from the telco perspective. All intervals refer to the number of weeks or days events occur prior to the software delivery.

One night process (ONP) software upgrade

- - 19 weeks: initiate order for new software
- - 17weeks: capture customer specific data regarding software order
- - 7 weeks: poll customer switch for specific switch information
- - 35 days: preliminary tapes and documentation shipment sent from NTI
- - 30 to - 15 days: load the PMs and XPM with new software loads, and perform XPM patching (if required)
- - 26 calendar days or 20 working days: Parmmail sent
- - 17 calendar days or 13 working days: Parmmail due
- - 12 days: complete all memory extension, gating hardware (feature and BCS gating hardware), installation, network additions, and regrades
- - 10 days: pre-application procedure performed with telco personnel
- - 10 to - 3 days: run call tests and verifications
- - 8 days: test image due from telco
- - 8 calendar days or 6 working days: loadbuild complete
- - 3 to - 1 day: final tape and documentation shipment arrive at the telco
- - 2 days: final office review performed with telco personnel
- - 1 day: NTI downloads CC and any applicable XPM patches.
- **Insertion date**: software delivery occurs
  - telco assists NTI software delivery engineer with software upgrade
  - telco loads tapes, drops sync

  - after SWACT (switch activity) to new software, telco performs call test scripts to verify call processing on new software load
  - telco accepts software load based on successful switch performance
- morning after software upgrade: NTI application engineer syncs the DMS on the new load. Telco monitors switch until 12:00 noon, site time.
- I + 1 to 5 days: BCS post-insertion polling
- I + 2 weeks: retest appropriate customer service reports from previous software load. These CSRs are reopened on the new software load or closed depending on whether the problem exists

Abbreviations

AMA
Automatic Message Accounting

BCS
Batch Change Supplement

CAP
Change Application Procedure

CC
Central Control

CI
Customer Input

CM
Computing Module

CPU
Central Processing Unit

C-SCAN
Customer Service Computerized Access Network

CSR
Customer Service Report

D/R
Dump and Restore

DMOPRO
Data MOdification PROcessor

DMSE
DMS Evolution

DPP
Distributed Processing Peripheral

EMG
Emergency

ETAS
Emergency Technical Assistance Service

IOC
Input Output Controller

MISM
MISMatch

MM
MisMatch

MOP
Method Of Procedure

MS
Message Switch

NTI
Northern Telecom Inc.

NTP
Northern Telecom Practice

OAM
Operations, Administration, and Maintenance

OBE
Obsolete Emergency

OBR
Obsolete Replacement

OBS
Obsolete

ONP
One Night Process

PCL
Product Computing-Module Load

PM
Peripheral Module

REX
Routine Exerciser

SFDEV
Store File

SLM
System Load Module

SWACT
SWitch ACTivity

TAS
Technical Assistance Service

XPM
Extended multiprocessor system peripheral module

List of terms

Abort

Termination of a BCS application when an unrecoverable error or malfunction occurs, or when directed by the operating company.

Active BCS

Software release designation for a previous software release once a new production software release becomes available. At any given time, the BCS stream includes 1 production, and 5 active levels. The remaining levels are retired.

Application

Installation of the new software into the DMS switch. A software application may be performed by an NTI software application engineer or telephone company personnel. An "application" may also be called an "insertion" or an "upgrade."

AutoApply

Automated series of programs for upgrades to BCS 25 through 28 which determine the routines needed for an office upgrade, and runs them with limited engineer input and intervention. Used with NTI- or telco-administered upgrades.

AutoImage

Feature which takes the office image automatically without user intervention. It stops journal file and then restarts it after the image is taken.

Automail

Automated electronic mailing system for core/regional information exchange regarding software orders.

Batch Change Supplement (BCS)

Software load or release which consists of base level software and a collection of feature packages. A new BCS is released two or three times per year.

BCSUPDATE

DMS-resident program in BCS 29 and higher that applies the new datafilled software load into the switch during the One Night Process (ONP) software delivery and the Hybrid process software delivery. If the "From BCS" is BCS 28 or below, BCSUPDATE must be loaded into the switch.

Bulletin

See Software Delivery Bulletin System.

CHECKTAB

Program available with BCS34 and lower which identifies errors and inconsistent data in selected tables. These problems should be corrected before the software delivery. (Also see TABAUDIT.) TABAUDIT or CHECKTAB is more powerful than TABCHK.

Controlled introduction

Status designation for new software feature packages that are not yet generally available. These packages require approval from NTI Marketing, New Product Introduction, for inclusion in a software order.

Core

Centralized Northern Telecom INS organizations located in the Research Triangle Park area of North Carolina. For software delivery, the term refers to the centralized RTP organizations which perform software delivery functions in all regions.

Custom calling features

Features that can be altered by residential and business subscribers, such as speed calling and call forwarding.

Customer

DMS switch owner such as a telephone company or operating long distance carrier. Should not be confused with residential or business telephone subscribers.

Customer input

Specific information that is needed from the customer (telephone company) before provisioning and production of new software can begin. Customer specific information for a new software load is recorded on the CI (customer input) document.

DMS Evolution

Transition from BCS software releases to standardized PCL loads.

Dump and restore

Process of dumping all office data from the old BCS load and restoring it into the new BCS load. This applies only to the conventional and hybrid software delivery processes.

Fail

Condition of a software upgrade in which the customer or any of its subscribers experience any type of service degradation as a result of the software delivery.

FAST (First Application System Test)

Northern Telecom facility for testing new software loads. FAST I is in Canada; FAST II is in the Research Triangle Park area.

Frozen image

"Snapshot" image of the switch when the data is frozen, allowing no service orders. The frozen image tape is sent to NTI where the data is dumped from the old load, and restored to the new load. The frozen image is required only for the conventional and hybrid software delivery processes.

Gating hardware

Hardware required for a new software load because of a specific feature or the entire BCS release.

General availability

Feature packages that are available for order by any customer.

Hardware extensions

Requests for upgrades to existing hardware. Hardware extensions may also have software requirements.

Image tape

Magnetic tape containing the datafilled software load which is produced by the telco and sent to NTI for testing or dump and restore. A system image tape is not necessarily a frozen image.

Inform list

List of feature packages and patches currently present in the office. The inform list is obtained when NT dials into the customer's switch and requests it. This listing is generated in either PATCHER or PRSM

Initial order

Customer order for a new DMS or network product. The initial order schedule establishes the common base for all other order types for that job, including information that identifies the customer, the location, product and other data pertinent to the order.

Insertion

Installation of new software into a DMS switch. The terms "upgrade," "insertion," and "application" are synonymous.

In-sync

See "Sync"

JFDB (Job Features Database)

NTI database that stores office- and job-related information. It is used during software production to generate a list of feature packages to include in the new software load.

JFFREEZE

Feature activated prior to dump and restore that assists in making the image tape and preparing the journal file.

Job book

Internal NTI tracking notebook that follows a software job from Loadbuild through the software delivery. Each group inserts relevant documentation that can be used by later groups in the process.

Journal file (JF)

Collection of stored service orders made during the office data freeze period. The journal files are rotated daily and applied during the application.

Loadbuild

Series of processes that merge DMS base level software with ordered feature packages into a customized undatafilled software load. This term also refers to the group that performs these procedures.

Loadmate

Process of loading the new software load into the inactive side of the switch to begin the software delivery.

Manual apply process

Series of programs requiring much engineer input and intervention to apply a software load through BCS 24.

MemCalc

Software tool which calculates program and data store requirements for a new software load based on the existing switch configuration.

MOVEBCS

DMS-resident program in BCS 29 and higher that moves the data from the old software load to the new load during the One Night Process (ONP) software delivery. If the "From BCS" is BCS 28 or below, MOVEBCS must be loaded into the switch.

NSR (Network Software Release)

Software loads for the Dynamic Network Controller family of products (DNC-500, DNC-100, etc.)

NT-Access

Computerized on-line questionnaire used by the telco to input provisioning information for an order.

One Night Process (ONP)

Software delivery option for smaller offices beginning with BCS 29 which moves data (using MOVEBCS) and applies the new load (using BCSUPDATE) in one night, eliminating the need for freezing office data.

PARMMail

Electronic transmission of software parameters requested by the telco for the new software load. The PARMMail is sent to the regional software system engineer (SSE) who then verifies and forwards it to core for setting the parms.

Parms (Parameters)

Software variables which are identified in four software tables in the DMS switch: OFCENG (office engineering), OFCSTD (office standards), OFCOPT (office options), OFCVAR (office variables). Parameters are used by the DMS software during switch operation to define the length of timing intervals, routing options, and other elements in the switch.

Pass, by process

Any BCS application that takes place with no unplanned activities, e.g., software parameters changes, patches needed, translation changes, defective hardware.

Pass, with process intervention

Any BCS application that requires some unplanned activities to avoid service-affecting issues.

Patch

Rewrite to an existing software load which changes only a small portion of data or program.

Polling

Process of dialing into the customer switch prior to the software upgrade to obtain memory and other information on the existing system.

Pre-application procedure

Series of pre-application office checks to ensure that the office is ready for the software upgrade. The NTI BCS Pre-application engineer performs these procedures with telephone company site personnel on the DMS switch.

Production BCS

Software release designation used to indicate the most recent software release.

Regions

NTI organizations located in the major regional areas of the United States that perform various customer interface functions in the software delivery process.

Reschedule

Condition in which a scheduled software upgrade is cancelled and re-scheduled due to an unexpected problem or issue that would impact the success of the software delivery. This condition occurs after the production flag is set in loadbuild, but before sync is dropped for the application.

Retired BCS

Designation for a software release which has been followed by six newer software releases (five active and one production) and is, therefore, no longer supported by NTI.

RTP dump and restore

Process in which the telco sends a frozen image to NTI, and captures service orders through journal file. In an NTI captive lab, the data is dumped from the image and restored to the new load in a captive lab one week before the application.

Service orders

Process of changing customer data in the switch. For conventional and hybrid software deliveries, service orders are not allowed during the data freeze period. Any required service orders are collected in journal files, which are then applied during the application.

Soak rule

Policy requiring all gating hardware to be installed 12 days before the scheduled insertion date to ensure good working order.

Split site dump and restore

Process similar to the site dump and restore except that service order activity is provided during the time between the dump and restore procedures.

Software delivery

Process of updating software in existing in-service telephone office. The term also refers to installing software loads in new DMS offices.

Software Delivery Bulletin System

Computerized menu-driven bulletin system on C-SCAN that provides temporary "workaround" procedures for conditions that have been identified

to be changed. Bulletins contain information that has not yet been released in NTI documentation.

Software extensions

Requests for software-only upgrades to existing DMS switches, or Network Products.

SWACT (SWitch of ACTivity)

Switching of all switch activities and operations from the old software load to the new load. The inactive side with the new software becomes the active side.

Sync (synchronization)

Process of having active and inactive sides running on the same software load, with the inactive side serving as backup to the active side (duplex mode). When the switch is out-of-sync (simplex mode), the inactive side is being used for another purpose, such as upgrading to a new software load, and cannot back up the active side.

TABAUDIT

Program available with BCS35 and higher which identifies errors and inconsistent data in selected tables. These problems should be corrected before the software delivery. (Also see CHECKTAB.) TABAUDIT or CHECKTAB is more powerful than TABCHK.

TABCHK

Program which identifies basic inconsistencies in tables, including false tops and bottoms. TABCHK is not as powerful as TABAUDIT or CHECKTAB, but it can be used on all tables.

Telco

Telephone company or Carrier company, Northern Telecom's customer.

Undatafilled image

DMS base level software combined with all feature packages ordered by the telephone company, but without office data assignments (line, trunk assignments, routing options, etc.) An undatafilled system image tape is produced during the loadbuild process.

Upgrade

Installation of new software into a DMS switch. The terms "upgrade," "insertion," and "application" are synonymous.

Verification Office (VO)

Telco offices which test new software releases before they become generally available.

DMS-100 Family

Software Delivery

Software Delivery Planning and Provisioning

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