Meridian 1

Network ACD

Description and operation

Document Number: 553-3671-120
Document Release: Standard 9.00
Date: June 1999

© 1989, 1999
All rights reserved

Printed in the United States of America

Information is subject to change without notice. Nortel Networks Corporation reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules, and the radio interference regulations of Industry Canada. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

SL-1 and Meridian 1 are trademarks of Nortel Networks Corporation.

Revision history

June 1999

Standard, issue 9.00. This is the X11 release 24.2x standard version of this document.

October 1997

Standard, issue 8.00. This is the X11 release 23 standard version of this document.

December 1995

Standard, release 7.00. Reissued to include editorial changes.

July 1995

Standard, release 6.00. This document is issued to include X11 release 21 changes.

December 1994

Standard, release 5.00. Reissued to include editorial changes and indexing.

August 1, 1993

Standard, release 4.00. Reissued to include updates and new information.

December 31, 1992

Standard, release 3.00. Reissued to include updates for X11 release 18.

December 1, 1991

Standard, release 2.00. Reissued to include technical content updates. Service change and system error message information has been removed from this document. Refer to the *X11 input/output guide* for this information.

December 20, 1989

Standard, release 1.00. Reissued for compliance with Northern Telecom standard 164.0 and to include updates for X11 release 15.

Contents

General information 1

Enhanced Overflow 4

Network ACD overview 5

- Environment 5
- NACD on a 911 application 5
- Call Processing 5
- Call Request queue 6
- Engineering 6
- Management reports 7
- Collect Call Blocking (Brazil) 7
- Meridian Link Predictive Dialing Support 17
- Meridian 911 34

ISDN overview 58

- Primary Rate Interface (PRI) 58
- D-channel 59
- ISDN Signaling Link (ISL) 59

Supporting documents 59

- ACD 59
- ISDN 60
- System support documents 60

Functional description 61

Network environment 61

- Routing Tables 62
- Source Table Viewer 65
- Cascade routing 68
- Dynamic status change 70

Incoming calls 71
Call Requests 71
Canceling Call Requests 72
Queue priorities 73
Call presentation 75
Interactions 75
ACD interactions 76
Feature interactions 83

NACD engineering 85

Dependencies 85
Package dependencies 85
Feature limitations 86
Feature requirements 87
ESN requirements 88
Recommendations 90
Customer configurations 90
NACD engineering guidelines 92
Target table definition 93
Real-time impact 93
Noncoincidence busy hour (time zone difference) 93
ACD DN load at each node (spare capacity) 94
Agent group size in an ACD DN 94
Number of hops 95
Parameter definition 95
Flow Control (Overlay 23: FCTH) 95
Call Request Queue Size (Overlay 23: CRQS) 96
Resend Timer (Overlay 23: RSND) 96
Reserve Agent Timer (Overlay 23: RAGT) 96
Oldest Call in Network (Overlay 23: OCN) 97
ACD agents requirement at each node 97
Trunking requirements at the Source and Target nodes 97
Duration Timer (Overlay 23: DURT) 98
Network requirements 99
Signaling link requirements between Source and Target nodes . . . 99

Overflow traffic estimation 100
Average CCS loading per agent at each ACD DN 100
Call register requirements 101
Designing the NACD Routing Table 103
ACD agent group size (P1) 104
Average agent load at each target ACD DN (P2) 104
Number of hops (P3) 105
Noncoincidence busy hour and time zone difference (P4) 106
Ranking of Target nodes on NACD Routing Table 106
Timer value in NACD Routing Table 107
Incremental impact engineering 111
Trunking requirement 111
Trunk traffic to source ACD DN 112
Overflow traffic from source ACD DN 112
Calls handled by the Source node agents 112
Incremental traffic to each Target node 113
Real-time requirement 114
Call register requirement 115

Implementation 117

Operations 119

Agent telephone displays 119
Management reports 119
Administration and operational measurements 120
Service change 120
Traffic measurements 122

Index 123

List of tables

Table 1
Time Overflow versus Enhanced Overflow 4

Table 2
Example routing table (UDP) 64

Table 3
Print Source Table 66

Table 4
Print Source Table Example 67

Table 5
NACD Target entry registration 93

Table 6
Data Link capacity for NACD and ISL calls 99

Table 7
Poisson table at P.01 grade of service 102

Table 8
NACD configuration data and timer priority assignment 110

Table 9
An NACD Routing Table 111

Table 10
Prompts and responses 121

List of figures

Figure 1
High-level overview of Network ACD 3

Figure 2
Cascade routing 69

Figure 3
Target agent available 82

Figure 4
A 5-ACD DN and 4-node NACD network 108

General information

Enhanced Overflow (EOVF) vastly expands the operations for overflow queues and Target queues within an existing Automatic Call Distribution (ACD) switch. The Enhanced Overflow package can operate in any existing ACD application.

Network ACD supports ACD functions over an Integrated Service Digital Network (ISDN). All the requirements for ISDN are required for Network ACD.

This is a descriptive and administrative publication for the Enhanced Overflow feature and Network ACD. This feature requires X11 Release 15 or higher and is supported only on the following machine types:

— SL-1 ST, STE, NT, RT, XT

— System options 11, 21, 21E, 51, 51C, 61, 61C, 71, 81, and 81 C.

Starting with X11 Release 21, the following features are available:

— Collect Call Blocking (Brazil) provides a mechanism for special treatment of incoming DID and CO collect calls on 2 Mbit/sec digital trunks and analog trunks. This feature is provided on a route and individual user basis.

— Meridian Link Predictive Dialing Support

— M911 Enhancements include Call Abandon and MADN Display Coordination. Call Abandon provides the ability to treat an abandoned call as though the calling party remained online. MADN Display Coordination adds the Application Module Link, Meridian Link, and Application Module Base Application Program Interface (API) messages that enable Meridian 911 and ML applications to provide display coordination for a call taker that holds/receives multiple active calls across a MADN.

— Multiple Queue Assignments allows ACD agents to service calls from multiple ACD queues simultaneously, and choose the queues they wish to service at login.

Before using this document, you must have a working knowledge of both ACD and Integrated Service Digital Networks. Refer to the publications listed on page 59 for related background information.

This section is an introduction to the Network ACD application. Details for the administration and operation of the features are covered later in this document.

Enhanced Overflow (EOVF) increases the number of Target ACD Directory Numbers (DNs) from 6 to 100 within the existing Time Overflow (TOF) feature application. As a stand-alone feature, it works only in local applications. EOVF alone does not provide network services, but is prerequisite for Network Automatic Call Distribution (NACD).

Network ACD provides ACD capabilities over an Integrated Service Digital Network (ISDN). An NACD system distributes ACD activities between several sites. Connected by ISDN voice and data services, different sites can be physically or geographically separated within the network.

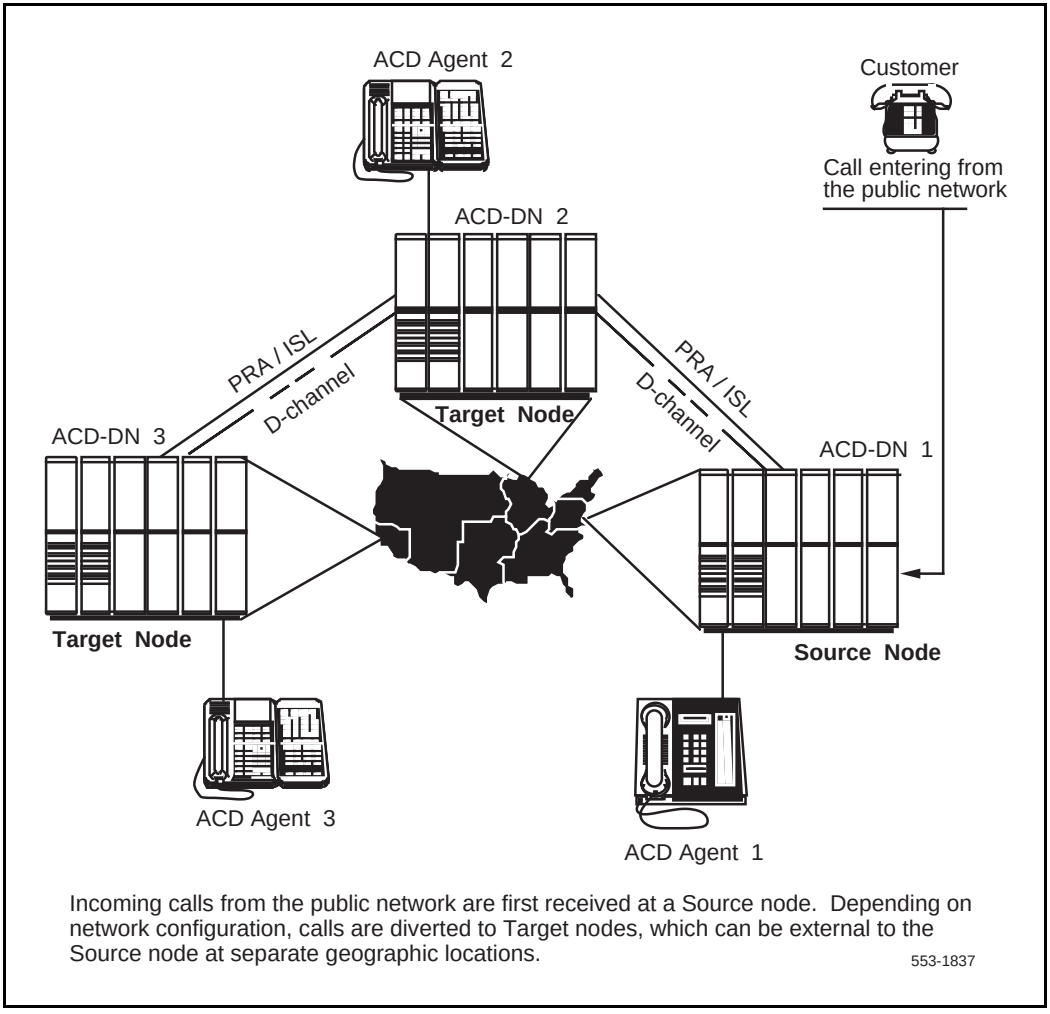
System operations and call overflows are transparent to the caller. The ACD agents notice some display changes; however, ACD supervisors and system technicians must be aware of the configuration and operation of NACD to properly support the application for a customer.

With EOVF and NACD enabled and supported in the network, calls can be serviced as shown in Figure 1.

The Source node is a queue that has target queues assigned, and makes outgoing calls.

The Target node is the queue that the calls come into.

Figure 1
High-level overview of Network ACD



Incoming calls from the public network are first received at a Source node. Depending on network configuration, calls are diverted to Target nodes, which can be external to the Source node at separate geographic locations.

553-1837

Enhanced Overflow

Enhanced Overflow (EOVF) allows a maximum of 20 Target queues for each Source ACD DN.

Enhanced Overflow defines local Target queues for each Source ACD DN. EOVF diverts incoming calls from an overloaded ACD DN to Target ACD DNs (like Time Overflow) that are local to the Source ACD DN.

Enhanced Overflow enhances Time Overflow (TOF) operation to increase the number of ACD DNs serviced by a Target from 6 to 100. That is, with the EOVF package, any particular ACD DN configured as a Target can accept calls from up to 100 other ACD DNs on the same switch.

Diverting calls from the Source ACD DN to the appropriate Target ACD DN is controlled by Routing Tables configured in software LD 23, with related timers and threshold values. Engineering for these tables is described later in this document.

A Source can define 20 Targets. A Target can have an unlimited number of Targets. The range is

— TOF 2 to 1800 seconds

— EOVF 0 to 1800 seconds

Table 1
Time Overflow versus Enhanced Overflow

	Timers	Number of Targets	Number of Sources	Night mode supported
Time Overflow (TOF)	2 to 1800 seconds	3 Must be the same Targets as overflow by count	6	no
Enhanced Overflow (EOVF)	0 to 1800 seconds	20 Does not have to be the same Targets as overflow by count	no limit	yes

Network ACD overview

Environment

The Enhanced Overflow (EOVF) (package 178) is required to support Network ACD (NACD). Network ACD (package 207) allows ACD functionality between physically separated locations in a multinode Meridian 1 network. This allows ACD agent groups at different locations (nodes) to service calls over the network at remote targets, independent of where the call first entered the network. Network ACD uses ISDN D-channel messaging to exchange information between nodes.

NACD on a 911 application

If the incoming route is set up with CPDC = YES and it uses CDP to direct the call to queue 2 without using NACD, the call will go to queue 2. For an NACD application, CPDC must be set to NO.

Call Processing

Like EOVF, Network ACD allows Target queues to be defined for Source ACD DNs. Network ACD can define Source and Target queues for each ACD DN. NACD diverts incoming calls from an overloaded ACD DN to Target ACD DNs (like EOVF), which can be local or remote to the Source ACD DN. Local Targets are on the same node as the Source ACD DN, and remote Targets are at a different node.

Diverting calls in NACD is controlled by Routing Tables with timers. Calls diverted by NACD can be answered by the Source ACD DN or any one of up to 20 Target ACD DNs. By using ISDN D-channel messaging to queue Call Requests at remote Target ACD DNs, voice calls are not physically diverted until an idle agent is reserved for that call at the remote Target node. If no trunks are available, a call doesn't go across the network. If trunks are available, the agent is reserved until the timer expires.

Refer to "Designing the NACD Routing Table" on page 103.

When the Target timer expires and there are no idle agents available at the Source node, NACD software sends a Call Request over the ISDN D-channel to a defined Target ACD DN. An idle Target agent is matched with an individual Call Request. That Target agent is reserved for that call, and the Target node responds through the D-channel with an Agent Free notification. When the Agent Free notification is sent, the agent is reserved and a customer-defined Reserve Agent Timer starts. Only after receiving the Agent Free notification does the NACD Source node physically divert the voice call to the Target ACD DN. When reserved, an agent is not available to receive ACD calls from any other queue.

The Reserve Agent Timer (RAGT), as configured in CD 23, prevents an agent from being reserved indefinitely and unavailable for calls. A timer countdown is shown on the agent's Digit Display if desired. If the call is not presented before the timer expires, the agent is returned to the Idle Agent queue and the call remains in place in the Source node.

There are some situations that can change an agent's reserved status or cancel a Call Request; these situations are described later in this document.

Call Request queue

Target ACD DNs have an additional queue created to handle incoming NACD traffic—the Call Request queue. Logical Call Requests (*not* physical calls) are queued in the Call Request queue for the Target ACD DN until an agent is available.

Engineering

Operating parameters for NACD must be carefully engineered for proper functioning. To interact with supporting systems, this feature requires certain configurations. In order to protect other feature operations, some precautions are suggested in "NACD engineering" on page 85.

The NACD engineering section also contains a list of all hardware and software requirements for Networking ACD applications. Be sure to read the entire section before starting to implement NACD.

The NACD feature requires ISDN to already be active between the sites enabled for NACD. Take special note of the sections in this document that address package requirements, feature engineering, and feature interactions.

Network ACD is a separate package from the ACD packages. Refer to the engineering section for a complete list of the package dependencies involved.

Dialing plan configuration is critical to NACD operation. See “NACD engineering guidelines” on page 92.

Management reports

Package C for ACD provides reports to assist ACD supervisors with agent and traffic statistics. Although no new fields are introduced in the output reports, the reports are changed by circumstance because calls are presented or received at potentially diverse locations. Supervisors must be aware of network operations, because the values presented in the supervisor’s display are affected by NACD.

Details for changes to Management reports are covered in the section on operations in this document. See “Management reports” on page 119.

Collect Call Blocking (Brazil)

In Brazil an automatic long distance collect call service called DDC is available. The collect Call Blocking feature enables a Meridian 1 administrator to block DDC calls on incoming Direct Inward dialing (DID) and Public Exchange/Control Office trunks (analog or DT12). Under the following conditions, the Meridian 1 sends a special answer signal to the Central Office that collect calls cannot be accepted:

— The Collect Call Blocking (CCB) package 290 is enabled

— The incoming route has CCB enabled via the CCB prompt in the Route Data Block, and

— The call is answered by a CCB user (i.e., Collect Call Blocking Allowed Class of Service or option).

New Classes of Service and prompts have been introduced to inhibit specific users fro receiving collect DID and Central Office calls. These can be configured for the following:

— Analog (500/2500 type) and Meridian 1 proprietary sets, through the Collect Call Blocking Allowed/Denied (CCBA/CCBD) Class of Service.

— Attendant and Network Alternate Route Selection calls on a per customer basis through CCBA/CCBD option.

— Automatic Call Distribution (ACD) queues through the CCBA prompt.

— Direct Inward system Access (DISA) through the CCBA prompt.

— Tandem calls dialed with Coordinated Dialing Plan (CDP) (Trunk Steering Code, Distant Steering Code) through the CCBA prompt.

— Tandem non-CDP calls through the CCBA prompt in the Route Data Block from the outgoing trunk route.

The Meridian 1 sends the CCB answer signal in place of the regular signal for incoming DID/CO calls from routes with CCB enabled, when a call is answered by a CCB user. If the call is a collect call, the CO will disconnect the call.

Operating parameters

The Collect Call Blocking feature supports both analog and DT12 trunks, and the following Intelligent Peripheral Equipment (IPE) cards:

— The NTCK 16BB Extended Flexible COT Trunk Card (XFCOT) with firmware flash timing

— The NT8D14BA Enhanced Extended Universal Trunk Card (EXUT) containing the Centrex Switchhook Flash function in the firmware, and

— The NT8K14AK Extended Universal Trunk Card (XUT) which may be used if the Centrex Switchhook Flash is configured with software timing.

— The Collect Call Blocking answer signal can only be sent in cases where answer supervision is provided by the Meridian 1.

Once the modified answer signal is sent to the CO, the Meridian 1 has no control over how the call will be handled by the CO.

If a CCB user answers a call from a CO/DID route with Collect Call Blocking activated, the CCB answer signal is sent to the CO for all incoming DID and CO calls. For analog trunks, the user will experience clicking on the line and a temporary break is speechpath (0.5 to 2.5 seconds) while the CCB answer signal is being sent.

If the XFCOT and EXUT cards do not have flexible firmware timing, the CCB flash portion of the CCB answer signal will be returned to the CO. However, software controlled signaling can be done with EXUT cards.

In a standalone environment, all input from a set (except from the Release key) is ignored while the Collect Call Blocking answer signal is being sent.

Collect Call Blocking is applied to attendants on a customer basis only; it cannot be applied on a tenant basis.

The answer signal returned for a call from a route with CCB enabled and that is Network Attendant Service (NAS) routed is determined by the customer option on the source node. Thus, NAS routing can be configured across any Meridian Customer Defined Network environment, but the source node determines the answer supervision sent to the CO.

Call Detail Recording (CDR) record timing begins on the first answer of the CCB answer sequence. For this reason, CDR records will be generated for incoming calls to CCB users across routes on which CCB is enabled. If the call is collect, and is dropped, a CDR record of approximately CCB1 + CCB2 length will be generated.

For data calls all calls will be answered with the CCB answer signal, if CCB is enabled. This may have an effect on data protocols, while CCB signaling is taking place.

If firmware timing is used (FWTM = YES in LD 14) for sending the CCB flash, the CCB2 timer is downloaded to the card before sending the firmware flash. If the CCB2 timer is changed in the Route Data Block, either the card has to be enabled or the switch has to be initialized to get the new CCB2 timer downloaded to the card.

Feature interactions

Automatic Answerback The Automatic Answerback (AAB) feature, when assigned to a Meridian 1 proprietary set, allows any incoming N) to be answered automatically. If an incoming DID or CO call terminates on a set with the AAB feature enabled, the call is automatically answered after one ring. If the set has a CCBA Class of Service, the CCB answer signal is provided in the place of the regular answer signal.

Automatic Call Distribution Collect Call Blocking can be enabled on an ACD queue basis. Hence, if an incoming CO or DID call is answered by an ACD agent, the answer supervision signal that is returned to the CO is determined by the value of the CCBA prompt in LD 23. While the CCB answer signal is being sent, the same limitations apply to ACD as apply to sets with CCBA Class of Service.

Automatic Call Distribution Interflow If an ACD call from a route with CCB enabled is diverted to an interflow DN, and answer supervision has not already been provided, the answer signal returned to the CO depends on the source ACD queue. The CCB answer signal is returned to the CO if the source ACD queue has CCB enabled.

Automatic Call Distribution Night Call Forward If an ACD call from a route with CCB enabled is diverted to a Night Call Forward DN, and answer supervision has not already been provided, the answer supervision signal returned to the CO depends on the source ACD queue. The CCB answer signal is returned to the CO if the source ACD queue has CCB enabled.

Automatic Call Distribution Night RAN Route Announcement If an ACD call from a route with CCB enabled is diverted to a Night RAN route (defined by NRRT in the ACD block), the CCB signal returned to the CO depends on the source ACD queue. If the source ACD queue has CCB enabled, the CCB answer signal is sent to the CO.

Autoterminate If an incoming DID or CO call from an autoterminate trunk terminates on a set or ACD queue with a CCBA Class of Service, the CCB answer signal is provided in place of the regular answer signal.

Basic Rate Interface (BRI) Sets For BRI sets CCBA/CCBD Class of Service cannot be programmed. Therefore, it is not possible to prevent BRI sets from accepting DDC collect calls.

Central Answering Position (CAP) The answer signal returned to the CO for calls that get answered by a Central Answering Position (CAP) is determined by the source ACD configuration and not the customer option (CCBA/CCBD in LD 15) on the source node.

Centralized Attendant Service The answer signal returned to the CO for calls that get answered by a Centralized Attendant Service is determined by the customer option (CCBA/CCDB in LD 15) on the source node.

Centrex Switchhook Flash A Centrex Switchhook Flash cannot be invoked by another feature while the CCB answer signal is being sent.

Enhanced Malicious Call Trace If a station activates Malicious Call Trace (MCT) while the CCB answer signal is being sent, MCT activation is ignored. This also applies to the case when MCT is activated from a remote node.

Meridian Mail Because Meridian Mail is configured using ACD queues, the same interactions exist as in the ACD case. When Meridian Mail sends a call answer message to the Meridian 1, the CCB configuration in the source ACD queue is used to determine if a CCB answer signal should be sent to the Central Office. All mail boxes using the same ACD queue to access Meridian Mail will get the same CCB treatment.

If some of the mail boxes are allowed to receive collect calls, this may be a problem. A possible solution is to configure two ACD queues on the Meridian 1 to access Meridian Mail. One queue would have collect calls allowed (i.e.e, CCBA = NO) and the second queue would have collect calls denied (i.e.e, CCBA = YES).

Network Automatic Call Distribution The answer signal returned to the CO for a network ACD call from a route with CCB enabled is determined by the source ACD queue. If the source ACD queue has CCB enabled, the CCB answer signal is returned in place of the regular answer signal.

Pilot DN If an incoming DID or CO call has CCB enabled and is routed to a pilot DN, the answer signal returned to the CO is determined by the CCB configuration of the terminating station.

Private Line Service If an incoming DID or CO call from a private line trunk terminates on a set with a CCBA Class of Service, the CCB answer signal is provided in place of the regular answer signal.

Recorded Announcement (RAN) A RAN route is defined as having CCBA YES or NO, which is used if Coordinated Dialing Plan (CDP) or ACD queues were not used to get to the RAN route. If the call is routed through ACD/CDP to terminate on RAN, the CCB treatment will depend upon the CCB data of the ACD/CDP, and not the RAN route.

Tandem to Unsupervised Trunk If an incoming DID or CO call tandems to an unsupervised trunk before it terminates, the answer signal is sent by time-out. Therefore, any CCB tandem calls made to unsupervised trunks will not have the CCB answer signal sent until the time-out occurs.

Trunk Hook Flash (THF) If a station activates THF while the CCB answer signal is being sent, THF activation is ignored.

Feature packaging

Collect Call Blocking (CCB) package 290 must be provisioned to activate this feature.

Feature implementation

LD 16 – Enable Collect Call Blocking on a route and configure timers.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route Number.
TKTP	aaa	Trunk type. Must be COT,DID,FEX, or WAT for CCB.
...		
M911_ANI	NO	M911 route. Must be set to NO to enable CCB.
ISDN	NO	ISDN route. Must be set to NO to enable CCB.
...		
ICOD	IAO,ICT,OGT	Incoming and outgoing, incoming, or outgoing. Must be either IAO or ICT to enable CCB.

		Must be either IAO or OGT to get the CCBA prompt for outgoing calls.
...		
CNTL	(NO), YES	Collect Call Blocking enabled or disabled on incoming route. CCB package 290 is required. Enter YES to obtain CCB timer prompts.
CCB1	512-(1536)-4992	Collect Call Blocking delay timer 1 in milliseconds. Input rounded to the next multiple of 128 milliseconds.
CCB2	500-(1520)-2550	Collect Call Blocking delay timer 2 in milliseconds. Input rounded to the next multiple of 10 milliseconds. If any CCB route members (trunks) are using firmware timing (FWTM = YES in LD 14), changes to the CCB2 timer value will not take effect until the new timer value is downloaded to the card. This can be done by enabling the card or initializing the switch.
CCBA	(NO), YES	Collect Call Blocking allowed or denied for outgoing route.

LD 14 – Set up the firmware timing for XFCOT and EXUT cards.

Prompt	**Response**	**Description**
REQ	NEW CHG	Add new data. Change existing data.
TYPE	DID,COT,FEX,WAT	Trunk Type.
TN	l s c u c u	Terminal Number. For Option 11.
XTRK	ECUT,XCOT	Type of card.
FWTM	(NO), YES	Firmware timing for flash. Enter YES to enable firmware timing.
CUST	xx	Customer number.
RTMB	xxx xxx	Trunk route and member number.
SUPN	YES	Answer supervision required.

LD 15 – Add or change Collect Call Blocking for attendants.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	CDB	Customer Data Block.
CUST	xx	Customer number.
...		
CAS	(NO, YES)	Centralized Attendant Service.
OPT	(CCBD), CCBA	(Deny) allow Collect Call Blocking.

LD 10 – Add or change Collect Call Blocking for analog (500/2500 type) sets.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	500	Telephone type.
TN	l s c u c u	Terminal Number. For Option 11.
...		
CLS	(CCBD), CCBA	(Deny) allow Collect Call Blocking.

LD 11 – Add or change Collect Call Blocking for Meridian 1 proprietary sets.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	aaaa	Telephone type, where: aaaa = SL1, 2006, 2008, 2009, 2016, 2018, 2112, 2216. 2317, 2616, or 3000.
TN	l s c u c u	Terminal Number. For Option 11.
...		
CLS	(CCBD), CCBA	(Deny) allow Collect Call Blocking.

LD 23 – Enable Collect Call Blocking on ACD queues.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	ACD	ACD data block.
CUST	xx	Customer number.
ACDN	xxxx	ACD Directory Number.
...		
CCBA	(NO), YES	(Deny) allow Collect Call Blocking.

LD 24 – Enable Collect Call Blocking on DISA blocks.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	DIS	DISA data block.
CUST	xx	Customer number.
...		
DN	xxxxxxx	DISA Director Number.
...		
CCBA	(NO), YES	(Deny) allow CCB answer signal to be sent.

LD 87 – Enable Collect Call Blocking on CDP Steering codes**.**

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
CUST	xx	Customer number.
FEAT	CDP	Coordinated Dialing Plan
TYPE	TSC, DSC	Steering code type.
...		
CCBA	(NO), YES	(Deny) allow CCB answer signal to be sent.

Feature operation

No specific operating instructions are required to use this feature.

Meridian Link Predictive Dialing Support

With Predictive Dialing, the process of making outgoing calls to customers is automated for Automatic Call Distribution (ACD) agents. Host applications can request the Meridian 1 to make calls using autodialers or phantom TNs. When a call is answered, the application sends a request to the switch to transfer the call to a live agent. The call needs to be transferred before, or while, the customer starts speaking in order to prevent customers from abandoning the call if they think no one has called them. This transfer was previously performed by Meridian Link in two steps by sending two separate Application Module Link (AML) messages to initiate and then complete the transfer. This operation takes a minimum of 400 to 500 milliseconds for the Meridian 1 to process.

The Fast Transfer development in X11 Release 21 allows applications residing on the application Module (AM) or host computers to transfer a call in one step, a blind transfer, by sending only on AML message (Fast Transfer) to the switch, thereby saving approximately 200 to 250 milliseconds of transfer time. This Fast Transfer feature is useful for predictive applications to make outbound calls and then quickly transfer them once the customer has answered (i.e., live voice has been detected). Fast Transfer can also be used in a non-predictive dialing environment. Applications that want to perform a blind transfer can now execute it more quickly.

The Predictive Dialing feature enables applications residing on the AM or host computers to send a combined Make Call and Transfer request on behalf of an autodialer or Phantom TN. As soon as live voice is detected by third-party equipment, or notification is sent to the switch indicating the call has been answered (e.g., answer supervision), the application can send the Fast Transfer request to the switch immediately transferring the call to an ACD agent.

Operating parameters

When Phantom TNs/DNs are used to originate calls as part of a predictive dialing operation, the Option 11 will not be supported.

Attendant Consoles, and Basic Rate Interface sets cannot initiate Fast Transfer or predictive calls.

The Meridian 1 does not support live voice answer detection. Live voice answer detection is currently achieved through third-party vendor equipment.

If phantom TNs/DNs are used, this development only supports calls and Fast Transfers originated by phantom TNs/DNs which are defined as Associate set (AST) Meridian 1 proprietary sets on a phantom loop.

Data calls are not supported.

For outbound trunk calls, if no third-party equipment is used to detect live voice answer, the switch will have to depend on receiving answer supervision before transferring the call to the target DN.

If voice detection is used, the application will not be able to Fast Transfer the call before the call is established (i.e., answer notification is received).

The application will not be able to complete the transfer when Fast Transferring over a trunk.

Not all analog trunks support answer supervision. All digital trunks do not provide answer supervision. For trunks that do not support answer supervision, the End-of-Dialing (EOD) timer will be used to trigger the transfer.

Receiving answer supervision depends on the accuracy of signals returned by the external network. Answer supervision may be received before an OED timeout, fake answer supervision may also be received due to an OED timeout, and a pseudo answer supervision may be received if the far-end has an EOD timeout even though the local switch has answer supervision configured.

The AML requires an Enhanced Serial Data Interface (EDSI) card or Multi-purpose Serial Data Link (MSDL) card (NT6D80AA) on the switch. If an Option 11 is used, a Serial Data Interface/D-Channel (SDI/DCH) card (NTAK02AA) is required to configure the EDSI port.

The AML connection requires an FS232 cable.

Meridian Link software is required for host application to utilize this feature.

Feature interactions

Call Transfer by Meridian 1 proprietary Set The application sends the Fast Transfer request on behalf of a Meridian 1 proprietary set, and then the switch initiates and completes the transfer immediately which is similar to a normal call transfer from a Meridian 1 proprietary set.

In a Predictive Dialing scenario where the autodialer (origination DN) is a Meridian 1 proprietary set, the Make Call message sent by the application to the switch to make a call on behalf of the Meridian 1 proprietary set, and then the call transfer call, will interact with the Meridian 1 proprietary Call Transfer feature. The autodialer is configured with Class of Service TRN so that the switch can transfer the call to the target destination.

Call Transfer by analog (500/2500 type) Set The application sends the Fast Transfer request on behalf of an analog (500/2500 type) set. The switch will then initiate and complete the transfer in one step.

— In a predictive dialing scenario, the application will send the Make Call request on behalf of the autodialer (analog (500/2500 type) set) to have the switch make the call, and then transfer the call when the switch receives the Fast Transfer message. The autodialer needs to be configured with Classes of Service Dial Pulse (DIP) and Transfer Allowed (XFA) for 500 sets, or with Classes of Service Digitone (DTN) and XFA for 2500 sets.

Command and Status Link The Command and Status Link also known as the AML, is the link on which the messages for the Predictive Dialing feature flow between the switch and an Application Module. The CON/Fast Transfer is an AML message.

Trunks Only certain trunks will support answer supervision. The End-of-Dialing timer will be used for trunks that do not support answer supervision.

Call Hold If an established call is put on hold by the set initiating the Fast Transfer, the switch will not be able to transfer the call. The switch can only transfer a call if it is in the established state.

Feature packaging

There are no new software packages required for the Predictive Dialing feature. However, the following packages are required to utilize the feature:

— Application Module Line (IAP3P) package 153, and

— Meridian Link Module (MLM) package 209 if the Meridian Link Module is involved.

Feature implementation

This feature does not require any changes to the overlays. The following illustrates the configuration requirements to set up this feature. Most of these requirements are used by existing Meridian Link and Application Module application.

LD 17 – Configure the ADSI port to the Meridian Link Module.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	CFN	Configuration record.
ADAN	NEW AML x	Add I/O device type AML to TTY port x. x is the port number.
- CTYP	EDSI	Card Type. EDSI card.
- DNUM	x	Device number is x.
- DES	NEWTTY	Description of this I/O device.
- BPS	19200	Baud rate is 19,200 bits per second.
- CLOK	INT	Internal clocking.
- IADR	3	HDLC protocol individual address.
- RADR	1	HDLC protocol remote address.
...		

- CSQI	(20)	Maximum call registers for Command and Status Link (CSL) input queues (use the default, unless the system requires otherwise).
- CSQO	(20)	Maximum call registers for CSL output queues (use the default, unless the system requires otherwise).
...		
VAS	NEW	New value added server ID.
- VSID	y	Server ID y.
- AML	x	Port used by AML defined earlier in this overlay.
- - SECU	YES	Security on for Meridian Link.
- - INTL	x	Length of time interval (five-second increments) (e.g., 2).
- - MCNT	x	Threshold for number of messages per time interval (e.g., 100).
- - CONF	DIR	Direct link configuration.

LD 17 – Configure the MSDL port to the Meridian Link Module.

Prompt	**Response**	**Description**
REQ	CHG	Change existing data.
TYPE	CFN	Configuration record.
ADAN	NEW AML x	Add I/O device type AML to TTY port x. x is the port number.
- CTYP	MSDL	Card Type. MSDL card.
- DNUM	y	Device number is y. Refers to the device number on the MSDL card.
- DES	MERIDIAN_LINK	Description of this I/O device.
- BPS	19200	Baud rate is 19,200 bits per second.

- PARM	RS232 DCE	Parameters for interface and transmission mode. DTE/DCE setting.
- IADR	3	HDLC protocol individual address.
- RADR	1	HDLC protocol remote address.
...		
- CSQI	(20)	Maximum call registers for Command and Status Link (CSL) input queues (use the default, unless the system requires otherwise).
- CSQO	(20)	Maximum call registers for CSL output queues (use the default, unless the system requires otherwise).
VAS	NEW	New value added server ID.
- VSID	y	Server ID y.
- AML	x	Port used by AML x, defined earlier in this overlay.
- - SECU	YES	Security on for Meridian Link.
- - INTL	x	Length of time interval (five-second increments) (e.g., 2).
- - MCNT	x	Threshold for number of messages per time interval (e.g., 100).
- - CONF	DIR	Direct link configuration.

LD 10 – Configure non-ACD analog (500/2500 type) telephones as autodialers.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	500	Telephone type.
...		
TN	l s c u c u	Terminal Number. For Option 11.
...		
CUST	xx	Customer number.
...		
DN	x...x	Internal Director Number
AST	YES	Associate set assignment. The internal DN is at AST.
CLS	XFA	Transfer allowed.
CLS	DIP	dial Pulse Class of Service for 500 sets (use DTN for 2500 sets).

LD 11 – Configure non-ACD Meridian 1 proprietary telephones as autodialers.

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	aaaa	Telephone type, where: aaaa = SL1, 2006, 2008, 2009, 2016, 2018, 2112, 2216. 2317, 2616, or 3000.
TN	l s c u c u	Terminal Number. For Option 11.
...		
CUST	xx	Customer number.
...		
KLS	1-7	Number of key lamp strings, typically one.
...		
AST	xx yy	Key number for Associate set DN assignment.
...		
KEY	xx SCR yyyy	Key number, Single Call Ringing, DN.
KEY	xx TRN	Key number, Call Transfer.
KEY	xxx AO6	Key number, six-party conference.
KEY	xxx SCR yyyy	Key number, Single Call Ringing, second DN.
CLS	xx RLS	Key number, Release.

LD 23 – Configure ACD groups.

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	ACD	Automatic Call Distribution data block.
CUST	xx	Customer number.
ACDN	xxxx	ACD Directory Number.
xxx		
ISAP	YES	Integrated Services Application Protocol. ACD DN uses Meridian Link (ISDN/AP) messaging.
- VSID	0-15	Value Added Server ID. This Server ID used for Meridian Link messaging must match the VSID defined in LD 17.

LD 10 – Configure ACD analog (2500/500 type) telephones as autodialers.

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	500	Telephone type.
...		
TN	l s c u c u	Terminal Number. For Option 11.
...		
CUST	xx	Customer number.
...		
DN	x...x	Internal Directory Number.
AST	YES	Associate set assignment. The internal DN is an AST>
CLS	AGTA	ACD agent allowed Class of Service.

CLS	DIP	Dial Pulse class of Service for 500 sets (use DTN for 2500 sets).
...		
AACD	TES	ACD telephone is an Associate set.
FTR	ACD xxxx yyyy	ACD DN and the ACD position ID.

LD 11 – Configure ACD Meridian 1 proprietary telephones as autodialers.

Prompt	**Response**	**Description**
REQ	NEW	Add new data.
TYPE	aaaa	Telephone type, where: aaaa = SL1, 2006, 2008, 2009, 2016, 2018, 2112, 2216. 2317, 2616, or 3000.
TN	l s c u c u	Terminal Number. For Option 11.
...		
CUST	xx	Customer number.
...		
KLS	1-7	Number of key lamp strips, typically one.

...		
AST	xx yy	Key numbers for Associate set DN assignment.
...		
KEY	0 ACD xxxx yyyy	Key 0, ACD, ACD DN, and agent's ID.
KEY	xx MSB	Key number, Make Set Busy.
KEY	xx NRD	Key number, Not Ready.
KEY	xx TRN	Key number, Call Transfer.
KEY	xx AO6	Key number, six-party conference.
KEY	xx SCR yyyy	Key number, Single Call Ringing, second DN
CLS	xx RLS	Key number, Release.

LD 23 – Configure a Control DN (CDN - default mode). If the application wants to transfer a call to a target CDN, a CDN must be configured. CDNs can be in default or controlled mode.

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	CDN	Control Directory Number data block.
CUST	xx	Customer number.
CDN	xxxx	DN of the Control DN (counts as an ACD DN).
...		
DFDN	xxx...x	Default destination ACD DN.
CEIL	0-(2047)	CDN ceiling value. CEIL limits the number of unanswered calls a CDN can have as its default ACD DN at a time. Enter a maximum value (the default).
...		
RPRT	YES	Report Control.
CNTL	NO	NO sends CDN calls to the Default ACD DN.

LD 23 – Configure a Control DN (CDN - controlled mode). When a CDN is in controlled mode, the application can have control of the call once it enters the CDN.

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	CDN	Control Director Number data block.
CUST	xx	Customer number.
CDN	xxxx	DN of the Control DN (counts as an ACD DN).
...		
DFDN	xxx...x	Default destination ACD DN.
CEIL	0-(2047)	CDN ceiling value. CEIL limits the number of unanswered calls a CDN can have as its default ACD DN at a time. Enter the maximum value (the default).
...		
RPRT	YES	Report Control.
CNTL	YES	Control DN is in control (the default).
VSID	0-15	Value Added Server ID. Server ID used for Meridian Link messaging (defined in LD 17).
HSID	0-15	Host Line ID used when Customer Controlled Routing and Meridian Link applications are both running.

LD 14 – Define answer supervision for trunks. If the application wants to transfer outgoing calls based on answer supervision, answer supervision must be configured. If answer supervision is not configured, the End-of-Dialing timer will be used as a trigger for the Meridian 1 to transfer the call.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	aaa	Trunk type where: aaa = CAA, CAM, COT, CSA, DID, FEX, FGDT, IDA, TIE or WAT.
TN	l s c u c u	Terminal Number. For Option 11.
	c u	Terminal Number for the Option 11.
...		
SUPN	YES	Answer and disconnect supervision are required.

LD 16 – If the application is using the End-of-Dialing timer to transfer outbound calls, the timer must be configured in the Route Data Block.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	RDB	Route Data Block.
...		
CNTL	YES	Change controls or timers.
- TIMR	EOD 1281-(13952)-32640	End-of-Dialing timer in milliseconds. The default is 13952 milliseconds.

LD 17 – In order to originate calls from phantom TNs/DNs, a phantom loop must first be configured. A Phantom DN can then be configured as part of a specific device group.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	CFN	Configuration data block.
...		
CEQU	YES	Change to Common Equipment parameters.
- TERM	0-159	Single density local terminal loops.
	(X) 0-159	Precede loop number with X to remove.
	(C) 0-159	Precede loop number with C to create a phantom loop.
- TERD	0-159	Double density local terminal loops.
	(X) 0-159	Precede loop number with X to remove.
	(C) 0-159	Precede loop number with C to create a phantom loop.
- TERQ	0-159	Quad density local terminal loops.
	(X) 0-159	Precede loop number with X to remove.
	(C) 0-159	Precede loop number with C to create a phantom loop.

LD 97 – If a superloop is used, the phantom look is configured in this overlay.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	SUPL	Superloop parameters.
SUPL	0-156	Superloop number in multiples of four.
	(X) 0-156	Precede superloop number with X to remove.
	(C) 0-156	Precede superloop number with C to create a phantom superloop.

LD 11 – After configuring the phantom lock, an AST Meridian 1 proprietary set can be designated to a specific device group which can be controlled by applications. Therefore, when an application wants to originate a call on behalf of an idle TN, it can use a phantom TN. This idle TN is an AST Meridian 1 proprietary set which is defined on a phantom loop. The ITNA and DGRP prompts must be configured as follows.

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	aaaa	Telephone type, where: zzzz = 2006, 2008, 2009, 2016, 2018, 2112, 2216, 2317, 2616, or 3000.
TN	l s c u c u	Terminal Number. For Option 11.
...		
CDEN		Card density.
	SD	Single density.
	DD	Double density.
	4D	Quad density.
DES	phanDN	One-to-six character Office Data Administration system (ODAS) Station Designator.
CUST	0-99	Customer number.
...		

CLS	NDD	No digit display is recommended if configuring phantom devices.
CLS	(DNDD)	Dialed Name Display denied is recommended if configuring phantom devices.
...		
AST	00	Key 0 is AST>
IAPG	(0)-15	Meridian Link Unsolicited Status Message (USM) group. These groups determine which status messages are sent for an AST set. The default 0 sends no messages, whereas Group 1 sends all messages.
ITNA	(NO), YES	Idle TN for third-party application.
DGRP	(1)-5	Device Group with which phantom TNs are associated.
...		
KEY	xx SCR yyyy	Key number, Single Call Ringing, DN.
CLS	xx RLS	Key number, Release.

Feature operation

Applications invoke the Fast Transfer feature by sending the application a Fast Transfer request message to the switch. No specific operating instructions are required to use this feature.

Meridian 911

The number 911 has been adopted for the purpose of reporting emergencies nd requesting emergency services. For localities with 911 systems, the number:

— is the same in all communities

— is easily remembered, even under adverse conditions, and

— provides direct telephone access to emergency services regardless of the time of day, or the caller's familiarity with an area, or the caller's ability to identify the type of emergency.

A 911 system is planned, implemented, and operated under the auspices of local governments. In most communities, 911 provides access to police, fire, and emergency medical services. In some locations additional services are accessible (e.g., dialing 911 in certain locations provides access to Coast Guard search and rescue services). Approximately 80 percent of all 911 calls are intended for the police, with the balance split between fire and ambulance.

Because the overwhelming majority of 911 calls require police attention, local police departments generally maintain, manage, and staff the center to which emergency calls are first directed. These centers are referred to as primary answering centers. A secondary answering center could be a police, fire, or ambulance station (e.g., fire-related 911 calls may be transferred to a secondary answering center that handles incoming calls regarding fires). In many instances, the fire department also determines the degree of urgency for emergency medical services.

If the primary or secondary answering center is busy or out of service, the 911 call is directed to a backup answering center, referred to as an alternate answering center.

The public network routes a 911 call to the appropriate primary answering center based on the caller's telephone number. for this reason, callers dialing 911 give up their right to privacy regarding:

— the telephone number of the station from which they are calling, and

— the billing address associated with that telephone number.

To protect a caller's right to privacy, some communities still allow the use of seven-digit emergency numbers, routed either to an answering center or directly to the responding agency.

Basic 911 service

Basic 911 service routes emergency calls to an answering center based on the location of the Public Exchange/Central Office serving the calling station. The jurisdiction of an answering center is determined by the Central Office boundaries. The most basic 911 system involves only one Central Office and one exchange service area, and may be a single answering center. Force Disconnect, and Idle Tone Application are examples of basic 911 features.

Enhanced 911 service

In areas where telephone company Central Office boundaries do not match jurisdictional boundaries, there is a problem in identifying which emergency agency should receive the emergency call. There may be an even more complicated situation if the 911 network includes two or more primary answering centers, and each serves areas that do not match the Central Office serving areas.

Enhanced 911 (E911) service ensures that an emergency call originating in any particular jurisdiction covered by the 911 system is recognized and forwarded to the appropriate responding agency in the same political jurisdiction as the originating call.

Enhanced 911 service uses more sophisticated equipment and features than basic 911 service. Specialized features include:

— Automatic Number Identification (ANI)

— Automatic Location Identifier (ALI), and

— Selective Routing (SR).

Display of the ANI associated with the originating call sometimes replaces the need for the following basic 911 options: Called Party Hold; Emergency Ringback; and Switchhook Status. Therefore, sometimes these features are not provided with enhanced 911 service.

The Automatic Number Identification (ANI) of a 911 call consists of eight digits (a Numbering Plan or Information digit followed by the seven digits of the calling party number). Whether the first digit of the ANI string should be interpreted as a Numbering Plan Digit (NPD) or an Information Digit (ID) depends on the trunk interface and Meridian 1 configuration.

The Automatic Location Identifier (ALI) host computer uses the ANI to locate the ALI record for the calling party number. This includes the name and address, and whether the line is business or residence. An enhanced 911 system creates ALI information from the ALI record and automatically route the ALI information to an optional data terminal display at the answering center.

An enhanced 911 system routes all emergency calls from the originating Central Offices through an E911 Tandem, sometimes call a 911 control office, to the primary answering center. There, using Selective Routing features, a call taken can transfer the call through the public network by signaling the E911 Tandem. The Autodial Tandem transfer feature can be used for this. For example, if the primary answering center transfers calls to several fire departments, it uses one fire department button. The option automatically:

— identifies the fire department associated with caller's location, and

— transfers the call to that department.

Meridian 911 system

The Meridian 911 system:

— gives priority to emergency calls

— routes priority calls, without interrupting service, to answering positions that can identify and dispatch the assistance required with minimum delay

— displays the calling party's number, and

— provides an external notification that an emergency call is queued.

When a call arrives at the Meridian 1 via an M911 trunk, the trunk software in the Meridian 1 communicates with the serving Central Office (CO) (either the local Central Office or the M911 tandem office) to receive the ANI information via multifrequency (MF) signaling. When all ANI digits are received, the Meridian 1 software starts to process the call.

Meridian 911 Call Abandon (Release 21)

A 911 call is considered abandoned by the Meridian 1 if the call terminates on a 911 trunk route, and the calling party disconnects are trunk seizure, but before the call is answered. This can occur while the call is waiting in an Automatic Call Distribution (ACD) or Controlled DN (CDN) queue, or when the call is presented to the ACD agent but is not yet answered.

The Call Abandon feature allows the Meridian 1 to treat an abandoned call as though the calling party is still connected. The call maintains its place in the ACD queue, and is presented to an agent. When the agent answers, the agent receives a continuous, cadenced six-second tone, as well as an indication on the set's display, to indicate that the call is an abandoned call. Automatic Number Identification (ANI) information is also displayed. The agent can then call back the originator of the call.

Once the call is abandoned, the trunk is released for other 911 calls. Information on abandoned calls can be included in Call Detail Recording (CDR) records if New Format CDR (FCDR) package 234 is equipped.

Operating parameters

Meridian 911 Meridian 911 routes are restricted to incoming traffic only.

Incoming M911 Trunks use MF signaling only. Dial Pulse (DP) and Dual-Tone Multifrequency (DTMF) are not supported for M911 routes.

911 Calls on Integrated Services Digital Network (ISDN) trunks are not supported.

A call is considered a 911 call by X11 software if it arrived on a trunk belonging to an M911 route. Calls dialing 911 internally can, through configuration of the Electronic Switched Network (ESN) digit manipulation tables, be terminated locally (e.g., to a Controlled DN), but these calls are internal calls to the software, not 911 calls.

ANI is expected for every call. Meridian 911 does not support 911 calls from an E911 Tandem which does not support sending ANI.

The priority of incoming trunk calls internally transferred to an Automatic Call Distribution (ACD) DN queue (a secondary answering center) may be preserved via blind transfer only. All other types of call modification (e.g., consultation transfer, or conference) are treated as internal calls and the calls are linked to the low priority queue of the ACD DN.

The No Hold Conference feature, the recommended feature for transferring calls between answering positions, is not available on analog (500/2500 type) sets.

The Call Prioritization (911 calls being presented with higher priority, i.e., superceding business or non-911 calls) and Call Waiting Notification features are applicable to ACD answering center only. These cannot be supported on Multiple Appearance Directory Number (MADN) answering centers.

The first answering center must be an ACD DN.

M911 trunk calls must terminate on a CDN. If an autoterminate DN is specified that is not a CDN, and SCH error message is printed. If a CDN is used as the autoterminate destination of at least one M911 trunk, the CDN cannot be removed via LD 23 (an SCH message will be given). To remove the CDN, all M911 trunks terminating to it must be removed, or they must be changed to terminate to a different CDN.

CDNs as well as ACD DNs are normal dialable numbers. Nothing prevents non-911 calls from arriving at either the CDN, or any of the ACD DNs acting as answering centers via direct dialing. NON-911 calls arriving at CDNs are defaulted to the CDNs default ACD DN; non-911 calls arriving at an ACD DN are treated as normal calls.

The Call Waiting Notification (CWNT) package 225 is a separate package and an M911 system can be installed without it. If the package is not equipped, no external alert can be given for 911 calls arriving at an ACD queue.

The SWNT software is available for 911 calls in ACD queues only. There is no provision for alerting MADN call takers of arriving 911 calls.

911 calls in an ACD queue are not treated nay different from other ACD calls. Therefore, if Recorded Announcement (RAN) is configured for the ACD queue, 911 calls will be given RAN treatment. The same interactions between RAN and Central Office loopstart trunks exist for M911 as they do for general ACD operation.

Meridian 911 Call Abandon (Release 21)

Calls released by the originator after the call has been answered are not calls abandoned by the definition used for the M911 Call Abandon feature and do not receive abandon treatment.

Abandoned calls waiting in the ACD queue activate the Call Waiting Notification Terminal Number.

If ANI is not received, the abandoned call is not presented to the agent since it is no longer useful; however, a Call Detail Recording (CDR) N record, if configured, can be printed to indicate that the call has abandoned.

Only external 911 calls abandoned before answer are supported.

When the call is abandoned, the speech path is dropped, and the trunk is released.

If Flexible Tone and Cadences (FTC) package 125 is equipped, it is possible to configure a tone other than the one provided by default.

Call Abandon is configured on a per route basis.

Call Abandon is supported on 911 trunks only.

No B record is generated by CDR for an M911 abandoned call, because the B record is package dependent and only applies to an established call with Internal CDR.

Wireless sets are not supported at the Public Safety Answering Point (PSAP) or Secondary Safety Answering Point (SSAP) for Call Abandon.

An MF tone receiver (QPC916 or NTAG20AA) is required.

Feature interactions (Meridian 911)

Automatic Call Distribution Interactions ACD-C Reports—The Meridian 911 product does not change the ACD-C reports. M911 will use the ACD-C reports for CDNs as introduced for Customer Controlled Routing CCR in Release 17.

Only three of the fields in the report will have any meaning. Because M911 uses the Route-to AML message instead of the Queue-to message, only "Route To", "Default DN", "Abandoned", and "Calls Accepted" are meaningful. Those calls that are successfully routed count towards the "Route To" category. Those calls that get default treatment count towards the "Default DN" category. Those calls that abandon while they are in the CDN queue count towards the "Abandoned" category. The "Calls Accepted" category will be the sum of the "Route To", "Default DN", and "Abandoned" categories.

The "# of CAlls in the Queue" category represents those calls that are sitting in the CDN queue. This should always be zero, since calls waiting for a Route-to request from the Application Module are sitting in a timing queue as opposed to the CDN queue.

M911 calls routed to an ACD answering center will show up in the normal ACD Queue and agent reports for that queue. Calls routed to MADN answering centers will show up only in the CDN report.

ACD-D Auxiliary Message No changes to the ACD-D reports are needed for Meridian 911.

Controlled Director Number (CDN) Ceiling The CDN ceiling feature returns busy tone to calls arriving at the CDN while it is in default mode. If a 911 call should arrive while these conditions are true, the 911 call will not hear busy tone, but will be linked into the default destination ACD DN's queue. Therefore, the setting of the ceiling value is irrelevant if only 911 calls are expected at the CDN. The ceiling value will, however, still be applied to non-911 calls arriving at the CDN.

Controlled Director Number (CDN) Ringback

911 Calls get ringback immediately upon arrival at a CDN, whereas CCR calls do not.

Custom Call Routing (CCR) Call Abandoned Message (ICAB) This message is sent for controlled calls that were abandoned before being answered.

Custom Call Routing (CCR) Call Enters Queue Message (ICEQ) This message is sent to ACD-MAX each time a default call is placed in the default ACD DN (default mode).

Custom Call Routing (CCR) Call Modification Message (ICCM) This message is sent to ACD-MAX when a call modification request (route to, disconnect, busy) is successfully executed upon a CDN controlled call.

Note that since the Rout To, Disconnect and Busy treatments remove CDN control from the call, ICCM messages will be sent for the call for each of the queues from where it must be removed. The ICCM message also applies to Enhanced ACD Routing calls or CDN default calls which were busied by the call ceiling value while trying to route to the default ACD-DN.

Custom Call Routing (CCR) "Route To" Command The Route to destination for 911 calls are restricted to ACD DNs only. If the routing destination is not an ACD DN, the call will be routed to the CDN's default destination ACD DN. CCR calls can be routed to any dialable number.

Enhanced ACD Routing/Customer Controlled Routing The Enhanced ACD Routing/Customer Controlled Routing (EAR/CCR) features introduce CDNs. The Enhanced ACD routing (EAR) package 214 allows CDNs to be configured and is a prerequisite of the Meridian 911 (M911) package 224.

Interflow 911 Calls interflow just like any other ACD calls. If the interflow feature is configured so that if a call gets busy tone from an internal destination, the 911 call will not get busy tone, but will instead be linked back into the source ACD queue.

If the interflow destination is a number outside the Meridian 1, the software has no control over the treatment the call gets, so this configuration is not recommended operation for 911 sites.

Load Management Commands No changes are made to Load Management for Meridian 911.

Night Service

Night Call Forward It is recommended that the primary ACD DN not be put in Night Service. If the primary ACD DN is put in Night Service, calls will be sent to the Night Call Forward (NCFW) destination. EVen if a 911 call arrived on a trunk with CPDC defined, the call will still be allowed to NCFW, unlike non-911 ACD calls. This restriction is lifted for 911 calls only. The CWNT set will not ring for calls entering the queue while in Night Service when the queue has a NCFW destination specified.

Overflow 911 Calls will overflow (by count and by time) just like any other ACD calls.

Supervisor Control of Queue Size This feature causes calls to get busy tone once the overflow threshold (OVTH) of the ACD queue is exceeded. This feature is bypassed for 911 calls.

Call Detail Recording (CDR) Records ANI available for 911 calls is included as the Calling Line Identification (CLID) in CDR Records pertaining to 911-trunk calls. CDR Records affected are: Normal Records, Start/End Records, Authorization Code Records, Connection Records (Q, R, and F records), and Charge Account Records.

Called Party Disconnect Control The Called Party Disconnect (CPDC) feature is used to retain a 911 trunk when a 911 call is disconnected by the caller. No modification to the feature is required for Meridian 911, except lifting the CPDC and ACD NCFW limitation. 911 Calls, arriving via trunks with CPDC defined, will be allowed to NCFW, unlike non-911 ACD calls.

Calling Party Name Display The Calling Party Name Display feature can be used to configure and display the incoming 911 route name.

Conference When a call is answered, and then conferenced, the trunk priority is lost (the conference consultation call is an internal call and treated as low priority be the software). This operation is the same for normal calls and 911 calls.

Dialed Number Identification Service (DNIS) DNIS is not supported on 911 trunks.

Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) Answering Positions are not supported on BRI sets.

Integrated Services Digital Network (ISDN) Primary Rate Interface 911 Trunks are not supported On ISDN PRI Trunks or Integrated Service Link (ISL) trunks.

Japan Direct Inward Dialing (DID) Trunks Japan DID trunks are not supported.

Malicious Call Trace The Malicious Call Trace (MCT) feature is modified to be supported on ACD sets. ACD sets are allowed to have the MCTA Class of Service and a TRC key defined. The feature is activated via pressing the MCT key or dialing a MCT access code.

No Hold Conference No Hold Conference calls are treated as internal calls and are linked to the low priority queue of the ACD DN.

Single and Multiple Call Ringing for MADNs The DN keys for multiple appearance sets can be defined as an SCR (single call ringing) key or as an MCR (multiple call ringing) key. For those DNs (keys on MADN sets) that are SCR, only one call may be answered at a time. That is to say that once a call taker has answered a call, future calls to that DN will receive busy tone until the call taken on that DN has disconnected.

For DNs that are MCR, calls will only be given bust tone once every call taker is busy answering a call. If one call taker is answering a call and there are other call takers available, a new call to that DN will cause the sets of the available call takers to ring. Any available call taker can then answer the new call.

Transfer Trunk priority associated with an incoming 911 call is only preserved if blind transfer is used.

Meridian 911 Call Abandon (Release 21)

Attendant Break-In Since an abandoned call does not have a speech path established, the Break-In deny treatment is given to the attendant so that Break-In cannot occur.

Automatic Call Distribution (ACD) When a call is abandoned, the call remains in its current state (i.e., ACD queue, CDN queue, or ringing on an ACD agent set).

Automatic Call Distribution Reports ACD-C and ACD-D packages are not modified for M911 Call Abandon. However, a new interpretation for the report fields are needed for abandoned calls. The incoming call is pegged as an abandoned call when the caller abandons. However, it si not repeatedly pegged as an answered call when the call taker answers the abandoned call.

For ACD-C package, the CALLS ANSWD field only accounts for real calls; the ABANDONED field accounts for abandoned calls that are answered, assuming all abandoned calls are eventually answered by an agent. Consequently, the CALLS ACCPTD field is equal to the CALLS ANSWD field plus the ABANDONED field (number of calls entering queue = number of real calls + number of abandoned ones). This way the Average or Total Call Processing (DCP) Time accurately reflects the amount of time an agent spent on real calls, since answering an abandoned call requires little time. The work an agent does for an abandoned call is more accurately reflected in the DN OUT and OUT TIME fields, which mean total number of outgoing calls and total time of all outgoing calls respectively. Since the agent must hang up the abandoned call and call back to see what the condition is, the outgoing call that is made is more valuable for reporting the agent's work.

For the ACD-D package, the reports also need to be interpreted in this way. When the caller abandons, CAB message is sent to Meridian MAX; however, later when an abandoned call is answered by an agent no CAA message is sent to Meridian MAX.

Call Force M911 abandoned calls cannot be call forced.

Called Party Disconnect Control There is no interaction with M911 Call Abandon and Called Party Disconnect Control.

Conference M911 abandoned calls cannot be conferenced.

Display Calls Waiting Key
ACD Calls Waiting Key
Ongoing Status Display
Real-time Display In all of these situations, abandoned calls contribute to the queue count.

Hold M911 abandoned calls cannot be put on hold.

Initialization Unanswered abandoned calls are lost if the system initializes.

Interflow Abandoned calls contribute to the queue count. An abandoned call can interflow only the ACD DNs.

Network ACD Network ACD is not supported.

Night Call Forward (NCFW) Abandoned calls can be forwarded to the Night Call Forward DN if the Night Forward DN is an ACD DN. If a primary answering center goes into Night Service while there are abandoned calls in the queue, those abandoned calls are dropped. A CDR N record is printed if CDR is configured.

Night Service Key Abandoned calls are part of the transition mode when agents go to Night Service and the supervisor selects transition mode.

No Hold Conference M911 abandoned calls cannot be No Hold conferenced.

Not Ready Key When an abandoned call is presented to an agent and the agent presses the Not Ready Key, the call is put back into the queue. If an agent is established on an abandoned call and presses the Not Ready Key, the call is dropped.

Overflow by Count Abandoned calls contribute to the queue count. An abandoned call can overflow.

Supervisor Observe Since there is no speech path between the ACD agent and the caller, the supervisor observe feature will be blocked. The supervisor can still press the observe key to observe an agent active on an abandoned call, but will hear silence.

Transfer M911 abandoned calls cannot be transferred.

Feature packaging

The following packages are required:

— Digits Automatic Call Distribution (DDSP) package 19

— Basic Automatic Call Distribution (BACD) package 40

— Automatic Call Distribution Package B (ACDB) package 41

— Automatic Call Distribution Package A (ACDA) package 45

— Enhanced Automatic Call Distribution Routing (EAR) package 214

— Meridian 911 (M911) package 224, and

— Call Waiting Notification (CWNT) package 225.

The following additional packages are not required, but are recommended:

— At least one of either Call Detail Recording (CDR) package 4, or Call Detail Recording on Teletype Machine (CTY) package 5

— Automatic Call Distribution Package C (ACDC) package 42 (not needed if packages 51 and 52 are enabled)

— Automatic Call Distribution Load Management Reports (LMAN) package 43

— Automatic Call distribution Package D (ACDD) package 50

— Automatic Call Distribution Package D, Auxiliary Link Processor (LNK) package 51

— Call Party Name Display (CPND) package 95

— Malicious Call Trace (MCT) package 107, and

— Calling Line Identification in Call Detail Recording (CCDR) package 118.

The M911 Call Abandon feature is included in Meridian 911 (M911) package 224, and required Call Identification (CALL ID) package 247.

If an application also involves Meridian Link, Meridian Link Module (MLM) package 209 is required.

Feature implementation

This section provides an example of how to configure Meridian 911. The order in which all items must be configured, in order for M911 to run on the Meridian 1, is outlined. In addition, the implementation procedures for M911 Call Abandon are shown.

LD 10 – Configure a Terminal Number for an analog (500/2500 type) set with a Class of Service of CWNA (Call Waiting Notification Allowed).

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	500	Type of telephone set.
TN	l s c u c u	Terminal Number. For Option 11.
DES	xxx	Office Data Administration System (ODAS) package designator.
CUST	xx	Customer number.
...		
DN	nn...n	Internal Director Number.
...		
CLS	CWNA	Call Waiting Notification Allowed Class of Service (DTN or DIP).

LD 23 – Configure ACD DNs. The SWNC (CWNT control) is recommended to be set as YES for the primary answering centers (rings for priority calls only) and NO for secondary answering centers (rings for all calls).

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	ACD	ACD Data Block.
CUST	xx	Customer number.
ACDN	nn...n	ACD Directory Number.
...		
MAXP	nn	Maximum number of agent positions.
...		
ISPA	YES	ACD DN uses Meridian Link messaging.
VSID	n	Servicer ID used for Meridian Link messaging (defined in LD 17).
...		
OVTH	2047	Recommended overflow threshold.
...		
CWNT	l s c u	Call Waiting Notification TN.
CWNC	YES	Call Waiting Notification control.

LD 23 – Configure CDNs. The coiling value is irrelevant for 911 calls terminating at the CDN, but will be applied to non-911 type calls. When the ceiling value is exceeded, new non-911 calls will receive busy tone.

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	CDN	Controlled Directory Number Data Block
CUST	xx	Customer number.
CDN	nn...n	Controlled DN number.
…		
DFDN	nn...n	Default ACD DN.
CEIL	2047	Recommended Ceiling Value
RPRT		Report control
CNTL	YES	Controlled mode (controlled = YES).
VSID	n	Server ID used for Meridian Link messaging (defined in LD 17)

LD 16 – Configure an M911 route.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route data block.
CUST	xx	Customer number.
ROUTE	nnn	Route number.
TKTP	DID	Meridian 911 routes use Direct Inward Dialing trunks.
M911_ANI	YES	Enter YES for 911 route.
K_TYPE	(911T), 911E	911T = E911 tandem connection 911E = End office connection.
NPID_TBL_NUM	0-7	NPID Table Index (NPID Table must be created earlier in LD 16 before using it here).

LD 16 –The following prompting sequence creates a Numbering Plan or Information Digit (NPID) Table.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	NPID	Numbering Plan or Information Digit data block.
IDTB	0-7	ID table index. ID table index to be used by this M911 route.
NPID	0-9	NPID for M911 routes.
TRMT	(NONE, NPA, FAIL, TEST	Numbering Plan Digit or Information Digit treatment.
- NPA	nnn	Numbering Plan Area. Prompted on if TRMT = NPA.

LD 14 – Configure 911 trunks.

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	DID	Meridian 911 trunks must be DID.
TN	l s c u c u	Terminal number. For Option 11.
...		
XTRK	XUT, XEM	Universal, or Enhanced EM trunk card.
CUST	xx	Customer number.
NCOS	xx	Network Class of Service Group Number.
RTMB	xx xx	Route number and Member number.
MNDN	xxxx	Manual Directory Number.
ATDN	xxxxxxx	Autoterminate DN.
TGAR	xx	Trunk Group Access Restriction.
SIGL	EAM, EM4, LDR	Trunk signaling.
...		
STRI	WNK	Incoming start arrangement.
SUPN	YES	Answer and disconnect required.
CLS	MFR APY	Meridian 911 trunks must have MFR and APY Classes of Service (this is done automatically).

LD 16 – Configure Call Detail Recording (CDR).

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	RDB	Route data block.
CUST	xx	Customer number.
ROUTE	xxx	Route number.
TKTP	DID	Meridian 911 routes use DID trunks.
...		
CDR	YES	CDR trunk route.
INC	YES	CDR records generated on incoming calls.
QREC	NO	CDR ACD Q initial records to be generated.

LD 17 – Configure the insertion of ANI digits into the CDR record.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	CFN	Configuration record.
...		
CLID	YES	Calling Line ID (ANI for M911) in CDR.

LD 10 – Configure non-ACD sets (that is, analog (500/2500 type) sets).

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	500	Type of telephone set.
TN	l s c u c u	Terminal Number. For Option 11.
CDEN	(DD), SD, 4D	(Double), single and quadruple card density.
CUST	xx	Customer number.
DIG	xx yy	Dial Intercom Group number and Member number.
DN	NN...N	Directory Number.
...		
IAPG	2	ISDN/AP status message group.
...		
CLS	USMA	M911 position.

LD 11 – Configure non-ACD sets (that is, Meridian 1 proprietary sets).

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	aaaa	Telephone type, where: aaaa = SL1, 2006, 2008, 2009, 2018, 2112, 2216, 2317. 2616, and 3000.
TN	l s c u c u	Terminal Number. For Option 11.
CDEN	(DD), SD, 4D	(Double), single and quadruple card density.
DES	x...x	ODAS set designator.
CUST	xx	Customer number.
KLS	1-7	Number of Key/Lamp strips.
...		
CLS	USMA MCTA	M911 position; Malicious Call Trace allowed.
...		
IAPG	2	ISDN/AP status message group.
...		
KEY	xx SCR yyyy	This defines a Single Call Ringing DN key. The xx is the key number and the yyyy is the DN.

LD 11 – Configure Meridian 1 proprietary sets to function as ACD sets.

Prompt	Response	Description
REQ	NEW	Add new data.
TYPE	aaaa	Telephone type, where: aaaa = SL1, 2006, 2008, 2009, 2018, 2112, 2216, 2317. 2616, and 3000.
TN	l s c u c u	Terminal Number. For Option 11.
CDEN	(DD), SD, 4D	(Double), single and quadruple card density.
DES	x...x	ODAS set designator.
CUST	xx	Customer number.
KLS	1-7	Number of Key/Lamp strips.
...		
CLS	ADD AGN USMA MCTA	AGN is for agent; SUPN is for supervisor. USMA = 911 position, and MCTA = Malicious Call Trace allowed.
...		
IAPG	2	ISDN/AP status message group.
...		
KEY	0 ACD yyy xx	The ACD DN key where yyyy is the ACD DN.
KEY	xx TRC	Malicious Call Trance key. The xx is the key number.

LD 16 – Enable M911 Call Abandon.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route number.
TKTP	DID	M911 trunks are DID trunk type.
...		
M911_ANI	(NO), YES	Set to YES to receive ANI for M911 routes.
M911_TRK_ TYPE	(911T), 911E	Meridian 911 ANI trunk types, where: T911T = E911 tandem connections, and 911E = End office connection.
M911_ABAN	(NO), YES	Optional call abandon treatment, where: YES = abandoned call treatment for this route, and NO = no abandoned call treatment for this route.
M911_TONE	(YES), NO	Optional call abandon tone, where: YES = tone given on answer, and NO = silence given on answer.

LD 56 – Configure the new flexible tone for M911 abandoned calls, if desired.

Prompt	Response	Description
REQ	NEW CHG PRT	Add new data. Change existing data. Print data.
TYPE	FTC	Flexible Tone and Cadence data block.
TABL	0-31	FTC table number.
DFLT	0-31	Default table number.
RING	<CR>	
...		
CAB	YES	M911 Call Abandon upon Answer Tone.
TDSH	i bb cc tt	TDS external, burst, cadence, and tone.
XTON	0-255	NT8D17 TDS Tone code.
XCAD	0-255	NT8D17 cadence code for FCAD.

Feature operation

Meridian 911 operation To answer a call at a primary, secondary, or alternate answering center that is configured with ACD positions, the 911 call taker presses the ACD DN key. The DN of the incoming call is displayed on the call taker's set.

Meridian 911 Call abandon operation When the call is abandoned it remains in its current state (i.e., in CDN or ACD queue or ringing a call taker). Once the call taker answers, a continuous cadenced tone is heard for six seconds, followed by silence. This tone is programmable with the FTC package; otherwise, a default is given. The call taker must hang up and dial the ANI that is shown on the terminal display if call back is required.

Upon answer, the telephone set display is updated with the 911 call taker's ANI and the trunk group name if the Call Party Name Display feature is used. Since the call has been abandoned, the telephone set display flags the abandoned call by appending "ABAND" to the ANI.

The following example shows what is displayed on a telephone set with a Numbering Plan Digit (NPD) call with an NPD of 2 and with the CAll Party Name Display feature enabled. The trunk group name is displayed on the first line of the set display; the ANI appears on the second line.

911 CALL
2 493-6002 ABAND

PD of 1 that was translated to 415 and has the Call Party Name Display feature enabled. The trunk group name (e.g., Palo Alto) is displayed on the first line of the set display. The ANI appears on the second line.

Palo Alto
415 493-6002 ABAND

ISDN overview

Integrated Service Digital Networks (ISDN) use a standard protocol to transport both call-related and non-call-related messages to other nodes.

Network ACD uses ISDN D-channel messages to transport call information between the Source node and the remote Target queues. ISDN services allow the messaging between nodes required for Call Requests, cancellation, and set-up messaging described later in this document. Source and Target nodes can be connected through tandem switches; they do not need to be connected point-to-point.

Primary Rate Interface (PRI)

The ISDN PRI architecture is composed of protocol layers providing different services. There are three supporting layers:

Layer 1	Physical layer
Layer 2	Link layer
Layer 3	Network layer

These layers provide a standard interface for voice and data communication. Each layer uses the services provided by the layer below, and builds on these services to perform functions for the layer above. This layered approach splits complex protocols into easily managed blocks. Each layer or block can be modified without affecting the protocols in another layer.

D-channel

Within an ISDN environment, call control is supported out-of-band over the D-channel. The D-channel transports call control information.

Each D-channel can support up to 383 B-channels for voice transmission. Each system can support up to eight D-channels. For installation and engineering details, be sure to review “ISDN” on page 60.

ISDN Signaling Link (ISL)

ISDN Signaling Link (ISL) provides the capability to replace both digital and analog conventional trunk signaling with out-of-band ISDN D-channel signaling. ISL supports tie and ISA trunk types with Meridian 1 to Meridian 1 connectivity.

There are two modes of ISL operation:

— **Shared mode** This configuration is basically the same as the PRI D-channel also supporting ISL trunks.

— **Dedicated mode** The D-channel interface is reserved for ISL use.

An ISA route must be established and identified with the dedicated or shared ISL interface. For a complete description of the ISL operating parameters, refer to the *ISDN Primary Rate Interface description and administration* (553-2901-100).

Supporting documents

Network ACD (NACD) uses more than one special feature from the X11 software packages. You should have all of the ISDN and ACD publications relative to your application environment.

ACD

Automatic Call Distribution (ACD) allows a large number of incoming calls to the same directory number (called the ACD DN) to be answered at agent positions that share the influx of calls equally. The Automatic Call Distribution system is fully described in these documents:

— *Automatic Call Distribution feature description* (553-2671-110)

— *Automatic Call Distribution ACD management commands and reports* (553-2671-112)

ISDN

Network ACD is dependent on the network services and transport provided by ISDN. The ISDN network should already be up and running before loading the NACD package. Therefore, you should already have the following publications on hand:

— *ISDN Primary Rate Interface Feature description and administration*

— *ISDN Primary Rate Interface Installation*

— *ISDN Primary Rate Interface Maintenance*

System support documents

NACD requires that the system have a specific configuration. The documents listed here provide background information supporting that configuration.

Dialing Plans

— *Automatic Number Identification* feature module *in X11 features and services*

— *Basic and Network Alternate Route Selection description* (553-2751-100)

— *Coordinated Dialing Plan description* (553-2751-102)

Electronic Switched Networks (ESN)

— *Electronic Switched Network description* (309-3001-100)

— *Electronic Switched Network signaling guidelines* (309-3001-180)

— *Electronic Switched Network transmission guidelines* (309-3001-181)

Functional description

Network environment

NACD employs ISDN D-channel as the vehicle for transport to send NACD call-related messages between sites. Refer to the ISDN NTPs listed under “Supporting documents” on page 59 for a complete description of channeling speech paths.

Only PRI/ISL and tie trunks can be used for Network ACD.

Proper routing requires the dialing plan to identify ACD DNs on different nodes. This function is handled by the Electronic Switched Network (ESN). All nodes on the network must use the same dialing plan: either CDP or VDP. Both plans cannot be used within a single network. Refer to the section on Engineering in this document.

The D-channel is also used to update the databases at the Source and Target nodes. Making new entries in the database triggers a D-channel message to query the far end for verification, before allowing the entry to be registered. When you update your Routing Tables, the system checks the ACD DN address at both ends before allowing the entry to be registered.

D-channel messages also keep the system updated on the operating status of different ACD DNs at separate locations. Source and Target ACD DNs can be local or remote, and Active or Closed. Local Targets are on the same node as the Source ACD DN, and remote Targets are at a different node. An Active status allows the remote Target ACD DN to receive NACD calls. Closed means the remote Target ACD DN is not available to receive NACD calls.

Routing Tables

The ACD DN at a Source node is called the Source ACD DN. The Source ACD DN is always used for routing ISDN messages over the D-channel.

Targets in each table are put in order by the system according to the Target timer value, from the lowest value to the highest value. The timer associated with each Target is used to decide when to issue a Call Request to that Target. The table entries can be entered in any order, and the table is automatically reordered when timer values are changed. If all the timer values are the same, the entries are listed in the order they are entered.

Network ACD uses Routing Tables for the Source ACD DN to direct calls to potential Target ACD DNs. Up to 20 different Targets can be defined for each Source ACD DN. Each Target can have an individual timer defined, from 0 to 1800 seconds. Each entry in the Routing Tables includes the Target ACD DN, an associated timer, and status information for the Target. The Targets in each routing table can be either local or remote.

The Routing Table information is used to determine when and where calls are diverted from the Source ACD DN to Target ACD DNs. There are two types of Routing Tables: Day Tables and Night Tables. The Day Table is used when the Source ACD DN is in Day mode. The Night Table is used when the Source ACD DN is in Night mode.

Calls not allowed to be diverted by NACD are listed here:

— calls with ACD Ring Again activated

— Call Park Recall calls

— calls active in Teleset Messaging

— calls without Disconnect Supervision

Day Tables The Day Table is used when the Source ACD DN is in Day mode. Targets in the Day Table are used independent of the Overflow by Number (OVDN) targets. They can be the same Targets, but they must be redefined in the Routing Table. If no Day Table is defined, then TOF (if enabled) operates as usual.

When a call exceeds the defined timer for a Target in the Day Table, the call remains in the originating queue, and a Call Request is sent to the Target TOF queue. If the call has overflowed by number to a Target node, and the Target timer expires, the call is returned to the Source TOF queue.

These calls are not allowed to access the Day Table:

— Call Park Recalls

— ACD Ring Again calls

— virtual calls (CCR, IVR)

While the ACD DN with a call is in Day Service, the call is monitored to see if it exceeds any other related timers.

Night Table The Night Table provides another night treatment that can be defined for the system. The Night Table is only accessed when an ACD DN is in Night mode.

When the Source ACD DN is in Night mode, the call accesses the Night Table for that ACD DN queue. If there is no Night Table defined, then the Night Call Forward (NCFW) DN is used, if it is enabled.

These calls cannot access the Night Table:

— calls with outstanding Call Requests in the Day Table

— Call Park Recalls

— ACD Ring Again calls

— callers active in Teleset Messaging

If the Night Table is defined, then Night Call Forward (NCFW) does not apply. An error message is output if anyone uses the NITE command in Load Management. Also, the NCFW prompt will not appear in LD 23 if a Night Table is defined.

When a call exceeds the defined timer for a Target in the Night Table, the call remains in the Source ACD DN queue, and a Call Request is sent to that Target. While the Source ACD DN with this call is in Night mode, the call is monitored to see if it exceeds any other Target timers. The call is not routed to its TOF queue, but remains in the incoming call queue.

Table 2
Example routing table (UDP)

Target ID	Timer value	Registered	Status
66552152	0	OK	Active
2108	250	Local	Active
64342998	1800	<blank>	Closed

Target ID This number shows the actual digits dialed. For remote Target ACD DNs, the dialing plans allowed are as follows:

UDP = <AC> <LOC> <ACD DN>

CDP = <DSC> <ACD DN>

where:

AC = Access Code

LOC = Location Code

DSC = Distant Steering Code

Refer to the section on Engineering in this document for more details on dialing plans.

Timer value This is the timer value associated with each Target ACD DN. This value is rounded off to an even number, and gives the amount of time (in seconds) that a call is queued by the Source ACD DN before a Call Request for this call is sent to the Target associated with this timer.

Registered When a Target ACD DN is entered into the Routing Table, the Source node attempts to register itself with the Target ACD DN. Receiving a positive response from the Target node indicates that the Target ACD DN is registered. A source is registered when the Target ACD DN has been queried and responds to the request.

OK indicates that the source is registered with this Target.

Local indicates that the Target defined is local to the Source node. Registration is not required.

<blank> indicates that if this field is blank, the Target has not accepted the Table entry. There has been either no reply or a negative reply from the Target node: the system is down, the network is down, or the DN is not valid.

Status This field describes whether the Target ACD DN is currently able to answer calls or not able to take NACD calls from the Source.

Active indicates that the Target is active or available to accept NACD calls.

Closed indicates that the Target is closed to incoming NACD calls. This occurs for different reasons:

— current number of Call Requests at the Target exceeds its Call Request Queue size (heavy traffic)

— currently in Night mode

Source Table Viewer

When an entry in a Routing Table is configured, an NACD facility message is sent to the Target node. When this message is received at the Target node, an ACD Source Table entry is created at the Target ACD queue. When the Target ACD queue changes state, the Target node can send a message to the Source node to inform it of the state change. Once the Source node receives this message, it changes the state of the entry in the associated Routing Table.

The customer can use the Source Table Viewer to determine which ACD queues are targeting a particular ACD queue at a particular node. Also, printing the Source Table can help determine if NACD Source tables have become corrupted, or out-of-sync with their associated Routing Tables.

The Source Table can be printed in overlay 23 as shown in Table 3 on page 66, an example appears in Table 4 on page 67.

Note: The NACD source table cannot be edited using this feature.

Table 3
Print Source Table

Prompt	Response	Description
REQ:	PRT	Print.
TYPE:	NACD	Network ACD.
CUST	xx	Customer number.
ACDN	x...x	ACD Directory Number.
TABL	S	Source Table.

Table 4
Print Source Table Example

```
REQ  prt
TYPE nacd
CUST 1
ACDN 3901
TABL s

ACD DN # :  3901
TABLE NAME: S
CURRENT STATUS: INACTIVE

ENTRY NO      SOURCE ID     LAST_ACK             OUTST_MSG

1             2901          INACTIVE SENT        NOT SENDING

2             2902          INACTIVE SENT        NOT SENDING

3             2903          INACTIVE SENT        NOT SENDING

4             2904          INACTIVE SENT        NOT SENDING

5             2905          INACTIVE SENT        NOT SENDING
```

Where:

CURRENT STATUS indicates the status of the local ACDN. This field will show either ACTIVE or INACTIVE.

SOURCE ID indicates the remote ACDN targeting this local ACDN.

LAST_ACK is the last MCDN message sent to the source node that has been acknowledged. This field will show either 'ACTIVE SENT' or 'INACTIVE SENT'.

OUTST_MSG indicates whether an MCDN message of INACIVE SENT or ACTIVE SENT is currently being transmitted. This field will show either 'SENDING MSG' or 'NOT SENDING'.

Cascade routing

A Call Request from the Source ACD DN is the first message sent to a Target node to queue the call waiting for the next available agent. The call stays at the Source node receiving the treatments defined for that ACD DN (Music, RAN, etc.).

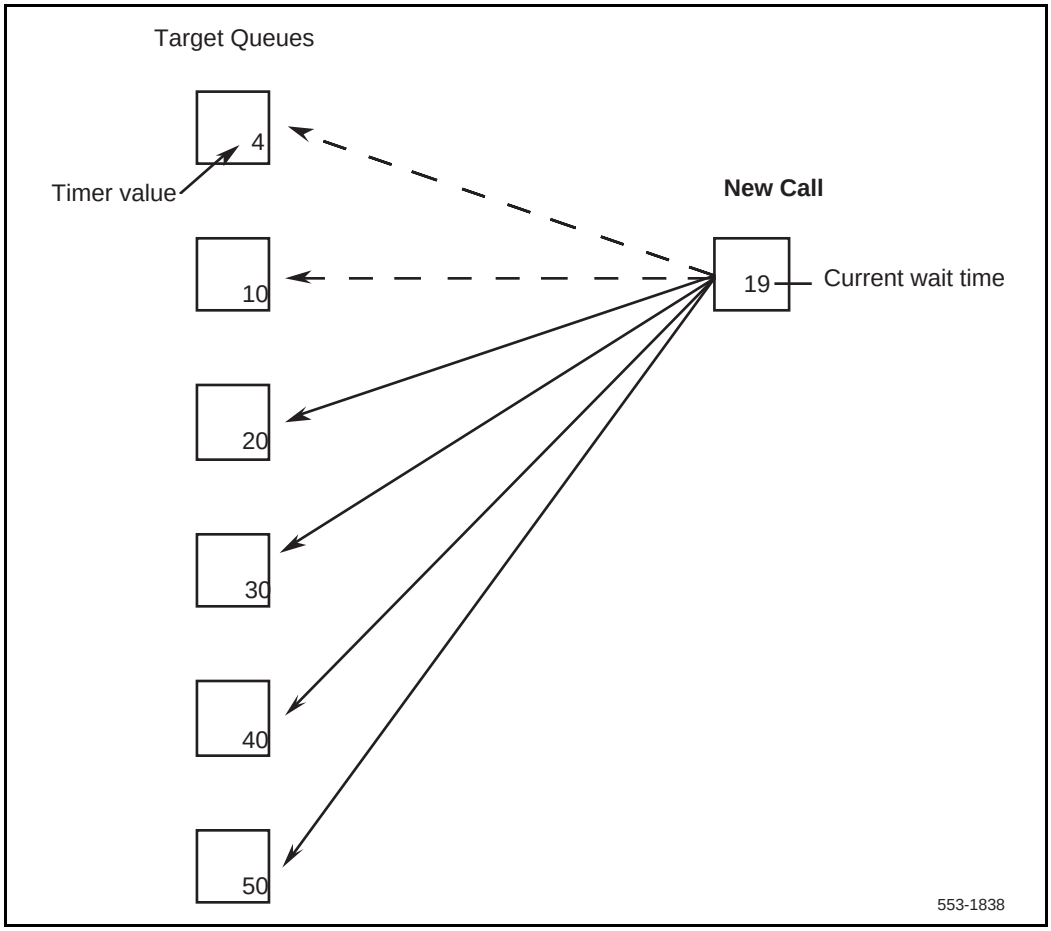
Network ACD sends out Call Requests to search for an available agent within the system. Only one Call Request is sent at a time, but the system continues to search until an agent is found. That is, while the first Call Request is pending at a Target, the system can send another Call Request for the same call to another Target. Up to 20 Call Requests can be pending at any one time.

If the duration timer (DURT) for a particular Target expires before the call is answered, there may be only 19 Call Requests pending. Then, the system resends the Call Requests to maintain the 20 pending. The Cascade occurs as the Call Requests are issued individually, and the system works through the Routing Table issuing Call Requests to Targets with successively longer timers as illustrated in Figure 2.

Targets are arranged automatically according to increasing timer values. The longer a call waits, the farther down the routing table it goes. That is, Call Requests cascade through the listed Targets looking for an available agent. If the timers for each Target are the same value, then the Targets are listed in the order they are entered into the database.

As soon as the call is answered, or abandoned, all pending Call Requests are canceled. That is, the system must follow through the process—Call Request, Free Agent notification, Agent Reserve, and Call Presentation (or abandoned)—and then cancel all outstanding Call Requests for that call.

Figure 2
Cascade routing



Dynamic status change

Certain events and conditions within the system allow the status for a particular queue to change automatically—a dynamic status change. Conditions that cause the status of a Target ACD DN to change are as follows:

— Night Service (NSVC):

When the Target ACD DN goes into Night Service, the status automatically changes to Closed at all its Source ACD DNs. As soon as one agent or supervisor logs in, the ACD DN is taken out of NSVC, and the status is automatically changed to Active.

— Traffic volume:

When calls in the Call Request queue exceed the Call Request Queue Size (CRQS) threshold, the status changes to Closed. The Target ACD DN remains Closed to further network call requests until the calls in the queue fall by the Flow Control Threshold (FCTH) *difference*.

CRQS – FCTH = *difference*

Example:

Set these parameters in service change:

CRQS = 80

FCTH = 20

When the queue = 80, the Target is Closed (CRQS = 80)
When the queue = 60, the Target is Active (CRQS – FCTH = 60)

— Manual Close:

CRQS = 0

CRQS can never be lower than the flow control threshold. Setting the CRQS to zero in service change or Load Management closes the queue. The Call Request queue shuts down. When the CRQS is changed to a positive value again, the Target becomes active. The CRQS must be at least the FCTH + 1 or 20, whichever is greater. The maximum value is 255 with a default of 100.

You can also remove or close the queue by removing that ACD DN from the Routing Table for that time frame (Day or Night).

Incoming calls

Incoming calls to a Network ACD site are initially handled as any other ACD application. That is, incoming calls are queued for presentation to the first available agent.

Call Requests

When calls have waited longer than the timer values in the Routing Table, calls can be diverted to Target agents for call presentation. Targets can be local or remote. Calls that are to be diverted to a remote Target remain in the queue for the Source ACD DN, and the software sends a Call Request over the ISDN D-channel to queue Call Requests at the Target node.

When an agent becomes available at the Target node, that agent is reserved for that particular call. The Target node responds to the Source node with an Agent Free notification over the D-channel. Only after receiving the Agent Free notification is the voice call physically diverted from the Source node to the Target node and presented to the reserved agent.

Reserve Agent Timer (RAGT) The Reserve Agent Timer keeps the agent reserved until call presentation or timeout. The timer also prevents a situation where an agent may be reserved indefinitely.

The Reserve Agent Timer is customer defined in service change LD 23 (2 – (4) – 30) and Load Management (RAGT). When an agent is reserved with Countdown Allowed (CNTA) CLS defined in LD 11, the RAGT countdown is shown on the agent's Digit Display.

The agent being reserved has a Reserve Agent Timer with countdown display. The countdown display starts when the Reserve Agent Timer (RAGT) starts, and counts down by increments of 2 seconds, to zero. If the call is not presented to the Target agent before the Reserve Agent Timer (RAGT) expires, that call remains at the originating Source queue. The Target agent is returned to the idle agent queue.

When a call is presented or answered (depending on the display CLS allowed), the Digit Display shows the appropriate call information—dialed DN, DNIS number, CLID, and so on. Diverting the call and system functions show the agent's display to the caller.

CAUTION
Call modification information may be lost.
If the call is transported over a node that does not support the same release or features, certain call information is lost and will *not* be displayed on the terminating telephone.

When a Target agent becomes available, the Target node sends an Agent Free notification message to the Source ACD DN. The agent is removed from the idle agent queue and reserved until the network call is presented. If the timer expires before the call is presented, the agent is returned to the front of the idle agent queue, and the call remains at the Source ACD DN queue. Refer to "Priority Agents" on page 81.

Canceling Call Requests

There are some situations that can change an agent's reserved status or cancel a Call Request, affecting the timer. Agent set key operations can change the status of a station to unreserved. Cancellations for other reasons may be initiated by the Source or Target ACD DNs also.

Source node The Source node cancels Call Requests on the following events:

— call is answered by any agent or supervisor

— call is abandoned

Cancellation messages are sent to all remote Target ACD DNs with Call Requests pending for that ACD call.

Target node A Target ACD DN cancels Call Requests on the following events:

— Duration Timer (DURT) expires

— Reserve Agent Timer (RAGT) expires

— Key Operation: An agent activates keys or logs out before the Call Set-up message is received (as in using the NRD/MSB keys)

— Night Service: If a Target ACD DN goes into Night Service, all pending calls in its Call Request queue are cancelled

Queue priorities

Each agent answers incoming calls based on the priorities established for that ACD DN. There are three different queue configurations that can be defined for Network ACD.

Oldest Call in Network (OCN) This option takes the oldest call in the network overall. This option requires the Oldest Call in Network (OCN) be enabled, and the High-Priority Queue (HPQ) be disabled in LD 23:

OCN = YES

HPQ = NO

The system compares calls from queues for that target ACD DN. The highest priority call that has waited the longest is the call presented to the next available agent.

Own TOF Queue First This option selects the oldest call from the ACD DN's own TOF queue. With this preference, both the Oldest Call in Network option and the High-Priority Queue option should be disabled in LD 23:

OCN = NO

HPQ = NO

If there are no calls in the Source Timed Overflow queue, the system looks at calls in the Call Request queue and Source Timed Local Flow-in queue. If there are no calls in either of those queues, then calls in the High-Priority queue and nonpriority queues are routed next. Calls for a Target ACD DN are best answered by the agents for *that* ACD DN. With this configuration, calls are selected in the following order:

1 the oldest call in the agent's own TOF

2 the oldest High-Priority call in the Call Request queue or Local Flow-in queue

3 High-Priority calls

4 nonpriority calls

Own TOF and High-Priority Queue over the network This option presents calls from the agent's own TOF queue and High-Priority queues before presenting calls from Source TOF queues and Call Request queues.

With this preference, the Oldest Call in Network option should be disabled and the High-Priority Queue option should be enabled in LD 23:

OCN = NO

HPQ = YES

With this configuration, calls are selected in the following priority:

1 the oldest call in the agent's own TOF queue

2 the oldest call in the agent's High-Priority queue

3 the oldest call from the Call Request queue or Local Flow-in queue

4 the oldest call in the agent's nonpriority queue

Call presentation

The customer must first define call processing priorities for the system, as described in the previous section. Then, the system follows this procedure to present a call to the next available agent. Calls diverted by NACD are placed in the queue for the Source ACD DN, until an agent becomes available for the call.

When an agent becomes available, that agent is reserved by the system for the NACD call. The Reserve Agent Timer starts, to prevent the agent from being reserved indefinitely. During the countdown, the system sends an Agent Free notification over the D-channel to the Source ACD DN.

Receiving the Agent Free notification, the Source ACD DN then diverts the physical voice call to the Target agent reserved for that call. On call presentation the display shows the appropriate information—dialed DN, DNIS number, CLID, for example. Diverting the call and system functions are completely transparent to the caller.

If the Reserve Agent Timer expires before the call can be presented, the call remains at the Source ACD DN.

Interactions

Features and services listed here are described in detail in other publications as ACD features or as software features compatible with Generic X11 software. Refer to the list of supporting documents in the front of this document. If a needed reference cannot be found in that list, please consult with your Northern Telecom representative.

Only calls eligible for TOF treatment are eligible for NACD treatment. The following calls are *not* eligible:

— **ACD Ring Again** If RGA is applied to a call, it is not eligible for NACD.

— **Call Park Recall** Parked calls that time out and recall back to the ACD agent are not eligible for NACD.

— **Non-ACD Interact** Digit translation is not supported on Target IDs within any Routing Table.

— **Teleset Messaging** Calls actively in Teleset Messaging are not supported by NACD.

Network ACD interacts with ACD and basic X11 features of the Meridian 1. These interactions are described in the following section.

ACD interactions

Agent (AGT) Lamps An AGT lamp shows the ACD supervisor the status for every agent in the group. The lamp states, explained in *Automatic Call Distribution feature description* (553-2671-110), are updated every time an agent's status changes.

When an agent is reserved for network calls, the AGT key/lamp on the supervisor's station is in the slow flash state.

ACD Calls Waiting (AWC) The ACD Calls Waiting key uses lamp states to show the agent when the number of calls waiting in the queue has exceeded the customer-defined threshold values. The lamp states work in conjunction with the normal Overflow by Number and Interflow features. However, by an optional command in LD 23, the AWC lamp states are enhanced in the NACD environment.

With the new lamp state option (NCWL) enabled, the Busy Threshold (BYTH) and Overflow Threshold (OVTH) apply only to Overflow by Number and Interflow conditions, but do not change the lamp states. Calls in the Call Request and Local Flow-in queues are included when adding up the calls in queue for lamp state updates.

The new lamp state settings separated from BYTH and OVTH are available to all ACD Package B users with X11 Release 15 or later. Independent of NACD, thresholds that now update lamps are defined by the customer in service change LD 23 and Load Management.

These lamp states are based on the sum of all calls in the following queues:

— the agent's TOF queue

— the agent's High-Priority queue

— the agent's nonpriority queue

— the Local Flow-in queue

— the Call Request queue

Dark	The sum of all calls in these queues is less than the Call Waiting Threshold (CWTH).
Steadily Lit	The sum of all calls in these queues is greater than the CWTH, but less than the Call Waiting Lamp Flash (CWLF) threshold.
Slow Flash	The sum of all calls in these queues is equal to or greater than the CWLF threshold, but less than the Call Waiting Lamp Fast Flash (CWLW) threshold.
Fast Flash	The sum of all calls in these queues is equal to or greater than the CWLW threshold.

Dialed Number Identification Service (DNIS) The DNIS information is propagated to remote Target nodes. On call presentation, it is displayed on the Digit Display.

If the call is incoming on a non-ISDN trunk, the displayed information includes only the trunk access code, to show that it is an ACD call.

Display Queue (DWC) key The lamp states for the Display Queue (DWC) key are updated for NACD enhancements, as explained above in the Calls Waiting (AWC) description. The DWC display shows queue status in the following format:

a a a – b b b – c c c – d d d d

where:

a a a = sum of calls waiting in queue:
Source TOF, High-Priority, nonpriority

b b b = agent positions available

c c c = waiting time for the oldest call in these queues:
Source TOF, High-Priority, nonpriority

d d d d = sum of all calls in the following queues:
nodal CCR, Flow-in, and Call Request queues

The supervisor can monitor the nodal Flow-in queue separately using the Display (DSP) key. Push the DSP key and dial the Source ACD DN. The display then shows the sum of calls in the Source TOF queue and Call Request queue.

Headset or MSB Logout (HOML) The HOML option allows an agent to log out by removing the headset or going on hook without using the Make Set Busy (MSB) key. Logout while on Agent Reserve causes a cancellation message.

Individual DN (IDN) key The IDN key can be any one of the following key types:

DIG	Dial Intercom Group
HOT	Hot Line
MCN	Multiple Call, Nonringing
MCR	Multiple Call, Ringing
PLN	Private Line, Nonringing
PLR	Private Line, Ringing
SCN	Single Call, Nonringing
SCR	Single Call, Ringing
VCC	Voice Call

When an agent or supervisor activates any IDN key while reserved, a cancellation message is sent to the Source node.

If any IDN key is used by a remote Target agent when being presented with a call from the Call Request queue, the call is terminated to another idle agent. If there are no idle Target agents available, the call remains at the front of the Target TOF queue and will be the first one to be answered.

Call Interflow (IFDN) Call Interflow takes precedence over Network ACD routing. That is, calls diverted to the IFDN are not routed by NACD. Network calls diverted to an IFDN lose all the network information, so that information cannot be displayed on the terminating telephone.

If the Target ACD DN is a local ACD DN, Interflow and recall to Source can be used. If the Target ACD DN is a remote ACD DN or a non-ACD DN, Interflow is not supported.

Disabling Interflow is recommended. Set the timer value to zero (0) in the routing table for those ACD DNs that need calls immediately diverted.

Key features When an agent is reserved, activation of the following keys removes the position from reserved status:

AAG	Answer Agent key
ACNT	Activity Code key
AMG	Answer Emergency key
ASP	Answer Supervisor key
ADL	Auto Dial key
CFN	Call Forward key
MSB	Make Set Busy key
NRD	Not Ready key
OBV	Observe Agent key
RAG	Ring Agent key
SCC and SSC	Speed Call key

If these keys are used by a remote Target agent when being presented with a call from the Call Request queue, the call is terminated to another idle agent. If there are no idle Target agents available, the call remains in the front of the Target TOF queue.

Night Call Forward (NCFW) Night Call Forward is used only if there is no Night Table defined for an ACD DN.

Night Service (NSVC) With NACD, there are three Night Service treatments that can be defined:

— with Night Tables

Callers receive Night RAN, while the call is monitored for the timers defined for Targets nodes.

— Night Tables only

No Night RAN is given, while the call is monitored for the timers defined for Targets.

— Night Tables with Delay Night RAN Route (DNRT)

With active entries in Night Tables (DNRT) on, callers will get Day treatment. The first FRRT must be 4 seconds greater than the timer value of the last entry in the Night Table for this to work. When all entries in the Night Table are inactive, then a Night RAN is returned to inform the caller that the network is closed.

Note: When a caller accesses the queue in Night Service and uses the NACD Night Table (the Night Table has open Targets), the caller hears first and second RAN.

Transition mode:
When the Source ACD DN goes into Night Service via the NSVC key (dialing T [8]), calls already in queue still access the Day Table, but all new calls access the Night Table. If there is no Night Table defined, traditional Night Treatment is given.

Night mode:
The Source ACD DN goes into the Night mode using the NSVC key (dialing N [6]), when all agents log out. Then all calls access the Night Table, unless they have outstanding Call Requests from the Day Table.

— Source node in Night Service

- Transition mode:
  - new calls access the Night Table
  - existing calls access the Day Table
- Night mode:
  - new calls access the Night Table
  - existing calls that have pending Call Requests from the Day Table are honored, but there is no more searching of the Day Table

— Target goes into Night Service

- Transition and Night mode:
  - new Call Requests are denied
  - existing Call Requests are canceled

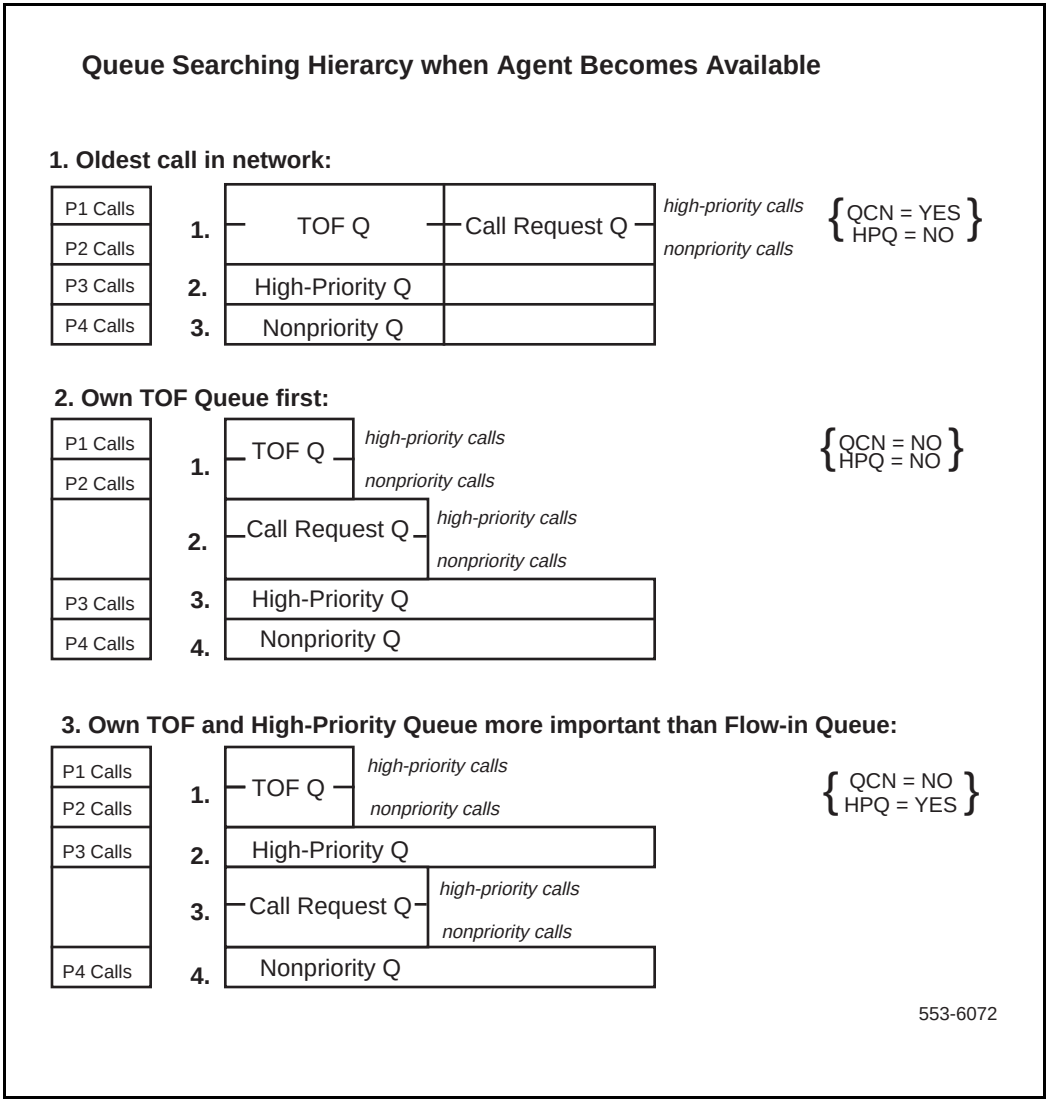
When the Source ACD DN comes out of Night Service, only current Call Requests accessing the Night Table still apply. All new calls access the Day Table. Only calls without outstanding Call Requests can access the Day Table.

Overflow by Number (OVDN) Overflow DNs defined at the OVDN prompt in LD 23 are not used by NACD. They are used by Overflow by Number only. The same ACD DNs can be defined in the NACD Routing Tables as local Targets. OVDN then recalls to Source when the call waits longer than the timer.

Priority Agents (PRI) PRI allows certain agents or groups to have priorities defined for preferential call presentation. Agents or groups with higher priorities are linked more readily to the front of the idle agents queue. Lower priority agents are presented with calls only when all higher priority agents are busy.

If a priority agent is reserved but is not presented with a call, the priority agent will be put after those agents with higher priority and in front of agents with equal priority.

Figure 3
Target agent available



Secondary DN call blocking (SDNB) Secondary DN call blocking prohibits call presentation to an agent's secondary DN while that agent is active on an ACD call.

Secondary DN calls block when an agent is reserved.

If the agent is no longer reserved, and IDN is MADN SCR, the light for that DN flashes.

Time Overflow (TOF) If Routing Tables are not defined, then TOF operates as usual. Refer to the publications listed in "Supporting documents" on page 59 for a complete description of TOF.

Feature interactions

Calling Line Identification (CLID) CLID numbers are sent across the link on call presentation to Target agents. With CLID enabled, the originator's name is sent across the network and displayed on the Target agent's telephone only if each route has Network CPND allowed. Refer to *ISDN Primary Rate Interface Feature description and administration* for more details on Network CPND.

Call Party Name Display (CPND) CPND displays preprogrammed names associated with incoming calls only on M2317, M3000, and Meridian Modular telephones (M2216ACD-1 and M2216ACD-2). Names associated with this feature are only sent across nodes with the CPND package (95) equipped. More complete details on Network CPND are in the *ISDN Primary Rate Interface Feature description and administration.*

Without CLID, a call from outside the network displays the name associated with the incoming route, if the Source node has a name defined for that route.

Call Forcing (FORC) After an ACD call is disconnected (by either party), there is a 2-second delay before the next call is accepted. If the next call is from the Call Request queue, there is an additional delay from 0 to the Reserve Agent Time before the call is presented to the agent.

NACD engineering

Dependencies

A Network ACD system requires that all nodes in the system have the same configuration. Networking parameters for ISDN and ESN *must be* consistent throughout all nodes or switches in the system with respect to NACD. Significant feature interactions may result unless all switches have the appropriate feature packages and classes of service enabled for NACD.

For the proper supporting generic and release, consult your Northern Telecom representative.

MSDL Engineering Guidelines

When configurations include a tandem Meridian 1, ensure that the D-channel link speeds are engineered to meet required response and performance objectives. Please refer to the MSDL Engineering Guidelines in the *Meridian 1 Capacity Engineering* 553-3001-149.

Package dependencies

NACD requires X11 Release 15 or later issues of software. Expanded Target capabilities are introduced with the Enhanced Overflow (EOVF) package (178), which is also a prerequisite for the Network ACD package (207).

The following are the minimum package requirements for Network ACD:

Package name	Mnemonic	Package number
Basic Routing	BRTE	14
Digit Display	DDSP	19
Basic Queuing	BQUE	28
Network Class Of Service	NCOS	32
Basic ACD	BACD	40
ACD Package B	ACDB	41
Network Alternate Route Selection	NARS	58
Coordinated Dial Pan	CDP	59
PBX Interface for DTI/CPI	PBXI	75
ISDN Signaling	ISDN	145
ISDN Primary Rate Access (CLID)	PRA	146
ISDN Signaling Link	ISL	147
Advanced Network service — Tandem nodes	NTWK	148
Enhanced Overflow (ACD)	EOVF	178
Network ACD	NACD	207

Note: Please remember that an error code is output for every package requirement not supported on your machine. For a complete definition of all error codes and system messages refer to the *X11 input/output guide.* Also, a list of the available feature packages and package requirements is included in *X11 features and services.*

Feature limitations

Calls from trunks without Disconnect Supervision are not able to initiate Call Requests.

Automatic Trunk Maintenance (ATM) is not supported on ISDN PRA or ISL trunks.

Network CPND is only supported on Meridian 1 nodes within the network.

The NACD feature allows ACD agents at different locations (nodes) to service call over the network at remote targets. When an unanswered ACD call is routed via NACD to a remote ACD DN node and the call is not answered by an ACD agent, the call is placed in a time overflow queue (TOQ) of the remote ACD node, the call is not returned to the original ACD DN target node queue.

Tandem Tie Trunk Networks (TTTNs) are not supported by NACD.

Only one location per NACD node can be used with HLOC in LD 15.

Pretranslation is not supported on Target IDs in the Routing Tables.

Calls ineligible for NACD treatment are:

— ACD Ring Again calls

— Call Park Recall calls

— An active Teleset Messaging call

There should be one home location code per node.

There can be no more than 20 Call Requests pending for any one call.

Feature requirements

Private Network Identifier (PNI) A Private Network Identifier (PNI) relates to the customer number. It is required for interworking between switches. Within one network, use the same PNI value in both the Customer Data Block (LD 15) and the Route Data Block (LD 16). When operating between different networks, the Customer Data Block PNI is the PNI for your switch and the Route Data Block PNI is the PNI for the remote switch where the route terminates.

ESN requirements

The Electronic Switched Network (ESN) provides least cost routing between locations in a private network with a consistent dialing plan. Consistent dialing plans for each node in the network are provided by the Coordinated Dialing Plan (CDP) or the Uniform Dialing Plan (UDP). If MAX is equipped, a 7-digit dialing plan is required. For a complete description, refer to "Electronic Switched Networks (ESN)" on page 60.

Each NACD node within the network must have a unique address that is known throughout the network. NACD requires that all nodes within the network have *either* a Coordinated Dialing Plan (CDP) *or* a Uniform Dialing Plan (UDP). The system with NACD cannot have *both* CDP and UDP.

These dialing plans are needed to identify each node within the network. All nodes within the network must be able to recognize every other node in the network. Identification is provided by the Local Steering Code (LSC) for CDP or the Home Location Code (HLOC) for UDP. When signaling messages are sent between nodes, each node is identified along with the return route for that node in response.

The Source identifier is put in the Source ACD DN field of the AUX messages at the Target node, and shown on the agent's Digit Display on call presentation.

Coordinated Dialing Plan (CDP) A Coordinated Dialing Plan (CDP) consists of the CDP code and the Directory Number (DN). This dialing plan does not need an access code because the CDP code is part of the internal dialing plan.

The CDP code is one of the following:

— Distant Steering Code (DSC)

— Local Steering Code (LSC)

The complete CDP can be from 3 to 7 digits long, or 3 to 10 digits with the DN Expansion package (DNXP, Package 150) enabled for Distant and Local Steering Codes. The DN length is defined in the ESN service change LD 86 at the NCDP prompt.

The Target ACD DN identifier is the remote ACD DN defined in the Routing Table, and can only use the Distant Steering Code (DSC).

Source ACD DN identifiers are composed of the Local Steering Code (LSC) followed by the Source ACD DN. Every node in the network must recognize the LSC used for Source identifiers as a Distant Steering Code (DSC). Trunk Steering Codes (TSCs) are not supported by ISDN; and therefore, are not supported by NACD.

Define 7-Digit CDP If no CDP is defined or if the existing CDP is 7 digits long, then the CDP can be used for the NACD application.

Overlay 86 ESN data block must have the number of digits in the CDP (NCDP) code prompt equal 7. Overlay 87 defines the 3-digit LSC. The LSC must have a PMI that deletes 3. A 3-digit DSC is required for each node on the network. Overlay 15, Customer Data Block, must also define LSC as the already defined LSC from Overlay 87. This programming must be done at all the nodes in the network.

Note: In Overlay 86, when defining Route List Entries that are associated with either DSCs or LOCs used with the NACD applications:

- The routes (ROUT) must be only ISDN routes. Also, the ISDN routes cannot step to non-ISDN routes.
- The PNI defined for the routes must be equal to the PNI defined in Overlay 15, Customer Data Block, of the node that it is directly connected to.
- No digit manipulation (DMI) can be defined; in other words, DMI = 0.

Uniform Dialing Plan (UDP) The Uniform Dialing Plan has an access code, a UDP code, and a DN. If the Network Alternate Route Selection (NARS, package 58) is enabled, there are two access codes that can be used, AC1 or AC2, and the location code. With the Basic Alternate Route Selection (BARS, package 57), you can only use AC1. Access codes for either AC1 or AC2 can be 1 or 2 digits long. The UDP must be 7 digits without the AC.

The UDP code can be any one of the following:

— Location Code (LOC)

— Home Location Code (HLOC)

If the Target node has a 5- to 7-digit ACD DN defined, only the last 4 digits are used as an identifier. When the terminating telephone answers the call, only the last 4 digits are shown as the CLID. The CLID can be used as a call back number.

Source ACD DN identifications are built from the Home Location Code (HLOC) and the Source ACD DN. The HLOC must be included in the AC1 translation table. Every node on the network must define the location code used for Target DNs as part of the AC1 translation table. Target identifiers are defined in the routing tables.

Recommendations

Customer configurations

Network ACD can function in three basic configurations: similar service, special service, and a hybrid of the two. There can exist a combination of these NACD configurations within the same network.

Similar Service Network This configuration is used when there is only one service handled by NACD, and all ACD agents are equally capable of handling any incoming call.

Every ACD DN within the network must be defined in all the other ACD DN's Routing Tables. Only the Oldest Call in Network (OCN) option is enabled, and all incoming trunks should be defined with the same priority.

OCN = YES

HPQ = NO

Special service network Here, there may be different services being offered by agents throughout the network. Each agent is specially trained for a particular product or service, but is still able to answer any incoming call. The ACD user can define specialized services among groups of agents and still allow calls to be evenly dispersed among all available agents during peak traffic times.

Only the ACD DNs with similar functions should be defined as Targets for each other. Every ACD DN should have OCN disabled (NO) and HPQ enabled (YES). All incoming trunks should be defined as High-Priority trunks.

OCN = NO

HPQ = YES

Hybrid network A hybrid network is a union of the two configurations mentioned above. Different services or products are being offered, but they are closely related. A TOF call for one ACD DN should have precedence over other calls overflowing to the same ACD DN. Still, it is best to answer the oldest calls first. After answering all TOF calls, agents return to answering calls in their own High-Priority queue.

Every ACD DN within the network must have all the other ACD DNs defined in the Routing Tables. Then, both OCN and HPQ are disabled (OFF).

OCN = NO

HPQ = NO

NACD engineering guidelines

When independent Automatic Call Distribution (ACD) nodes are properly networked using the Network Automatic Call Distribution (NACD) package, the overall performance of the network can improve in three areas:

— Reducing Average Speed of Answer (ASA)

— Increasing total ACD calls handled by the network

— Reducing ACD agents required to maintain the same service level

NACD is designed to allow the call distribution centers to function as one virtual queue based on the length of time calls have waited for available agents and on the work loads at each location.

> ***Note 1:*** Do not forward calls to centers that are overloaded or understaffed. Use care when provisioning trunks between locations. Underprovisioning can result in agents being reserved for calls, but with no facility available for presenting the overflowed network call.
>
> ***Note 2:*** If a call is presented to a remote target ACD agent, and is not answered by the romote target ACD agent, the call is returned to the front of the TOF queue of the remote target ACD DN. It is not routed back to the original ACD target node.

It is necessary to look at the call registers and the real-time effect of adding NACD to new or existing Meridian switches.

The following are guidelines for establishing NACD, including:

— Target table definition

— Parameter definition

— Network requirements

— Design of the NACD Routing Table

— Incremental impact engineering

Target table definition

NACD automatically routes calls to available agents. For maximum efficiency, define the order of remote Targets in the NACD Routing Table according to the guidelines below.

Real-time impact

CPU real-time engineering is always required at the Source node. The CPU of a tandem or remote Target node needs engineering only when its busy hours coincide with those of the Source node.

Noncoincidence busy hour (time zone difference)

Busy hours in branch offices are often similar for large organizations spread over a wide geographical area. NACD improves the utilization of facilities by overflowing calls arriving at the Source node to Target nodes in a different time zone so that idle resources at Target nodes with different busy hours can be fully utilized. This allows for a better balance of agents across the network. It may also reduce the need to provide extra staff at the Source location during peak times as the traffic is now distributed across the network.

Table 5
NACD Target entry registration

Reasons to get NACD002	Actions
Dialing Plan is incorrect	1. Try making a B-channel call from Source to Target node dialing the number that is in the target table. Make another call from Target node using the HLOC value in OVL 15 of the Source node and the Source ACD-DN preceded by Access code defined in OVL 15 at Target node. 2. If okay, then enable D-channel messages and try again. Look at originating and terminating IEs in facility messages. 3. If not okay, check DB.
D-channel is down	Enable D-channel at all affected nodes.
Route list does not have ISDN trunk	Define ISDN routes in route list.

ACD DN load at each node (spare capacity)

The relative ACD DN load between the Source node and a Target node is one of the most important considerations in determining where to overflow the waiting call. If the average loading per ACD DN is known, then the ACD DN with the lowest loading receives the highest priority for receiving networked overflow calls.

To calculate the ACD DN with the lowest loading (or the highest spare capacity), use the following formula:

$S = (33–A) \times N$

where:

S = spare capacity

A = agents load in CCS (Calls Accepted × Avg. Work Sec.) / 100

N = number of agents in the queue

Once the network is installed, it may be necessary to recalculate the spare capacity to provide better balance on the network.

The spare capacity is calculated only for the Target location since it receives the extra traffic.

If S is negative, the Target ACD DN is overloaded and cannot accept any overflow traffic.

Agent group size in an ACD DN

Due to the higher traffic carrying capacity of a larger service group, when two ACD DNs have the same average agent loading per ACD DN, the ACD DN with the most agents receives a higher priority in the routing table.

Number of hops

In general, a call with a number of switches involved in the call set-up requires more resources than a network call involving only two switches. As a general rule, the ACD DNs co-located in the Source node receive the highest priority in the routing table.

The next consideration is for locations with only one hop or point-to-point connections. If possible, nodes requiring tandem connections should receive a lower priority depending on how many tandem points are involved.

> ***Note:*** The real-time impact of each NACD call is 56 ms at the Source location, while tandem calls require 215 ms of real time. Each NACD call requires 194 ms to set up, while a nonnetwork ACD call requires 138 ms. Each time a Call Request is sent over the network, one call register is required at the Source node and one call register is required at the Target nodes. These call registers are required in addition to those necessary to establish the call. They are required only with Call Request messaging for NACD calls.

Parameter definition

The parameters used to control NACD are defined in the following sections.

Flow Control (Overlay 23: FCTH)

The Flow Control option opens and closes the ACD DN for network calls. Once the number of Call Requests received over the network meets the call request queue size defined in Overlay 23, the queue is shut down (INACTIVE) for network calls. For the queue to open for network calls, the pending queue request size must drop to a value equal to the flow calls control.

For example, a call request queue size of 50 with a flow control of 10 allows the queue to become inactive after 50 call requests are pending. After 10 calls or 10 Call Requests have been answered or removed, leaving 40 remaining in queue, the queue will reopen.

Call Request Queue Size (Overlay 23: CRQS)

It is recommended that the Call Request Queue Size be approximately 20% higher than the number of trunks available for networking. If the customer selects the Oldest Call in Network option (OCN), set this value at 5% over trunking capacity. This avoids reserving agents for calls on the network when trunking facilities are unavailable. Flow Control (FCTH) is typically set at 25% of the call request queue size.

The CRQS must be defined for each ACD DN in the network.

Resend Timer (Overlay 23: RSND)

This is the length of time the Source node waits for a response from the Target node after sending a Call Request message. When the Resend Timer expires, another message is sent. If the second Call Request message expires without a response, the Call Request is removed from the network queue. The Resend Timer is set to a 4-second default and should be changed only if the network uses multiple hops and ISL with lower baud rates.

A single hop typically requires 100 ms of real time to set up the call. When the Resend Timer is too large, the control function of the timer to limit traffic to busy nodes is lost. If the Resend Timer is too small, the access of calls to nodes may be limited unnecessarily.

The Resend Timer must be defined for the Source node and the Target nodes.

Reserve Agent Timer (Overlay 23: RAGT)

The Reserve Agent Timer indicates the maximum amount of time an agent is reserved for a network call. The range is 2–30 seconds with the default set at 16 seconds. The Reserve Agent Timer can be changed using 2-second increments.

If the Reserve Agent Timer is set too high, the agent is reserved waiting for calls. If the Reserve Agent Timer is set too low, the agent may be freed before the network facility can set up the call. Different timer settings can be tried through Load Management. Subsequent calls are presented to agents only after the Reserve Agent Timer has expired.

The RAGT must be defined only for Target queues.

Oldest Call in Network (Overlay 23: OCN)

This feature determines if the oldest call in the network is answered ahead of calls to the Source location. Use caution with this feature. Because agents are reserved for network calls, agents may remain idle while calls wait in the local queue.

To avoid reserving all the agents for network calls, split the ACD group into two areas: one area for all calls and the second area for a group of agents equal to the number of tie lines between the network locations. This solution allows local calls to overflow by time into the area for all calls.

The OCN option must be defined only for Target queues.

ACD agents requirement at each node

The current method of calculating ACD agents inflates ACD calls by 30% to allow for peak traffic during busy hours. The provisioning of agents requires 30% spare capacity to cover traffic peaks. When NACD is applied normally, this 30% spare capacity is not necessary since queued calls are offered to other nodes in the network after the designation overflow timer expires. However, if all nodes peak at the same busy hour, the 30% spare capacity is still required.

Trunking requirements at the Source and Target nodes

Each node on the network must have a connection to the Source node, either directly or through one or more tandem nodes. It is assumed that the trunking requirements have been satisfied to handle existing traffic. For NACD, estimate the incremental requirement for carrying overflow calls to each Target node.

In the current engineering procedure, there is an adjustment similar to agent traffic on the trunking requirement for traffic peaking of 30%. Waiting calls are eventually handled by other nodes with less average waiting and do not occupy the trunks.

Keep the peak load adjustment, but reduce the Average Speed of Answer (ASA) by half in the trunk calculation to allow for the potential reduction in waiting time. Modify trunk traffic calculations to the Source node by multiplying Average Busy Season Busy Hour (ABSBH) traffic by 1.3 to account for trunk traffic peak load. If the level of given traffic in calls already reflects the peaking factor, then replace 1.3 with 1.0 in the following calculation.

Trunk Traffic = (Offered Calls × 1.3 × DCP/100) + (Offered Calls × 1.3 × 0.5 × ASA/100) CCS

Direct Call Processing (DCP) is the time in seconds that is spent handling incoming ACD calls.

Where the objective of networking is to reduce the number of agents in the Source node while maintaining the same level of service, perform the same calculation but reduce the number of agents at the Source node and calculate trunk traffic without the 50% reduction of ASA in the above formula.

Duration Timer (Overlay 23: DURT)

The Duration Timer indicates how long a Target node honors a call request from the Source node. If the timer expires, the call is removed from the call request queue. The range of the Duration Timer is 15–45 minutes with the default set at 30 minutes. If this timer is too large, the network call request queues may become overcrowded. If the timer is too small, waiting customers may be cut off from receiving services.

This timer must be defined only for Target queues.

Network requirements

The requirements for establishing NACD on a network are outlined in the sections that follow.

Signaling link requirements between Source and Target nodes

If the signaling message for NACD applications is carried by a PRA D-channel between two nodes, the PRA D-channel's signaling capacity is so large that engineering of the link is not required. If the signaling link is ISL, the data rate of the signaling link must be determined. Use care in multiple hops to ensure recalculation of all the traffic on the ISL link. For multiple hops, engineer all links to the same baud rate. Avoid using ISL links at different speeds since this can block messages at the tandem location.

The formula to calculate the ISL/PRA rate is:

Number of NACD calls × .63 = BPS

where:

BPS = bytes per second

Table 6
Data Link capacity for NACD and ISL calls

Link Data rate (D) in kbps	64	19.2	9.6	4.8	2.4	1.2
NACD Calls	54,064	27,563	15,303	7,655	3,827	1,908
ISL Calls	77,582	39,553	21,960	10,985	5,492	2,738

Overflow traffic estimation

Since removing the high day traffic adjustment is recommended when engineering agent positions, consider 30% of Source traffic as potential overflow traffic. Use this rule when the average agent load at the Source node is unknown. Otherwise, traffic exceeding a loading of 33 CCS per agent is overflowed.

To calculate the number of overflowed calls from the Source node to Target nodes, use the average holding time of 180 seconds.

$OT0 = A0 - 33 \times N0$

OT0 = Overflow traffic from Source node in CCS

A0 = ACD traffic in CCS calculated from (Calls Accept × AVG Work Sec)/100

N0 = number of agents at the Source node

The number of overflow calls = OT0/180

If OT0 is a negative number, the traffic is too low or too many agents are assigned to this location and no calls will overflow onto the network from this node.

Average CCS loading per agent at each ACD DN

The relative ACD DN load between the Source and a Target node is one of the most important considerations in determining where to overflow a waiting call. If the average loading per agent is known, then the node with the lowest average load becomes the highest node in priority to receive overflow calls.

Average Agent Loading in CCS can be calculated from the ACD DN performance report. The equation is as follows:

Avg. Agent Loading in CCS = Average Work/Manned % × 36/100

The value of Work/Manned % from a Target ACD DN performance report is the average traffic level of the Target ACD DN during the busy hour of the Source ACD DN.

Call register requirements

The incremental requirements for call registers between ACD and NACD are the additional call registers required at the Source node to hold calls waiting to be overflowed to Target nodes. The recommended procedure is:

X = Calls/hours overflowed to all Target ACD DNs

This is OT0 ×100 /HT

Y = Calls/hours overflowed to the local Target ACD DNs

This is (OT1+...+OTk) × 100/HT, where k is the number of Target ACD DNs co-located in the Source node.

ASA = Average Speed of Answer in seconds required at the Source node

HT = Average holding time of an NACD call (default is 180 seconds)

Q = Average number of NACD timers expired before the call is answered

(Default is 1.5 queues)

W = Number of calls overflowed from other nodes to the Source node during the busy hour (should be 0 for an efficient network)

t = The first timer value in the NACD table

CRQ = Call Request Queue size

Incremental CR Traffic at Source node

Snacd = (X+W) × ASA × Q/100 + (X–Y) × HT/100 ccs

Incremental CR Traffic at Target node

Tnacd = CRQ × (ASA–t)/100 ccs

Incremental CR traffic at a combined Source and Target node

Snacd + Tnacd

Refer to Table 7 to find the number of incremental CRs required for NACD.

Note: Add the incremental CRs to the CR requirement for ACD based on the procedure in the next subsection.

Table 7
Poisson table at P.01 grade of service

CRs	1	2	3	4	5	6	7	9	10	15	20	25	30	35	40
CCS	.4	5.4	15.7	29.6	46	64	84	105	126	269	399	535	675	818	964

This procedure applies when NACD is engineered as an add-on to existing ACD nodes. To completely engineer an ACD network, use the equation in the next section, “CR for new NACD engineering.”

CR for new NACD engineering

Modify the CR engineering equations to include the incremental CR requirement of the NCAD feature. The result of this equation equals the number of CRs required.

$$(T + Snacd + Tnacd + 815)/33.8 + M$$

where:

$T = (A/2 \times C \times 1.42) – M \times L.$

A = the total voice loop (system) traffic in CCS

Snacd = 0, if the system is not an NACD Source node

Tnacd = 0, if the system is not an NACD Target node

M = the number of ACD incoming trunks

L = average CCS per ACD traffic

C = the call register traffic factor

= 1 + 0.037 if CDR Charge Account is equipped

+ 0.074 if Authorization Code

+ 0.037 if Parallel CDR ports per customer

+ 0.150 if NARS/BARS/CDP

+ 0.150 if FCBQ and OHQ

+ 0.033 if ACD RAN

+ 0.019 if Teleset Messaging

+ 0.140 if Integrated Messaging System

+ 0.083 if Ring Again

+ 0.033 if Music Trunk

+ 0.067 if Call Park

+ 0.003 if New Flexible Code Restriction

+ 0.039 if ESN Signaling

The accuracy of the above CR equation proves accurate for larger groups, for example, 100 CRs or more. It is not recommended for incremental estimations, which are usually smaller compared with the original ACD CR calculation.

Designing the NACD Routing Table

The objective of designing an overflow Routing Table is to minimize the waiting time of calls in the network without creating excessive internodal traffic.

A point system is used to rank the potential of success if the waiting call at the Source node is put into the Call Request Queue of a Target node. The Target ACD DN with the highest points indicates the best candidate to handle the overflow calls. The point system provides an objective way to evaluate the spare capacity of a potential Target node.

Whenever the same numbers are assigned to multiple ACD DNs due to equal value, the next number will continue, but the total in the set remains the same.

ACD agent group size (P1)

All Target ACD DNs are ranked according to the agent group size. The ACD DN with the largest agent group is assigned P1 = 5, the next one 4, and so on. If there are more than five Target ACD DNs, the rest are assigned zero P1, which means that no more preference is given to agent size after five groups. This variable should not be greater than five in weight. If any two ACD DNs have the same number of agents, they should be assigned the same value. No more than five ACD DNs will be assigned points in this category. In summary:

P1 = 5 for the ACD DN with the largest agent group

P1 = 4 for the next size group

P1 = 3 for the next

P1 = 2 for the next

P1 = 1 for the next

P1 = 0 for the 6th largest or less

Average agent load at each target ACD DN (P2)

Assign the highest priority to the Target node with the lowest average agent load during the Source node busy hour. If any two nodes have the same average DN loading, assign the same points to each of them. The proposed point assignment is as follows:

P2 = 5 for the Target node with the lowest average agent loading per ACD DN

P2 = 4 for the next lowest agent loading per ACD DN

P2 = 3 for the third lowest agent loading per ACD DN

P2 = 2 for the fourth lowest agent loading per ACD DN

P2 = 1 for the fifth lowest agent loading per ACD DN

P2 = 0 for agent loading higher than above

Number of hops (P3)

Multihop routes may require longer message delay, more CPUs to handle the same call, and more tandem trunks, may experience higher blocking, and may cost more because of the charges associated with the distance of the call. Multiple hops require a longer Reserve Agent Timer to wait for the call to set up. Therefore, multihop routes are not encouraged.

The weight of this variable is more than for the other categories listed above.

P3 = 5 if Target is co-located with Source node

P3 = 0 if Target ACD DN is the next node

P3 = –5 if one hop in the route (one tandem connection)

P3 = –7 if two hops in the route

P3 = –9 if three hops in the route

If sufficient trunking is available in an existing tandem route so that blocking and cost penalties are of little concern, the user may change the negative weighting factor assigned to this parameter. One example may be:

P3 = –1 for one hop; P3 = –2 for two hops; P3 = –3 for three hops.

No limitation exists (except for a satellite, which allows only one hop) on the number of hops permitted in an NACD. In a private network, any tandem call requiring more than three hops is unusual.

Noncoincidence busy hour and time zone difference (P4)

P4 is the point allocated to the Target node with a different busy hour from the Source node. Assign four points for each hour's difference in busy hour. For example, if the Source node experiences a busy hour at 9 a.m., and the Target node has a busy hour at 11 a.m., then assign P4 = 8 points (= 4 × [11–9]) to the Target node.

This allocation of points is based on the absolute difference of busy hour between the Source and Target node. For example, if the Source node is in Toronto and the Target node is Vancouver, the time zone difference of three hours brings 8 a.m. in Vancouver and 11 a.m. in Toronto into the same real-time hour. Since only an absolute difference in hours is allocated points, no points for nodes are allocated in the example involving Toronto and Vancouver.

If the busy hour of the Source node and a Target node are not known or cannot be located (inconsistency), let P4 = 0. In summary:

P4 = The points allocated to the Target node with different busy hours from the Source node. Each hour difference is assigned 4 points.

P4 = 4 × the number of absolute hours difference between the Source and Target node busy hours

P4 = 0 if there is no consistent busy hour at the Source and Target nodes

Ranking of Target nodes on NACD Routing Table

Every Target node is assigned points according to its relationship to the Source node based on the above four categories. All points are summed for each node. The node with the highest point total receives the top priority in the routing tables. Nodes are ranked from Q1 to Q20, from the highest to the lowest point total. The Routing Table allows a maximum of 20 DNs.

Q = P1 + P2 + P3 + P4

Negative values are ranked behind nodes with zero points.

Q1 > Q2 > Q3 > … Q20

If Qi equals Q (i + 1), choose the node closer to the Source node.

When an NACD has more than five nodes, several nodes after the first five have zero Qi values. This is expected since they are far down the NACD table. The preference of one node over the other is negligible, because their chances of being offered overflow calls are diminishing.

Timer value in NACD Routing Table

The timer value should allow calls to queue on as many virtual queues as possible, but not congest call request queues. The length of a wait for a call is closely associated with the Average Speed of Answer (ASA) that a customer specifies and which the system is configured to meet. Therefore, the overflow timer (Ti) should be a function of ASA. If the customer does not have an objective ASA, then use the default time interval of 10 seconds. Recommended settings are as follows:

T1 = 10 seconds or ASA/n, whichever is smaller. The value of n is the number of Target DNs.

T2 = 20 seconds or 2 × ASA/n, whichever is smaller.

T3 = 30 seconds or 3 × ASA/n, whichever is smaller.

T4 = 40 seconds or 4 × ASA/n, whichever is smaller.

•

•

T20 = 200 seconds or 20 × ASA/n, whichever is smaller.

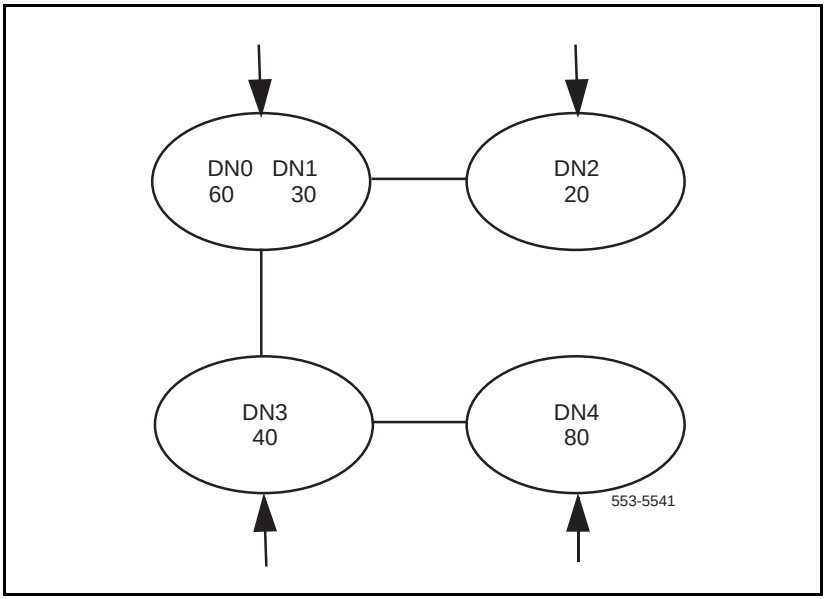
Whenever the timer value calculation results in an odd number, round it to the smaller even number, since the timer interval in NACD operates in 2-second increments. Also, timer values for several DNs can be the same so that when the NACD table contains many entries, a large timer for lower entries may not be necessary.

Engineering example: A 5 ACD DN and 4-Node NACD

The network consists of five ACD DNs and four nodes across three time zones with different busy hours. ACD DN1 is co-located with the Source node ACD DN0. ACD DN3 is a tandem node between the Source node and ACD DN4.

Figure 4 shows a simplified block diagram of the NACD. All DNs denote the ACD DN.

Figure 4
A 5-ACD DN and 4-node NACD network



— 1200 calls Average Busy Season Busy Hour (ABSBH) traffic are offered to the Source node (ACD DN0). The average agent service time, a total of direct call processing and post call processing time, is 180 seconds. The ASA is 60 seconds.

— The number of agents (Ni) is shown under each ACD DN.

— ACD DN0, ACD DN1, and ACD DN2 are within the same time zone.

— ACD DN3 is one hour ahead of ACD DN0.

— ACD DN4 is one hour ahead of ACD DN3 and two hours ahead of ACD DN0.

— CCS per agent was estimated at 33 CCS/agent for ACD DN0, 30 CCS for ACD DN1, 28 CCS for ACD DN2, 25 CCS for ACD DN3, and 25 CCS for ACD DN4 at the busy hour of ACD DN0. The number of agents at ACD DN0 was engineered to handle ABSBH calls. When High Day Busy Hour (HDBH) traffic is offered to ACD DN0, approximately 30% of calls overflow.

  Use the following formula to calculate CCS per agent from the ACD report:

  - CCS per agent = 36 CCS × Total Work/Total Manned Time
  - Work Time = direct call processing time + post call processing time
  - Manned time = the time consoles are manned by agents

  All time units are expressed in total minutes within the busy hour per an ACD DN.

— The busy hour for ACD DN0 is 11 a.m., ACD DN1 is 12 p.m., ACD DN2 is 11 a.m., ACD DN3 is 12 p.m., and ACD DN4 is 1 p.m. All times are expressed relative to the time zone of ACD DN0.

Design of NACD Routing Table The NACD configuration statistics are summarized in the following table. The shaded rows represent points assigned to the parameters above them. The total points for each node are tallied in the last row of Table 8.

Table 8
NACD configuration data and timer priority assignment

Source ACD DN		Target ACD DNs				
Assigned Pts.	**Node**	**DN0**	**DN1**	**DN2**	**DN3**	**DN4**
No. of Agents	NI	60	30	20	40	80
Assigned Points	PI		3	2	4	5
Avg CCS/Agent	ai	33	30	28	25	25
Assigned Points	P2		3	4	5	5
No. of Hops			co-locate	0	0	1
Assigned Points	P3		5	0	0	–5
Bush Hour in DN0 Time		11 a.m.	12 p.m.	11 a.m.	12 p.m.	1 p.m.
Assigned Points	P4		4	0	4	8
Sum of Assigned Points			15	6	13	13

The sum of total points for Target nodes uses the following sequence:

$Q1 > Q3 = Q4 > Q2$

Since ACD DN3 is closer to ACD DN0 than ACD DN4, it receives a higher priority than ACD DN4 in the NACD routing table. The sequence of the timer should be ACD DN1 first, ACD DN3 next, ACD DN4 next, and ACD DN2 at the bottom of the list.

The desired ASA for this network is 60 seconds, which yields a timer interval of 14 seconds (= 60/4–1). Since it is larger than the default timer value of 10 seconds, use 10 seconds as the timer interval. The NACD routing table looks like this:

Table 9
An NACD Routing Table

Target DN	Time in Seconds
ACD DN1	10
ACD DN3	20
ACD DN4	30
ACD DN2	40

ACD DN1 in this example is a 4-digit directory number, since it is located with the Source ACD DN. The other ACD DNs are likely to have more digits, which are defined according to a Uniform Dialing Plan or a Coordinated Dialing Plan.

Incremental impact engineering

To determine the incremental requirements when the five nodes change from serving individual nodes to NACD, consider the factors discussed in the sections below.

Trunking requirement

Estimate the amount of trunk traffic to be overflowed to other nodes from the source.

Trunk traffic to source ACD DN

Trunk CCS = (1200 × 1.3 × 180/100) + (1.3 × [0.5 × 60] / 100) = 2808 + 468 = 3276

Where the 1200 offered calls to the Source node is the Average Busy Season Busy Hour (ABSBH) traffic, an additional 30% of traffic reflecting High Day Busy Hour (HDBH) peak level is added as recommended in *Meridian 1 capacity engineering* (553-3001-149). If the customer defines the input traffic as an HDBH value, then the 30% adjustment is not required.

The ASA is reduced by half to reflect the effect on queuing time and trunk loading. This incoming traffic (3276 CCS) requires 115 trunks to carry it (based on Poisson P.01).

The incoming trunk requirement is estimated from 3276 CCS. However, for calculating actual overflow traffic, the portion associated with waiting (468 CCS) should be discounted, since it is an overhead in addition to the normal call service time (180 seconds per call), which should not be used for estimating overflow calls.

Overflow traffic from source ACD DN

OT0 = 2808 – (33 × 60) = 828 CCS or 460 calls (with 180 seconds HT)

Where 2808 CCS is the offered traffic to the ACD DN0 agents, the maximum loading per agent is set at 33 CCS or 92%. The CCS is converted to calls by multiplying 100/180 (= 828 × 100/180 = 460).

Calls handled by the Source node agents

33 × 60 × 100/180 = 1100 calls handled by ACD DN0.

Agent loading is set at 33 CCS and the average holding time is 180 seconds.

Incremental traffic to each Target node

1 The first ACD DN to accept overflow traffic: ACD DN1

The spare capacity at ACD DN1: S1, 1 = (33 – 30) × 30 = 90 CCS

OT1 = the smaller of OT0 (828 CCS) or S1,1 = 90 CCS or 50 calls

Since ACD DN1 is co-located with the Source ACD DN, no trunk is required to handle the overflow traffic.

2 The second DN to accept overflow traffic: DN3

The spare capacity at DN3: S3,2 = (33 – 25) × 80 = 640 CCS

OTC = the smaller of (828 – 90 – 320) or 640 = 418 CCS

At Poisson P.01 (a customer-designated value; blocking could be higher for a private network), the incremental trunks are 33. This traffic corresponds to 410 (= 178 + 232) overflowed calls.

3 The third DN to accept overflow traffic: DN4

The spare capacity at DN4: S4,3 = (33 – 25) × 80 = 640 CCS

OT3 = the smaller of (828 – 90 – 320) or 640 = 418 CCS

At Poisson P.01 (a customer-designated value; blocking could be higher for a private network), the incremental number of trunks required to handle 418 CCS is 21. The number of calls on this route is 232.

The traffic between the Source node and node 3 is 738 (= 320 + 418) CCS. The required incremental trunks are 33. This traffic corresponds to 410 (= 178 + 232) overflowed calls.

4 The fourth DN to accept overflow traffic: DN2

ACD – DN4: 232 × 0.63 = 147 bps. This is the data rate for the link between ACD DNs and ACD DN4.

Real-time requirement

Incremental real time is the extra processing time required of the Source node CPU to handle NACD overflow calls to all Target nodes. The Target node CPU does not require special engineering, since it is not in its busy hour and handles calls only when it has spare capacity.

Calls to all target ACD DNs

Incremental real time of NACD overflow calls: $460 \times 1.38 = 635$ EBC.

where:

460 is the total number of overflow calls from the Source ACD DN.

Incremental real time of NACD/ACD calls handled at the Source node over the basic incoming trunk to SL-1 set calls = 1100×0.60 EBC, where 1100 is the total number of calls handled by the Source ACD DN agents. This EBC should be taken care of if the NACD configuration is evolved from an existing ACD node. If the Source ACD DN is a new NACD node converted from a non-ACD switch, then the real-time impact is 1295 EBC (= 635 + 660).

When a Target node becomes a Source node during its busy hour, the rest of the nodes in the network are treated as Target nodes. When two or more nodes are Source nodes in the same busy hour, design the NACD routes tables one at a time and treat the rest of the nodes as Target nodes.

Call register requirement

From the “Overflow traffic from source ACD DN” on page 112 and “Incremental traffic to each Target node” on page 113, calls from ACD DN0 and to ACD DN1 can be calculated:

X = 460 calls (total overflow calls from ACD DN0)

Y = 50 calls (calls overflowed to ACD DN1)

Incremental Source node CR traffic: Snacd = (460 × 30 × 1.5/100) + (460 – 50) × (180/100) = 945 CCS, where an ASA of 30 seconds is assumed. Referring to a Poisson table with P.01 Grade of Service, the additional number of CRs required for the NACD application is 40.

Since none of the Target ACD DNs accepting overflow traffic has the same busy hour as the Source node, assume that all Tnacd traffic (CR traffic for each Target ACD DN) can be absorbed by the spare CRs available due to non-busy-hour traffic overflowing to that Target ACD DN.

Note: Although the number of calls offered to the NACD is 1200, the network is engineered for 1560 calls due to the ABSBH versus HDBH considerations.

Implementation

For information concerning the configuration of Network ACD, refer to the *X11 input/output guide*.

For information concerning Load Management commands related to Enhanced Overflow and other ACD features, refer to *Automatic Call Distribution ACD management commands and reports* (553-2671-112).

Operations

Agent telephone displays

Agent telephones equipped with display show information relating to call presentation and certain key functions. These displays are supported by NACD.

Network ACD functions also add information to the displays that is pertinent to the network functions involved with a particular call. The display is dependent on the conditions for each call presented.

Set displays for different telephones are significantly different. Please consult the appropriate user guide for your telephones.

Specific telephone displays are addressed in the *Meridian Modular Telephone user guide—North America* (P0800565). Please refer to the supporting documents listed in the front of this document.

Management reports

Package C for ACD provides traffic reports on a regular basis to assist supervisors. There are ongoing status displays, and four types of periodic reports and daily totals reports. These reports are essentially unchanged by NACD operation; but, the values generated in the output fields are changed according to the NACD traffic for your application.

Calls are diverted for different reasons, and Network ACD diverts calls over widely separated locations. Some calls overflowed by Network ACD may end up in queues that are reported under Management. Package C reports do not differentiate between Network calls and regular ACD calls (local). ACD supervisors can use the following calculations to interpret their Management reports. Network ACD impacts Report 2 (REPT 2), the Queue report, in Package C.

Administration and operational measurements

There are certain administrative works that must be performed before users can benefit from this feature.

Service change

Several service change programs need to be modified for this feature. The list includes overlays 11, 12, 20, and 95.

Overlay 11 No new prompt is added to this overlay. However, after each service change sequence, a language request is sent to the M2xxx set along with the proper download sequence.

Overlay 12 No new prompt is added to this overlay. The existing overlay already has a language preference prompt. The M2250 language preference will be taken from the response to the existing language prompt.

Prompt	Response	Comment
LANG	0–5	0 = English 1–5 = Roman

Overlay 20 Language selection will be printed for Aries sets. The output format will be as follows:

Prompt	Response	Comment
CPND LANG	ROM/KAT/ENG	Roman, Katakana, English

Overlay 95 Extensive changes are needed for overlay 95. This overlay must be able to allow and differentiate different languages for the CPND name inputs. Hence, a new language prompt is added to the existing sequence of prompts for this purpose. In the following simulation, uppercase prompts are the new or changed prompts.

Table 10
Prompts and responses

Prompt	Response	Comment
req	new/chg/out/prt	
type	name	
cust	xx	
LANG	ROM/KAT/ALL[1]	Roman, Katakana, or All (for req = out)
(page) dig	(yes/no) ggg mm	dial intercom group/member
name[2] (xpin)	xxxxxxxxxxxx xx	name entered for the dig member
... dn	... xxxx	directory number
name[3] ... (xpln)	xxxxxxxxxxxx ... xx	name entered for the dn

Note 1: ALL is an option only when the response to req is out. ALL will take out all language entries stored against a DN or dig.

Note 2: dig will be reprompted if req is chg. If req is new, dig will be reprompted after xpin.

Note 3: dn will be reprompted if req is dn. If req is new, dn will be reprompted after xpin.

Traffic measurements

Whenever the English CPND is generated from the Roman CPND, the resulting English CPND string may be longer than the Roman CPND that it is generated from (some Roman language characters translate to two English characters) and results in a slight increase in traffic.

Index

Numerics

911 applications, 5

A

ABSBH (Average Busy Season Busy Hour), 96, 110
access codes, 87
ACD (Automatic Call Distribution)
documents, 59
interactions, 74
performance improvements, 90
ACD DN, 2
active, 61
agent group size, 92
in CDP dialing plan, 86, 87
in Routing Tables, 62
Active ACD DN, 61
administration measurements, 118
Agent Free notification, 6
Agent Reserve, 66
agents
groups, 5, 92, 102
in network requirements, 98
in node requirements, 95
in Routing Table design, 102
statistics, 7
AGT (agent) lamps, 74
ASA (Average Speed of Answer)
in incremental impact engineering, 110
in Routing Table design, 105, 108
in trunking requirements, 96
reducing, 90
ATM (Automatic Trunk Maintenance), 85
Average Agent Load
in CCS, 98
in Routing Table design, 102
AWC (ACD Calls Waiting) key, 74

B

BARS (Basic Alternate Route Selection), 87
BYTH (Busy Threshold), 74

C

Call Presentation
in cascade routing, 66
in incoming calls, 73
call register requirements, 99, 113
Call Requests and Call Request queues, 6
canceling, 70
Disconnect Supervision for, 84
for Night Tables, 64
hops in, 93
in cascade routing, 66
ISDN D-channel messaging with, 5, 58
RAGT for, 69
to targets, 62
calls
in incremental impact engineering, 110
processing, 5
queue priorities, 71
canceling Call Requests, 70
cascade routing, 66, 67
CDP (Coordinated Dialing Plan), 85, 86, 87
CLID (Calling Line Identification), 81, 88
Closed ACD DN, 61
configurations, 6, 88

CPND (Call Party Name Display), 81, 85
CPU Real-Time engineering, 91
CR traffic, incremental, 99
CRQS (Call Request Queue Size) parameter, 68, 94
customer configurations, 88
CWLF (Call Waiting Lamp Flash) threshold, 75
CWTH (Call Waiting Threshold), 75

D

Day Routing Tables, 62
D-channels, 58, 59
    function, 61
    PRA, 97
    speeds, 83
DCP (Direct Call Processing), 96
dedicated ISL mode, 59
dependencies, 83
dialing plans, 60, 86
Digit Displays, 6, 86
Disconnect Supervision calls, 84
displays, agent telephone, 117
DMI (digit manipulation), 87
DN (Directory Number). *See* ACD DN
DNIS (Dialed Number Identification Service), 75
DNRT (Delay Night RAN Route), 78
documents, 59
DSC (Distant Steering Code), 86
DSP (Display) key, 75
DURT (duration timer) parameter, 96
    in Call Request canceling, 71
    in cascade routing, 66
DWC (Display Queue) key, 75
dynamic status changes, 68

E

engineering, 6, 83
EOVF (Enhanced Overflow), 1, 4, 83
ESN (Electronic Switched Network)
    documents, 60
    function, 61
    requirements, 85

F

FCTH (Flow Control Threshold) parameter, 68, 93
features
    interactions, 81
    limitations, 84
    requirements, 85
FORC (Call Forcing), 81
Free Agent notification, 66

H

HDBH (High Day Busy Hour), 110
HLOC (Home Location Code), 85, 86, 87
HOML (Headset or MSB Logout) option, 76
hops, 93, 103
HPQ (High-Priority Queue), 71, 72
Hybrid Network, 89

I

IDN (Individual DN) key, 76
IFDN (Call Interflow), 76
incoming calls
    call presentation, 73
    Call Requests, 69
    Call Requests canceling, 70
    queue priorities, 71
incremental CR traffic, 99
incremental impact engineering, 109
interactions, 73
    ACD, 74
    feature, 81
Interflow, 76
ISA routes, 59
ISDN (Integrated Service Digital Network), 2, 58, 59
    documents, 60
    function, 61
    PRA, 97
    speeds, 83
ISL (ISDN Signaling Link), 59, 85, 97

L

lamp states, 74
layered ISDN approach, 58

LD 11 program, 69
LD 15 program, 85
LD 16 program, 85
LD 23 program
AWC key, 74
lamp states, 74
Night Tables, 63
OVDN, 79
queue priorities, 71, 72
RAGT, 69
Routing Tables, 4
LD 86 program, 86
limitations, feature, 84
Link layer, ISDN, 58
LOC (Location Code), 87
Logical Call Requests, 6
LSC (Local Steering Code), 86

M

management reports, 7, 117
Manual Close condition for dynamic status changes, 68
measurements
administration and operational, 118
traffic, 120

N

NACD (Network Automatic Call Distribution), 2
NACD nodes, 85
NARS (Network Alternate Route Selection), 87
NCFW (Night Call Forward), 63, 77
NCWL (new lamp state option), 74
Network CPND, 85
network environment, 61
cascade routing, 66, 67
dynamic status changes, 68
Routing Tables, 61
Network layer, ISDN, 58
networks, requirements, 97
Night mode in NSVC, 78
Night Routing Tables, 63, 78
noncoincidence busy hours, 91, 104
NSVC (Night Service)
for dynamic status changes, 68
in Call Request canceling, 71
interactions, 78

O

OCN (Oldest Call in Network) parameter, 95
in queue priorities, 71
with similar service networks, 88
with special service network, 89
operating parameters, 6
operational measurements, 118
OVDN (Overflow by Number), 62, 79
overflow traffic, 98, 110
Overlay 11, 118
Overlay 12, 118
Overlay 15, 87
Overlay 20, 118
Overlay 23, 93, 94, 95, 96
Overlay 86, 87
Overlay 95, 119
overview, 3
OVTH (Overflow Threshold), 74
Own TOF and High-Priority Queue priority option, 72
Own TOF Queue First priority option, 71

P

Package C for ACD reports, 7, 117
package dependencies, 83
parameters, 6, 93
physical layer, ISDN, 58
PNI (Private Network Identifier), 85
point-to-point connections, 93
PRA D-channels, 97
pretranslation, 85
PRI (Primary Rate Interface), 58, 79
prompts and responses, 118

Q

queues, 3, 4, 5
- Call Request, 6
- priorities, 71
- searching hierarchy, 80

R

RAGT (Reserve Agent Timer), 94
- after Agent Free notifications, 6
- for call presentation, 73
- for Call Requests, 69

RAN, Night, 78
ranking Target nodes, 104
real-time engineering, 91, 112
registered field in Night Tables, 65
reports, 7, 117
requirements, features, 85
Routing Tables, 4, 5
- Day Tables, 62
- designing, 101
- function, 62
- Night Tables, 63
- pretranslation, 85
- updating, 61

RSND (Resend Timer) parameter, 94

S

SDNB (secondary DN call blocking), 81
service changes, 118
shared ISL mode, 59
signaling link requirements, 97
similar service network, 88
Source ACD DN, 62, 86
Source identifiers, 86
Source nodes, 3
- in Call Request canceling, 70
- in incremental CR traffic, 99
- in incremental impact engineering, 110
- in ISDN D-channel messaging, 58
- in NSVC, 79
- signaling link requirements, 97
- trunking requirements, 95
- updating, 61

Source Queues, 5
Source Timed Local Flow-in queue, 72
Source Timed Overflow queue, 72
special service network, 88
status field in Night Tables, 65
Supervisor reports, 7
supporting documents, 59
system documents, 60

T

tandem calls
- D-channel link speeds, 83
- hops in, 93

Target ACD DN, 2, 87
Target agents, queue searching hierarchy, 80
Target IDs for Night Tables, 64
Target nodes, 3
- in Call Request canceling, 71
- in cascade routing, 66
- in incremental CR traffic, 99
- in incremental impact engineering, 111
- in Routing Tables, 62, 104
- signaling link requirements, 97
- trunking requirements, 95
- updating, 61

Target queues, 4, 5, 58
Target table definition, 91
tie trunks, 59, 61, 85
time zone differences, 91, 104
timers
- after Agent Free notifications, 6
- for call presentation, 73
- for Call Requests, 69
- for diverting calls, 5
- for Night Tables, 64
- for targets, 62
- in cascade routing, 66
- in Routing Table design, 105
- priority assignment, 108
- RAGT, 6, 69, 73, 94

TOF (Time Overflow), 2
    and Day Routing Tables, 63
    enhancements to, 4
    interactions, 81
    with hybrid networks, 89
traffic
    for dynamic status changes, 68
    measurements, 120
    reports, 117
    statistics, 7
Transition mode in NSVC, 78
trunks
    in incremental impact engineering, 109, 110
    requirements, 95
TSC (Trunk Steering Code), 87
TTTN (Tandem Tie Trunk Network), 85

U

UDP (Uniform Dialing Plan), 85, 87

X

X11 release 15 and later, 1, 74, 83

Meridian 1

Network ACD

Description and operation

© 1989,1999 Nortel Networks Corporation
All rights reserved
Information is subject to change without notice. Nortel Networks Corporation reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules, and the radio interference regulations of Industry Canada. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.
SL-1 and Meridian 1 are trademarks of Nortel Networks Corporation.
Publication number: 553-3671-120
Document release: Standard 9.00
Date: June 1999
Printed in the United States of America

NORTEL NETWORKS

How the world shares ideas.