AT&T PRACTICE AT&T 231-390385
Issue 2, August 1990

E911 BULK RECENT CHANGE CAPABILITY

FEATURE DOCUMENT

1A ESSÔ SWITCH

CONTENTS PAGE

1. INTRODUCTION

DEFINITION

1.01 The E911 Bulk Recent Change Capability (EBRCC) feature provides the capability to efficiently store, update, and manage a very large E911 selective routing data base.

REASON FOR REISSUE

1.02 ->This practice is reissued to include the reading of recent changes from a file generated and transmitted to the Attached Processor System (APS) by the Data Management System (DMS). This practice is also reissued to change the number of emergency service numbers (ESNs). Revision arrows are used to denote significant changes.<-

BACKGROUND

1.03 The number 911 is the 3-digit number designated for public use to report an emergency to and/or request emergency assistance from a public safety answering point (PSAP). A PSAP is an agency which is designated and authorized to receive and respond to emergency calls requiring one or more public services such as police, fire, and/or ambulance services.

1.04 A 911 service area is usually established on a municipal basis (for example, town, city, county, state). A service area can include many PSAPs and telephone offices. Each PSAP serves all telephone stations located within a particular geographical area (for example, PSAP district). A designated PSAP district may or may not correspond to telephone wire center boundaries. Since each 911 call must be routed to the PSAP designated to serve the location of the originating station, the feature provides selective routing. Selective routing automatically routes each 911 call to the correct PSAP.

1.05 With the feature, one telephone office (that is, ESS switch) in the 911 service area is designated as the E911 tandem office. The E911 tandem office serves 911 calls from all stations (within the 911 service area) which are served by other local offices and stations which are served directly by the E911 tandem office. The E9!1 tandem office selectively, routes each 911 call based on translation data contained in a selective routing data base.

1.06 Each station telephone number (TN) in the 911 service area is associated with an ESN in the selective routing data base. An ESN represents a particular PSAP and is used as an index to obtain the TN for that PSAP. Thus, selective routing is based on the TN of the originating station and the ESN assigned for that TN. Depending on PSAP district boundaries and telephone wire center boundaries, selective routing may be accomplished on either a per-office code, per number group (NOG), or per-TN basis. The tive routing data base is actually one large translator named the 'DN to ESN' translator. This same translator is generally referred to as the 'TN to ESN' or 'TNESN" translator. For consistency, in this practice, the term "TN to ESN' translator is used.

1.07 For the E911 feature without EBRCC, the TN to ESN translator is located in unduplicated call store (UCS) and file store of a 1A ESS switch. two major concerns related to the TN to ESN translator are as follows:

(a) The translator has a theoretical size limit of approximately 40 million words, which exceeds the memory available in UCS.

(b) The translator is updated daily to reflect current TN and ESN assignments for all stations and PSAPs within the E911 service area.

1.08 A large data base serves many TNs. For example, a large data base can typically serve more than one million TNs. A significant amount of recent change overhead occurs due to the following:

(a) Even though every TN service order change does not necessarily require a change in the selective routing data base, a relatively large quantity of daily TN changes do require change in a large selective routing data base.

(b) The 1A ESS switch recent change update rate is relatively slow (that is, approximately 300 to 500 recent change messages per hour).

1.09 For more detailed information regarding the E911 feature and selective routing, see Part 6 A(1).

ECONOMIC WORTH

1.10 The EBRCC feature uses an APS to store the selective routing data base (that is, TN to ESN translator). The APS serves as a file store replacement for the 1A ESS switch. It is polled each time data is needed from the TN to ESN translator. All other translation data for 911 service remains resident in the ESS switch.

1.11 The advantages of storing the TN to ESN translator data in an APS are as follows:

(a) A very large TN to ESN translator can be built and expanded without using UCS memory in the ESS switch.

(b) Bulk recent changes for the TN to ESN translator can be made at a recent change update rate of approximately 18,000 recent change messages per hour. The bulk recent change update data is input either from 9 -track tape generated by the DMS or from a file transmitted to APS by the DMS.<-

Note: Individual recent change messages can be input manually at the APS maintenance TTY and at the Switching Control Center (SCC) which serves the APS. No TN to ESN translator change can be made via the 1A ESS switch.

(c) Data in the TN to ESN translator can be compared to current official data which is generated on DMS tapes.

(d) Data in the TN to ESN translator can be manually verified from either the ESS switch maintenance TTY or the APS maintenance TTY.

(e) The TN to ESN translator data is audited continuously by the APS to verify that each ESN assigned is valid. Audits can be manually controlled (for example, started, stopped, inhibited, redirected at the APS maintenance TTY.

AVAILABILITY

1.12 The EBRCC feature is a base controlled feature initially available in the 1AE8A.05 generic program. Please contact your AT&T Technologies representative for feature licensing information.

FEATURE GROUPS

1.13 The EBRCC feature requires the following feature groups and feature packages.

(a) The feature group (9SE911) and feature package (9FE911) must be loaded.

(b) The APS feature group (9SAPS) and feature package (9FAPS) must be loaded.

FEATURE ASSIGNMENT

1.14 The EBRCC feature is provided on a per-switch basis.

2. USER PERSPECTIVE

USER PROFILE

2.01 The EBRCC feature is designed for the following:

(a) Telephone companies using 1A ESS switches for E911 tandem offices with large E911 selective routing data bases.

(b) Telephone company personnel who update and manage large E911 selective routing data bases.

ATTACHED PROCESSOR SYSTEM

2.02 The E911 selective routing data is stored in the APS. Manual control for updating and managing the data is accomplished at the APS maintenance TTY. The input medium for ->data base comparisons is one or more 9-track tapes generated by the DMS or an APS file containing the updates. The input medium for bulk updates is either 9-track tapes generated by the DMS or files generated by the DMS or files generated and transmitted to the APS by the DMS.<-

2.03 The APS is an AT&T 3B20D Computer which serves as a file store replacement for the 1A ESS switch. For APS descriptive and application information, see Part 6 A(2) and A(3).

DATA MANAGEMENT SYSTEM

2.04 The DMS is an independent system used to initially build and maintain the official copy of a selective routing data base. The DMS is not central office equipment and it is not necessarily dedicated to serve one particular E911 tandem office. The DMS output ->mediums are 9-track tapes or ASCII files containing tape images transmitted to the APS via asynchronous data link.<-

(a) Initialization and compare tapes contain the entire selective routing data base in the form of sequentially ordered (by TN) recent change messages. These tapes are used to initially build, reinitialize, and/or compare a data base for a particular E911 tandem office. The selective routing data base in APS is initialized/compared using this type tape.

(b) The daily update tapes $or files contain<- recent change updates to the data base. The daily updates reflect changes in current TN and/or ESN assignments. The selective routing data base in APS is updated using the daily update tapes.

2.05 A standard DMS is available. For DMS descriptive information and operating procedures, see Part 6 B(2) through B(4).

Note: If any other management system is used, the tapes ->or files<- generated must provide the same data format as the tapes ->or files<- generated by the standard DMS.

FEATURE DESCRIPTION

A. Selective Routing Data Base

2.06 The selective routing data base is stored in APS main memory and a backup copy is stored on disk. Within the APS, this data base is referred to as

the EBRCC data base. The EBRCC data base structure is similar to the TN to ESN translator, which otherwise (without EBRCC) is located in the ESS switch.

2.07 The EBRCC data base provides selective routing data (that is, ESNs) for up to 500 office codes within four numbering plan areas (NPAs). An NPA is identified in the data base by a numbering plan digit (NPD). Up to ->1023<- different ESNs can be contained in the data base, The basic data base structure consists of the following tables:

(a) NPD table

(b) Office code (OFC) tables

(c) NOG tables

(d) Thousand group (THG) tables.

2.08 An ESN can be obtained from either an OFC table, NOG table, or THG table as follows:

(a) An ESN is provided on a per-office basis only if all stations within that office code are assigned the same ESN. This is known as a pure office code.

(b) An ESN is provided on a per-NOG basis only if all stations within that NOG are assigned the same ESN. This is known as a pure NOG.

(c) An ESN is provided on a per-TN basis in the THG table. A THG table is required when one or more stations within a thousand group are assigned different ESNs.

2.09 The characteristics of each table are as follows:

(a) The NPD table allows up to four NPAs to be included in one 911 service area. This table is indexed by, an NPD and contains either a pointer to an OFC table or zero if the NPD is unassigned.

(b) An OFC table is built for each assigned NPD. This table is indexed by the first three digits of the TN to obtain one of the following:

(1) ESN-Provided only, for a pure office code.

(2) Zero-Indicates the office code is unassigned.

(3) NOG pointer-Indicates NOG translation is required.

(c) A NOG table is built for each office code that is not pure. The NOG table is indexed by the fourth digit of the TN to obtain one of the following:

(1) ESN-Provided only for a pure NOG.

(2) Zero-Indicates the NOG is unassigned.

(3) TTIG pointer-Indicates THG translation is required.

(d) A THG table is built for each NOG that is not pure, This is the lowest level table to provide ESNs on a per-TN basis. Each word contains the ESN assignments for three TNs. If a TN is unassigned, a value of zero may be used to indicate no ESN is currently assigned. There are no default ESNs assigned on a per-THG basis; therefore, when no assigned ESN is found during call processing, the default ESN contained in the ESS switch translation data is used to route the call. The THG table index value is found by dividing the last three digits of the TN by three.

B. ESS Switch Translation Data

2.10 All translation data except the selective routing data is stored in the ESS switch. For a detailed description of translation data for the 911 feature, see Part 6 A(1).

2.11 The emergency service central office (ESCO) translator contains a primary, translation word (PTW) for each local office serving stations within a 911 service area. The ESCO PTXV for each assigned office contains the following data:

(a) Item EAPS (bit 21) indicates that selective routing data is stored in the APS.

(b) The NPD for the local office is provided in bits 16 and 17.

(c) The default ESN for the local office is provided in bits 0 through ->9<-, The default ESN is used to route a 911 call in cases where the primary ESN for selective routing is either unassigned, unavailable (for example, APS failure), or invalid (for example, ESN audit verification failure).

2.12 The ESN translator contains the PSAP DN assigned for each valid ESN. This translator is indexed using either the ESN obtained from the selective routing data base or the default ESN from the

ESCO translator to obtain the PSAP DN. The translator contains one PTW or auxiliary block for each assigned ESN and can serve up to 511 ESNs.

Note: The APS uses this translator to build a table of valid ESNs in APS memory. The APS ESN table is used for TNESN audits. Any ESN change (that is, new or deleted ESN) is automatically sent to the APS to update the ESN table.

C. Call Processing

2.13 During 911 call processing, the selective routing translations are transparent to the ESS switch. When the ESCO translator indicates

selective routing data is stored in the APS, the ESS switch generates an sends a poll request (ESN request message) to the APS to obtain the primary ESN assigned for the originating station TN.

2.14 Messages between the ESS switch and APS are sent via message handler programs which assign message sequence numbers and administer message transmission. Prior to message transmission, the following data is stored in an attached processor request block (APRB):

(a) Internal sequence number

(b) Default ESN

(c) Client call register address

(d) NPD

(e) Client return address.

2.15 After an APRB is loaded, a poll request message is built in an attached processor request scratch (APRS) area and sent to the APS. Each message has a 10-word header and a 3-word data field. The message structure is the same for poll requests and poll answers. For a poll request, the 3-word data field contains the following data:

(a) The poll request is identified as either a call processing request or a verify request. For a verify request, a verify range digit is included to specify the range of TNs to verify.

(b) The NPD and 7-digit TN of the originating station are provided to index into the selective routing data base.

2.16 When the APS receives the poll request, it saves the sequence number for the poll response message. The NPD and 7-digit TN are used to access the data base and obtain the ESN. The APS checks the ESN against its table of valid ESNs and sets the validity indicator accordingly in the poll answer message. The poll answer message returned to the ESS switch contains the validity indicator and the ESN.

Note: If the APS detects an invalid ESN, APS automatically initiates a TNESN audit and outputs an error message at the APS maintenance TTY.

2.17 The APS poll response message must be received within 1.5 seconds after the poll request message is sent. Otherwise, the poll request message times out. In this case, the APRB is released, a traffic counter is pegged, and the default ESN is returned to the client. Any subsequent APS poll response message related to this poll request is ignored. The PSAP DN for the default ESN is used to complete the call.

2.18 When the APS poll response message is received by the E911 message handler within 1.5 seconds, the E911 message handler unloads the message buffer, releases the APRB, and returns the ESN obtained from APS to the client. Call processing uses the ESN to index into the ESN translator to obtain the PSAP DN for call completion.

E911 TRAFFIC AND ERROR MESSAGES

2.19 Traffic and error data are provided in the ENO1, ENO2, and ENO3 output messages printed at the 1A ESS switch maintenance TTY. The printing of these output messages is selectively controlled by the EMCALL-PRT input

message. For detailed input and output message information, see Part 6 B(1) and B(6).

2.20 The ENOl and ENO2 output messages contain two error categories affected by the EBRCC feature. An hourly count is maintained for each error category. The output of these counts is contained in an EN02 output message, which is optionally printed on the half hour. The two error categories affected by the EBRCC feature are as follows:

(a) Error category translation data error (TDA) contains the following error codes:

(1) TDA 003-Unassigned entry found in the APS selective routing data base

(2) TDA 004-ESCO not assigned in the ESCO translator

(3) TDA 005-ESN not assigned in the ESN translator

(4) TDA 006-Primary and default ESN not assigned in the ESN translator

(5) TDA 007-DN from ESN translator is unassigned.

(b) Error category APS (error related to APS) replaces error category peripheral data storage (PDS) processor error for the EBRCC feature. Error category APS has the following error numbers:

(1) A1 001 -APRB table is full (or incorrectly built)

(2) APS 002-APS poll requests time-out

(3) APS 003-Message handler cannot send messages to the APS.

DATA BASE UPDATE AND MANAGEMENT

2.21 Data base update and management functions include the following:

(a) Bulk recent changes

(b) Individual recent changes

(c) Data base comparison

(d) Data verification

(e) TNESN audit.

These update and management functions are initiated and accomplished by telephone company, personnel. These functions are manually controlled at the APS maintenance TTY (or SCC which serves the APS) using input messages and recent change messages. Output messages provide status and error data. Several of these functions, either individually or combined, are considered

maintenance routines. This practice only identifies and describes these functions For detailed maintenance procedures and routines, see Part 6 A(4).

2.22 All output messages generated by the APS are saved in an EBRCC log file. This file is set up as a standard duplex multienvironmeni real time (DMERT) log file. Standard DMERT log administration commands allow maintenance personnel at the APS maintenance TTY to delete the log, print the log, search the log for entries, etc.

A. Bulk Recent Changes

2.23 Bulk recent changes are made to either initialize, reinitialize, or update the TN to ESN data in the selective routing data base. The data base is updated periodically (that is, daily) to reflect the current changes in TN to ESN assignments. Bulk recent changes are accomplished using ->either 9-track tapes generated by the DNIS or tape image files transmitted to the APS by the DMS.<- (See paragraphs 2.04 and 2.05.) The bulk recent change process is manually controlled at the APS maintenance TTY using UPD:TNESN; input messages. For detailed UPD:TNESN message formats, see Part 6 A(4).

B. Individual Recent Changes

2.24 Individual recent changes can be made to change the TN to ESN assignment data for either an office, NOG, or TN. Usually, individual recent changes are made to correct or update a relatively small number of TN to ESN assignments. Individual recent changes are input manually at the APS maintenance TTY using RC:TNESN recent change messages. Individual recent changes can also be input manually at the SCC which serves the APS.

Note: No TN to ESN assignment changes can be made via the switch.

C. Data Base Comparison

2.25 The selective routing data in APS main memory can be compared (periodically or as required) to the current official data maintained by the DMS. The DMS can produce a compare tape which reflects the current official TN to ESN data that should exist in the data base. The TN to ESN data on a compare tape is sequentially arranged by TNs, A comparison can be done for either the entire data base or a portion (for example, per office code) of the data base. The comparison process includes manually controlled options to print out data base mismatches and to correct data base mismatches. The comparison options are a subset of the initialization/update options and are manually controlled at the APS maintenance TTY using UPD:TNESN, input messages.

D. Data Verification

2.26 The ESN assigned for one TN or a range of TNs within an ESCO can be verified at either the ESS switch maintenance TTY or the APS maintenance TTY. If many ESNs and TNs are to be verified, verification should be done via the APS maintenance TTY.

2.27 The ESN assigned for up to ten TNs can be verified at the ESS switch maintenance TTY using a V-DNES verify message. Only one V-DNES verify message can be active at a particular time. The assignment data is returned

in a TR70 output message. A V-DNES verify message is considered active until the TR70 output message completes printing. For detailed input and output message formats, see Part 6 B(1) and B(6). The verification data is obtained from the APS data base the same way an ESN is obtained during call processing. The ESS switch generates and sends verification poll request messages and the APS replies with verification poll response messages.

2.28 The ESN assigned for up to 1000 TNs can be verified at the APS maintenance TTY using the VFY:TNESN: verify message. This verification process is internal to APS and does not involve the ESS switch. The assignment data is returned in an APS maintenance TTY output message.

E. TNESN Audit

2.29 The TNESN audit performs the following functions:

(a) Maintains and verifies the integrity of the ESN table.

(b) Checks the validity of every assigned ESN.

(c) Monitors data base access errors for unassigned ESNs.

(d) Verifies that APS main memory and disk copies of the data base are the same.

(e) Checks data base linkage, table allocation data, and THG backward pointers.

2.30 The TNESN audit has limited correction capability. It can correct discrepancies between main memory and disk if only one of the two copies has a valid ESN. The audit is automatically inhibited during an update/compare process.

2.31 At the end of an audit cycle, a completion message including an error count is output at APS maintenance TTY. An error message is also output when a data base error is found. Excessive amounts of TTY audit output messages can be inhibited.

2.32 The input messages that control the TNESN audit and verification output messages are as follows:

(a) AUD:TNESN!-This initiates the audit.

(b) STOP:AUD:TNESN!-This stops a currently active audit.

(c) INH:AUD:TNESN!-This indefinitely inhibits the audit.

(d) ALW:AUD:TNESN!-This restores an inhibited audit.

(e) OP:AUD:TNESN!-This requests an output indicating the audit inhibit status.

(f) SET:TNESN;AUD:NPD a, OFC bbb!-This allows a user to specify which NPD and office to audit next.

(g) SET:TNESN;PUNASGN [on/off]!-This allows a user to inhibit or allow output messages generated when an invalid or unassigned ESN is detected during verification of an ESN for call processing. The default state for this message is off.

3. ENGINEERING

3.01 The Central Office Equipment Engineering System (COESS) Information System Engineering Document, Index 5 2, should be used to manually order and engineer the 1A ESS switch for the EBRCC feature. The standard recommended automated procedure is OEES-Mechanized Ordering (MO).

HARDWARE

3.02 The EBRCC feature requires an APS equipped with 340-megabyte disk drives. For APS descriptive and application information, see Part 6 A(2) and A(3). For file store to APS conversion procedures, see Part 6 A(6).

3.03 ->The asynchronous data link capability requires installation of a cable and modem to TN74 interface card. Implementation procedures are covered in Part 6 A(4).<-

SOFTWARE

A. Base Generic Program

3.04 Approximately 100 words are required in fixed program store regardless of whether or not the EBRCC feature is used.

B. Optionally Loaded Feature Groups

3.05 The following feature groups are required:

(a) Feature group 9SE911 requires approximately 5200 words.

(b) Feature group 9SAPS requires approximately 800 words,

C. Parameters/Call Store Areas

3.06 Set card FFC103 activates the EBRCC feature and allocates a 64-word EBRCC call store block. Parameter words FEACTS + 4 and FEACTS + 5 contain the starting address and length of the EBRCC call store block. The structure of the EBRCC block is as follows:

(a) The attached processor request block (APRB) table contains 42 words.

(b) The attached processor request scratch (APRS) area contains 13 words.

(c) Nine words are spare.

Note: For detailed parameter and set card information, see Part 6 B(5) and B(7).

D. Translations

3.07 One item (item EAPS) is required in each ESCO PTW assigned in the ESCO translator. Item EAPS indicates that selective routing data is stored in the APS. (See paragraph 2.11.)

Note: For detailed translation information, see Part 6 A(1), B(8) and B(9).

4. IMPLEMENTATION

4.01 Implementation procedures are provided in Part 6 A(4). Prerequisites to implement the EBRCC feature are as follows:

(a) The APS must be available or installed and feature group 9SAPS must be loaded. The file store to APS conversion must be accomplished. See Part 6 A(6).

(b) Feature group 9SE911 must be loaded and the translations for the E911 feature (except for the selective routing data base) must be built. See Part 6 A(7).

Note: Item EAPS in the ESCO translator should not be built until the selective routing data base in the APS has been built, verified, and initialized.

(c) The selective routing data base in the APS must be built, verified, and initialized using tapes generated by the DMS (or equivalent). See Part 6 A(4).

4.02 The EBRCC feature is activated in the 1A ESS switch using set card FFC 103.

TRANSLATION FORMS

4.03 An entry for item EAPS is required on ESS 1313 (Expanded 911 Emergency Service Central Office Record) to indicate selective routing data is stored in the APS.

RECENT CHANGE MESSAGES

4.04 The recent change message RC:ESCO: with keyword APS sets item EAPS in the ESCO translator. For detailed information, see Part 6 A(3).

5. MEASUREMENTS

5.01 Standard traffic measurements for the E911 feature are described in Part 6 A(1). Related E911 traffic and error messages are discussed in paragraphs 2.19 and 1.20.

5.02 Three traffic counts maintained in the APS are as follows:

(a) 1ACP----This count is the number of call processing poll requests received from the 1A ESS switch.

(a) 1AVFY-This count is the number of verify poll requests received from the 1A ESS switch.

(b) APVFY-This count is the number of APS verify requests from the APS maintenance TTY.

5.03 These three counts are collected in hourly and daily accumulators. Once an hour the hourly counts are added to the daily counts and the hourly accumulators are reinitialized. Once a day during the midnight routines, the daily accumulators are reinitialized.

5.04 The hourly and daily counts can be optionally printed at the APS maintenance TTY. The output of these counts is initiated by the ALW:TC911:[HOURLY] [,DAILY]! input message. This message initiates an immediate output of all the counts (that is, hourly or daily), The output of these counts inhibited by the [NH:TC911:[HOURLY] [,DAILY]! input(4) message.

6. REFERENCES

A. AT&T Practices

(1) 231-090-288-Universal Emergency Service Number 911 Feature-Enhanced 911 Service

(2) 231-301-005-Attached Processor System-General System Application

(3) 231-300-012-File Store to Attached Processor System Conversion-Description

(4) 231-302-301-E911 Bulk Recent Change Capabilities-Implementation and Maintenance Procedures

(5) 231-318-348-Recent Change Formats for ESCO, ESN, and TNESN.

(6) 231-361-020-File Store to Attached Processor System Conversion-Task Oriented Practice

(7) 231-367-010-Enhanced 911-Task Oriented Practice.

B. Other Documentation

(1) Input Message Manual IM-6A00l

(2) NPA-03510-02-Data Management System User Identification/Data Management System User Manual

(3) NPA-03510-01-Data Management System Administrative Reference Manual

(4) NPO-03510-01-Data Management System Operations Manual

(5) Office Parameter Specification PA-6A001

(6) Output Message Manual OM-6A001

(7) Parameter Guide PG-1A

(8) Translation Guide TG-1A

(9) Translation Output Configuration PA-6A002.

7. COMMENT FORM

7.01 A comment form is located at the back of this practice to provide a communications channel from the user to the writer.

COMMENT FORM

Your comments and suggestions concerning accuracy, level of coverage, organization, etc., of this document will be appreciated. Please be as specific as possible for technical comments

( ) Check to request reply (technical comments only, please).

Mail comments to:

AT&T Network Systems
Dept. NJWR441350
2400 Reynolda Road
Winston-Salem, N.C. 27106

AT&T Practice

Name Tel ( )

Co.

Address

City, State Zip