

1 SUPRA TELECOMMUNICATIONS & INFORMATION SYSTEMS, INC.

2 REBUTTAL TESTIMONY OF DAVID A. NILSON

3 BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

4 DOCKET NO. 990649-TP

5 JUNE 9, 2000

6

7

8 Q. PLEASE STATE YOUR NAME AND ADDRESS

9

10 A. My name is David A. Nilson. My address is 2620 SW 27th Avenue, Miami, Florida

11 33133.

12

13 Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPICITY?

14

15 A. I am the Chief Technology Officer of Supra Telecommunications and Information

16 Systems, Inc. ("Supra").

17

18 Q. PLEASE DESCRIBE YOUR BACKGROUND AND WORK EXPERIENCE.

19

20 A. I have been an electrical engineer for the past 26 years, with the last 22 years spent

21 in management level positions in engineering and quality, and regulatory

22 departments. In 1976, after spending two years working in the microwave industry

23 producing next generation switching equipment for end customers such as AT&T

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1 long lines and ITT, I was part of a three-man design team that produced the world's
2 first microwave integrated circuit. This job involved extensive work with various
3 government agencies. At that time, our design was considered the "holy grail" of
4 the microwave industry and was placed in production for AT&T within 30 days of
5 its creation. This job also involved communications equipment design work with
6 various government entities covered by United States Departments of Defense
7 security restrictions. I spent several years in quality control management,
8 monitoring and trouble-shooting manufacturing process deviations, and serving as
9 liaison and auditor to our regulatory dealings with the government. I spent 14
10 years in the aviation industry designing communications systems, both airborne
11 and land-based, for various airlines and airframe manufacturers worldwide. This
12 included custom designed hardware originally designed for the Pan American
13 Airlines call centers, and the HF long range communications system controllers
14 used on Air Force One and Two and other government aircraft. In this job I was
15 also responsible for validation design testing and FAA system conformance
16 testing. Since 1992 I have been performing network and system design consulting
17 for various industry and government agencies, including the Argonne National
18 Laboratories. I am the principal architect of Supra's ATM backbone network and
19 our central office design.

20
21
22

1 Q. HAVE YOU EVER PREVIOUSLY TESTIFIED BEFORE THIS
2 COMMISSION?

3

4 A. Yes, I testified before this Commission in numerous generic dockets and in various
5 disputes between Supra Telecom and BellSouth.

6

7

8 Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

9 A. The purpose of my testimony is to address the issues identified in this proceeding.

10 I have reviewed the testimonies of the ILECs regarding issues 5 (which signaling
11 networks and call-related databases should rates be set); 6 (when is it appropriate
12 to recover non-recurring costs through recurring rates); 9(b) (should the
13 Commission require ILECs to unbundle any other elements or combinations
14 thereof); and 13 (when should recurring and non-recurring rates take effect) and
15 will rebut the asserts made in general by the ILECs. I will also rebut the direct
16 testimony of BellSouth witnesses Alphonso Varner, and Sprint witness James W.
17 Sichter on issues 5, 6 and 9b.

18

19

20 **ISSUE 5: FOR WHICH SIGNALING NETWORKS AND CALL RELATED**
21 **DATABASES SHOULD RATES BE SET.**

22

1 Q. AS DEFINED BY BELLSOUTH WITNESSES VARNER, ARE THERE ANY
2 OTHER NETWORKS OR DATABASES FOR WHICH RATES SHOULD BE
3 SET?

4

5 A. Yes. Unbundled Local switching requires that the ALEC who leases a switching
6 port be given all features and functionality of the port. One such feature is the
7 ability of the port to produce stutter dialtone, or activate a light on the telephone
8 set of a subscriber in response to a signal from a voicemail system or provider to
9 let the telephone subscriber know there is a message waiting. Traditionally this
10 task has been done via the System Message Desk Interface (SMDI) and
11 enhancements to it such as Inter Switch Voice Messaging (ISVM) which allows
12 one switch to pass messaging requests across the network to other switches
13 without the use of a dedicated network.¹

14

15 While this is clearly a function of the switch port, and functionality of it comes
16 with the switch port, in Florida there is no unbundled access to this fundamentally
17 important signaling network / switch port functionality. Therefore an ALEC is not
18 in parity with the ILEC for the Local Switching UNE.

19

¹ Lucent Document 235-190-104 5ESS 2000 switch ISDN Feature Descriptions, Section 13.4 Message Service System Features, Issue 3 pages 13-67 through 13-126 – Attached as Exhibit DAN-1.

1 BellSouth does not provide unbundled access to this signaling network, but in their
2 FFC #1 Access Tariff lists SMDI and something called ISMDI. The description of
3 ISMDI is an SS7 / TCAP based network that through a convoluted conversion of
4 conversion between SMDI, ISDN and SS7 / TCAP messages provides a single
5 connection to a signaling connection that is supposed to be able to activate a
6 Message Waiting Indicator (MWI) on a Latawide basis. This is clearly not as cost
7 effective as the ISVM approach. The alternative an ALEC has would be to
8 establish an SMDI connection to each and every BellSouth switch in Florida, a
9 total of 206 individual connections at last count. This is not cost effective
10 compared to ISVM and presents a substantial barrier to entry.

11
12 Nowhere is there any mention of direct access to the ISVM signaling, or
13 unbundled access to any signaling required to activate MWI on a leased Local
14 Switching port. These omissions are creating an unusually high barrier to entry for
15 an ALEC like Supra Telecom who is expected by telephone subscribers to provide
16 the same services as the ILEC as seamlessly as the ILEC provides those services.

17
18 As shown in Figure 13-11 (of attachment DAN-1), and 13-13 there is no separate
19 signaling network required to transmit messages switch to switch. It is included in
20 the basic switch port functionality, according to meetings Supra Telecom has held
21 with Bell Labs personnel on this issue. Additionally the Bell Labs Engineers
22 confirmed that this ISVM has been adopted as an industry standard for many years

1 now. This industry standard is also supported by Nortel and Siemens, so that all
2 switches in the BellSouth's network are compliant. Figure 13-14 along with
3 section 13.4.1.2 shows that the required software is part of the base generic
4 software since, at least the 5E8 generic. Since the current software release from
5 Lucent is 5E14, and since Lucent does not support switches with software loads
6 beyond two prior revisions, it is obvious that the required software is already
7 loaded on BellSouth's switches.

8

9 ALEC access to the ISVM signaling "network" should be defined as a
10 fundamental component of Local Switching line and trunk ports and ALEC access
11 to this network required of and provided by all Florida ILECs as it is elsewhere in
12 the country. The various message signaling networks are necessary to an ALEC to
13 compete with the ILEC, and failure to have access to such signaling impairs Supra
14 Telecom's ability to acquire new customers who view such a limitation as the
15 mark of an inferior carrier.

16

17 Q. ARE THERE ANY OTHER ISSUES WITH WITNESS VARNER'S
18 TESTIMONY?

19

1 A. The Local Number Portability (LNP) Query Service.² All of the databases listed
2 are query databases. However the specific identification of this as a Query Service
3 in reference to LNP underscores the fact that there is no unbundled OSS access to
4 the system. There is no way for an ALEC to directly provision LNP translations,
5 they must be performed via LSR instead of the obvious, and speedy solution of
6 providing unbundled access to the LSMS system [the standard provisioning
7 hardware / software system used nationwide for entering LNP translations for
8 Nuestar (previously Lockheed Martin)].

9
10 LIDB, which is used for authorization of third party billed calls, collect, credit
11 card, etc. is the type system that contains ALEC specific data on a given line.
12 Unbundled OSS access to this system to deal with the minute to minute needs of
13 an ALEC to render or remove credit authorization to a customer speedily and
14 freely and without unnecessary infrastructure overhead.

15
16 Therefore it is essential to provide unbundled OSS access to ALECs in a manner that
17 the LIDB records for a given ALEC customer may be directly modified by the
18 ALEC.

19

² BellSouth witness Varner, page 32 line 25.

1 **ISSUE 6: UNDER WHAT CIRCUMSTANCES, IF ANY, IS IT**
2 **APPROPRIATE TO RECOVER NON-RECURRING COST THROUGH**
3 **RECURRING RATES?**

4

5 Q. IN DEFINING "NON-RECURRING COST", SHOULD SUBCATEGORIES BE
6 RECOGNIZED IN DEALING WITH THE ANSWER TO ISSUE 6.

7 A. Yes. Task related non-recurring costs that repeat, each time an ALEC or ILEC
8 places a service order are a legitimate non-recurring charge. For example, the non-
9 recurring cost to move a cross-connect, or change the carrier code from ILEC to
10 ALEC in the OSS is directly related to the service provisioned.

11

12 Within that category, non-recurring costs to convert a working circuit to another
13 carrier are different than placing a circuit in operation at a given address. The
14 current structure of just one non-recurring rate per UNE loop is allowing the ILEC
15 undue enrichment for activities that are not performed. For example, the non-
16 recurring cost to combine NID, Subloop distribution and Subloop feeder
17 components together into a full loop to the customer is a cost that is substantially
18 higher than the non-recurring cost to switch an existing, in-service loop from one
19 carrier to another. Yet with the exception of the limited scope of order PSC-98-

1 0810-FOF-TP³, most ALECs in Florida are paying charges for placing a loop in
2 service, for the first time, whenever they order a conversion of a working circuit.

3

4 The non-recurring costs of infrastructure, purchase, and construction is a cost to be
5 shared by the carriers using the facility, over the useful life of the facility. Beyond
6 this point the cost model needs to deal with the facility in a different fashion
7 depending upon whether it remains in service or not.

8

9 Task related non-recurring costs are specific to a given carriers order for a
10 particular service and should remain non-recurring costs. These non-recurring
11 costs should be specific and the use of Individual Case Basis (ICB) be limited in
12 the extreme, if allowed at all.

13

14

15 Q. DOES THE TESTIMONY OF BELLSOUTH WITNESS VARNER AND SPRINT
16 WITNESS SICHTER REPRESENT ALL THE ISSUES?

17

18 A. No, not at all. Sprint witness Sichter states that “To the extent that high non-
19 recurring charges are a significant barrier to competitive entry, it may be
20 appropriate to require at least a portion of those non-recurring charges through

³ Page 55-56

1 recurring rates. This is in recognition of the FCC's continued efforts to ensure that
2 such non-recurring rates could and might be used by an ILEC to prevent a new
3 competitive carrier from competing with the ILEC in a given area or on a specific
4 product. Unfortunately his final conclusion on this issue ignores this statement in
5 favor of financial protection for the ILEC.

6
7 BellSouth witness Varner then goes on to make statement that "In a competitive
8 environment, a providers ability to predict how long an ALEC will remain on the
9 providers network is limited"⁴. Sprint witness Sichtler states "... the incumbent
10 LEC is financially exposed if the ALEC discontinues service before the non-
11 recurring costs are fully recovered."⁵ Whether it is the high cost burden of current
12 non-recurring charges that causes an ALEC to discontinue leased services, or other
13 reasons, both Sprint and BellSouth indicate that users of facilities will change over
14 the life of the facility.

15
16 In spite of their recognition that there must not be barriers to entry in the
17 competitive market, and that the users of facilities will change over time, both
18 ILEC witnesses go on to ask the commission for financial protection from an
19 ALEC who cancels service early!

20

⁴ BellSouth witness Varner page 33, line 13.

1 This limited view of reality is trying to deal with non recurring costs related to the
2 first user, rather than the life of the facility. It ignores the fact that over the useful
3 life of the facility, the ILEC itself may well be a user of the facility. It also ignores
4 the fact that due to universal service, a large portion, if not all of the listed UNEs
5 would have to be constructed anyway. Therefore when an ALEC is not leasing a
6 specific UNE, the ILEC may still be generating revenue from it, either by leasing
7 or from Universal Service funds.

8
9 The non-recurring infrastructure charges should be apportioned between the ILEC
10 and all ALECs based upon who has "ownership" of the facility in a given month.
11 These charges should be assessed throughout the amortized life of the equipment.
12 Any attempt to charge non-recurring infrastructure costs to the first user of a
13 facility at a higher rate than subsequent users of the facility violates creates an
14 unnecessarily high barrier to entry.

15
16
17 Q. CAN YOU PROPOSE A TEST TO DETERMINE WHETHER A COST SHOULD
18 BE INCLUDED IN THE RECURRING CHARGE?
19

⁵ Sprint witness Sichtler page 26, line 3.

1 A. Well defined, repetitive costs related to service provisioning should remain non-
2 recurring costs. However the cost of placing a loop in service should be recognized
3 as substantially different from converting an existing, in-service loop from one
4 carrier to another. The non-recurring rates set by this commission should reflect
5 these very different costs. This is true whether the new carrier is provisioning
6 service via UNE combination⁶ or directly from their own facilities based
7 equipment.

8
9 This test addresses witness Varner and Sichters concern that an ALEC might
10 cancel service earlier than expected. The ALEC is billed direct costs of
11 provisioning service as a non-recurring rate, and construction costs are assessed to
12 all users over the life of the facility.

13
14 Another test for whether a non recurring cost should be separate from the
15 recurring charge are ICB charges. Typically all ICB costs are actually
16 infrastructure construction – they vary depending on physical circumstances and
17 cannot be modeled specifically. ICB charges should be included in recurring rates
18 where they get picked up by the cost model and apportioned to all users.

19

⁶ As provided for by this commission in PSC-98-0810-FOF-TP, conclusion on pages 55-56.

1 **ISSUE 9(b): SUBJECT TO THE STANDARDS OF THE FCC'S THIRD**
2 **REPORT AND ORDER, SHOULD THE COMMISSION REQUIRE ILEC'S**
3 **TO UNBUNDLE ANY ELEMENTS OR COMBINATIONS OF ELEMENTS.**
4 **IF SO, WHAT ARE THEY AND HOW SHOULD THEY BE PRICED?**

5
6 Q. ARE THERE ANY OTHER ELEMENTS NOT LISTED IN ISSUE 9(A) THAT
7 NEED TO BE UNBUNDLED?

8
9 A. Yes. One missing element is unbundled DSLAM access. In addition to providing
10 high speed Internet access via ADSL, there are an increasing list of other
11 Telephony related services provided by xDSL circuits, controlled by Central
12 Office located DSLAMS.

13
14 First of all, in order to serve any customer in the state with xDSL derived services,
15 one MUST have access to a DSLAM in every central office. Second, With the
16 exception of IDSL (an ISDN BRI equivalent) all other DSL flavors must have
17 direct copper connection between the DSLAM and the customer premises.
18 According to reported figures 60% of BellSouth customers are fed with some
19 amount of fibre optic cable between the central office and the customer. To
20 Service these customers an ALEC must now collocate in every Remote Terminal
21 in the state, an outstanding number of collocations for facilities that quite honestly
22 were never designed to have the capacity to support collocation.

1

2 Yet DSL variants are extremely and increasing used by all telephone companies to
3 deploy voice services. Supra Telecom has numerous T1 circuits running into our
4 corporate headquarters. Not one of those T1's is provisioned over a standard 4
5 wire DS1 circuit. Every one is provisioned over an HDSL (2 wire POTS or DSL
6 loop) or MHDSL(2x2wire POTS or DSL loops) rather than a conditioned,
7 repeater equipped DS1 loop.

8

9 The voice over DSL standards have come a long way in the past year, and all over
10 the country, high density voice circuits are increasingly being provisioned over 2
11 wire circuits instead of DS1 circuits due to lack of facilities, speed of provisioning,
12 or for the reduced cost of this approach.

13

14 Packet switched products such as Frame Relay are also delivered over DSL. All of
15 Supra Telecom's Frame Relay circuits connection us to the various ILEC data
16 centers around the country were provisioned by BellSouth over HDSL circuits. So
17 as the commission addresses the unbundling of packet switching, it must deal with
18 the delivery of said service to the end user. Such local loop delivery is
19 increasingly being provided by the ILECs DSLAMS or equivalent equipment.

20

21 The ILEC is the one carrier who has deployed DSLAMS ubiquitously throughout
22 its network in Central Offices AND Remote Terminals. This piece of equipment

1 and its attendant transport, has become an important device in provisioning voice
2 services and as such should be offered in unbundled access. The ILEC must be
3 compelled to provide unbundled access to this switch with pricing based on
4 standards already established by this commission for Unbundled Network
5 Elements.

6

7 Q. ARE THERE ANY OTHER?

8

9 A. Yes. With the creation of Dark Fibre UNE's the question of Wave Division
10 Multiplexing (WDM) UNEs should be considered. WDM is a technique of using
11 multiple chromatically different lasers to provide 48 (or more) channels of capacity
12 over a circuit that would support one circuit using standard Fibre optic equipment.
13 Not that the practice is any less reliable, but cost studies for dark fibre and lit fibre
14 may have 48 times the revenue bearing capability that has been envisioned in the
15 cost model, and the technological advance that allows this extra capacity should be
16 factored into the cost models. As such it becomes a legitimate consideration as a
17 separate UNE.

18

19 Additionally, loops within the distance limitations of xDSL technology should be
20 set aside as a UNE, even if the loop only has voice-grade capabilities. The reason
21 for establishing such a category would be to comply with the TELRIC model
22 requirements that the best and most efficient technology be used when determining

1 costs. Since it appears that xDSL capable loops will be less expensive than the
2 standard voice grade loop, all loops within the xDSL distance capability (i.e.
3 18,000 feet to some vendors and ILECs such as BellSouth, greater lengths to
4 others) should be install as the less expensive xDSL loop, rather than the more
5 expensive standard voice-grade loop. Pricing of these xDSL length loops, for
6 which only voice-grade quality can be guaranteed, should be the same as the xDSL
7 loops minus any cost of ensuring that the xDSL loop meets the higher standard.

8
9

10 **ISSUE 13: WHEN SHOULD THE RECURRING AND NON-RECURRING**
11 **RATES AND CHARGES TAKE EFFECT?**

12

13 Q. WHEN SHOULD THE RECURRING AND NON-RECURRING RATES AND
14 CHARGES TAKE EFFECT?

15

16 A. Immediately after the Commission has made a final determination of the rates set
17 by this docket.

18

19 Q. DOES THIS CONCLUDE MY TESTIMONY?

20

21 A. Yes, this concludes my testimony.

13.4 MESSAGE SERVICE SYSTEM FEATURES

13.4.1 Interswitch Voice Messaging

13.4.1.1 Description

National

Custom

The Interswitch Voice Messaging (ISVM) feature enables voice mail and call answering capabilities to be extended to business customers served by other switches, in addition to those customers connected to a 5ESS®-2000 switch with a voice messaging system (VMS). The ISVM feature allows voice messaging (VM) providers to expand their current intraswitch customer base to potential VM customers served by other switches. This feature provides switch support for the necessary interswitch signaling. This feature does not change or modify existing intraswitch VMS configurations or their interface to the serving 5ESS®-2000 switch.

The ISVM feature is defined by the ability to provide VM capabilities to a customer who can be served by a different switch other than that connected to the VMS itself. The switch serving the VMS is referred to as the *near switch*. If the VM user is served by a different switch, that switch is referred to as the *far switch*. With the 99-5E-3270.A, Line Blocking Enhancements - Phase 1 feature the message service center (MSC) will deliver the calling party number (CPN) to the VMS even if it is restricted. The CPN is delivered for both direct or forwarded calls. The VMS can then allow users to retrieve messages from their VMS without having to reenter their directory number (DN). This 5E10 software update (SU) feature is activated on a per-switch basis with an optioned feature identifier (OFID 669) for all MSCs. A related 5E11 SU feature, 99-5E-3270, Line Blocking Enhancements - Phase 2, allows the service provider to selectively activate the feature on specific terminating MSCs. These are secured features (SFID 240) and a right-to-use (RTU) fee must be paid to Lucent Technologies before enabling information is provided. The Line Blocking Enhancements - Phase 1 and Line Blocking Enhancements - Phase 2 features do not affect CPN delivery when an intraswitch call with privacy activated is made or forwarded to a screening MSC serving an MSS VMS.

13.4.1.2 Availability

The ISVM feature is available in the following software releases:

- National ISDN — 5E8 and later software releases
- Custom ISDN — 5E7 and later software releases.

The Line Blocking Enhancements - Phase 1 feature is available for Custom and National ISDN as a software update for 5E10 and 5E11, and as a part of the 5E12 software release. The Line Blocking Enhancements - Phase 2 feature is available for Custom and National ISDN as a software update for 5E11, and as a part of the 5E12 software release.

13.4.1.3 Environment

The ISVM capability allows VM providers to expand their current intraswitch customer base to potential VM customers served by other switches in the same local access and transport area (LATA). This feature gives VM service providers the ability to offer voice messaging on an interswitch, intra-LATA basis. In order to provide VM services, a VM provider is assigned one or more multiline hunt groups (for example, analog, BRI) and a data link by service order.

Line Blocking Enhancements - Phase 1 is provided on a per-switch basis using OFID 669. Line Blocking Enhancements - Phase 2 allows the feature to be provided to selected terminating MSC multiline hunt groups. Both Custom and National ISDN are supported for these two features

13.4.1.4 Cross References

The following cross references apply to the Interswitch Voice Messaging feature:

■ Feature Number:

- 99-5E-0658, Interswitch Voice Messaging
- 99-5E-3270.A, Line Blocking Enhancements - Phase 1
- 99-5E-3270, Line Blocking Enhancements - Phase 2

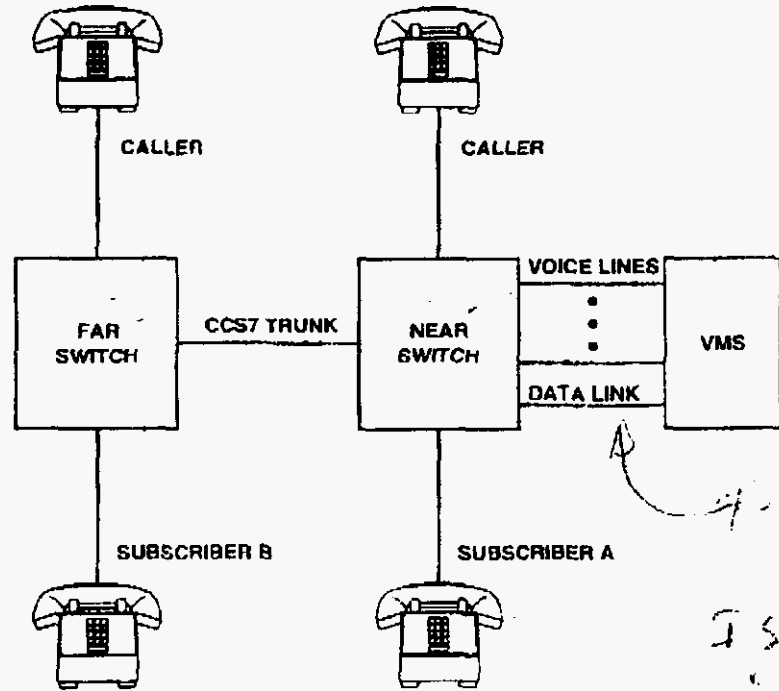
13.4.1.5 Background

Intraswitch VM refers to the VM subscriber being served by the same switch that is connected to the VMS. The caller (that is, someone who calls the subscriber) need not be served by the same switch. Intraswitch VMS is currently available on the 5ESS®-2000 switch through the Message Service System (MSS) feature, working with the applications processor interface (API). (It is also available on the 1A ESS™ switch through either the simplified message service interface (SMSI) or MSS features and the SMSI or bulk calling line message service (BCLMS) interface protocols.)

The ISVM capability refers to the VM subscriber being served by a different switch other than that connected to the VMS. The caller can be served by the VMS's switch, the subscriber's switch, or any other switch.

The *near switch* is the switch that serves the VMS. The *far switch* is the switch that serves a VM user who is served by a different switch other than that connected to the VMS.

Figure 13-11 illustrates these definitions.



NOTE: SUBSCRIBER A IS AN INTRASWITCH VMS USER.
SUBSCRIBER B IS AN INTERSWITCH VMS USER.
CALLS TO USERS A AND B CAN BE FROM ANY SWITCH.

Figure 13-11 — Intraswitch and Interswitch VM Definitions

The term *voice mail* is the name given by VM providers to that component of the VM which allows a subscriber to send messages to other subscribers and to retrieve messages. Voice mail can be subscribed to through a contract between the user and the VM provider, with no involvement by the 5ESS®-2000 switch owner. In this case, the VMS would operate in a stand-alone mode, but the subscriber would not have message waiting indicators (MWIs). That capability requires that the VMS be integrated with the switch. In this case, the VM user would subscribe to an MWI feature through the service provider.

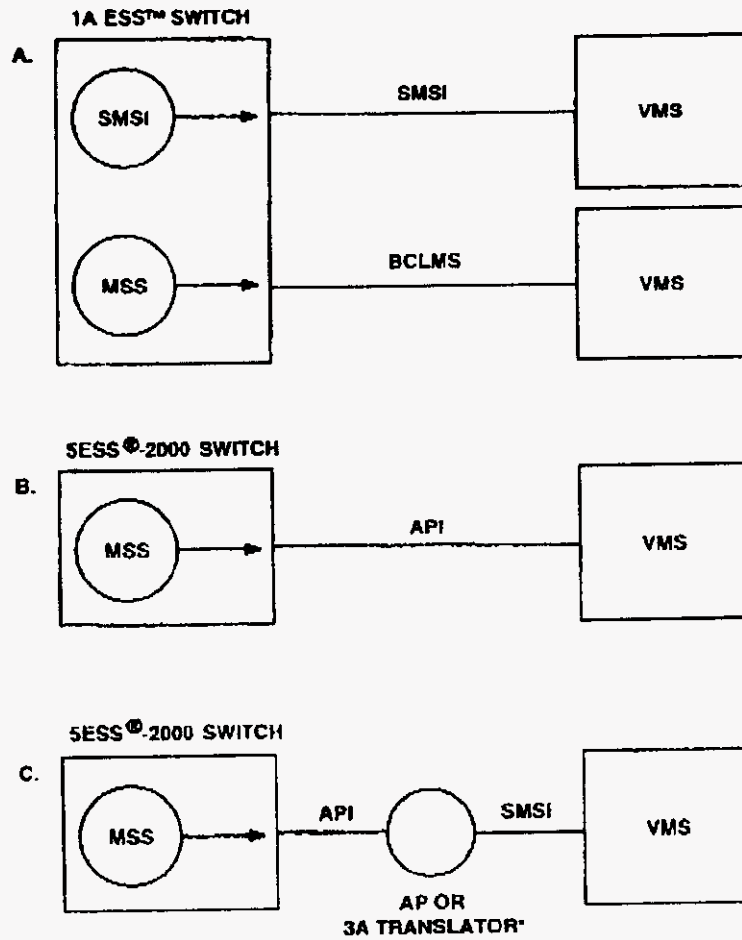
The term *call answering* is the name given to another VM component, whereby users forward calls to the VMS. The user subscribes to some version of call forwarding through the service provider, with the VMS as the destination DN. In order to receive notification that a call has been forwarded to the VMS and that a message has been left, the user also subscribes to MWI.

The 5ESS®-2000 switch supports the MSS feature, which is associated with the API protocol to provide feature-related signaling on the interface between the 5ESS®-2000 switch and an applications processor (AP), a VMS, or some other adjunct. The API protocol supports full NANP DNs; however, in the 5E6 software release, the 5ESS®-2000 switch sends a full NANP calling DN and an NANP called DN (without the NPA)

to the AP. The AP previously has received NANP DNs without the NPA, which it passed unchanged to the VMS on the SMSI. However, if it received a full NANP DN, the protocol conversion would strip off the first three digits before passing the NANP DN (without the NPA) to the VMS.

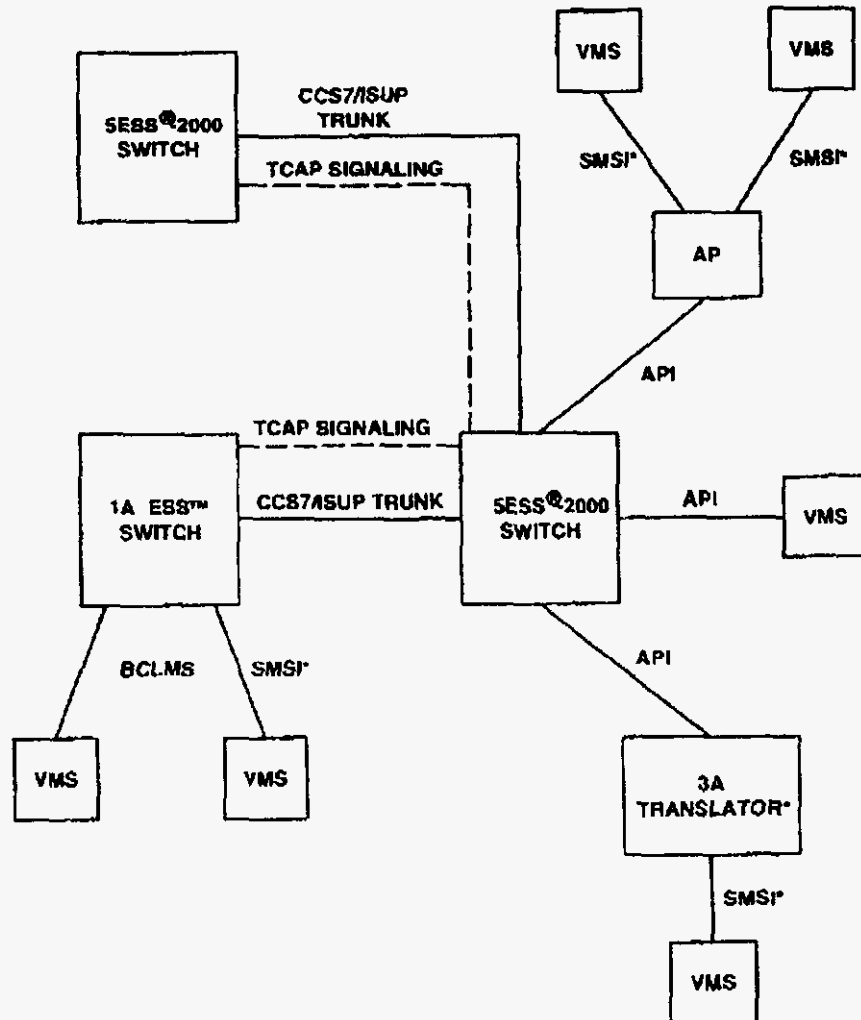
Figure 13-12 illustrates the message feature and protocol definitions for VMS configurations with 5ESS®-2000 switches and 1A ESS™ switches.

The 5ESS®-2000 switch supports the API protocol, but many VMS configurations support SMSI. In order to provide intraswitch VM capabilities from a 5ESS®-2000 switch, in this case, protocol conversion is required between the API and SMSI. This can be performed by connecting the 5ESS®-2000 switch to an intermediate adjunct which performs this protocol conversion. This adjunct can be an AP, or it can be a unit called the 3A SMSI translator. This is illustrated in Figure 13-13.



*NOTE: THE AP AND 3A TRANSLATOR ARE SEPARATE PRODUCTS FROM ISVM.
THE 3A TRANSLATOR HAS THE OPTION OF SUPPORTING 7-OR 10-DIGIT
SMSI. ACP VERSION 7 IS SCHEDULED TO SUPPORT 10-DIGIT SMSI.

Figure 13-12 — 5ESS®-2000 Switch/1A ESS™ Switch Feature and Protocol Definitions



*NOTE: THE AP AND 3A TRANSLATOR ARE SEPARATE PRODUCTS FROM ISVM. THE 3A TRANSLATOR HAS THE OPTION OF SUPPORTING 7- OR 10-DIGIT SMSI. ACP VERSION 7 IS SCHEDULED TO SUPPORT 10-DIGIT SMSI.

Figure 13-13 — ISVM Switch Interface Configurations

The previous figures illustrated a far switch connected directly to the near switch. However, another possible architecture includes an intermediate tandem switch. Such a switch must be able to pass Common Channel Signaling, Version 7/ISDN User Part (CCS7/ISUP), call forwarding parameters for ISVM to function. Figure 13-14 illustrates this arrangement and indicates the required 5ESS@-2000 switch, 1A ESS™ switch, and 4ESS™ switch software releases.

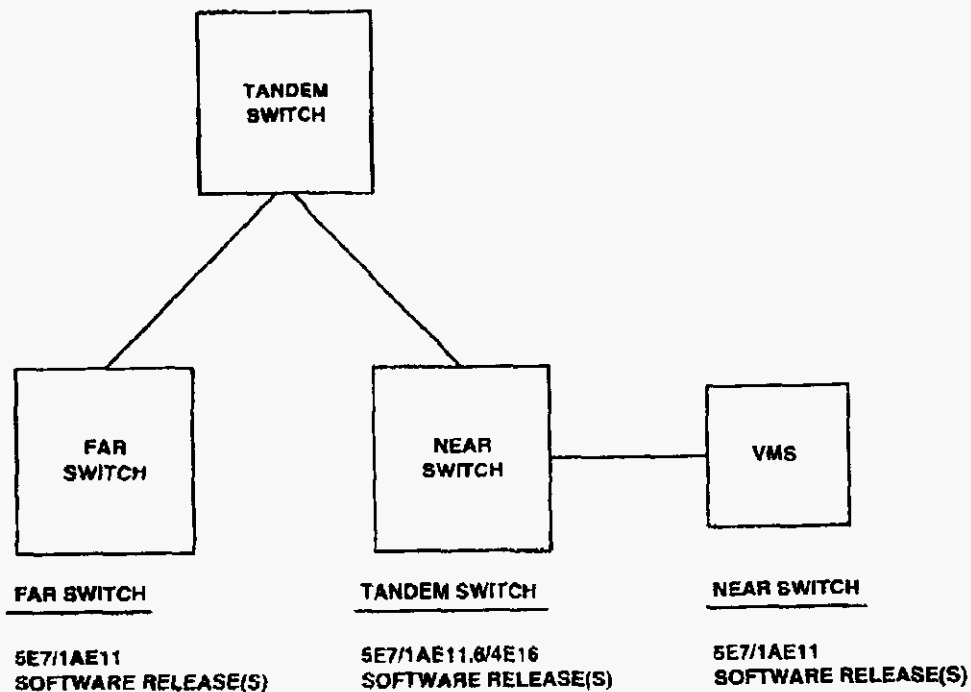


Figure 13-14 — Switch Software Releases Required for ISVM

13.4.1.6 User Operation

13.4.1.6.1 General

End-users can subscribe to two VM capabilities through a VM provider as follows:

- Voice mail, which enables the user to compose and broadcast messages to other users
- Call answering, which allows the user to have the VMS act as an answering service.

For both voice mail and call answering capabilities, if the end-user wants notification that there are messages to be retrieved, the end-user subscribes to an MWI feature. Users served by the 5ESS®-2000 switch subscribe to the MSS feature, which provides MWI. For call answering, the end-user subscribes to a Call Forwarding feature.

Typically, the VM provider assigns a voice mailbox to the end-user and arranges (with the service provider) for the user to be assigned an MWI and call forwarding to the VMS. For call answering, the user can subscribe to Call Forwarding Busy Line (CFBL), Call Forwarding Don't Answer (CFDA), Call Forwarding Variable (CFV), or some combination of these features for an interswitch operation.

Generally, an end-user's MWI is activated when a message arrives in their end-user voice mailbox and is deactivated when all the messages have been retrieved. These activations and deactivations are done by the user's switch upon receipt of an MWI request from the VMS. However, the end-user also has the capability to deactivate the MWI from the end-user station set by dialing an access code or using a feature button. This action simply turns off the indicator light or stutter dial tone. It does not alter the status of the MWI as far as the VMS is concerned. This MWI deactivation by user capability is transparent to the VMS and continues to be available with the ISVM feature.

To ease retrieval of messages for end users who have privacy on their lines, the service provider can enable and activate the Line Blocking Enhancements - Phase 1 and Line Blocking Enhancements - Phase 2 features for ISVM. For Line Blocking Enhancements - Phase 1, the service provider must unlock this secured feature (SFID 240) using recent change procedures. This feature is assigned on a per-switch basis using OFID 669.

The service provider must also use SFID 240 to unlock Line Blocking Enhancements - Phase 2 and must use recent change procedures to assign this feature to specific terminating MSC multiline hunt groups. Once the feature is activated, the end-users with privacy accessing the VMS are able to retrieve either direct or forwarded calls to the VMS without having to reenter their DN.

13.4.1.6.2 Activation

In order to provide VM services, a VM provider is assigned one or more multiline hunt groups (for example, analog, BRI) and a data link by service order. The ISVM feature is an extension of the existing attendant-based MSS feature. A VM user separately subscribes to MWI option of the MSS feature. Users can choose either audible or visual MWIs. A VM user subscribes via service order to some form of Call Forwarding. For CFBL and CFDA, the forwarded-to DN is specified as that of the VMS. The CFV is activated and deactivated from the user's station set, and the forwarded-to DN would be entered at that time.

13.4.1.6.3 Deactivation

The MWI deactivation and activation are done by the user's switch upon receipt of an MWI request from the VMS. However, the end-user has the capability to deactivate the MWI from the end-user station set by dialing an access code or using a feature button. This action simply turns off the indicator light or stutter dial tone. It does not alter the status of the MWI as far as the VMS is concerned.

If the VM provider deactivates ISVM service to customers (for example, end-user, clients, etc.), then recent change procedures are required.

13.4.1.6.4 Voice Mail User Scenario

1. End user subscribes to MWI provided by MSS.
2. Dial VMS number (7 or 10 digits for interswitch operation)
3. When the VMS answers, enter touch-tone login and ID, and follow menu to compose or retrieve messages (for example, press 1 to compose a message, press 2 to retrieve messages). Note that a touch-tone phone or touch-tone generator is a requirement.

4. Compose a message and address it by using touch-tones when prompted by the VMS. The message can be broadcast to multiple addressees.
5. Retrieve messages.
6. Hang up.
7. Message is delivered to addressees' voice mailboxes, and MWIs are activated at their station sets.
8. If messages are retrieved, MWI is deactivated at the user's station set.

13.4.1.6.5 Call Answering User Scenario

The user subscribes to a version of call forwarding, with the VMS as the destination DN. It is assumed here that the existing preconstructed Call Forwarding features are to be used. However, if a service provider has the BRCS customization package on the 5ESS@-2000 switch, other call forwarding options could be available.

The existing preconstructed Call Forwarding features essentially are /CFDA, /CFBL, and /CFV. The user subscribes to one or more of these by service order. For /CFDA and /CFBL, call forwarding is on all the time with the VMS as the forwarded-to DN. With /CFV, activation and deactivation are performed by access code from the user's station set. The forwarded-to DN is also entered from the user's station set.

1. End-user subscribes to MWI and call forwarding.
2. For CFV, dial the activation access code and the DN of the VMS. A courtesy call is then made to the VMS and, when the VMS answers, CFV is activated. Callers can then leave voice messages in the user's voice mailbox.
3. When a message is left for the user, an MWI is activated at the user's station set.
4. User dials the VMS number to retrieve messages, and MWI is deactivated when all messages are retrieved.
5. To deactivate CFV, the user dials another access code.

13.4.1.7 Engineering

13.4.1.7.1 Special Planning Considerations

The service provider installs CCS7 signaling facilities that satisfy the following two conditions:

1. Calls forwarded from any far switch to the near switch are routed entirely over trunks with CCS7 signaling. Furthermore, the CCS7 signaling protocol supports the call forwarding parameters needed for the CHI sent by the far switch to the VMS.
2. The near and far switches support the CCS7 messages used to send the specific interswitch MWI activate/deactivate messages.

The current and planned capabilities of the 5ESS@-2000 switch do not allow for selectively routing calls over CCS7 trunks. When calls are forwarded over non-CCS7 trunks, the ISVM feature does not function properly.

The ISVM feature is an intra-LATA service and needs to be configured as such to operate properly.

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The ISVM feature can be used with any VMS that supports the API for operation with the 5ESS®-2000 switch. Many VMSs support the SMSI protocol, but the 5ESS®-2000 switch does not. If the 5ESS®-2000 switch is required to provide VM services from an SMSI, then the 10-digit SMSI feature and protocol are supported from the 5ESS®-2000 switch through the AP or 3A translator. The 3A translator supports a single API/SMSI data link. The API data link on the 5ESS®-2000 switch is implemented through a special permanent virtual circuit (PVC) on an OB+D digital subscriber line (DSL).

The ISVM feature does not change or modify existing VMS configurations or their interface to the serving 5ESS®-2000 switch.

For the VMS to function completely, CCS7-controlled trunks must exist from the calling party's switch to the far switch and from the far switch to the near switch. However, it is very likely that there are no CCS7 trunks between the calling party and the far switch. Assuming that the first forwarding occurs at the far switch, information concerning the calling DN is lost. However, the calling DN, while convenient, is not essential to VMS.

No hardware considerations are associated with Line Blocking Enhancements - Phase 1 or Line Blocking Enhancements - Phase 2.

13.4.1.7.2.2 3A Simplified Message Service Interface Translator

The 3A simplified message service interface (SMSI) translator provides a versatile, user-configurable and self-diagnosing interface between an integrated services digital network (ISDN) basic rate interface (BRI) and customer-supplied Electronic Voice/Attendant Message Service Systems.

The 3A SMSI translator allows the customer to send and receive SMSI messages when connected to an 5ESS®-2000 switch. The 3A SMSI translator receives MSS messages from the 5ESS®-2000 switch through the D-channel of an ISDN line. The MSS messages are defined in 235-900-303, *Applications Processor Interface (API) Specification*. The 3A SMSI translator takes care of layers 1, 2, and 3 of the ISDN communications with the 5ESS®-2000 switch. After the MSS message is received, the 3A SMSI translator translates the message into an SMSI message. After the translation, the message is sent to the VMS.

The 3A SMSI translator supports the traditional SMSI protocol. This interface supports 7 digits in both the calling and called DN fields. The 7-digit SMSI interface does not support interswitch voice messaging which uses full NANP calling and called DN fields. The 3A translator supports a 10-digit SMSI interface that delivers 10 digits in both the calling and called DN fields. If the voice mail vendor is not capable of supporting full NANP calling and called DN fields, do not use the 10-digit option on the 3A SMSI translator for ISVM.

One 3A SMSI translator is needed for every API link used. Both the business customer identification (BCID) and line card equipment number (LCEN) are programmed into the 3A SMSI translator during installation.

13.4.1.7.2.3 TCAP/ISUP Hardware

The common network interface (CNI) ring provides a general interface among nodes communicating with the common channel signaling (CCS) protocol. This is true for either CCS direct signaling (for example, TCAP) or CCS trunk signaling (for example, ISUP) messages. A direct link node (DLN) is optional; it improves the capacity. If a DLN is used, then a communications module 2 (CM2) is required.

13.4.1.7.3 Software Resources

The VMS connection requires a loaded SM. The ISUP trunk terminates on either a standard or loaded SM. The software packages available for ISVM are as follows:

- Existing MSS software
- CCS7 TCAP
- CCS7 ISUP
- AP Communications Package (APCP).

The ISVM feature uses CCS7 messages to transport all call information to a single switch. The VMS at that single switch may need a small amount of *added capability*. The far switch has the capability of sending the interswitch part of the CHI in the appropriate CCS7 ISUP message. In addition, the far switch is also able to translate the incoming MWI CCS7 translation capabilities application part (TCAP) message into the appropriate action.

The Line Blocking Enhancements - Phase 1 and Line Blocking Enhancements - Phase 2 are optional ISVM features. No additional software considerations are associated with these features.

13.4.1.7.4 Transition Considerations

No transition considerations are associated with Line Blocking Enhancements - Phase 1 or Line Blocking Enhancements - Phase 2.

13.4.1.7.5 Network Operations

- *SMSI Support of Variable Length DNs*

Currently, the SMSI protocol supports NANP calling and called DNs (without the NPA) in CHI and MWI messages. Pending Bellcore approval for the SMDI* industry standard, the SMSI protocol will be enhanced to support full NANP DNs and can then allow support of ISVM.

- *Alternatives to SMSI for ISVM.*

The 5ESS®-2000 switch sends and receives full NANP DNs on the API for both intraswitch and interswitch applications. Therefore, any VMS that supports the API receives and sends full NANP DNs. The 3A translator, or AP (when available), translates the API protocol to SMSI and also provides full NANP DNs to the VMS. A full NANP DN version of the 3A translator will be available as a separate product

* Simplified Message Desk Interface (SMDI) is the Bellcore Industrial Standard version of the SMSI protocol. The SMDI is described in Bellcore document TR-TSY-000283.

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in the 5E7 software release. An enhancement to version 7 ACP SMSI to support full NANP DN is also available as a separate product from ISVM. Currently, the AP only displays an NANP called DN without the NPA.

- *Sending 10-Digit DNs on API.*

The API supports full NANP DNs, but in the 5E6 software release, the 5ESS@-2000 switch sends a full NANP calling DN and an NANP called DN (without the NPA). This is sufficient for intraswitch applications, but interswitch operations require 10 digits. The 5ESS@-2000 switch supports ISVM by sending full NANP calling and called DNs in the CHI message over the API.

- *Receiving 10-Digit DNs from API.*

The MWI messages sent from the VMS to the 5ESS@-2000 switch contain a full NANP destination DN for interswitch applications. Previously, for intraswitch VM, an NANP DN (without the NPA) has been sent in the MWI message. The 5ESS@-2000 switch can handle a full NANP DN (with or without the NPA) in the MWI message. If the switch receives an NANP DN without the NPA and determines that no such DN exists on the switch (that is, it can be an interswitch application), an MWI Fail message is returned to the VMS. Note that this is the way that unrecognized destination DNs have been handled.

13.4.1.8 Interactions

An originating interaction is when the VM user is the originating party. A terminating interaction is when the multiline hunt group (MLHG) serving the VMS is the terminating party. A list of features with no additional interaction is provided at the end of this section.

The following interactions apply for this feature:

- *Service Switching Point (SSP) 800 Services.*

VM user can forward calls to a toll-free access number (such as, 800 or 888), where this number translates to an MLHG serving the VMS.

Call history information delivered to the VMS cannot be complete if one of the parties in the call forwards their call to a toll-free access number and the VM is the final termination of the call.

- *900 Services.*

If the service provider makes the DN of the MLHG serving the VMS a 900 number, a VM user can forward calls there.

Call history information delivered to the VMS cannot be complete if one of the parties in the call forwards their call to a 900 number and the VMS is the final termination of the call.

Typically, the call history is missing or incomplete if the call goes through a tandem switch [local exchange carrier (LEC) or interexchange carrier (IEC)] which does not pass OCN, RgN, or RI parameters.

- *Account Codes.*

The Account Code/Customer Dialed Account Recording (CDAR) feature can be used normally in direct calls to the VMS. A VM subscriber may wish to use Account Codes/CDAR to add an account code to the AMA record or MDR record for calls

forwarded to the VM systems. This can be done using the Call Forwarding Over Private Facilities (CFPF) feature, but not with other Call Forwarding features. When activating CFPF, the user has the option of forwarding calls over the commercial network rather than over private facilities. This option is useful because private facilities do not support CCS7 signaling.

The Account Code/CDAR feature can be assigned to a terminal in the MSS MLHG.

■ *Add-On! Consultation Hold Incoming Only.*

A VM user can add a VMS to an existing conversation.

■ *Analog MWI.*

The far switch interworks with an incoming MWI transaction capabilities application part (TCAP) message with MSS, and must then be able to activate/deactivate the MWI lamp. However, the mechanism for turning on and off the lamp is not impacted.

■ *CCS7 Network Interconnection.*

At a 5ESS@-2000 switch toll office, the RI, OCN, and RgN parameters are considered unrecognized and are dropped.

■ *Attendant Call Transfer / Call Splitting / ISDN Attendant Call Transfer.*

When a call is transferred, it appears as new call to the switch. Thus, if user A calls user B, and user B transfers user A to the VMS, the calling DN is user B, not user A. Similarly, if user A calls user B, and user B transfers to user C who, in turn, forwards to the VMS, the originally called DN is user C and the calling DN is user B.

■ *Attendant Conference — Six-Way.*

A VMS could be part of a conference call, provided that one of the conferees can provide a valid login and ID.

■ *Attendant Recall from Satellite.*

An attendant could transfer a call to a VMS using this feature. The party transferred would have to know a valid login and ID to access the system.

■ *Authorization Codes.*

An authorization code could be required in order to place a call to the VMS. Normal procedures apply for the use of the Authorization Code feature in any direct call to the VMS. When users forward their calls to the VMS, the required authorization code can be entered along with the forward-to DN, using the Call Forwarding Over Private Facilities (CFPF) feature. This cannot be done with other Call Forwarding features.

The Authorization Code feature can be assigned to a terminal in an MSS MLHG.

■ *Automatic Callback-Calling.*

There are interactions with call forwarding in scenarios; such as, user A calls user B and is forwarded by user B to the MLHG of the VMS. If the call cannot be queued for the MLHG and receives busy treatment, ACBC cannot be used to camp on to the MLHG. Interactions with ACBC are not changed by ISVM.

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- *Automatic Intercept System/Intercept Service Using an External Information System.*

The call gets routed to an intercept trunk. The called DN is put in the calling DN/ANI bits and an intercept digit is also inserted. This information is signaled to the Automatic Intercept System (AIS) along with the rerouting of the call.

If the forward-to DN goes directly, or after rerouting, to a nonworking DN, then interswitch forwarded calls get AIS treatment at the far switch; an intraswitch forwarded call gets AIS treatment at the near switch.

- *Automatic Route Selection/Deluxe ARS/Electronic Tandem Switching Trunk Access/Expensive Route Warning Tone/Facility Restriction Level/Outward Calling for PBX Via ARS.*

The ARS feature cannot be used to route forwarded calls unless CFPF is used.

It is assumed, if on a direct call, that if ARS selects a CCS-controlled trunk, then the calling and called DNs are successfully interworked into the ISUP Initial Address Message (IAM). Of course, if a non-CCS-controlled trunk is chosen, then the calling party number is lost. The pre-5E7 software release 5ESS®-2000 switch implementation supports ASP hop-off which allows subscribers to call and access their ARS list until they reach a list entry that indicates 'ASP.' At that point, the call becomes ASP as if the subscriber had dialed an ASP access code or was from a dedicated line. Once the call has 'hopped-off' to ASP, the subscriber cannot reenter the ARS list for continued searching.

A VMS could have ARS assigned to its MLHG lines, but this is not likely.

- *Basic Queuing/Priority Queuing.*

Calls that terminate at the DN of the MLHG serving a VMS are queued if all lines to the VMS are busy. If the queue is full, the calling party receives busy treatment.

- *Call Associated CCS7 Network Interconnect.*

Prior to the 5E7 software release, an exchange acting as an access tandem drops unrecognized ISUP parameters and does not pass them on to an IEC switch.

- *Call Forwarding Busy Line.*

The VM users can forward their calls to a VMS using CFBL. For interswitch operation, where the VM user is served by a different switch than the VMS, the call must be forwarded on a CCS7 trunk. The far switch sends call-related data for the CHI, required by the VMS, in a CCS7 ISUP message to the near switch. This information includes the originally called DN, the reason for forwarding, and the redirecting DN (if multiple forwarding).

The near switch routes the call-related CCS7 information in the ISUP message to MSS, and then maps this information to API messages. The MSS then sends the information to the VMS on the API.

- *Call Forwarding Busy Line -- Incoming Only.*

VM users can forward their calls to a VMS using CFBLIO.

For interswitch operation, the near switch routes the call-related CCS7 information in the ISUP message to MSS and then maps this information to API messages. The MSS then sends the information to the VMS on the API.

In the case of a direct call from party A to party B [the originally called directory number (OCDN) with *privacy=Yes*] and queued or directed call pickup being used, the private OCDN is provided for display on party C's [the individual calling line identification (ICLID) user's] terminal.

In the case of a direct call from party A to party B (the OCDN with *privacy=Yes*) who forwards the call to party C (ICLID user) and the call picked up by party D (ICLID user), the private OCDN is not provided for display on party D's terminal. Instead, party D has a "private number" indication displayed because, technically, the OCDN (user B) is not the party whose call is being picked up.

An OCDN privacy request is respected when using CPU on forwarded calls and is not respected when using CPU on direct calls.

In the case of a direct call from party A to party B (the OCDN) who forwards the call using CCS7 to party C (ICLID user) and the call picked up by party D (ICLID user), the off-switch OCDN is not displayed on party D's terminal.

■ *Call Trace.*

A call to a DN on the trace list causes a printout of trace information, even when the call is forwarded from that DN to the VMS.

■ *Call Transfer — Individual — All Calls / Satellite Attendant Transfer.*

The VM users transfer calls to a VMS. However, since the call appears to the VMS to be a direct call from the party who does the transfer, the calling party is prompted for login and ID and is not able to leave a message in the VM user's mailbox.

If a call is transferred to a VM subscriber and then forwarded to the VMS, the call appears to the VMS to be a forwarded call, and the calling party is the one who does the transfer.

■ *Call Transfer — Individual — Incoming Only / Internal Only.*

The VMS can be part of a terminal group. All the existing restrictions apply to the VMS.

■ *Calling Party Number Presentation.*

The ISVM feature sets the privacy status of the original called DN to that of the calling party number. The changes CPNP makes then carries over to the OCDN.

When the CPNP feature has been activated, the presentation status of the forwarding DN is determined based on the following precedence list. Precedence ranges from highest to lowest:

- Line Indicator — values: Public, Private, and Not Set. The default value is Not Set. The line indicator is the existing all-call privacy (ACP) indicator.
- Screening Index Indicator — values: Public, Private, and Not Set. The default value is Not Set. The screening index indicator is a new indicator.
- Switch Indicator — values: Public and Private. The default value is Public. The switch indicator is the existing switch indicator.

When an indicator has a value of *Not Set*, the next indicator is examined in precedence order. This applies to both the OCDN and RDN. This presentation status is indicated when a call to the party is forwarded and the forwarding

numbers are provided.

When the CPNP feature is not active, but the line indicator (ACP indicator) has a value of Not Set, this value is treated as though it were a value of "Public."

The CPN delivery is also affected if either the Line Blocking Enhancements - Phase 1 or Line Blocking Enhancements - Phase 2 feature is active. See "Description", Section 13.4.1.1 for further information.

■ *Carrier Interconnection.*

Call Forwarding does not allow forwarding to 950-XXXX numbers. As a result, the VMS should not have a 950-XXXX number assigned to it.

■ *CCS7 Improved ISUP.*

Direct and forwarded interswitch calls to a VMS use 5E7 software release ISUP procedures.

Direct and forwarded interswitch calls to a VMS use ISUP procedures.

■ *Code Restriction.*

Forwarded calls to 3-digit customer-specified codes ((numbering plan area (NPA))) or to 6-digit codes (NPA-NXX) are blocked.

■ *Common Channel Signaling 7 ISDN User Part Version 4 Enhancements.*

The new ISUP parameters (OCN, RgN, RI) are considered under the ISVM feature, as opposed to this feature.

The ISUP Version 4 feature is providing, among other things, a new ISUP message called the Call Progress (CPG) Message. As currently planned for the 5E7 software release, the call forwarding scenarios involving this message, user-to-user information (UII), etc., are implemented by the ISUP Version 4 feature.

■ *Common Control Switching Arrangement Access.*

Interswitch calls to a VMS must be forwarded over CCS7 trunks. If they are not, essential call-related information is lost.

A call that is forwarded to a VMS over a non-CCS7 trunk does not have access to the calling DN, originally called DN, the redirection DN, the redirection information parameter, and other data needed by the VMS.

■ *Conference Calling — Three-Way/Six-Way.*

A VM user can add a VMS to a conference call for the purpose of recording the conversation. However, the administered message length of the VMS limits how much of the conference is recorded.

The VMS/MSC can be added on a conference call. For call history information delivery purpose, each leg set up by the conference controller is considered as a separate call.

■ *Customer Access Treatment Code Restriction.*

Depending on digits dialed and originating restrictions of a station, direct or forwarded calls to the VMS can be blocked in some cases.

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Depending on the origin of a call and on terminating restrictions of the VMS MLHG, direct or forwarded calls to the VMS may be blocked in some cases.

■ *Delay Announcement for Queued Calls on Hunt Group.*

It is expected that calls to a VMS are to be queued. However, the design of the MLHG is probably such that the waiting time in the queue is minimal, on the order of 2 or 3 seconds. An announcement is probably not needed nor appropriate; however, it is an available feature, if needed.

■ *Dial Access to Private Facilities.*

Both direct and forwarded calls can be routed by the 5ESS®-2000 switch over private facilities toward a switch that serves a VMS. The ISVM can only be supported if the private facility is a CCS7 trunk. Since CCS7 private facilities are not supported, ISVM cannot be supported over private facilities.

Both direct and forwarded calls can be routed by the 5ESS®-2000 switch over private facilities toward a switch that serves a VMS. The ISVM can only be supported if the private facility is a CCS7 trunk. Since CCS7 private facilities are not supported, ISVM cannot be supported over private facilities.

■ *Dial Pulsing.*

Touch-tone dialing/signaling is needed to operate a VMS inband. Thus, rotary dialing does not work with recovering messages from a VMS.

■ *Defense Switched Network/Automatic Voice Network (DSN/AUTOVAN).*

ISVM is not supported in the DSN environment.

■ *Dual Telephone Coverage.*

One of the MSS features to which a client subscribes may be an ISVM feature. This means that the client can subscribe to up to four MSS features of which only one can be ISVM. The client uses the various flavors of call forwarding to redirect calls to the appropriate messaging system.

When an MWI control message comes from another switch to a client with multiple MWIs, the 5ESS®-2000 switch knows which MWI to update since the client is allowed to have only one ISVM feature with auto MWI security set to "No."

■ *E911 Service.*

Calls cannot forward to an E911 call type.

■ *Enhanced Private Switched Communications Service/CCS7 Leased Network Interoffice Signaling/ISDN Access to Leased Network Features.*

The CCS7 transport within the EPSCS network is supported. The 5ESS®-2000 switch can act as an EPSCS node.

The 5ESS®-2000 switch can also provide access to an EPSCS network for users served by the 5ESS®-2000 switch. This access uses inband signaling rather than CCS7. The EPSCS subscribers can also gain access via the PRI from a PBX. Since neither access method is via CCS7, ISVM cannot be supported when a VM subscriber is connected to the VMS via EPSCS.

A 5ESS®-2000 switch EPSCS node does not support NANP private-network DN_s (without the NPA) on the API.

■ *Feature Code Definition.*

Feature codes can be used to activate and deactivate Call Forwarding features. A feature code can be used to deactivate an MWI from the user's station set.

■ *Foreign Exchange Line.*

This is transparent to the 5ESS®-2000 switch and 1A ESST[™] switch. This capability should not be confused with tie trunks, which are interswitch private trunk groups.

● *ICLID Call Forwarding Display.*

When an ISVM call terminates, the CCS7 redirection information (RI) parameter is mapped from the original redirection reason (ORR) to the corresponding ISDN call identification (ICI) value.

The MSS software checks to see that if the OCDN/RDN is 10 digits. If it is 10 digits and the call reason is unknown/other, then call forwarding all (CFA) is displayed on the ISDN station set. If the OCDN/RDN is not 10 digits, then INX (incoming) is displayed on the ISDN station set.

Only the MSC attendant has the option to display either the first or last redirecting DN.

The ICLID displays can be the same for intraswitch and interswitch call forwarding scenarios when all switches and trunks are equipped to transmit/receive the calling DN, redirecting DN, redirecting DN presentation indicator, and redirecting reason. For example, user A originates a call to user B. User B has calls forwarded to user C on another switch. The switches are connected with CCS7 lines that transmit originating DN and redirecting information. User C displays user A's DN, user B's DN, and ICI indicating the reason for forwarding. The ICLID displays the original called DN for multiple forwardings, but options on a message service center (MSC) attendant can allow ICLID to display the original called DN or the DN of the last forwarding party.

■ *Inspect for ISDN Terminals.*

Additional DN (for example, originally called DN, redirecting DN) information is not displayed.

■ *Intercom Dialing / Single-Digit Dialing.*

A number dialed per a special dialing plan, and intended for another switch, is translated to a normal full NANP number before being sent to the other switch.

When calls are forwarded to a VMS, the originally called DN, or the redirecting DN, is sent in the CHI to the VMS. If the originally dialed number was per a special dialing plan, the 5ESS®-2000 switch translates all the directory numbers from the individual dialing plan format to the full directory number format.

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When a call is forwarded to a VMS, the following call-related information is available to be sent to the VMS:

- Originally called DN.
- Original redirection reason.
- Redirecting DN.
- Redirection reason. Intermodule trunking does not have the capability of sending this information from the forwarding SM to the VMS's SM if non-CCS7 controlled trunks are utilized.

If CCS7-controlled trunks are used for the inter-SM trunking, the call forwarding parameters (OCN, RgN, RI) would be passed in and obtained from the ISUP IAM used for these trunks' signaling.

■ *INWATS (800 Services).*

A VM user can forward calls to a toll-free access number, where this number translates to an MLHG serving the VMS.

Terminating — Call history information delivered to the VMS may not be complete if one party in the call forwards a call to a toll-free access number and the VMS is the final termination of the call.

Typically, the call history is missing or incomplete if the call goes through a tandem switch (LEC or IEC) which does not pass the OCN, RgN, or RI parameters.

■ *ISDN Attendant Conference Calling.*

An attendant could add a VMS to a conference call (for example, to record the conversation) provided the attendant or one of the conferees could log on to the system. Also, if the attendant attempted to include a VMS subscriber whose calls were forwarded to a VMS, the VMS would be added to the conference if the originally called party did not answer or was busy.

■ *ISDN Attendant Control of Voice Terminals.*

A call could terminate at an MLHG serving the VMS and then be diverted to an attendant.

■ *ISDN Attendant Emergency Override.*

Attendant Emergency Override would override CF to a VMS.

■ *ISDN Attendant Night Service/Night Service/ISDN Attendant Power Failure Transfer.*

The attendant can use the night service (NS) feature button to forward calls to a VMS. The VMS could be either preselected or selected by using CFV.

■ *ISDN Basic Message Service System.*

Basic MSS is not extended for ISVM.

■ *ISDN Delayed and Abbreviated Ringing.*

The MSS MLHG associated with the VMS should not have shared directory numbers.

■ *ISDN Electronic Directory Service.*

The EDS feature is an intraswitch feature. There is no impact of ISVM on EDS. However, the 5E4 software release requires that if a client has MSS and EDS, the client must be in the same business customer identification (BCID) for both of these features. In addition, in the 5E6 software release, a client is able to subscribe to four MSS and one EDS features. However, the client can only be in one business customer group (BCID).

With ISVM, the auto MWI security value is set to "No." When the "Auto" MWI security is yes, the BCID association with the MSS feature may be 0. If the customer decides that security is necessary, then auto MWI security is set to "Yes." In this case, the service is intraswitch.

■ *ISDN Key Set Intercom Functions / ISDN Single-Digit Intercom.*

The calling and called DNs are given to the terminating side.

Intercom calls cannot be forwarded and, therefore, cannot be forwarded to a message service.

■ *ISDN Multibutton Key System Feature Definition Buttons.*

Message service supports several feature buttons. One of which is the message waiting indicator(s). Other feature buttons are associated with aspects of MSS which are not being extended interswitch.

■ *ISDN Message Service -- Automatic Control of Message Waiting.*

When a message is recorded at, or retrieved from, a VMS, the VMS issues an MWI activation or deactivation request and sends it to the switch. The switch determines whether the destination DN is served by itself or another switch. If the switch serves the destination DN, it acts upon the MWI request. If the DN is on another switch, the MWI request is packaged into a TCAP message and sent to that switch for action. Success or failure is reported back to the switch that sent the TCAP message. If the result is failure, the external messaging system is notified that the MWI update failed.

■ *ISDN Message Service -- Leave Word Calling.*

For interswitch call forwarding using CCS7, if the leave word calling (LWC) requester is on a switch different from the OCDN, the LWC requester receives rejection treatment when attempting to activate LWC for the off-switch OCDN.

■ *ISDN Multiple Call Appearances.*

A voice messaging system would not typically have multiple call appearances for a given DN. If the voice messaging system did have multiple call appearances, since these DNs are part of a uniform call distribution (UCD) multiline hunt group, if any one of the call appearances is busy, the DN itself is considered busy.

Since there is an option for "No Screening" on the MSS MLHG, it is possible to forward secondary-only, or non-MSS, directory numbers to the messaging system, and the forwarding DNs phone number is sent to the voice messaging system.

■ ISDN Multiple DNs.

The MSS feature can only be assigned to the primary DN.

When a VMS issues an MWI request, the message contains the destination DN. The MWI lamp is activated or deactivated at the station set where the destination DN is primary.

■ ISDN Number of Calls on Queue.

It is not anticipated that the ICIs would change due to ISVM.

■ ISDN Shared Call Appearances of a Directory Number.

If call forwarding is active for a shared DN, the shared DN becomes the originally called DN (rather than using the primary DN of the terminal on which the shared DN appears).

If a VMS issues an MWI request, the message includes a destination DN. The MWI is activated and deactivated at the station set which is the primary terminal for the destination DN.

If the VMS specifies a DN which does not subscribe to the MSS feature, the MWI request is rejected by the switch.

■ LASS Automatic Callback.

A VMS can place a call in order to deliver a message. This occurs when MWIs are not used. However, the ISVM feature assumes that an MWI is used to alert a user that a message is waiting.

Automatic Callback cannot be activated on a DN which has call forwarding active (for example, CFV, CFBL, or CFDA). If AC is used in a call terminating to the VMS, the call history information contains the calling party DN and a call reason of direct call. The AC has a window where it can camp on to a line with forwarding.

■ LASS Automatic Recall.

If a VM user calls the VMS directly and gets busy signal (that is, all lines in the MLHG are busy and the queue is full), AR could be activated. Then, the calling party would be called back and connected to the MLHG queue when space becomes available.

The AR cannot be activated to a DN which has call forwarding active (for example, CFV, CFBL, or CFDA). If AR is used in a call terminating to the VMS, the call history information contains the calling party DN and a call reason of direct call. The AR has a window where it can camp-on to a line with forwarding.

■ *Individual Calling Line Identification Calling Number Delivery/BRCS Supplementary Services for ISDN Circuit-Switched Data Calls/ISDN ICLID Calling Number Delivery.*

For calls that are forwarded to a VMS, the calling party DN is included in the call history information sent to the VMS. For interswitch call forwarding, the calling party DN is in the CCS7 IAM. The ISVM feature makes off-switch originally called DN available to the ICLID feature.

The ICLID Calling Number Delivery feature is modified to directly accept 10 digits for the originally called DN. The originally called DN becomes available for both intraswitch and interswitch calls.

The ICLID Calling Number Delivery provides full NANP originally called DN's for intraswitch and interswitch calls.

The ICLID DN Privacy feature is extended to apply to the originally called DN for an incoming call, for both intraswitch and interswitch calls. If the party originally forwarding the calls subscribes to either "all-call" DN privacy, or the switch has office privacy active, then the party's DN, (that is, the originally called DN) is marked as "presentation restricted." When the call is terminated, the presentation restriction indicator should be examined to determine whether the originally called DN is to be displayed.

■ *Individual Calling Line Identification Directory Number Privacy.*

If a line with privacy has its calls forwarded to a VMS MLHG, the line's DN is sent to the VMS in the forwarded DN field of the call history information, (that is, privacy is ignored for calls forwarded to the VM MLHG.) The VMS needs to know the forwarded DN (either the originally called DN or the redirecting DN) in order to route the call to the called party's mailbox so that a message can be left.

The calling (originating) line's DN is not sent to the VMS in the calling party number field of the call history information, either for a direct or a forwarded call, if the calling DN has all-call privacy (fixed) or per-call privacy activated. The 5ESS®-2000 switch overrides privacy if the calling DN is in a business customer group served by the VMS (intra-business group calls). For ISVM services, the Line Blocking Enhancements - Phase 1 and Line Blocking Enhancements - Phase 2 features override privacy to the VMS. The calling DN is not necessary for the VMS to operate, although there are instances where it can be convenient.

The redirecting DN (that is, the OCDN or RDN) is marked as private if the forwarding party has either "all-call" privacy or the forwarding party's switch has office privacy active.

If the call terminates to a BRI with ICLID assigned, all-call privacy status of the forwarding DN is referenced when displaying the called DN at the forward-to party. For example, if user A originates to user B, user B has an all-call privacy status of PRIVATE, and user B has calls forwarded to user C, then user C displays user A's DN, PRIVATE NUMBER (represents user B's DN), and the reason for forwarding.

■ *LASS Selective Call Acceptance/Computer Access Restriction.*

A VM user can use the SCA feature for those calls to be forwarded to the VMS.

The SCA feature can be assigned to the main DN of the MLHG associated with a VMS. Incoming calls are then screened against the SCA list before an idle member is searched. Calls from DNs not on the list are either forwarded or routed to announcement. If the VM provider only allows specific users to have calls accepted by the VMS, SCA can be used.

■ *LASS Selective Call Forwarding.*

A VM user with SCF activated has the DN of the VMS MLHG as the SCF forward-to number for calls to be forwarded to the VMS. Other Call Forwarding features can also be assigned to the same user, but SCF has precedence. An SCF user is able to forward to a nonscreening MSC.

■ *LASS Selective Call Rejection.*

The SCR feature can be assigned to the main DN of the MLHG associated with a VMS.

Incoming calls to the VM user are checked against the SCR list. Only if the call is accepted is it then terminated to the VMS.

■ *Line Blocking Enhancements - Phase 1 or Line Blocking Enhancements - Phase 2*

The Line Blocking Enhancements - Phase 1 and Line Blocking Enhancements - Phase 2 features override the privacy restriction for CPNs on ISVM calls for both direct and forwarded calls to all MSCs on a specific switch (in Phase 1) and to specific MSCs (in Phase 2).

■ *Multiline Hunt Service Circle Hunting.*

Uniform call distribution (UCD), regular, and circular are valid hunt types for an MSC.

■ *Multiple DNs Per Line with Distinctive Ringing.*

For all versions of this feature, an originating call from an MDNL port is always associated with the "Master DN," pointed to by the LEN translator. Therefore, any call placed from an MDNL port (associated with the LEN) passes the "Master DN" as the calling party number. **Terminating** — Clients with MDNL can only subscribe to the MSS feature once. However, they can assign MSS to either the master or dependent DNs; but the MSS feature is "assigned" to the master DN and all of the dependent DNs. Thus, the same assignments of the visual and audible MWIs are used for the master DN and all of the dependent DNs. When the VMS issues an MWI request, the destination DN is the DN whose mailbox received a message or had its messages erased.

■ *MultiPoint or Standard BRI.*

As long as users have their own unique DN, they can subscribe to MSS (and ISVM). Users can forward calls to a VMS and receive MWIs from a VMS.

■ *OUTWATS/OUTWATS with Simulated Facilities Group.*

Calls cannot forward over OUTWATS trunks.

Call history information delivered to the VMS may not be complete if the call terminates to the VMS through an OUTWATS trunk.

■ *Precedence and Preemption.*

There are interactions between PP and CF. For example, if a busy subscriber has CFBL active, they can have their active call disconnected and be connected to a new incoming precedence call.

There are interactions between PP and calls terminating to an MSS MLHG. For example, an active call to the MSS MLHG can be torn down and replaced by a precedence call.

■ *Q.931 and CCS7 ISDN User Part Interworking Enhancements.*

There are some changes to the ICLID feature involving the display of the OCN.

■ *Remote Activation of Call Forwarding/Remote Access to Call Forwarding.*

A VM user can remotely activate CFV to the VMS. However, CFBL and CFDA cannot be remotely activated. Remote call forwarding allows someone who has CFV assigned to their phone to activate it from a remote location. Once CFV is activated in this way, it acts just like it would if activated from the user's station set except that a courtesy call is not sent.

■ *Remote Call Forwarding.*

The remote DN can be the DN of the MLHG serving the VMS. This feature is similar to CFV, but is always active and not controllable by the subscriber.

A physical station set is not required to be associated with the dialed DN; however, CHI would be sent as if it were. For example, if a call was forwarded to a VMS from such a DN, the originally called DN in the CHI would be the forwarding DN. An MWI would not be assigned to the forwarding DN.

■ *Series Completion.*

Each member of a series completion list can separately subscribe to call forwarding; however, call forwarding has precedence over Series Completion.

Series Completion does not update the forwarding parameters.

■ *Service After Delay Announcement.*

Call history information is stored while the announcement is being played and is sent to the VMS when the call is terminated to an MLHG member.

■ *Software Defined Network.*

Two cases for ISVM configuration are as follows:

1. The VM subscriber is also an SDN customer, while the VMS is outside the SDN.
2. The VM subscriber and the VMS are both SDN users in the same virtual private network.

Terminating based on the previous two cases is as follows:

1. An on-net call arriving at the VM subscriber's DN can be forwarded to the VMS, and ISVM works properly.
2. Calls can be forwarded via SDN from a VM user to the VMS. However, the ACP does not pass along the CCS7 Call Forwarding parameters. Therefore, the CHI is not available when the call terminates to the VMS. The conclusion

is that ISVM cannot work in this configuration.

■ *Special Intercept Announcement.*

A forwarded call could get routed to a special intercept announcement.

■ *Speed Calling.*

A speed calling code can be used to place a direct call to a VMS. To activate CFV from a station set, speed calling can also be used, either as the forwarded-to DN or including the CFV access code. A maximum of 32 digits can be represented in the code.

The speed calling codes used in place of DNs by a subscriber are expanded within the switch to full directory numbers.

■ *Terminal Group Station Restriction.*

Current Call Forwarding procedures apply. If VM users are restricted to forwarding calls to a VMS within their own terminal group, then interswitch VMS does not work, since the concept of a terminal group cannot be extended across switches.

Restrictions on calling privileges are based on the terminal group that the client belongs to. No checks are made based on business customer group.

■ *Tie Trunk Access/Tandem Tie Trunk Dialing.*

Calls cannot be forwarded over tie trunks.

Calls for the MLHG serving a VMS must arrive on a CCS7 trunk if they originate on another switch.

■ *Time-of-Day.*

TOD can be used to schedule call forwarding to a VMS.

■ *Toll Diversion to Attendant.*

If the attendant forwards the call to a VMS, the attendant's DN is the OCDN.

13.4.1.9 Limitations

The ISVM feature extends MWI control and call history information flow between switches. These capabilities are extended interswitch as part of the MSS feature. This document refers to voice messaging. The messaging system on the near switch serving clients on the far switch could also be a text-based attendant service; such as, the 5ESS®-2000 switch applications processor. However, the ISVM feature will NOT extend any of the other capabilities of MSS (that is, MRD, POD, LWC, CLWC, Auto Call) to clients on the far switch.

In addition, ISVM does not extend any of the capabilities of basic MSS, such that basic MSS attendants cannot serve clients on another switch. The ISVM feature does not extend the capabilities of attendant activation/deactivation of MWI to work interswitch. There is no modification or enhancement to intraswitch attendant activation, and deactivation of MWI (that is, the security check) is not bypassed. Only MWI control messages which are received over the data link from the voice messaging system is sent interswitch using CCS7. The ISVM feature is an interswitch intra-LATA service and needs to be configured as such to operate properly.

13.4.1.10 Incompatibilities

No incompatibilities are associated with any of the ISVM features.

13.4.1.11 Dependencies

The ISVM feature requires CCS7 connectivity (that is, TCAP direct signaling and ISUP trunk signaling) from the far switch to the near switch; however, the calling party's switch to the far switch does not require CCS7. The calling party's DN is not available if the CCS7 connectivity does not exist between the calling party's switch and the far switch. The ISUP trunk must terminate on either a standard or loaded SM.

In order for Line Blocking Enhancements - Phase 1 and Line Blocking Enhancements - Phase 2 to work, the ISVM feature must be active. No other features need to be installed or activated

13.4.1.12 Isolation Constraints

No isolation constraints are associated with these features.

13.4.1.13 Service Order Perspective

In order to provide VMS capabilities, a provider is assigned one or more multiline hunt groups and a data link by service order. A VM user subscribes to the MWI option of the MSS feature. Users can choose either audible or visual MWIs. A VM user also subscribes by service order to some form of the Call Forwarding (CF) feature. For the CFBL and CFDA features, the forwarded-to DN is specified as that of the VMS itself. The CFV feature is activated and deactivated from the user's station set, and the forwarded-to DN would be entered at that time.

13.4.1.14 Feature Implementation

13.4.1.14.1 Modified RC Office Records

The following Office Records are modified for the Interswitch Voice Message feature:

- *Multiple TNs for Multiline Hunt Groups* — 5114.

The attribute CLIENT TN TYPE — Client Telephone Number Type is added and the values for this attribute are "OCDN," "RDN," or unknown. The default value is unknown.

- *Multiline Hunt Group* -- 5110-2.

The following attributes were added:

- CLIENT TN TYPE — Client Telephone Number Type is added and the values allowed for this attribute are "OCDN," "RDN," or unknown. The default value is unknown.
- BCID SCRNING — Business Customer Identification Number Screening is added and the values for the attribute are "Y," "N," or unknown. The default value is unknown.
- DELAY RING — Delay Ring is used to indicate whether the power ringing of the MSC MLHG is to be delayed for two seconds so that the application processor (AP)/voice messaging service (VMS) has time to process the call history information sent from the switch. The default entry "N" indicates do not

delay power ringing.

— INTRA SW DN — Intraswitch Directory Number determines whether the MSC is sent the interswitch DN (OCDN or RDN) or the intraswitch DN (OCDN or RDN). This field applies to the CLIENT TN TYPEs "OCDN" and "RDN". Valid entries for this attribute are "Y" and "N". The default entry is "N".

— MSC — Message Service Center is an added verify only attribute. The values for the attribute are "Y" or "N."

■ *Message Service System Group Parameters — 5962-2.*

The attribute GRP TYPE — Message Service System Group Type is added. If the GRP TYPE is "ISVM"; the rest of the fields are automatically translated, DELUXE and PASSWORD are "N" and other fields are blank. If GRP TYPE is "MSS," the other fields, except for SRV ID, cannot be unknown.

■ *Message Service System Feature Definition — 5962-1.*

The attribute MSG WAIT IND SCTY — Message Waiting Indicator Security is added and the values are "Y," "N," or unknown. The default is unknown.

■ *DSL AP Communications Data — 5963.*

The attribute ISVM is added with allowed values of "Y" and "N." The default is "N."

Additional information on the attributes for the ISVM feature can be found in 235-080-100, *5ESS®-2000 Switch Translations Guide (TG-5)*.

13.4.1.14.2 Recent Change Provisioning

13.4.1.14.2.1 Recent Change Implementation Steps

See 235-118-2xx, *Recent Change Reference*, for detailed information on allowed values.

The steps necessary to implement ISVM are very similar to implementing a typical Message Service System (MSS) BRCS Feature.

1. RC View 8.1

The attribute Applications Processor Option (APOPTION) on this view must be set to SM. This option determines if an applications processor is allowed for either the SM or the AM.

2. RC View 8.15

The ISVM TCAP Time-out Parameter for the office should be set on this view as desired. The default value is 3 seconds, and the range is from 1 to 10 seconds. This parameter would be set the first time ISVM is implemented in an office.

3. RC View 8.17

The ISVM Translation Type and Subsystem Number is set using this view which is keyed by Application Type. For ISVM, the type is "ISVM." This tuple would be provisioned the first time ISVM is provisioned in an office.

4. RC View 24.11

Only one ISVM group can be assigned to a line. Measurements cannot be taken for ISVM groups. This view does not allow the ISVM group to be input.

5. RC View 24.7

The attribute ISVM on this view indicates if the applications processor can be used for ISVM. If the AP is used for E911, then it cannot be used for ISVM.

6. RC View 3.5

This view's CLIENT TN TYPE attribute should be set to OCDN or RDN to indicate which DN will be sent to the VM system in the event of multiple call forwarding legs. The OCDN indicates that the originally called DN will be sent to the VMS. The RDN indicates the last redirecting DN will be sent to the VM.

This view's BCID SCRNING attribute should be set to "N" for ISVM. The value of this field also appears on RC View 4.36's display only attribute BCID SCRNING.

Note: If BCID SCRNING is changed from "Y" to "N" in error and an attempt is made to change it back to "Y," this change is blocked if the MSC has MSS groups (that is, if any of the fields BCID1-6 are assigned). This block ensures that when BCID SCRNING is reactivated, the BCIDs are set up properly.

The only way that the BCID SCRNING field can be changed from "N" to "Y" when the MSC has MSS groups is to use the following procedure:

1. Build a temporary MSS UCD MLHG on RC View 3.5, keeping in mind that all BCIDs for the temporary MLHG must match the BCIDs for the original MLHG.
2. Make a note of the MSS GRPs for the original MLHG on RC View 4.36.
3. Update the MSS GRPs for the original MLHG by changing the MSG SRV CNTR field on RC View 4.37 to the temporary MSS UCD MLHG (thus updating RC View 4.36 to reflect the temporary MLHG).
4. Change the original MLHG's BCID SCRNING to "Y" on RC View 3.5.
5. Update the MSS GRPs for the temporary MSS UCD MLHG by changing the MSG SRV CNTR field on RC View 4.37 to the original MLHG (thus updating RC View 4.36 to reflect the original MLHG).
6. Delete the RC View 3.5 for the temporary MLHG.

The INTRA SW DN applies to CLIENT TN TYPEs OCDN and RDN. If "Y" is the value for this field an intraswitch DN is used. If the default value "N" is entered in this field an interswitch DN is used.

The "Y" value for the DELAY RING field is used to delay power ringing for two seconds to allow the AP/VMS time to process call history information sent from the switch. If the "Y" value is used, then the AP SITE ID field must be specified. The default value "N" is used to keep power ringing from being delayed.

7. RC View 3.3

The attribute CLIENT TN TYPE on this view should be set to OCDN or RDN to indicate which DN will be sent to the VM system in the event of multiple call forwarding legs. The OCDN indicates that the originally called DN will be sent to the VM. The RDN indicates the last redirecting DN will be sent to the VM. When the CLIENT TN TYPE is OCDN, the OCDN COUNT on RC View 4.36 is incremented accordingly. When the CLIENT TN TYPE is RDN, the RDN COUNT on RC View 4.36 is incremented accordingly. The COUNTs (OCDN and RDN) are

decremented when CLIENT TN TYPE goes from any of the allowed options to blank.

8. RC View 4.37

The attribute GRP TYPE on this view is used to identify the type of MSS group used when provisioning ISVM. If GRP TYPE is MSS, the group is used for normal MSS service. If GRP TYPE is ISVM, the group can only be used for ISVM.

9. RC View 12.37

The attribute MSG WAIT IND SCTY on this view allows a Voice Mail (VM) system on the switch to activate/deactivate an ISVM customer's message waiting indicator (MWI) on the subscriber switch, thus bypassing the normal BCID and applications processor identification (APID) security checks. This option is also available to MSS subscribers in the configuration where MSS resides on the same switch as the subscriber. The MSS feature assigned to the line has MSG WAIT IND SCTY set to "N" on this view.

10. Call Forwarding

In order to have ISVM, a subscriber with attendant coverage must have some type of call forwarding.

The ISVM Recent Change Service Order Processing flowchart is shown in Figure 13-15.

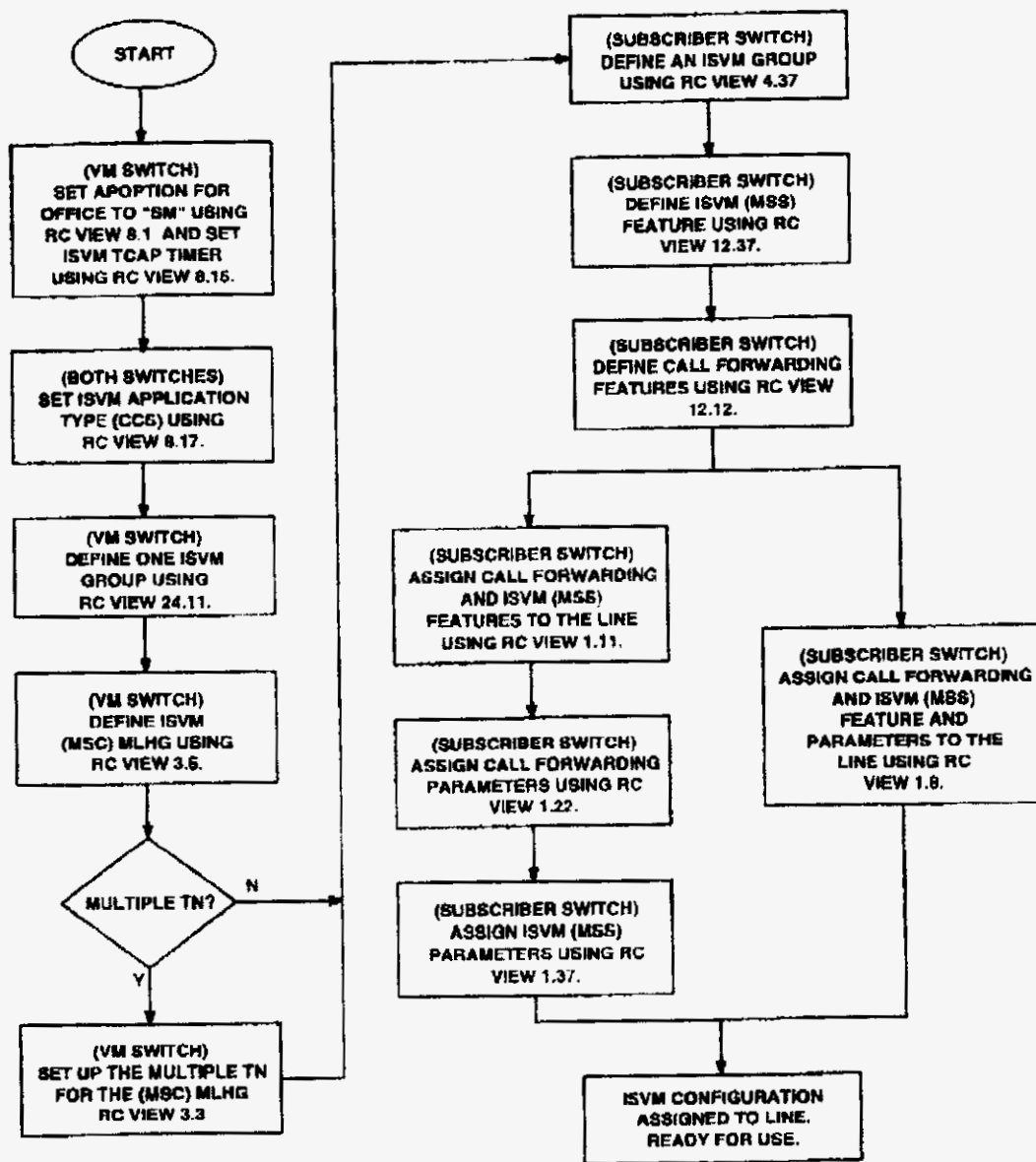


Figure 13-15 — Recent Change Service Order Processing Flowchart

13.4.1.14.2.2 RC Views Associated with ISVM

See 235-118-2xx, *Recent Change Reference*, for detailed information on allowed values.

The Interswitch Voice Messaging feature modifies the following views for 5E7 and later software releases:

■ **RC View 3.3.**

Multiple TNs for Multiline Hunt Groups View — Added the attribute **CLIENT TN TYPE**. This determines which telephone number would be sent to the VMS. The telephone numbers that can be sent are the originally called directory number (OCDN) or the redirecting directory number (RDN). **CLIENT TN TYPE** is not a required field. The default value is *unknown* (blank space). Only multiple DNs associated with the group DN may be assigned a client TN type.

■ **RC View 3.5.**

Multiline Hunt Group View — added the following attributes:

- **MSC** — **Message Service Center**: This is a display-only field that determines whether a multiline hunt group is a Message Service Center or not. **MSG SRV CTR?** has a default value of "No."
- **CLIENT TN TYPE** — **Client Telephone Number Type**: This determines whether the telephone number that is sent to the VMS is the OCDN or the RDN. The value entered for this field serves as the default for the active Message Service Center. This includes all multiple DNs of the group DN. The default value of this field is *unknown* (blank space).
- **BCID SCRNING** — **Business Customer Identification Number Screening**: This field determines whether the Message Service Center screens the BCIDs. It has a default value of *unknown* (blank space).
- **The INTRA SW DN applies to CLIENT TN TYPEs** OCDN and RDN. "Y" is the value in the **INTRA SW DN** field when an intraswitch DN is used. If the default value "N" is entered in this field an interswitch DN is used.
- The "Y" value for the **DELAY RING** field is used to delay power *ringing* for two seconds. If the "Y" value is used, then the **AP SITE ID** field must be specified. The default value "N" is used to keep power ringing from being delayed.

■ **RC View 4.96.**

MSC Users Group View — added three new display only attributes:

- **BCID SCRNING** — **Business Customer Identification Number Screening**: This field is a verify-only field to indicate what the **BCID SCRNING** field from RC View 3.5 is set to.
- **OCDN COUNT** — **Originally Called Directory Number Counter for MSC Group DN**: This is a verify-only field that keeps track of how many multiple directory numbers have **CLIENT TN TYPE** set to OCDN from RC View 3.3. The **OCDN COUNT** is derived by subtracting `rc_msusr.rdn_cnt` from `rc_msusr.cdn_cnt`.
- **RDN COUNT** — **Redirecting Directory Number Counter for MSC Group DN**: This is a verify-only field that keeps track of how many multiple directory numbers have **CLIENT TN TYPE** set to RDN from RC View 3.3.

■ **RC View 4.37.**

MSS Group Parameters View — added the attribute Group Type. This is used to identify the type of MSS group that is used when provisioning Interswitch Voice Messaging. It is an enumerated field with "0" being "MSS" and "1" being "ISVM." If the GRP TYPE is MSS, then the group is used for normal MSS service. If the GRPTYPE is ISVM, then the group can only be used for Interswitch Voice Messaging.

■ **RC View 8.15.**

CCS Office Parameters View — added the attribute ISVM TCAP Timer. This is a Global CCS Office Parameter that specifies the time-out value (in seconds) for TCAP Message Waiting Indicator Activate/Deactivate requests. It has a default value of 3 seconds.

■ **RC View 8.17.**

Direct Signaling Application View — This is not modified; however, the field, APPLIC, is modified to accept "ISVM" as an application type.

■ **RC View 12.37.**

MSS Feature Definition View — added the attribute Message Waiting Indicator Security. The MSG WAIT IND SCTY field allows a VMS on the switch to activate/deactivate an Interswitch Voice Messaging customer's message waiting indicator on the subscriber switch; bypassing the normal BCID and APID security checks. This option is available to Message Service System subscribers in a configuration where the MSS resides on the same switch as the subscriber. It has a default value of unknown (blank space); either AUD MSG WAIT IND or VIS MSG WAIT IND has to be Y for MSG WAIT IND SCTY to be known.

■ **RC View 24.7.**

DSL AP Communications Data view — added the attribute ISVM. This field indicates that the application processor can be used for interswitch voice messaging. If E911 SITE = Y, then ISVM must be N.

13.4.1.14.2.3 RC Views Associated with Line Blocking Enhancements

See 285-118-2xx, *Recent Change Reference*, for detailed information on allowed values.

The service provider unlocks the security lock for the Line Blocking Enhancements - Phase 1 and Line Blocking Enhancements - Phase 2 features by populating the following fields in RC/V view 8.22, SECURED FEATURE UPGRADE:

FIELD	VALUES
FEATURE ID	240
MODULE	OFC
PASSWD	(Obtain from Lucent Technologies SFID Administrator)
ACTIVE	Y

The service provider assigns the Line Blocking Enhancements - Phase 1 feature on a per-switch basis by populating the following fields in RC/V view 8.31, OPTIONED FEATURES:

FIELD	VALUES
FEATURE ID	669
MODULE	OFC
ACTIVE	Y

The service provider either assigns the Line Blocking Enhancements - Phase 2 feature on a per switch basis as described for Line Blocking Enhancements - Phase 1, or they assign it on an MSC basis by populating the following fields in RC/V view 3.5, MULTILINE HUNT GROUP (LINE ASSIGNMENT):

FIELD	VALUES
BCID SCRNING	No
INTRA SW DN	No
CPN PRVCY OVERRIDE	Y

Note: If both options of Line Blocking are required simultaneously, the two separate options of the features must be assigned as required for each phase.

13.4.1.14.3 Customer Premises Equipment

End-users can access the VMS from either analog or ISDN station sets. The VMS can either be on service-provider premises or on the premises of a third-party VMS provider. The VMS is connected to a single switch, but serves a multiswitch area through use of the CCS7 network. The operation of the VMS is the responsibility of the VM provider. Neither Line Blocking Enhancements - Phase 1 nor Line Blocking Enhancements - Phase 2 have an impact on customer premises equipment (CPE).

13.4.1.14.4 CCS7 ISUP Protocol

13.4.1.14.4.1 Setting the Mandatory ISUP Parameters for the Initial Address Message

For every CCS7 interswitch call, information needed for call processing and service logic is carried between switches in an ISUP initial address message (IAM). Every IAM contains six mandatory ISUP parameters. These include the message type, nature of connection indicators, forward call indicators, calling party's category, user service information, and called party number (CdPN) parameters. In addition, an IAM can contain one or more optional ISUP parameters.

13.4.1.14.4.2 Setting Selected Optional Parameters for the IAM

Setting the Calling Party Number:

For intra-LATA calls, an originating exchange (1A ESS™ switch, 5ESS®-2000 switch, etc.) always generates and sends in an IAM the calling party number (CPN) parameter. The CPN parameter can only transport network validated numbers. This is a number that is either provided by the network or provided by the originating user and has passed network screening.

If the user-provided number is network validated, it replaces the network-provided number in the ISUP CPN parameter. In all other cases, the CPN parameter is the network provided number.

A calling address is said to be "unique" if calls to the address always alert at the same unique terminal. Nonuniqueness indicates the sharing of an address between two or more terminals. Nonunique line types include the following:

- Lines behind a PBX
- Multiparty lines
- Lines which are part of an MLHG
- Shared DNs.

Beginning with the 5E6 software release, the NPA is stored as the 3-digit CPN for a call originating from a multiparty line over a trunk, or a PRI when the CPN is not available.

13.4.1.14.4.3 Call Forwarding

Once an exchange determines that a call is forwarded, it first checks that the forwarding does not result in the call exceeding the number of forwardings allowed within the network. Next, given that the limit is not exceeded, the parameters that are to be used in an IAM for the forwarded call are set.

The ISVM service relies on interswitch call forwarding which requires that the CCS7 ISUP protocol provide the CPN, CdPN, RI, and the OCN parameters on all incoming interswitch calls in the ISUP IAM. In addition, if a call has been forwarded two or more times, the redirecting number (RgN) is also provided. The OCN and RgN parameters, when generated, contain 10 digits. The CPN contains 10 digits for the MSS to send to the VM provider. If it is not 10 digits or if the nature of address indicator is international, then the CPN is not sent to the VMS provider.

A switch acting as a local tandem passes the OCN, RgN, and RI parameters. They should also be passed by a forwarding exchange to a toll office of an interexchange carrier (IEC). Once passed to the IEC, these parameters may or may not be delivered to the terminating LEC. A toll office (for example, a 5ESS®-2000 switch acting as a toll office) drops these parameters. The ISUP parameters CPN/GAP, CN/OLI, ATP, and UUI are passed by a forwarding exchange to an IEC based on IEC subscription options. Upon receipt of an incoming CCS7 call from a far switch, the ISVM user's switch attempts to set up the call.

13.4.1.14.5 Assignment Verification

The following testing procedures assure proper assignment of the ISVM feature and allow verification of proper ISVM functionality:

- Assignment Testing

- End-user is responsible for deciding the following options:

1. The end-user can access the VMS from either analog or ISDN station sets.
2. The end-user subscribes to the MSS feature.
3. The following two capabilities are offered to the end-user:

- a. Voice Mail — end-user subscribes to an MWI feature (through MSS) and chooses audible, visual, or both MWI.
- b. Call Answering — end-user subscribes to an MWI feature and subscribes to a Call Forwarding feature (for example, CFV, CFBL, CFDA, or a combination).

— Service provider is responsible for the following:

1. The service provider is assigned one or more multiline hunt groups and a data link by service order.
2. The service provider installs CCS7 signaling facilities for complete functionality.
3. ISVM can be used with any VMS that supports the API (and with use of a 3A translator).
4. RC Views are populated as follows:
 - a. RC View 8.1 — Set APOPTION for office to "SM."
 - b. RC View 8.15 — Set the ISVM TCAP Time-out Parameter.
 - c. RC View 8.17 — Set ISVM Application Type (CCS).
 - d. RC View 24.7 — Set the ISVM use field to "Yes."
 - e. RC View 3.5 — Define ISVM (MSC) MLHG.
 - f. RC View 3.3 — Set up the multiple TN for the (MSC) MLHG, if needed.
 - g. RC View 4.37 — Define an ISVM group.
 - h. RC View 12.37 — Define ISVM (MSS) feature.
 - i. RC View 12.12 — Define Call Forwarding features and assign associated RC Views associated with Call Forwarding.

■ Usage Testing

— Review all of the required views to assure they have been completed properly.

13.4.1.14.6 CCS7 TCAP Protocol

13.4.1.14.6.1 General

Internal messages have a CNI header. If requested, CNI returns an error message if a problem in routing an outgoing message occurs (for example, congestion, subsystem number not defined, etc.). The return bit is set in the CNI header for MWI activate/deactivate TCAP messages. Error codes returned by CNI are mapped to the API error cause for a failure message sent to the VMS. Table 13-8 maps error code descriptions, VM cause, and failure type.

TABLE 13-8 MESSAGE WAITING INDICATOR NETWORK FAILURE		
ERROR CODE DESCRIPTION	VM CAUSE	FAIL TYPE (NOTE)
No global title translation	INVALID	LT
Translation failure of global address	INVALID	LT
Far-end subsystem congestion	BLOCKED	ST
Far-end subsystem prohibited	INVALID	LT
Far-end subsystem unequipped	INVALID	LT
Network failure	INVALID	LT
Network congestion	BLOCKED	ST
Message returned from the CNI	INVALID	LT
Failed to send query to the CNI	INVALID	LT
Unable to read the RLds_app relation	INVALID	LT
Failed to format query message	INVALID	LT
Failed to parse response message	INVALID	LT
Unexpected component sequence	INVALID	LT
Unexpected data value	INVALID	LT
Unavailable resource	BLOCKED	ST
Reject received	INVALID	LT
Note: LT = Long-term failure. ST = Short-term failure.		

Transaction capability applications part (TCAP) is the control protocol that is used for MWI. Any TCAP protocol (formatting or parsing) errors should be handled according to TCAP specifications. These are laid out in the T1-Based Signaling System No. 7 Transaction Capabilities Protocol Specification for the Local Exchange Carrier Applications, Issue 2.

13.4.1.14.6.2 Message Waiting Indicator

The MWI alerts the VM subscriber that a voice message is available for retrieval. This indicator can be either a visual lamp or a stutter dial tone, depending on the CPE. When the VM subscriber and the VM provider are situated on different switches, the near switch sends TCAP query messages to notify the far switch that a voice message is available or that a voice message is no longer available.

13.4.1.14.6.3 Signaling Connection Control Part (SCCP) Procedures

The MWI TCAP query messages are sent in the data field of an SCCP unit data message. Query messages are routed by global title translation (GTT); therefore, the destination point code (DPC) is that of the signal transfer point (STP) performing the GTT. The originating point code (OPC) is that of the near switch. The protocol class is connectionless (class 0) and the unit data service option is "return on error." The messages are routed using connectionless service.

The called party address contains a subsystem number of 0, a translation type for ISVM, and a global title of NPA-NXX-XXXX (the full NANP DN of the ISVM subscriber.) The calling party address contains the subsystem number for ISVM and the point code of the near switch. Any error code returned in a unit data service message should be mapped to API as referred to in Table 13-8.

The MWI TCAP response messages are sent in the data field of an SCCP unit data message. Response messages are routed through DPC. The DPC is that of the near switch and the OPC is that of the subscriber's switch. As with query messages, the protocol class is connectionless (that is, class = 0); however, the unit data service option is "return on error." The called party address parameter contains the subsystem number of the ISVM feature from the calling party address parameter received in the initial message. (Note that the SSN for ISVM in the near switch need not be the same as the SSN for ISVM in the far switch.)

13.4.1.14.6.4 Message Available/Provided (MWI Activation/Deactivation)

The following list reviews the sequence of TCAP messages exchanged between near and far switches when a voice message is available or when all voice messages have been retrieved:

1. Send notification from near (VM) switch as follows:

When the VMS informs its switch that it has a message for a VM subscriber through an MWI ACT message, or that all messages have been retrieved through an MWI DEACT message, the near switch determines if the subscriber is supported by a different switch. If not, then the switch should follow the procedures for intraswitch MWI activation/deactivation.

If the subscriber is served by a different switch, then a TCAP message is sent using global title translation (based on the subscriber's DN, specifically NPA-NXX-XXXX digits) to notify the served user that they have a voice message available or that all messages have been retrieved. A timer is set upon sending this message. It can have a value between 1 and 10 seconds with default value of 3 seconds.

The notification message is of the "Query with Permission" package type and contains a single "Invoke (Last)" component with an operation type of "Report Event — Voice Message Available" or "Report Event — Voice Messages Retrieved." The component contains an "Invoke Identifier." There are two "Digits" parameters contained within this component. The first contains the destination number (number of the served user), and the second contains the VMS storage and retrieval ID (VMSRID). The default value for the VMSRID is hard coded to 0.

The far (serving) switch can receive (from another vendor's switch) a VMSRID, timestamp, or CPN parameters. This causes no special action to be taken by the 5ESS®-2000 switch.

2. Send response from far (serving) switch as follows:

- a. *Send confirm* — Upon receiving the TCAP query activation/deactivation notification, the far switch notifies the VM user through the subscribed form of notification (lamp or dial tone). In normal situations, the far switch serves the destination number and is able to notify the served user that there is a voice message waiting, or that all messages have been retrieved by activating or deactivating their MWI indicator. To confirm success, the far switch sends a TCAP message of the "response" package type containing a single empty "return result (last)" component to the VMS switch. No parameters are present in this message.
- b. *Send fail* — If the activation/deactivation notification could not be performed, the far switch sends a TCAP message of the "response" package type containing a "return error" component and error code to the VMS switch. The following service-specific errors can be encountered:
 - If the destination DN is not currently assigned to an active interface, the far switch returns the error code "Unassigned DN."
 - If the received destination DN is not a full NANP DN, the far switch returns the error code "Unassigned DN."
 - If the far switch is overloaded and cannot currently handle the request, the far switch returns the error code "Task Refused."
 - If the far switch implements MWI security based on the VMSR ID and if a destination DN is not a customer of the identified VMS, the far switch returns the error code "VMSR System Identification did not Match User Profile." This implementation of ISVM does not provide any MWI security checking (for example, by checking the VMSR IDs) for received interswitch TCAP MWI messages. Regardless of the value of the received VMSR ID, ISVM ignores it and, hence, this error code is not returned.
 - If there is no feature in the destination DN's line data at the far switch that has the security option set to "no" (that is, the destination DN is not an ISVM subscriber), then the switch returns the error code "Unassigned DN."
 - If the far switch detects other TCAP data errors (for example, unavailable resources, an unexpected data value) the switch returns an appropriate error code.
- c. *Send reject* — If a far switch receives a TCAP message with a missing mandatory parameter (for example, destination DN or VMSRID), a response package containing a "reject" component is returned to the near switch. If a far switch receives a TCAP message with any unrecognized parameter (for example, destination DN or VMSRID), a response package containing a "reject" component and problem code is returned to the near switch. In either case, MWI activate/deactivate is not carried out by ISVM service.

If other TCAP protocol errors are detected (for example, a message type, component type, operation code, or legitimate TCAP parameters other than those permitted for ISVM), a "reject" component and problem code are returned to the near switch.

3. Receive response at near (VM) switch as follows:

- a. *Receive confirm* — If, after sending a query message indicating voice message available/retrieved, the near switch receives a "response" package containing a "return result (last)" component and the near switch cancels the waiting timer and assumes that the transaction was completed. No corresponding message is sent to the VMS.
- b. *Receive fail* — If, after sending a query message indicating voice message available/retrieved, the near switch receives a "response" package containing a "return error" component and cancels the waiting timer and generates an *MWI_Fail message*. This message is generated from the information received in the "return error" component. The application-returned error code is mapped into the cause field, and the *message type* field is set to "MWI_Fail" of the *MWI_Fail message*. Network-returned error code is mapped into the cause field. The *MWI_Fail message* is sent to the VMS.

If the waiting timer expires, an *MWI_Fail message* is generated. Moreover, if a response is received after a time-out, then no additional *MWI_Fail* is generated.

Any TCAP error code other than the four specified for ISVM (for example, unavailable resources) is mapped to the API error cause in the *MWI_Fail message* sent to the VMS per Table 13-8.

- c. *Receive reject* — If, after sending a query message indicating voice message available/retrieved, the near switch receives a "response" package containing a "reject" component, the near switch cancels the waiting timer and generates an *MWI_Fail message*. The problem code contained in the returned "reject" component is mapped to the API error cause in the *MWI_Fail message* sent to the VMS per Table 13-8.

If a protocol or application error is detected by the near switch in the received response message from the far switch, the near switch cancels the timer and sends a unidirectional package containing a reject component or a return error component, respectively, to the far switch. The near switch also sends (through API) an *MWI_Fail message* containing an "invalid" error code to the VMS. This unidirectional message is discarded by far switch.

13.4.1.14.6.5 Network-Returned Messages

After sending a query or response message into the CCS7 network, the message can be undeliverable to the final destination for a variety of reasons. Because the UDS option is set in the SCCP header for both queries and responses, the CCS7 network returns the message to the sender in these cases. The message format is identical to that sent, with the exception of appropriate returned bits being set.

13.4.1.14.7 Deleting Customer Service

If a VM provider deactivates ISVM service to customers (that is, end-users, clients, etc.), the service provider requires recent change procedures to delete the VMS provider's MSC from the switch data base. An MSC is defined as a multiline hunt group that serves a message service provider.

In the 5E6 software release, the 5ESS®-2000 switch does not allow an MSC to be deleted unless the association in switch data between each message service client and the serving MSC has previously been removed. In addition, all clients of an MSC are served by the same switch as the MSC.

With the interswitch capabilities provided by the ISVM feature, the association in switch data between each voice messaging client and an MSC is not present. For clients on a different switch from the MSC, no association is possible. For clients on the same switch as the MSC, the association with the MSC in switch data may or may not exist. If ISVM service is to be deactivated, a list of the end-users to be notified is kept independently of switch data. Either the service provider or the VM provider (or both) could maintain this list, depending on the business arrangement used.

13.4.1.14.8 Changing a Subscriber's Service

13.4.1.14.8.1 General

Service changes by the service provider are accomplished by recent change (RC) procedures. In ISVM, recent change is used for the following:

- Assignment of Call Forwarding features to provide coverage
- Assignment of data link to serve VMS
- Assignment of MLHGs to serve VMS
- Assignment of client TN type to be included in CHI for forwarded calls
- Construction of MSS features
- Assignment of MSS features to end-users
- Assignment of ISVM subsystem number and translation type
- Assignment of TCAP time-out parameter for ISVM.

13.4.1.14.8.2 Call Forwarding Features

Users who want Call Answering forward their calls to the VMS. Standard methods for assignment and activation of Call Forwarding features are used for this purpose.

13.4.1.14.8.3 AP Data Link Assignment

For both the 5ESS®-2000 and 1A ESS™ switches, existing methods are to be used for assigning the data link to serve the VMS. For the 5ESS®-2000 switch, the following applies: with each AP site ID, the RC parameter "ISVM" with allowed values Yes/No, default=No. If AP is dedicated to E911 service, then the value is set to "No." The E911 feature uses a dedicated AP.

When the 5ESS®-2000 switch receives an MWI request with a full NANP destination DN over an API data link and determines that the target DN is not served by the same switch, it checks the value of the parameter "ISVM" before sending a TCAP MWI request toward another switch. If "ISVM=Yes," then the TCAP message is sent; whereas, if "ISVM=No," then the TCAP message is not sent, and an MWI_Fail message is sent to the VMS.

13.4.1.14.8.4 Screening for Multiline Hunt Groups

Each VMS is served by one or more MSS MLHGs. For MSS MLHGs, the applications processor identification (APID) identifying the associated API data link is specified on a per-MLHG basis, just as in the 5E6 software release. Also, as in the 5E6 software release, the API data link is defined in recent change before it is assigned to an MSS MLHG.

In addition, a new attribute is specified on a per-MLHG basis for MSS MLHGs. This attribute is "Screening=(Yes/No)." It is mandatory for MSS MLHGs. When "Screening=Yes," the following applies:

- Calls forwarded to the MSS MLHG receive screening as in the 5E6 software release.
- Courtesy calls to the MSS MLHG from subscribers on the same 5ESS@-2000 switch are blocked.
- When a subscriber with a Call Forwarding feature on the same 5ESS@-2000 switch as the MSS MLHG requests the 5ESS@-2000 switch to change the forwarded-to DN to that of the MSS MLHG, the 5ESS@-2000 switch screens the request the same as in the 5E6 software release.

When "Screening=No," none of the three types of screening specified previously are done. In other words, all calls (that is, direct, forwarded, courtesy) are allowed to terminate to a non-screening MSC. When "Screening=Yes/No," the MLHG is referred to as a screening/non-screening MLHG. The ISVM subscriber forwards their calls to a non-screening MLHG; otherwise, the call forwarding request receives failure treatment. For the deluxe MSS feature (used with ACP and an API data link), both screening and non-screening MLHGs can be associated with the same API data link. When an MSS group is defined, the MSS MLHG associated with it can either be screening or non-screening. For basic MSS (meaning an API data link is not used), only screening MLHGs can be used.

In the 5E6 software release, at least one BCID is associated through recent change with each MSS MLHG. This is also true in the 5E7 software release with one exception: a non-screening deluxe MSS MLHG can be assigned either with or without one or more BCIDs.

13.4.1.14.8.5 Assignment of OCDN/RDN to Lead DN of MLHGs

An attribute to be specified on a per-lead DN of MSS MLHG basis is "Client TN Type=(OCDN/RDN)," where OCDN means originally called DN, and RDN means redirecting DN. Client TN type is a mandatory parameter. Since this parameter is applied to the lead DN of the MLHG, this field is added to View 3.5 (which "creates" the MLHG) and to View 3.3 (used to add additional lead DNs to an MLHG). If an individual DN within the MLHG is "forwarded-to," the DN which is sent to the VMS (either OCDN or RDN) is based on the option which is set for the MLHG as a whole (View 3.5). In other words, the option set in View 3.5 is the default.

For calls forwarded to an MSS MLHG, the client TN type controls which DN is inserted into the client DN field in the CALL_INFO message sent over the data link from the switch towards the message system. If a message is left, it is put into the mail box associated with the client DN. When "Client DN Type=OCDN," the OCDN is sent in the client DN field. When "Client TN Type=RDN," the RDN (that is, the DN that

forwarded the call to the MSS MLHG) is sent. The OCDN and RDN are the same for calls that are forwarded only once, but they differ for multiple forwarded calls.

For a basic MSS MLHG on the 5ESS®-2000 switch, the value of the client TN type is OCDN. However, a no-screening basic MSS MLHG with "Client TN Type=OCDN" is not allowed. The value of RDN is not allowed for basic MSS MLHGs.

13.4.1.14.8.6 Construction and Assignment of VMS Features

An option provided by the present feature is the ability to bypass the MWI security check. This is necessary to allow the far switch to carry out MWI activation/deactivation requests received through CCS7 from the near switch. Equivalent service for intraswitch subscribers is provided by bypassing the security check for MWI activation/deactivation requests received over API. The ability to bypass the MWI security check applies only to MWI requests received over a data link (CCS7 or API). The MWI security check is not bypassed when an MSS attendant sends an MWI activation/deactivation request to the near switch through the attendant's analog line or DSL.

To provide the option of bypassing the MWI security check, recent change provides for definition of an MSS feature option. This MSS option is "Auto MWI Sec=Yes/No."

When "Auto MWI Sec=Yes," the 5ESS®-2000 switch acts on all MWI activation/deactivation requests the same as in the 5E6 software release. (The MWI security check is made). When "Auto MWI Sec=No," the 5ESS®-2000 switch bypasses the security check for MWI activation/deactivation requests received through CCS7 or API. The choice of option has no effect on MWI activation/deactivation requests sent by an attendant to the 5ESS®-2000 switch through the attendant's analog line or DSL. Regardless of the value of this option, the MWI security check is not bypassed for these requests.

For interswitch subscribers, the service provider administers the feature "Auto MWI Sec=No," so that the MWI security check is bypassed.

The procedure for assigning MSS features is the same in the 5E7 software release as it is in the 5E6 software release. For the 5E7 software release, no more than one MSS feature with "Auto MWI Sec=No" can be assigned to a primary DN.

For an interswitch VM subscriber, it is known that deluxe MSS (AP-based CMSS) is used, but the APID and the identity of the message system are not needed. In addition, no BCID is used; therefore, the information in the MSS group is not needed for an interswitch subscriber. The same is true for intraswitch subscribers who are provided equivalent service.

Consistent with the current practice for provisioning all MSS features, a special MSS group (can be called an ISVM group) is used to provision ISVM. This special MSS group is not predefined in the 5ESS®-2000 switch ODD. The service provider personnel define the group when they desire to provision the ISVM service. The ISVM group can only be assigned to a line in conjunction with an MSS feature with MWI "Security=No" and the LWC, CLWC, POD, MRD, and AC options set to "No."

The parameters in the ISVM group are default values that have no effect on the service provided to users. When "Auto MWI Sec=No," it should be possible to assign the ISVM group to a (primary DN, MSS feature) pair. The service provider can use this procedure to simplify the administration of MSS groups. The 5E6 software release requirement (that all MSS features assigned to a given primary DN have the same BCID) continues

to apply, except that a single MSS feature having "Auto MWI Sec=No" can be assigned with the ISVM group. The 5ESS®-2000 switch enforces the restriction that the ISVM group cannot be assigned when "Auto MWI Sec=Yes."

An attribute "Type" should be associated with each MSS group. For ISVM groups, type has the value "ISVM." For pre-5E7 software release MSS groups, type has the value "MSS." The default is "MSS."

The ISVM group can be assigned to intraswitch MSS subscribers when both of the following are true:

- The desired service does not involve the switch receiving any MWI activation/deactivation requests through an attendant's analog line or an attendant's DSL.
- The MSS feature options listed as follows have the values shown:
 - Auto MWI Sec=No
 - Leave Word Calling=None
 - Cancel Leave Word Calling=None
 - Message Retrieval Display=No
 - Print on Demand=No
 - Auto Call=No.

If the MSS feature has any of the previously listed feature options, the ISVM group should not be used. The 5ESS®-2000 switch enforces this restriction.

For interswitch subscribers, the only available MSS feature options are "Aud MWI" and "Vis MWI," "MWI Deact by User," and "Att Cov." The ISVM group can be assigned to simplify service provider administration of MSS groups for interswitch subscribers.

The preconstructed MSS features are provided in Table 13-9. In each case, the feature definition should include association with the ISVM group, and all MSS feature options not shown should be denied.

FEATURE	AUTO MWI SEC	AUD MWI	VIS MWI	DEACT MWI	ATT COV
/MSAAM	No	Yes	No	Yes	Yes
/MSAVM	No	No	Yes	Yes	Yes
/MSAAVM	No	Yes	Yes	Yes	Yes
/MSAA	No	Yes	No	No	Yes

The following are the four preconstructed features introduced by ISVM and the definitions:

- /MSAAM — Attendant Coverage, Audible Message Waiting Indicator, Message Waiting Indicator Deactivation.

- /MSAVM — Attendant Coverage, Visual Message Waiting Indicator, Message Waiting Deactivation.
- /MSAAVM — Attendant Coverage, Audible Message Waiting Indicator, Visual Message Waiting Indicator, Message Waiting Indicator Deactivation.
- /MSAA — Attendant Coverage, Audible Message Waiting Indicator.

The service provider can also assign any of these preconstructed features in association with an MSS group of type MSS or ISVM.

13.4.1.14.8.7 ISVM Subsystem Number and Translation Type

The ISVM is an application type. The capability to specify the subsystem number and translation type for the ISVM application is provided on a per-office basis.

This is administered through recent change in the 5ESS®-2000 switch. In the 5ESS®-2000 switch, the ISVM application type is entered as the key in an existing recent change view, and the subsystem number and translation type are entered as mandatory parameters in this view.

13.4.1.14.8.8 TCAP Time-Out Parameter for ISVM

When a TCAP MWI activation/deactivation request is sent, a timer is set where expiration is determined by the value of the TCAP time-out parameter for ISVM. This is a per-office parameter that is recent changeable in the 5ESS®-2000 switch. The allowed values are from 1 to 10 seconds in steps of 1 second, with a default value of 3 seconds.

13.4.1.14.8.9 Recent Change Table

For the 5ESS®-2000 switch, the recent change parameters for ISVM specified previously are summarized in Table 13-10. Each parameter in the first column is to be assigned to the entity specified in the second column.

PARAMETER	ASSIGNMENT	ALLOWED VALUES	COMMENTS
Screening	MSS MLHG	Yes/No	Mandatory for MSS MLHG _s
Client TN Type	Lead DN and up to 15 of its Multiple DNs	OCDN/RDN/null	Mandatory for MSS MLHG _s
Type	MSS Group Parameter	MSS/ISVM	Default=MSS
Auto MWI Sec	MSS Feature Option	Yes/No/null	Mandatory if Feature has A-MWI or V-MWI Assigned
Application Type	Per Office	ISVM	New Value for Existing Field
TCAP Time-Out Parameter for ISVM	Office Parameter	1 to 10 sec.	Default=3 sec.
ISVM	AP Site ID	Yes/No	Default=No

13.4.1.14.8.10 Counter for Multiple DNs

The service provider is not allowed to change an MSC MLHG to a non-MSC MLHG whenever there is a lead multiple DN assigned with a valid client TN type. In order to assist the service provider in determining the number of lead multiple DNs with a valid client TN TYPE, a counter is implemented. Two counters are used to keep track of how many lead multiple DNs have a nonnull value for client TN TYPE. One counter indicates how many have the client TN option and the other indicates the RDN option. Each counter is 4 bits, thus, allowing a maximum of 15 lead multiple DNs with a value for client TN TYPE specifically set for that DN.

13.4.1.15 Feature Operation

13.4.1.15.1 Overview

When a VMS is integrated with a 5ESS®-2000 switch to provide intraswitch VM, two types of messages are exchanged between the switch and the VMS. These are the CHI and MWI control messages. The CHI receives information from the 5ESS®-2000 switch to the VMS concerning the call that is being set up. The MWI control messages include MWI activation and deactivation requests sent by the VMS to the 5ESS®-2000 switch, and an MWI_Fail message sent from the 5ESS®-2000 switch to the VMS.

When VMS is extended to cover users on another switch, information for the CHI and MWI control messages is exchanged between the switch serving the VMS (the near switch) and the switch serving the user (the far switch). In addition, the near switch converts the interswitch CCS7 signaling messages into CHI or MWI messages that can be sent on the switch/VMS interface (that is, the API for the 5ESS®-2000 switch). The far switch converts the MWI activation and deactivation signals into a lamp or stutter dial tone indication. The far switch also generates and sends ISUP data for CHI messages and TCAP MWI_Fail and MWI confirm messages to the near switch.

13.4.1.15.2 Interswitch Data for CHI

13.4.1.15.2.1 General

The following information is sent from the far switch to the near switch (on the CCS7 network) to support the ISVM feature.

13.4.1.15.2.2 Voice Mail

The only CHI data needed for voice mail (that is, a direct call to the VMS) is the calling party number (that is, the DN of the party who is calling the VMS).

13.4.1.15.2.3 Call Answering

The CHI data needed for call answering (that is, for calls that are forwarded to the VMS) include the following:

- The calling party number — The DN of the party originating the call.
- The originally called DN (OCDN) — The DN of the party who was originally called and who forwarded the call either to the VMS or to some intermediate station.
- The original redirecting reason — The reason the call was forwarded from the originally called station (for example, user busy, no reply, unknown).
- The redirecting DN (RDN) — The last DN that a call is forwarded to before it is forwarded to the VMS. For example, if party A calls party B who forwards to party C, and party C forwards to the VMS, party B is the originally called DN, and party C is the redirecting DN.
- The redirecting reason -- The reason the call was forwarded to the VMS from the redirecting DN.

For both voice mail and call answering, calls are terminated at one of the MLHGs serving the VMS. The near switch puts the MLHG ID and the MLHG member ID in the CHI sent to the VMS.

13.4.1.15.2.4 Multiple Call Forwarding

Calls can be forwarded more than once before arriving at a VMS. The number of times a call is forwarded is kept in a call forwarding counter in the redirection information parameter. This counter records the total number of forwardings, both intraswitch and interswitch. The originally called directory number (OCDN) and the redirecting directory number (RDN) are sent from the far switch to the near switch in the CCS7 ISUP initial address message (IAM). The OCDN is the DN of the party who was originally called and who forwarded the call either to the VMS or to some intermediate station. The RDN is the last DN that a call is forwarded to before it is forwarded to the VMS. The RDN is the party that forwards to the VMS.

13.4.1.15.3 MWI Control Messages

The following messages are exchanged between the near switch and far switch, using CCS7, in order to implement MWI control:

- MWI activation request — Sent from the near switch to the far switch.
- MWI deactivation request — Sent from the near switch to the far switch.
- MWI confirm — Sent from the far switch to the near switch when an MWI activation or deactivation request has been successfully carried out.

- MWI fail — Sent from the far switch to the near switch when an MWI request is not able to be carried out.

13.4.1.15.4 Call Processing Treatment

13.4.1.15.4.1 General

The ISVM feature uses the MSS software to send and receive CHI and MWI messages. However, some aspects of MSS are modified for ISVM services.

There is no provision for a BCID to be sent interswitch. For ISVM operations, it is required that calls can be forwarded to a VMS and that MWI requests can be acted upon. This implies that the BCID security checks for CF and MWI control are not performed.

An option to bypass BCID screening of forwarded calls is provided on a per-MLHG basis. When the no-screening option is chosen, calls forwarded to the MLHG by both interswitch and intraswitch subscribers bypass BCID screening. Intraswitch subscribers who want BCID screening of forwarded calls should forward their calls to an MLHG that has the screening option.

13.4.1.15.4.2 Call Processing for Call Forwarding to VMS

When a call is forwarded to the VMS from a subscriber's phone, the 5ESS®-2000 switch first checks the attributes of the MLHG that the call is forwarded to. The new screening attribute is set to "No" for MLHGs that ISVM users forward to. This directs the 5ESS®-2000 switch not to look for the BCID-based call forwarding check, but to forward the call without any screening to the VMS. This option is also available to intraswitch users, if needed.

For calls that are forwarded interswitch, and for some intraswitch calls also, a BCID is not associated with the forwarding DN. However, MSS requires that the BCID field in the call history message be populated. Where there is no BCID associated with the calling party DN (for direct calls) or the forwarding party (for forwarded calls), a default value can be put into the BCID field of the CHI message. Previously, if an interswitch direct call was made to a VMS (implying that there was no BCID available), a value of zero was put in the BCID field. This practice is extended to all calls where BCIDs are not available.

13.4.1.15.4.3 Call Processing for MWIs from VMS

As already stated, it is highly desirable that a VM provider have the option to provide or not provide MWI security to intraswitch users. There are a number of ways that intraswitch MWI security can be bypassed.

An MWI message from the VMS to the near switch contains the destination DN and, also, a BCID and station ID (SID) (optional). The BCID and SID (optional) can be put into the MWI message either by the VMS or an AP, depending on how the VMS is connected to the near switch. An SID is only needed if the VMS is connected to an AP with multiple messaging services.

For end-users with "Security=No," any value could be put in the BCID field since the end-user would not be associated with a business group so far as this feature is concerned.

The 5ESS®-2000 switch would first assume that the MWI message pertained to an MSS feature with "Security=Yes." Just as previously done, it would check the value of the BCID, the service ID, and APID against values contained in the MSS group description (MSS GRP) for each MSS feature associated with the destination DN which had "Security=Yes." If a match was found, the 5ESS®-2000 switch would adjust the user's MWI. If no match was found among the features with "Security=Yes," but there was a feature left with "Security=No," the 5ESS®-2000 switch would assume that this was the right feature and would activate or deactivate the MWI.

Note: An end-user can only subscribe to one MSS feature with "Security=No."

If the full NANP destination DN for the MWI request is on another switch. It then packages the request into a TCAP message and sends it to the far switch. There is no BCID, APID, or SID in the message.

In the 5E6 software release, end-users who subscribe to multiple messaging services receive the Dual Telephone Coverage feature, allowing them to have a unique MWI for each service. For example (with the 5E6 software release), the 5ESS®-2000 switch is able to turn on indicator light 1 if an MWI activation request originates from messaging service 1. The 5ESS®-2000 switch turns on indicator light 2 if the request comes from messaging service 2. If a 5E7 software release customer wants to subscribe to multiple messaging services (one of which is VM on another switch), the switch that is turning on the indicator light recognizes when that particular VMS sends an indication. It can do this because it is assumed that an off-switch MWI comes from a VMS. (Note that this restricts a user to either subscribing to only one messaging service with "Security=No," or else to accept that MWIs generated by all off-switch messaging services are treated as if they came from the same source.)

13.4.1.15.5 Call Processing Scenarios

13.4.1.15.5.1 Overview

The following discussion describes typical scenarios for direct and forwarded calls to the VMS.

13.4.1.15.5.2 Direct Call to VMS — Voice Mail

13.4.1.15.5.2.1 Intraswitch Operation

It is assumed that VM user A, voice mail user B, and the VMS share the same 5ESS®-2000 switch. For voice mail, user A calls the VMS, retrieves messages, and composes and sends a message to user B. The following steps occur:

1. User A calls the VMS (NANP DN without the NPA).
2. The call is completed to an MLHG serving the VMS.
3. The MSS sends CHI to the VMS, using the API protocol.
4. The VMS answers the call.
5. After sending a message to user B and retrieving messages, user A hangs up.
6. The VMS sends an MWI deactivation message for user A to the 5ESS®-2000 switch. The message contains user A's DN, a BCID, and an SID, if appropriate.

7. The VMS sends an MWI activation message for user B to the 5ESS®-2000 switch. The message contains user B's DN, a BCID, and an SID, if appropriate.
8. The 5ESS®-2000 switch checks the MSS features associated with the destination DN in the MWI message. For each feature with "Security=Yes," it checks the associated group view to see if there is a match between the BCID, APID, and SID, if appropriate. In this case, no such match would be found (having assumed a "Security=No" feature), and the 5ESS®-2000 switch would check the list of MSS features to see if there was one with "Security=No." Upon finding this feature, the 5ESS®-2000 switch acts upon the MWI request without first attempting the security check. If no feature with "Security=No" is found, an MWI_Fail message would be sent to the VMS.
9. The 5ESS®-2000 switch deactivates user A's MWI and activates user B's MWI. If users A and/or B subscribe to more than one messaging service with a corresponding multiplicity of MWIs, the 5ESS®-2000 switch then identifies which MWI is to be activated or deactivated.

13.4.1.15.5.2.2 Interswitch Operation

Here, it is assumed that VM user A and VM user B are served by the far switch, with the VMS served by the near switch. As for the intraswitch scenario, user A calls the VMS, retrieves messages, and sends a message to user B. It is assumed that users A and B are in the same LATA. The following steps occur:

1. User A calls the VMS (NANP DN with or without the NPA).
2. The call is completed to an MLHG serving the VMS.
3. The far switch sends CHI to the near switch in a CCS7 IAM message.
4. The ISUP process in the near switch delivers the information in the CCS7 message to MSS, and MSS maps the message to an API message.
5. The MSS sends CHI to the VMS, using the API protocol.
6. The VMS answers the call.
7. After sending a message to user B and retrieving messages, user A hangs up.
8. The VMS sends an MWI deactivation message for user A to the 5ESS®-2000 switch. The message contains user A's DN, BCID, and an SID, if appropriate.
9. The VMS sends an MWI activation message for user B to the 5ESS®-2000 switch. The message contains user B's DN, a BCID, and an SID, if appropriate.
10. The MSS feature in the near switch verifies that the full NANP DNs in the MWI request messages for users A and B are not on the near switch. The switch performs screening, maps the MWI request messages for users A and B into separate CCS7 TCAP messages and then sends these messages to the TCAP process. The TCAP process sends the messages to the far switch. One TCAP message contains user A's DN and the other contains user B's DN. They also contain a 10-digit default value of the VMSRID, although this is not used. There is no BCID, APID, or SID.
11. The far switch maps the CCS7 MWI messages to MSS. Included in the mapping is the information that the MWI originated at another switch.

12. If the far switch is a 5ESS®-2000 switch, it uses the information that the MWI originated at another switch to deduce that the MWI came from a VMS. The 5ESS®-2000 switch checks the MSS features associated with the destination DN (user A's or B's) and finds the one with the "Security=No" attribute. There can be only one such feature for each DN. When the 5ESS®-2000 switch finds an MSS feature with "Security=No," it acts upon the MWI request without first attempting the security check. If the check is negative (that is, there is no feature with "Security=No"), the far switch sends an TCAP error message to the near switch and the near switch sends the MWI_Fail message to the VMS.

13. The far switch deactivates user A's MWI and activates user B's MWI.

Note that VM user B could be served by the near switch. In that case, the near switch would not map the MWI activation message for user B to a CCS7 TCAP message, and the procedure would be the same as the intraswitch case. Also, VM user A could be served by the near switch, with user B on the far switch. The MWI deactivation message for user A would not be mapped to a CCS7 TCAP message, and the procedure would be the same as the intraswitch case.

13.4.1.15.5.3 Call Forwarding to the VMS Call Answering

13.4.1.15.5.3.1 Intraswitch Operation

Here, it is assumed that user B has subscribed to Call Forwarding to the VMS. User A may or may not be a VM subscriber. The following occurs:

1. User A calls user B (who has call forwarding to the VMS).
2. The call is forwarded to the MLHG serving the VMS.
3. The MSS checks the attributes of the MLHG serving the VMS. (It is assumed in this scenario that the VMS subscriber forwards calls to an MLHG that has been assigned the value "Screening=No" by the service provider.) The switch then forwards the call to the VMS without screening.
4. The MSS sends CHI to the VMS.
5. The VMS answers the call.
6. User A leaves a message for user B and hangs up.
7. The VMS sends an MWI activation request for user B to the switch. The MWI message contains user B's DN, a BCID, and an SID, if appropriate.
8. The switch checks the MSS features associated with the destination DN (user B's DN) in the MWI message. For each feature with "Security=Yes," it checks the associated group view to see if there is a match between the BCID, APID, and SID. In this case, no such match would be found (because we have assumed a "Security=No" feature), and the switch would then check the list of MSS features associated with user B to see if there was one with "Security=No." Upon finding this feature, the switch acts upon the MWI request without first attempting the security check.
9. The switch activates user B's MWI.

13.4.1.15.5.3.2 Interswitch Operation

Here, it is assumed that VM users A and B are served by the far switch, and the VMS is served by the near switch. User A calls user B who has calls forwarded to the VMS. It is also assumed that user A and B are in the same LATA. The following steps occur:

1. User A calls user B who has call forwarding to the VMS (interswitch)
2. The call is forwarded to the MLHG serving the VMS
3. The far switch sends the data for CHI to the near switch in a CCS7 IAM message.
4. The ISUP process in the near switch delivers the information in the IAM message to MSS, and MSS maps the message to an API CHI message.
5. The MSS checks the attributes of the MLHG serving the VMS. (It is assumed in this scenario that the VMS subscriber forwards calls to an MLHG that has been assigned the value "Screening=No" by the service provider.) The switch then forwards the call to the VMS without screening.
6. The MSS sends CHI to the VMS.
7. The VMS answers the call.
8. User A leaves a message for user B and hangs up.
9. The VMS sends an MWI activation request for user B to the switch. The MWI message contains user's B's DN, a BCID, and an SID, if appropriate.
10. The MSS process in the near switch maps the MWI message to a CCS7 TCAP message and sends it to the TCAP process. The TCAP process sends it to the far switch. The TCAP message contains user B's DN. It also contains a default value of the VMSRID, although this value is not used. There is no BCID.
11. The far switch maps the CCS7 TCAP message to the MSS. Included in the mapping is the information that the MWI originated on another switch.
12. If the far switch is a 5ESS®-2000 switch, it uses the information that the MWI originated at another switch to deduce that it was sent by a VMS. The 5ESS®-2000 switch checks the MSS features associated with user B's DN and finds the one with "Security=No." There can only be one such feature per DN. When the 5ESS®-2000 switch finds this feature, it acts upon the MWI request without attempting the security check. If there is no feature with "Security=No," the far switch sends an TCAP error message to the near switch and the near switch sends it to the VMS.
13. The switch activates user B's MWI.
14. The far switch sends back a TCAP response to the near switch.

13.4.1.15.6 Internal Call Processing Controls**13.4.1.15.6.1 Code Interpretation**

The service provider continues to have the ability to assign and change the access codes for call forwarding to the VMS and to screen MWI deactivation by user.

13.4.1.15.6.2 Screening

The 5ESS®-2000 switch MSS feature screens call forwarding to a message service, based on a BCID. For ISVM, this screening cannot be done since BCIDs are not sent interswitch. For a VMS serving only intraswitch customers, screening is an option.

Similarly, the 5ESS®-2000 switch MSS feature screens MWI activation and deactivation messages based on a BCID and APID. For ISVM, this screening is not done. For intraswitch VMS, it is an option. In addition, the 5ESS®-2000 switch performs the following screening for interswitch MWI requests. After verifying that the DN specified in the MWI request is not on the same switch, the 5ESS®-2000 switch checks for the following:

- That the MWI request was received over an API data link having the value "Yes" for its associated "ISVM" parameter.
- That the full NANP DN in the MWI request is allowed as a possible full NANP DN in the North American Numbering Plan.

If both these conditions are met, the MWI request is mapped to a TCAP message which is sent towards a far switch. If neither condition is met, no TCAP message is sent and an MWI Fail message is returned over the API data link. The purpose of this screening is to avoid, to the extent possible, using network resources to process unauthorized or invalid interswitch MWI requests.

13.4.1.15.7 TCAP Message Trapping

The service provider is provided the capability to trap on abnormal events that occur in connection with CCS7 TCAP messages used for MWI activation/deactivation. When a trap has been set, occurrence of the specified abnormal event triggers a display or printout which indicates occurrence of the abnormal event and provides information about the event. Capability is provided to set and clear traps, to verify the status of a trap, and to display the information related to a trapped event.

Capability is provided to trap on the following types of abnormal events:

- a. **Response Time:** A TCAP MWI activation/deactivation request is sent out over CCS7, but no response is received before time-out.
- b. **Failure Message Received:** Either a TCAP response package or unidirectional package is received containing a return error component or a reject component.
- c. **Message Not Delivered:** A TCAP MWI activation/deactivation request is sent out over CCS7, and the message is returned by the CCS7 network because it could not be delivered to its intended destination.
- d. **Failure Message Sent:** Either a TCAP response package or unidirectional package is sent out over CCS7 containing a return error component or a reject component.

Abnormal events of types 1 and 3 occur when the 5ESS®-2000 switch plays the role of near switch. Event types 2 and 4 occur when the 5ESS®-2000 switch is acting either as far switch or near switch.

When an abnormal event is trapped, the resulting display or printout includes the following information, when available:

- Type of abnormal event.
- Type of request (activation or deactivation) in the TCAP message.
- Values of destination DN in the TCAP message.

13.4.1.16 Administration

13.4.1.16.1 Measurements

13.4.1.16.1.1 VM Provider (MLHG)

An existing AMA record (Call Code 320, Structure Code 01058) records peg counts of call history messages sent out over the API data link and of MWI activation/deactivation requests received and successfully carried out. The events are pegged on a per-MLHG basis. They are treated similarly to those in Section 75 of TRFC30. All call history messages are pegged to the MSS MLHG to which the call is offered.

The MWI activation/deactivation requests that are received by the 5ESS®-2000 switch over an MSS attendant's analog line (or digital subscriber line) are pegged to the MSS attendant's MLHG, just as in the 5E6 software release. However, MWI activation/deactivation requests that are received by the 5ESS®-2000 switch through TCAP or API encounter the following complication. When an MWI activation/deactivation request is carried out, but the MWI security check is bypassed, there is no determination by the 5ESS®-2000 switch as to which message service originated the MWI request. Therefore, the event cannot be pegged to an MSS MLHG. On the other hand, when the MWI security check is made, the 5ESS®-2000 switch uses parameters in a pre-5E7 software release MSS group to identify the message service. The MSS MLHG number is one of the parameters of this pre-5E7 software release MSS group. Therefore, the 5ESS®-2000 switch pegs the count for the specific MSS MLHG.

These facts lead to successful MWI activation/deactivation requests, received over TCAP or API, being pegged in Structure Code 01058 if the MWI security check is made, but not pegged if the MWI security check is not made. This provides a meaningful AMA record in the 5E7 software release. Interswitch MWI activation/deactivation events are never pegged. Intraswitch counts are pegged only when originated by an attendant or when the MWI security check is carried out. The name of the field that records MWI activation/deactivation counts in Structure Code 01058 is not changed.

The MWI activation/deactivation events are pegged in Structure Code 01058 and are summarized in Table 13-11. The results are given separately for MWI activation/deactivation requests received from an MSS attendant over TCAP and API.

TABLE 13-11 MWI ACTIVATION/DEACTIVATION EVENTS			
SOURCE OF MWI REQUEST	SECURITY CHECK YES	SECURITY CHECK NO (MSS)	SECURITY CHECK NO (ISVM)
MSS Attendant	Pegged	Not Applicable	Not Applicable
API	Pegged	Pegged	Not Pegged
TCAP	Not Applicable	Not Pegged	Not Pegged

For MWI requests received from MSS attendants, a security check of BCID is always made. For successful requests received over TCAP, the security check is never made. This accounts for the two boxes labeled "Not Applicable" in Table 13-11. Note that Structure Code 01058 records all call history messages, but records only those MWI activation/deactivation events that have the MWI security check.

The Section 75 of TRFC30 is an existing special study (on a per MSS MLHG basis) in which the following types of events are pegged:

- a. The number of attempts to complete incoming calls to the MSC MLHG.
- b. The number of incoming calls completed to the MSC MLHG for which call history information is received and then sent over the API to the VMS.
- c. The number of incoming calls completed to the MSC MLHG for which call history information, minus the calling DN, is received and then sent over the API to the VMS.
- d. The number of MWI activation/deactivation requests.

For more detailed information on measurements and peg counts, refer to 235-070-100, *Traffic and Plant Measurements*, Appendix 1.

13.4.1.16.1.2 End-User

For MSS features, an existing AMA record (Call Code 319, Structure Code 01057) records (on a per-BCID basis) peg counts of business customer requests to use the following MSS feature options:

- MWI Deactivation by User
- Leave Word Calling (LWC)
- Message Retrieval Display (MRD)
- Printout on Demand (POD)
- Auto Call.

In the 5E6 software release, each MSS feature option is assigned with a pre-5E7 software release MSS group which specifies the BCID to which the request is pegged. A changed aspect for the 5E7 software release is that, when "Auto MWI Sec=No," certain MSS feature options can be assigned with the ISVM group which does not specify a BCID. In this case, it is not appropriate to peg the request on a per-BCID basis in Structure Code 01057. In Structure Code 01057, the 5ESS®-2000 switch pegs requests for feature options that are assigned with a pre-5E7 software release MSS group, but does not peg requests for feature options assigned with the ISVM group.

The MSS feature options LWC, MRD, POD, and Auto Call can be assigned only with a pre-5E7 software release MSS group. Therefore, requests to use these feature options are always pegged in Structure Code 01057. There is no change from the 5E6 software release; however, the MSS feature option "MWI Deact by User" can be assigned with either a pre-5E7 software release MSS group or the ISVM MSS group. Requests for "MWI Deact by User" that are associated with the ISVM group are not pegged. This would typically occur for interswitch subscribers and for intraswitch subscribers with equivalent service.

The net result is that existing AMA recording on a per-BCID basis is preserved, but no AMA recording is made of requests for "MWI Deact by User" when this feature option is assigned with the ISVM group. For this case, flat-rate charging of end-users meets service provider needs.

13.4.1.16.2 Billing

There are three parties involved in VM services: the 5ESS®-2000 switch service provider, the VM provider, and the end-user. The 5ESS®-2000 switch service provider supplies services to both the VM provider and the end-user and has the capability to charge both parties. The VM provider supplies services to the end-user and is assumed to keep appropriate records for charging the end-user.

It is assumed that the 5ESS®-2000 switch service provider and the VMS provider create the arrangement, whereby, the end-user is billed by both parties separately, or the service provider bills the VM provider for all VM-related items and the VM provider bills the end-user. (The service provider can also be the VM provider.)

A possible business billing arrangement is for end-users to request VM from the provider and for the VM provider to order the appropriate end-user features from the service provider. The service provider would charge the VM provider for these services and the VM provider would bill the end-user who would then receive a single monthly bill for VMS. This arrangement requires the service provider to administer data of the following type (note that this data need not be administered in the switch):

- a. Associated with the VM provider— A list of end-users and a list of the service provider services provided to each end-user that are to be charged to the VM provider.
- b. Associated with each end-user— A list of services that are to be charged to the VM provider and the identity of the VM provider.

The VM provider can choose to charge the end-user for placing and storing messages in the end-user's voice mailbox. The VMS would use CHI received from the switch on a per-call basis to determine into which end-user's voice mailbox to place a message.

In order to make use of call answering, the end-user also subscribes to at least one Call Forwarding feature. The usual billing for call forwarding subscription applies (that is, subscription to call forwarding is billed flat rate).

The ISVM feature uses call code 320 and structure code 01058 for billing the voice message provider by the telephone service provider. The ISVM feature uses call code 319 and structure code 01057 for billing the end-user by the telephone service provider.

With the Line Blocking Enhancements - Phase 1 and Line Blocking Enhancements - Phase 2 features usage sensitive "Per Call Privacy" will be pegged even if overridden.

For more detailed information on AMA records and billing information, refer to 235-190-300, *5ESS®-2000 Switch Billing Features and Specifications* document.

13.4.2 Message Service Center**13.4.2.1 Description — MSC Basic Service**

National

Custom

When a call is terminated to the basic message service attendant, the switch collects the following information:

- The calling DN (if available)
- The originally dialed DN
- A reason indication.

The 5ESS®-2000 switch then sends the call information over the D-channel to the answering attendant's visual display. Based on the call information displayed, the attendant may provide customized responses.

Basic service does not use the AP and is limited to the use of ISDN station sets by Message Service Center attendants. An MSS client with basic service may use either analog or ISDN station sets. Additionally, basic service only supports the OCDN client.

The MSS client can leave messages, retrieve new messages, or update personal status by calling the MSC directly. The MSS user, wishing to have call coverage, may subscribe to the Call Forwarding feature to forward user phone calls to the basic MSC.

13.4.2.2 Description — MSC Deluxe Service

National

Custom

When a call is terminated to the Message Service Center, the switch collects the following call information:

- The business customer identification (ID)
- A reason indication (Call Forwarded Don't Answer, Call Forward Busy Line, All Calls Forwarded)
- The calling DN (if available)
- The originally called (dial) DN (OCDN)
- The redirecting DN (optional in Custom ISDN)
- The identity of the MSC line answering the incoming call.

Call information is sent to the AP or the VMS through the AP Interface data link.

An MSS client can retrieve new messages or update status information by calling the MSC directly. The direct call screen provides the attendant with call information, the client's status profile, messages left by the client for incoming callers, and messages left for the client by incoming callers. The forwarded call screen provides the attendant with call information, the client's status profile, messages left by the client for incoming callers, and a message input form.

The MSS deluxe service uses an ACP or VMS to automate the message entry-retrieval and MWI activation-deactivation requests. The MSS clients and MSC attendants with deluxe service may use either analog or ISDN station sets. Additionally, MSS deluxe

service supports either the OCDN or RDN client types.

13.4.2.3 Cross References

The following cross references apply to the Message Service Center feature:

- Feature Number: 99-5E-0389

13.4.2.4 Availability

The MSC capability is available in the:

- 5E8 software release for National ISDN
- 5E4 software release for Custom ISDN.

13.4.2.5 Interactions

The following interactions apply for this feature:

- *Call Forwarding (CF).*

A user may activate Call Forwarding to the MSC if the user has Attendant Call Coverage and is served by the MSC.

When a call terminates to an MSC after multiple forwardings, the originally dialed DN is the number presented to the attendant for MSS Basic Service or sent across the API link for MSS Deluxe Service.

Note: Since call coverage is being provided for an MSC client, an error condition will result if the originally dialed DN is different from an MSC client.

If a user has Call Forwarding and attempts to forward calls to a message service that does not cover the BCID of the user, the switch does not forward calls to that service.

The following describes when the switch checks for a valid BCID:

- When the forward-to DN is entered via recent change, recent change does not check for a valid MSS feature and BCID. When the feature is activated via recent change, or by the user via an activation action (for example, when using the action BNTOG), during the forwarding attempt, the switch checks for a valid MSS feature and BCID. The BCID of the client must match the BCID of the MSC on the 5ESS®-2000 switch. In addition, the message service provider's BCID must match the client's BCID on the switch. If the checks do not pass, the call is not forwarded.
- When the user is allowed to enter the forward-to DN (using the action CFDNCH) and the forward-to DN is for a message service, but the user does not have a valid MSS feature and BCID, then the forward-to DN is not updated. The user is then given reorder tone treatment.
- *Time-of-Day (TOD).*
Time-Of-Day lines forwarded to the MSC must be served by the MSC. If not, they will be rejected.
- *DN Privacy.*

An incoming call to an MSC attendant will override DN Privacy on direct forwarded calls if the calling party is also in a BCID served by the MSC. Incoming forwarded calls will override privacy of the forwarding party since the forwarding party must be served by the MSC.

■ *Electronic Directory Service (EDS) Calling Name Display (CND) (Custom Only).*

The calling party's name will be displayed at the ISDN MSC for Custom ISDN. EDS is not available on the National ISDN BRI.

■ *Multiline Hunt Group (MLHG) Hunting.*

The MSC is dependent on MLHG Hunting. An MSC consists of an MLHG with a uniform call distribution (UCD), regular or circular hunt type.

■ *Individual Calling Line Identification (ICLID).*

An incoming call from within the same business customer group to an MSC attendant will display the originator's DN even if the DN Privacy feature is activated during the origination.

■ *Shared DN.*

The MSC DNs should not be shared. The MSC DNs may be equipped as a primary DN or a secondary-only DN for MSC Attendants with ISDN station sets.

13.4.2.6 Feature Implementation

Refer to MLHG in 235-190-103, *Business and Residence Feature Descriptions*.