Corporate Headquarters
5200 Paramount Parkway
Morrisville, NC 27560 USA
Phone +1.888.628.5521
+1.919.468.5500
Fax: +1.919.380.3862
E-mail: info@tekelec.com

Network Signaling Group

Dimensioning Guide for EPAP Advanced DB Features

EAGLE 35.0 and later

CHANGE HISTORY

Date	Revision	Author	Revision Description	Approved (Yes/No)
30 Apr 04	1.0	R. Allison	New document	N
1 July 04	1.1	R. Allison	Updates from Review	Y
1 July 04	1.2	R. Batko	Updates for publication	Y
23 Jun 06	1.3	C. Villareal	Updates for EAGLE 5 ISS	Y
23 Jul 06	1.4	C. Villareal	Updates for EAGLE 5 ISS	Y

TABLE OF CONTENTS

List of Figures

List of Tables

1 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to provide planning and dimensioning information to aid Tekelec personnel and EAGLE customers in the sale, planning, implementation, deployment and upgrade of EAGLE 5 ISS which are equipped with one of the EAGLE's EPAP Advanced Database (EPAD) Features. The EPAD features include:

Deleted: EAGLE 5 ISS

- G-Port Mobile Number Portability (G-Port MNP)
- G-Flex Virtual HLR (G-Flex vHLR)
- GSM Equipment Identity Register (EIR)
- INAP-based Number Portability (INP)
- IS-41 to GSM Migration (GSM Migration)

All of the EPAD features utilize the same EAGLE+MPS architecture for the purposes of provisioning data and for message processing. For the purposes of background information, some brief details on the system architecture are included in Section 2 below.

All EPAD features include a common set of static components that are always included for any installation. In addition, the EPAD features include a variable set of components based on the number of database entries purchased and the number of transactions per second purchased. See Section 2 for details.

This document is intended to complement, but not replace, the EAGLE Planning and Feature Guides, Refs [1] and [2].

1.2 REFERENCES

1. *EAGLE® 5 SAS Feature Guide*, 910-1225-01, Rev I, Tekelec, December 2003.
2. *EAGLE® 5 SAS Planning Guide*, 908-0124-01, Rev K, Tekelec, December 2003.
3. *EIR on MPS/EPAP Technical Reference*, TR005450, Rev 2.1, September 2003.
4. *ELAP/EPAP UI 2.0 for EAGLE 28.0 Technical Reference*, TR005112, Rev 2.0, January 2003.
5. *EPAP Provisioning Database Interface Technical Reference*, TR003029, Rev 2.7, April 2004.

1.3 ACRONYMS

ANSI-41	American National Standards Institute 41
DN	Directory Number
DSM	Database Services Module
EIR	Equipment Identity Register
EPAD	EPAP Advanced Database features
EPAP	EAGLE Provisioning and Application Processor
GB	Gigbyte
G-Flex	Global Flexible numbering
G-Port	GSM mobile number Portability
GSM	Global System for Mobile communication
HLR	Home Location Register
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
INAP	Intelligent Network Application Part
INP	INAP-based Number Portability
IS-41	Interim Standard 41 (same as ANSI-41)
ISDN	Integrated Services Digital Network
ITU	International Telecommunications Union
MDN	Mobile Directory Number

MIN	Mobile Identification Number
MNP	Mobile Number Portability
MPS	Multi-Purpose Server
MSISDN	Mobile Station ISDN number
PDB	Provisioning Database
PDBI	Provisioning Database Interface
RTDB	Real Time Database
SAS	Signaling Application System
vHLR	Virtual HLR

1.4 DOCUMENT ORGANIZATION

Section 1 of this document is administrative in nature.

Section 2 of this document is introductory in nature and provides background technical information which helps to explain the reasoning behind the dimensioning rules for the EPAD features.

Section 3 of this document contains the commercial dimensioning rules for configuration of an EAGLE 5 ISS with EPAD features. These rules are to be used for all quotations for new installations and for quotations to increase the database capacity of existing installations.

Deleted: EAGLE 5 ISS

Section 4 of this document includes an interactive tool which allows the user to enter different configurations of feature sets and database number entries and provides detailed statistics regarding the memory space used and the memory space allocated for each configuration. This tool is for informational purposes only, and is not used to derive the commercial dimensioning guidelines for these features. The commercial guidelines are per Section 3.

2 TECHNICAL BACKGROUND

This section provides a high level technical overview of the provisioning side of the EAGLE 5 ISS when equipped with one of the EPAD features. This background is intended to familiarize the reader with some of the concerns that should be considered when dimensioning such a system and the technical reasoning for those concerns.

Deleted: EAGLE 5 ISS

2.1 EAGLE+MPS SYSTEM OVERVIEW

This is a brief overview of the EAGLE+MPS system used for provisioning and message processing of the EPAD features, and is not intended to give an in depth explanation of the EAGLE or the MPS system.

Figure 1 shows a block diagram of the EAGLE+MPS platform. The diagram shows a mated pair of EAGLEs, each with an MPS (Multi Purpose Server). The EAGLE handles all SS7 message processing functionality, while the MPS is responsible for receiving database updates from the customer's IP provisioning network, storing those updates for redundancy, and passing those updates to the EAGLE's SCCP handler cards (Database Service Modules, or DSMs) for SS7 message processing. The large red-shaded cube represents the EAGLE proper. The entities shown above (EPAP A and EPAP B) represent the MPS platform attached to the EAGLE.

An MPS system consists of two TekServers (each running the EPAP application) and associated hardware (circuit breakers, Ethernet hub, etc.). Each EAGLE in a mated pair has one MPS system attached. The two MPS systems are referred to as a mated MPS system. Within one MPS system (i.e. the MPS system for one EAGLE), the two TekServer EPAPs would be considered mated EPAPs and would be referred to as an EPAP A and EPAP B.

The EPAP (EAGLE Provisioning and Application Processor) application includes the software application needed for provisioning of the EPAP databases and the EAGLE's DSM SS7 processing cards. This software is referred to as the PDBA (Provisioning Database Application). The EPAP houses two kind of databases, including the PDB (Provisioning Database) and RTDB (Real Time Database). The PDB is the human-readable "golden copy" of the customer provisioned data. This is the database which is directly updated by the customer's provisioning systems. The RTDB is a binary version of the PDB which is generated by the PDBA application and is optimized for performance. This is the format of the data which is replicated on the EAGLE's DSM cards for use in SS7 message processing.

EPAP A and EPAP B are slightly different in their configuration. EPAP A holds a copy of both the PDB and the RTDB. EPAP B contains a redundant copy of the RTDB, but does not contain a copy of the PDB. This architecture is duplicated on the mated MPS system on the mated EAGLE. Thus, within a single mated pair of EAGLEs, there are two redundant copies of the PDB version of the data, and four redundant copies of the RTDB version of the data. This does not include the copies of the RTDB which are resident on the DSM cards. Each DSM card in the EAGLE holds a copy of the RTDB in its entirety. The EPAP is connected to the DSM cards via a 10/100 base T Ethernet for downloading of the RTDB to the DSM cards.

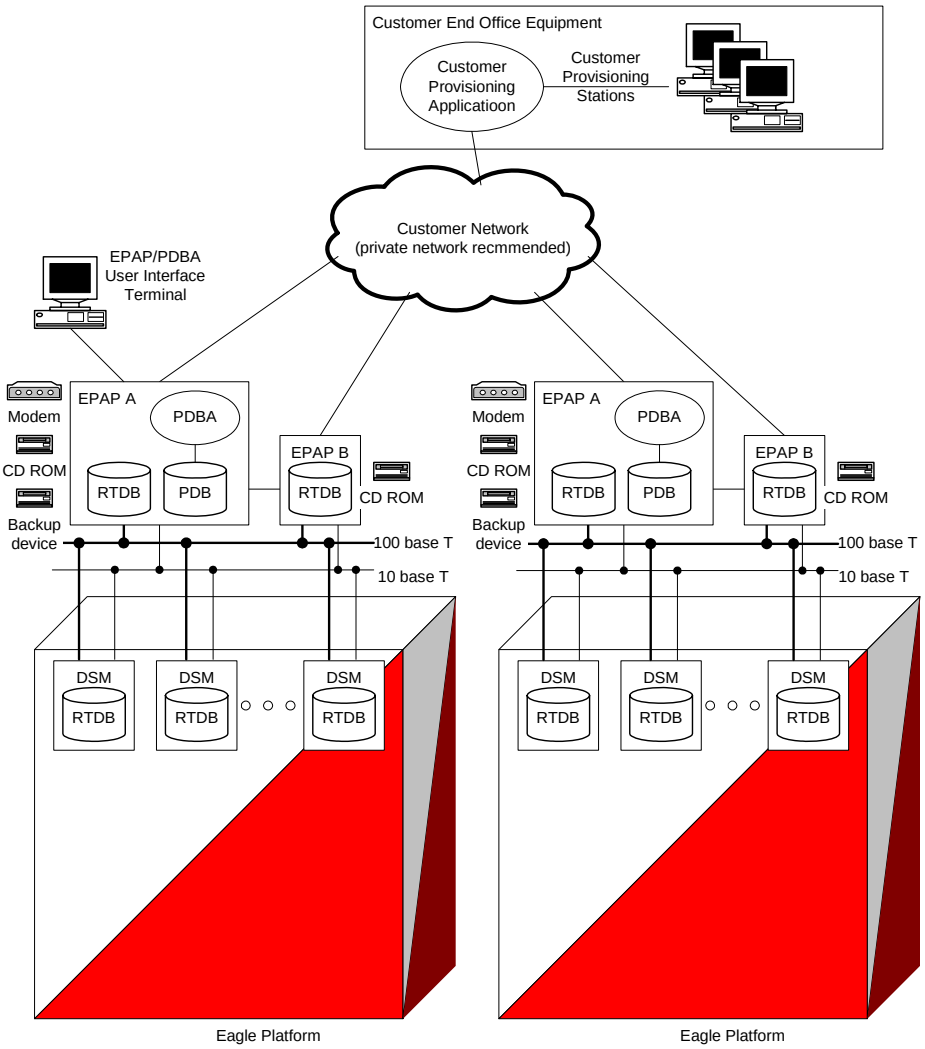

Figure 1: EAGLE/MPS System Architecture

2.2 PROVISIONING FLOW OVERVIEW

This section offers an overview of the provisioning flow process, which is relevant to the subject of this document in that this mechanism has a bearing on the dimensioning of the hardware in the EAGLE 5 ISSs for EPAD features. Again, this is a high level overview and is not intended to be an in depth explanation of all aspects of the EPAP provisioning process. See Ref [5] for more details regarding the EPAP process.

Deleted: EAGLE 5 ISSs

Referring again to Figure 1, the two EPAPs on the mated sites are in an active/standby relationship such that the customer provisioning system only needs to update one of the sites, and the PDBA application on the active EPAP automatically replicates the data to the standby EPAP on the mated site. (The EAGLE 5 ISS currently supports automatic replication for up to 8 EAGLE nodes from a single source).

When data is provisioned by the customer provisioning system, the following sequence of actions is taken by the PDBA application on the active EPAP (Active PDBA):

1. Data is committed to the PDB on the active EPAP
2. Data is replicated to the PDB on the standby EPAP on the mated site
3. Data is converted to RTDB format and is committed to the RTDBs on local EPAP A and EPAP B (the RTDBs on the active MPS site). NOTE: If Selective Homing is set to Active, the Active PDBA will also replicate the RTDB data to the RTDBs on remote EPAP A and EPAP B at the standby MPS site.
4. If Selective Homing is not set to Active, the Active PDBA will not replicate data to the RTBDs on the remote EPAP A and EPAP B. Rather, the Standby PDBA will replicate locally after having been updated by the Active PDBA.

Once the data has been provisioned to the EPAP RTDBs, it will then be forwarded to the EAGLE's DSM cards over the private IP network that exists between the EPAP and each DSM. Only after this step is the data active in the DSM card, and therefore active for SS7 routing. In this step, each set of DSMs are updated by their respective EPAP RTDB on the local MPS. In this manner, each EAGLE's DSM cards are updated by the EPAPs at that particular site. There is no option for an EAGLE's DSMs to be updated from the EPAP RTDBs on a remote MPS.

2.3 EPAP DATA TYPES

The EPAP system is used by all of the EPAD features for provisioning of data and for replication of this data to the EAGLE's DSM cards for SS7 routing. For the provisioning of these features, the customer's provisioning IP network connects to the EPAP an API known as the PDBI (Provisioning Database Interface). Because the PDBI and the EPAP databases (i.e. PDB and RTDB) are shared among all of the EPAD features, the PDBI has adopted six generic data types which are utilized by one or more of the EPAD features. These data types are DN, IMSI, IMEI, DN Block, IMEI Block, and Network Entity, and are described below. Again, this is relevant to the subject of this document because the data type has a bearing on the dimensioning of the EAGLE 5 ISS.

Deleted: EAGLE 5 ISS

In terms of dimensioning of the system, only the DN, IMSI, and IMEI are factors in the size of DSM cards needed because each of these data types are priced and sold separately, and have different impacts on the memory usage in the DSM card. Network Entity, DN Block, and IMEI Block are automatically factored into the base system.

The DN, IMSI, and IMEI data types are known collectively as Subscriber Numbers. The total system capacity currently supported is 56 Million Subscriber Number entries. These 56 Million number entries are divided among the DN, IMSI, and IMEI data types.

2.3.1 DN

The DN (Dialed Number) data type corresponds to the E.164 number assigned to a subscriber as their "telephone number". This is the number dialed by someone trying to call the subscriber. The DN data type is used by the INP, G-Port MNP, and GSM Migration features, and optionally by the G-Flex vHLR feature.

For the G-Port MNP feature, the DN data type corresponds to the subscriber's GSM MSISDN. For the GSM Migration and G-Flex vHLR features, the DN data type corresponds to the subscriber's GSM MSISDN on a GSM network and the subscriber's IS-41 MDN on the IS-41 network. For the INP feature, the DN data type corresponds to the subscriber's ETSI/ITU DN.

In terms of data storage in the PDB and RTDB, whether the number is a GSM MSISDN, IS-41 MDN, or ETSI/ITU DN, it is stored as a DN data type.

Up to 56 Million DN data types may be purchased and provisioned on an EAGLE 5 ISS. However, the actual number of DN data types allowed on a particular system is dependent on (1) the number or other data types (IMSI and IMEI) coexisting on the system, and (2) the size of DSM card installed in the system (1, 2, 3 or 4GB).

2.3.2 IMSI

The IMSI (International Mobile Subscriber Identity) data type corresponds to the E.212 number assigned to a particular subscriber. Unlike the DN, this is not a "telephone number" which can be dialed to reach the subscriber. This is a number used to identify a particular mobile subscriber in the network. The IMSI data type is used by the G-Flex vHLR and EIR features.

For the EIR feature and for G-Flex used in a GSM environment, the IMSI corresponds to the subscriber's GSM IMSI. For G-Flex used in an IS-41 environment, the IMSI data type corresponds to the subscriber's IS-41 MIN.

In terms of data storage in the PDB and RTDB, whether the number is a GSM IMSI or IS-41 MIN, it is stored as an IMSI data type.

Up to 56 Million IMSI data types may be purchased and provisioned on an EAGLE 5 ISS. However, the actual number of IMSI data types allowed on a particular system is dependent on (1) the number or other data types (DN and IMEI) coexisting on the system, and (2) the size of DSM card installed in the system (1, 2, 3 or 4GB).

2.3.3 IMEI

The IMEI (International Mobile Equipment Identity) data type corresponds to the unique identification number assigned to a particular mobile handset in a GSM network. This data type is used only by the EIR application. In terms of data storage in the PDB and RTDB, the IMEI data type corresponds directly to the GSM IMEI.

Up to 32 Million IMEI data types may be purchased and provisioned on an EAGLE 5 ISS. However, the actual number of IMEI data types allowed on a particular system is dependent on (1) the number or other data types (DN and IMSI) coexisting on the system, and (2) the size of DSM card installed in the system (1, 2, 3 or 4GB).

2.3.4 DN Block

This data type offers the ability to enter ranges of DN numbers for the INP, G-Port MNP and GSM Migration features (and optionally the G-Flex vHLR feature). Up to 50,000 DN Blocks are allowed on an EAGLE 5 ISS. DN Blocks are part of the base system, and the full capacity is configured regardless of the other data types present on the system, or the size of the DSM cards. As a result, the actual number of DN Block data types used has no impact on the dimensioning of an EAGLE 5 ISS.

Deleted: EAGLE 5 ISS

Deleted: EAGLE 5 ISS

2.3.5 IMEI Block

This data type offers the ability to enter ranges of IMEI numbers. Up to 50,000 IMEI Blocks are allowed on an EAGLE 5 ISS. IMEI Blocks are part of the base system, and the full capacity is configured regardless of the other data types present on the system, or the size of the DSM cards. As a result, the actual number of IMEI Block data types used has no impact on the dimensioning of an EAGLE 5 ISS.

Deleted: EAGLE 5 ISS

Deleted: EAGLE 5 ISS

2.3.6 Network Entity

This data type corresponds to the HLR or other SS7 node address translations used by the G-Port, G-Flex, INP, and GSM Migration features. Up to 150,000 Network Entities are allowed on an EAGLE 5 ISS. Network Entities are part of the base system, and the full capacity is configured regardless of the other data types present on the system, or the size of the DSM cards. As a result, the actual number of Network Entity data types used has no impact on the dimensioning of an EAGLE 5 ISS.

Deleted: EAGLE 5 ISS

Deleted: EAGLE 5 ISS

2.4 DSM MEMORY ALLOCATION

The EPAP replicates the entire RTDB database to each of the DSM SCCP processing cards on the EAGLE 5 ISS. Each DSM stores a copy of the entire RTDB, which contains all of the provisioned data types for all of the EPAD features. Each DSM will contain all of the DNs, IMSIs, and IMEIs that have been provisioned for the EPAD features. All SS7 processing and routing occurs on the DSM cards.

Deleted: EAGLE 5 ISS

The EAGLE supports four types of DSM cards which differ only in the amount of memory installed on the card. There are 1GB, 2GB, 3GB, and 4GB DSM cards.

The currently supported system maximum of 56 Million total Subscriber Numbers requires a 3GB DSM minimum.

2.4.1 Memory Allocation on DSM Card

Subscriber Number data is written to three different types of tables on the EAGLEs DSM cards: DN table type, IMEI table type, and IMSI table type.

When data is written to the DSM card from the EPAP RTDB, the DSM's memory is allocated in chunks per data type. For example, when DN data (MSISDN, MDN, or DN subscriber numbers) is written to the DSM, memory is allocated in chunks of 6 Million number entries. Likewise, when IMSI data (IMSI or MIN subscriber numbers) is written, DSM memory is allocated in chunks of 7.5 Million number entries; and IMEI data is allocated in chunks of 2 Million number entries. This is an important aspect of the architecture as it has direct impact on the dimensioning of the DSM cards.

Due to the fact that memory is allocated in chunks, the actual space used in a DSM card (and thus the amount of space available for new entries) is not a *direct* correlation between the actual number of entries provisioned. It is related, but not in a one-to-one manner. Table 1 illustrates graphically the breakpoints of provisioning which would cause the next chunk of memory allocation on a DSM card.

EPAP Data Type	Number of entries actually provisioned on the DSM	Amount of space actually allocated on the DSM (in terms of reserving space for entries)
DN	0 (i.e. feature active, no entries provisioned)	0
	1 – 6,000,000	6M
	6,000,001 – 12M	12M
	12,000,001 – 18M	18M
	18,000,001 – 24M	24M
	24,000,001 – 30M	30M
	30,000,001 –36M	36M
	36,000,001 – 42M	42M

EPAP Data Type	Number of entries actually provisioned on the DSM	Amount of space actually allocated on the DSM (in terms of reserving space for entries)
	42,000,001 – 48M	48M
	48,000,001 – 54M	54M
	54,000,001 – 56M	56M* (current system limit)
IMSI	0 (i.e. feature active, no entries provisioned)	0
	1 – 7,500,000	7.5M
	7,500,001 – 15M	15M
	15,000,001 – 22.5M	22.5M
	22,500,001 – 30M	30M
	30,000,001 – 37.5M	37.5M
	37,500,001 – 45M	45M
	45,000,001 – 52.5M	52.5M
	52,500,001 – 56M	56M* (current system limit)
IMEI	0 (i.e. feature active, no entries provisioned)	0
	1 – 2,000,000	2M
	2,000,001 – 4M	4M
	4,000,001 – 6M	6M
	6,000,001 – 8M	8M
	8,000,001 – 10M	10M
	10,000,001 – 12M	12M
	12,000,001 – 14M	14M
	14,000,001 – 16M	16M
	16,000,001 – 18M	18M
	18,000,001 – 20M	20M
	20,000,001 – 22M	22M
	22,000,001 – 24M	24M
	24,000,001 – 26M	26M
	26,000,001 – 28M	28M
	28,000,001 – 30M	30M
	30,000,001 – 32M	32M* (current system limit)

Table 1: DSM Memory Allocation

NOTE: The numbers in the tables are maximums for each data type in seclusion. If multiple data types exist on the same node, the stated allocations are made for each data type. See Section 2.4.2 for more details.

2.4.2 Effect of Multiple Data Types on DSM Memory Allocation

As mentioned in the note under Table 1, if multiple data types are provisioned on the same node, the total amount of memory allocated on the DSM is the sum of the memory allocations for each data type.

For example, if a system is running both G-Flex and G-Port, then both DN and IMSI data types will be provisioned on the system, and the DSM will allocate chunks of memory for both data types. The following table gives some examples the memory allocations for this scenario.

Number of DN Entries Provisioned	Number of IMSI Entries Provisioned	Amount of space actually allocated on the DSM (in terms of reserving space for entries)
8M	6M	12M DNs + 7.5M IMSIs
8M	8M	12M DNs + 15M IMSIs
31M	8M	36M DNs + 15M IMSIs

Table 2: Effect of Multiple Data Types on a Node

As seen in the first entry in Table 2, the actual number of provisioned entries is 14M (8M DNs + 6M IMSIs). However, the DSM has allocated memory space for up to 19.5M entries (12M DNs + 7.5M IMSIs).

In the second entry, the number of provisioned IMSIs has increased to 8M, but the number of DNs has remained the same at 8M, for a total of 16M provisioned entries. However, the DSM has now allocated memory space for up to 27M entries (12M DNs + 15M IMSIs).

The importance of this point is that in both of these cases, if DSM dimensioning were based strictly on the number of entries actually provisioned [(8M DNs + 6M IMSIs) in the first case and (8M DNs + 8M IMSIs) in the second case], then a 1GB DSM would be sufficient for both scenarios. HOWEVER, due to the way in which the DSM allocates memory, going from 6M IMSIs to 8M IMSIs causes another 7.5M entry block of memory to be allocated, even though the amount of entries in the database is only increased by 2M.

Because of this, a **1GB DSM** is sufficient to support the **first case** (8M DNs + 6M IMSIs), even when the memory allocation rules are factored in. However, a **2GB DSM** would be required at a minimum to support the s**econd scenario** (8M DNs + 8M IMSIs), even though the actual number of provisioned entries would theoretically fit on a 1GB DSM card.

Likewise, in the third entry, the number of provisioned DNs has been increased to 31M, but the number of provisioned IMSIs has remained the same at 8M. Again, without factoring in the memory allocation rules, this number of entries would theoretically fit on a 2GB DSM. However, because the DSM is allocating space for 36M DNs + 15M IMSIs for this case, the minimum required hardware for this configuration is a 3GB DSM.

This point is key to understanding the dimensioning of DSMs for an EAGLE 5 ISS with EPAD features. Due to the way in which DSMs allocate memory, the minimum required size of DSM card on an EAGLE 5 ISS is dependent upon how much memory the DSM will allocate, NOT how many entries will actually be provisioned on the database.

Section 4 of this document includes a tool which can be used to enter any combination of data types/database entries, and will give the actual memory consumed as well as the amount of memory allocated by the DSM. This tool will give the absolute minimum supported DSM card for the entered configuration.

3 COMMERCIAL GUIDELINES FOR DIMENSIONING EAGLE EPAD FEATURES

This section contains commercial guidelines for dimensioning of EAGLE 5 ISSs which have one or more EPAD features. These guidelines are to be applied for quotations of new installations as well as quotations for extensions of existing installations.

Deleted: EAGLE 5 ISSs

Note that these guidelines are not derived directly from the engineering dimensioning tool in Section 4, and therefore will not provide the same card sizes for the same amount of number entries. These rules are much more conservative than the scientific tool. The tool in Section 4 gives an accurate reflection of the usable space on a DSM based on the number of entries provisioned. However, the tool is complex due to the interaction of the three different data types and six different EPAD features. In order to simplify the dimensioning process, more straightforward (and more conservative) rules are given within this section and shall be used for quotation purposes. The tool in Section 4 is informational only and is intended to be used by/for existing customers who have less than 4GB DSM cards and need to evaluate whether an upgrade is needed. It is not to be used in the commercial quotation process.

NOTE: New systems are planned to be deployed with 4GB DSMs regardless of the initial database size.

3.1 G-PORT MNP ONLY SYSTEM

In addition to the base EAGLE 5 ISS with appropriate base hardware and release software, the following additional components are required for the purchase of the G-Port MNP feature.

Deleted: EAGLE 5 ISS

- **Baseline Components**

Quantity	Description	Attribute	Rule
1	G-Port MNP	Optional Software Feature	AP
N+1	Database Services Module (DSM)	Base System Hardware	1,2
1	TekServer EPAP MPS	Support Hardware	3
Interdependencies			
1	Global Title Translation (GTT) or Enhanced GTT (EGTT)	Optional Software Feature	4

- **Dimensioning Rules**

AP – Always Provide

1 – DSM quantity is calculated based on the number of expected total SS7 SCCP TPS, including messages that will be processed by G-Port MNP as well as messages processed by standard/enhanced GTT. (The DSM card processes SS7 traffic destined for both the G-Port MNP and GTT service). With G-Port active, each DSM can process 850 TPS.

Calculate:

N = ROUNDUP[(G-PORT TPS + GTT TPS) / 850]

NOTE: A maximum of 25 DSM cards, or 20,400 TPS is enforced per system.

2 – DSM size (e.g. 1GB, 2GB, 3GB, or 4GB) is calculated based on (1) whether the system is a new system or an extension to an existing system, and (2) if an extension to an existing system, the number of database entries purchased or being purchased by the customer. For G-Port, this is the number of MSISDNs needed in the network. In the DB, these are stored as DN data types. See table below for calculation:

Calculate:

New System?	Current DSM Size	# MSISDN Entries (DN Data Type) Purchased (Current + New)	New DSMs required?	DSM Size Required
Y	N/A	N/A	Y	4GB
N	1GB	<= 10 Million	N	N/A
		> 10 Million	Y	4GB
N	2GB	<= 20 Million	N	N/A
		> 20 Million	Y	4GB
N	3GB	<= 30 Million	N	N/A
		> 30 Million	Y	4GB
N	4GB	<= 56 Million	N	N/A
> 56 Million MSISDNs (DN Data Type) Not Supported				

3 – Requires TekServer MPS frame, two TekServers running EPAP application, and associated peripheral hardware.

4 – Provision one (1) GTT or EGTT software module per system. If GTT or EGTT is not activated, the system will not allow G-Port MNP to be activated. If this is an existing system which already has GTT or EGTT active, this feature is not required.

3.2 G-FLEX VHLR ONLY SYSTEM

In addition to the base EAGLE 5 ISS with appropriate base hardware and release software, the following additional components are required for the purchase of the G-Flex vHLR feature.

Deleted: EAGLE 5 ISS

- **Baseline Components**

Quantity	Description	Attribute	Rule
1	G-Flex vHLR	Optional Software Feature	AP
N+1	Database Services Module (DSM)	Base System Hardware	1,2
1	TekServer EPAP MPS	Support Hardware	3
Interdependencies			
1	Global Title Translation (GTT) or Enhanced GTT (EGTT)	Optional Software Feature	4

- **Dimensioning Rules**

AP – Always Provide

1 – DSM quantity is calculated based on the number of expected total SS7 SCCP TPS, including messages that will be processed by G-Flex as well as messages processed by standard/enhanced GTT. (The DSM card processes SS7 traffic destined for both the G-Flex and GTT service). With G-Flex active, each DSM can process 850 TPS.

Calculate:

N = ROUNDUP[(G-FLEX TPS + GTT TPS) / 850]

NOTE: A system wide maximum of N=25 (20,400 TPS) is enforced.

2 – DSM size (e.g. 1GB, 2GB, 3GB, or 4GB) is calculated based on (1) whether the system is a new system or an extension to an existing system, and (2) if an extension to an existing system, the number of database entries purchased or being purchased by the customer.

NOTE 1: For G-Flex, the customer may purchase IMSI entries (IMSI Data Type) only, or they may purchase IMSIs with MSISDN entires (DN Data Type) to correlate to those IMSIs. The SUM of two types of database entries being purchased is the total G-Flex database entries that must be considered.

NOTE 2: When used in an IS-41 environment, the entry types IMSI and MSISDN correspond to MIN and MDN, respectively. In either case, the numbers are stored in the EPAP as IMSI and DN data types.

Calculate (GSM): # G-Flex Entries = SUM(IMSIs + MSISDNs)

OR

Calculate (IS-41): # G-Flex Entries = SUM(MINs + MDNs)

New System?	Current DSM Size	# G-Flex Entries (IMSIs/MINs + MSISDNs/MDNs) (IMSI and/or DN Data Types) Purchased (Current + New)	New DSMs required?	DSM Size Required
Y	N/A	N/A	Y	4GB
N	1GB	<= 10 Million	N	N/A
		> 10 Million	Y	4GB
N	2GB	<= 20 Million	N	N/A
		> 20 Million	Y	4GB
N	3GB	<= 30 Million	N	N/A
		> 30 Million	Y	4GB
N	4GB	<= 56 Million	N	N/A
> 56 Million IMSIs (IMSI Data Type) and/or MSISDNs (DN Data Type) Not Supported				

3 – Requires TekServer MPS frame, two TekServers running EPAP application, and associated peripheral hardware.

4 – Provision one (1) GTT or EGTT software module per system. If GTT or EGTT is not activated, the system will not allow G-Flex to be activated. If this is an existing system which already has GTT or EGTT active, this feature is not required.

3.3 EIR ONLY SYSTEM

In addition to the base EAGLE 5 ISS with appropriate base hardware and release software, the following additional components are required for the purchase of the EIR feature.

Deleted: EAGLE 5 ISS

- **Baseline Components**

Quantity	Description	Attribute	Rule
1	EIR	Optional Software Feature	AP
N+1	Database Services Module (DSM)	Base System Hardware	1,2
1	TekServer EPAP MPS	Support Hardware	3
Interdependencies			
1	Global Title Translation (GTT) or Enhanced GTT (EGTT)	Optional Software Feature	4

- **Dimensioning Rules**

AP – Always Provide

1 – DSM quantity is calculated based on the number of expected total SS7 SCCP TPS, including messages that will be processed by EIR as well as messages processed by standard/enhanced GTT. (The DSM card processes SS7 traffic destined for both the EIR and GTT service). With EIR active, each DSM can process 850 TPS.

Calculate:

N = ROUNDUP[(EIR TPS + GTT TPS) / 850]

NOTE: A system wide maximum of N=25 (20,400 TPS) is enforced.

2 – For the EIR feature, DSM size (e.g. 1GB, 2GB, 3GB, or 4GB) is calculated based on (1) whether the system is a new system or an extension to an existing system, and (2) if an extension to an existing system, the number of database entries purchased or being purchased by the customer.

NOTE: For EIR, the customer may purchase IMEI entries (IMEI Data Type) only, or they may purchase IMEIs with IMSI entries (IMSI Data Type) to correlate to those IMEIs. The SUM of two types of database entries being purchased is the total EIR database entries that must be considered:

Calculate: # EIR Entries = SUM(IMEIs + IMSIs)

New System?	Current DSM Size	# EIR Entries (IMEIs + IMSIs) (IMEI and/or IMSI Data Types) Purchased (Current + New)	New DSMs required?	DSM Size Required
Y	N/A	N/A	Y	4GB
N	1GB	<= 10 Million	N	N/A
		> 10 Million	Y	4GB
N	2GB	<= 20 Million	N	N/A
		> 20 Million	Y	4GB
N	3GB	<= 30 Million	N	N/A
		> 30 Million	Y	4GB
N	4GB	<= 32 Million	N	N/A
> 32 Million IMEIs (IMEI Data Type) Not Supported				

3 – Requires TekServer MPS frame, two TekServers running EPAP application, and associated peripheral hardware.

4 – Provision one (1) GTT or EGTT software module per system. If GTT or EGTT is not activated, the system will not allow EIR to be activated. If this is an existing system which already has GTT or EGTT active, this feature is not required.

3.4 INP ONLY SYSTEM

In addition to the base EAGLE 5 ISS with appropriate base hardware and release software, the following additional components are required for the purchase of the INP feature.

Deleted: EAGLE 5 ISS

- **Baseline Components**

Quantity	Description	Attribute	Rule
1	INP	Optional Software Feature	AP
N+1	Database Services Module (DSM)	Base System Hardware	1,2
1	TekServer EPAP MPS	Support Hardware	3
Interdependencies			
1	Global Title Translation (GTT) or Enhanced GTT (EGTT)	Optional Software Feature	4

- **Dimensioning Rules**

AP – Always Provide

1 – DSM quantity is calculated based on the number of expected total SS7 SCCP TPS, including messages that will be processed by INP as well as messages processed by standard/enhanced GTT. (The DSM card processes traffic for both the INP and GTT service). With INP active, each DSM can process 850 TPS.

Calculate:

N = ROUNDUP[(INP TPS + GTT TPS) / 850]

NOTE: A system wide maximum of N=25 (20,400 TPS) is enforced.

2 – DSM size (e.g. 1GB, 2GB, 3GB, or 4GB) is calculated based on (1) whether the system is a new system or an extension to an existing system, and (2) if an extension to an existing system, the number of database entries purchased or being purchased by the customer. For INP, this is the number of DNs (DN Data Type)

Calculate:

New System?	Current DSM Size	# DN Entries Purchased (DN Data Type) (Current + New)	New DSMs required?	DSM Size Required
Y	N/A	N/A	Y	4GB
N	1GB	<= 10 Million	N	N/A
		> 10 Million	Y	4GB
N	2GB	<= 20 Million	N	N/A
		> 20 Million	Y	4GB
N	3GB	<= 30 Million	N	N/A
		> 30 Million	Y	4GB
N	4GB	<= 56 Million	N	N/A
> 56 Million DNs (DN Data Type) Not Supported				

3 – Requires TekServer MPS frame, two TekServers running EPAP application, and associated peripheral hardware.

4 – Provision one (1) GTT or EGTT software module per system. If GTT or EGTT is not activated, the system will not allow EIR to be activated. If this is an existing system which already has GTT or EGTT active, this feature is not required.

3.5 IS-41 TO GSM MIGRATION ONLY SYSTEM

In addition to the base EAGLE 5 ISS with appropriate base hardware and release software, the following additional components are required for the purchase of the IS-41 to GSM Migration feature.

Deleted: EAGLE 5 ISS

- **Baseline Components**

Quantity	Description	Attribute	Rule
1	IS-41 to GSM Migration	Optional Software Feature	AP
N+1	Database Services Module (DSM)	Base System Hardware	1,2
1	TekServer EPAP MPS	Support Hardware	3
Interdependencies			
1	Global Title Translation (GTT) or Enhanced GTT (EGTT)	Optional Software Feature	4
1	G-Port MNP	Optional Software Feature	5

- **Dimensioning Rules**

AP – Always Provide

1 – DSM quantity is calculated based on the number of expected total SS7 SCCP TPS, including messages that will be processed by IS-41 to GSM Migration as well as messages processed by standard/enhanced GTT. (The DSM card processes SS7 traffic destined for both the GSM Migration and GTT service). With GSM Migration active, each DSM can process 850 TPS.

Calculate:

N = ROUNDUP[(IS-41 TO GSM MIGRATION TPS + GTT TPS) / 850]

NOTE: A system wide maximum of N=25 (20,400 TPS) is enforced.

2 – DSM size (e.g. 1GB, 2GB, 3GB, or 4GB) is calculated based on (1) whether the system is a new system or an extension to an existing system, and (2) if an extension to an existing system, the number of database entries purchased or being purchased by the customer.

NOTE: IS-41 to GSM Migration uses two types of subscriber numbers – MINs for the IS-41 network (or MDNs, depending on network implementation), and MSISDNs for the GSM network. Both types of numbers are stored in the EPAP as DN Data Types.

The customer will always purchase DN entries corresponding to the MSISDN numbers for subscribers migrating to the GSM network. They may or may not also purchase additional DN entries corresponding to MIN/MDN numbers for subscribers remaining in the IS-41 network who have not migrated to GSM. This is a network engineering choice. The total number of DN entries needed for the IS-41 to GSM Migration application is thus the sum of the numbers (MSISDNs) for GSM migrated subs plus the optional numbers (MINs or MDNs) for IS-41 non-migrated subs.

Calculate: # IS41 to GSM Migration Entries = SUM(GSM MSISDNs + IS41 MINs/MDNs)

New System?	Current DSM Size	#IS41 to GSM Migration Entries (MSISDNs + MINs/MDNs) (DN Data Types) Purchased (Current + New)	New DSMs required?	DSM Size Required
Y	N/A	N/A	Y	4GB
N	1GB	<= 10 Million	N	N/A
		> 10 Million	Y	4GB
N	2GB	<= 20 Million	N	N/A
		> 20 Million	Y	4GB
N	3GB	<= 30 Million	N	N/A
		> 30 Million	Y	4GB
N	4GB	<= 56 Million	N	N/A
> 56 Million MSISDNs and/or MINs/MDNs (DN Data Types) Not Supported				

3 – Requires TekServer MPS frame, two TekServers running EPAP application, and associated peripheral hardware.

4 – Provision one (1) GTT or EGTT software module per system. If GTT or EGTT is not activated, the system will not allow G-Flex to be activated. If this is an existing system which already has GTT or EGTT active, this feature is not required.

3.6 COMBINED EPAD FEATURES SYSTEM

In the case that multiple EPAD features are deployed on the same node/system, the following guidelines are used:

- **Baseline Components**

Quantity	Description	Attribute	Rule
1	EIR	Optional Software Feature	1,7
1	INP	Optional Software Feature	1,7
1	G-Port	Optional Software Feature	1
1	G-Flex	Optional Software Feature	1
1	IS-41 to GSM Migration	Optional Software Feature	1,6
N+1	Database Services Module (DSM)	Base System Hardware	2,3
1	TekServer EPAP MPS	Support Hardware	4
Interdependencies			
1	Global Title Translation (GTT) or Enhanced GTT (EGTT)	Optional Software Feature	5
1	G-Port MNP	Optional Software Feature	6

- **Dimensioning Rules**

1 – Provide software modules for the feature(s) being requested.

2 – DSM quantity is calculated based on the number of expected total SS7 SCCP TPS, including messages that will be processed by G-Port, G-Flex, INP, EIR, and IS-41 to GSM Migration, as well as messages processed by standard/enhanced GTT. (The DSM card processes SS7 traffic destined for all EPAD features and GTT services). With any EPAD feature active, each DSM can process 850 TPS.

Calculate:

N = ROUNDUP[(EPAD features TPS + GTT TPS) / 850]

NOTE: A system wide maximum of N=25 (20,400 TPS) is enforced.

3 – DSM size (e.g. 1GB, 2GB, 3GB, or 4GB) is calculated based on (1) whether the system is a new system or an extension to an existing system, and (2) if an extension to an existing system, the total number of database entries purchased or being purchased by the customer.

NOTE: Refer to the individual feature dimensioning notes in Sections 3.1 through 3.5 for an explanation of the different types of entries and the EPAP Data Types they correspond to, summarized below:

- GSM MSISDN entries (for all features) correspond to the DN EPAP Data Type
- IMEI entries (EIR feature) correspond to IMEI EPAP Data Type
- IMSI entries (for GSM G-Flex and EIR) correspond to IMSI EPAP Data Type
- DN entries (for INP feature) correspond to DN EPAP Data Type
- IS41 MDN entries (for IS41 to GSM Migration feature) correspond to DN EPAP Data Type
- IS41 MIN entries (for IS41 G-Flex) correspond to IMSI EPAP Data Type
- IS41 MDN entries (for IS41 G-Flex) correspond to DN EPAP Data Type

Calculate: # EPAD Entries = SUM[G-Port entries (MSISDNs) + G-Flex entries (IMSIs and optional MSISDNs; or MINs and optional MDNs) + EIR entries (IMEIs and optional IMSIs) + INP entries (DNs) + IS41 to GSM Migration entries (MSISDNs and optional MINs/MDNs)]

New System?	Current DSM Size	# EPAD Entries Purchased (Current + New)	New DSMs required?	DSM Size Required
Y	N/A	N/A	Y	4GB
N	1GB	<= 10 Million	N	N/A
		> 10 Million	Y	4GB
N	2GB	<= 20 Million	N	N/A
		> 20 Million	Y	4GB
N	3GB	<= 30 Million	N	N/A
		> 30 Million	Y	4GB
N	4GB	<= 32 Million IMEIs AND <= 56 Million total EPAD	N	N/A
> 32 Million IMEIs and > 56 Million Total EPAD entries Not Supported				

4 – Requires TekServer MPS frame, two TekServers running EPAP application, and associated peripheral hardware.

5 – Provision one (1) GTT or EGTT software module per system. If GTT or EGTT is not activated, the system will not allow any EPAD feature to be activated. If this is an existing system which already has GTT or EGTT active, this feature is not required.

6 – Provision one (1) G-Port software module per system for each system requiring the IS-41 to GSM Migration feature. If G-Port is not activated, the system will not allow the IS-41 to GSM Migration feature to be activated. If his is an existing systems which already has G-Port activated, this is not required.

7 – EIR and INP cannot coexist on the same node.

4 DSM ENGINEERING & DIMENSIONING TOOL

The “DSM Dimensioning Tool.xls” file provides an accurate view of the amount of memory allocated on a DSM card as well as the amount of memory space actually in use on a DSM card depending on the number and type of entries provisioned. This is for informational and planning purposes and is not to be used in generating quotations. Section 3 contains the guidelines for commercial quotations.

THIS PAGE INTENTIONALLY BLANK