Quick Guide to DSP Resource Requirements for the Sonus SBC 2000 Session Border Controller: New Investment Protection Configurations

Introduction

This document describes how to calculate DSP resource requirements for the New Investment Protection Configurations of the SBC 2000 using Release 3.2 and 4.0 software.

For earlier configurations please refer to the "Quick Guide to DSP Resource Requirements for the Sonus SBC 2000 Session Border Controller: Older Configurations."

Purpose

This guide is intended to help partners and customers understand how to determine DSP resource requirements for both their immediate needs and to support future growth.

How to use this guide

This guide is intended to be used in conjunction with the Partner Configurator to determine DSP resource requirements for various codec/transcoding scenarios. This guide is not a replacement for the Partner Configurator.

WHAT YOU NEED TO KNOW

Default transcoding scenario: The most common transcoding scenario for SBC 2000 is from G.711 to G.711 (SRTP). This is considered as the default transcoding scenario for SBC 2000 when calculating DSP resource requirements. For TDM-IP, the default codec assumed is G.711 (SRTP) on the IP side.

DSP resource requirement number: DSP resources are needed to transcode from one codec to another. For SBC 2000, 1 DSP resource is equal to 1 transcoding session for the default transcoding scenario (described above). All calculations mentioned in this document build upon the default transcoding scenario mentioned above. For example, the DSP resource requirement number for 100 IP-IP sessions for a default transcoding scenario is 100.

Special case for multiple low-bit rate codecs: In the case where two or more low-bit rate codecs (G.729ab, G.723.1, G.726, or T.38) will be used (IP-IP and/or TDM/IP) a 20% up-lift is applied to the calculated results. For example, if several codecs will be used and this calculates to a DSP resource requirement of 100, then a 20% uplift is applied and the true DSP resource requirement will be

120. Note that this uplift requirement only applies for multiple low-bit rate codecs (G.729ab, G.723.1, G.726, or T.38). Combination of a single low-bit rate codec with G.711 does not require an uplift. It is also important to design for the most DSP intensive usage. Hence, where multiple codecs will be used and the split among these codecs will vary be sure to calculate using the codec that is most DSP intensive and then apply the 20% uplift.

Multiplication factor: Multiplication factor when multiplied with your session requirement count gives you the total number of DSP resources required for those sessions.

Survivable Branch Appliance (SBA): Addition of the SBA does not affect DSP requirements.

DSP mode versus RTP Proxy (Media Pass Through): In the case of RTP Proxy media passes through the SBC and does not use the DSP.

DSP MATRIX FOR IP-IP OPERATING MODE

The following table provides multiplication factor (to be used with IP-IP session count requirement) to determine DSP resource requirement. To determine the multiplication factor for your transcoding scenario, select from-codec ('codec type' column) and to-codec ('codec type' row) in the following table. The intersecting cell gives you your multiplication factor.

SBC 2000 IP-IP DSP Multiplication Factor													
Codec Type	G.711	G.722	G.722.2	G.723.1	G.726	G.729ab	T.38	G.711 (SRTP)	G.722 (SRTP)	G.722.2 (SRTP)	G.723.1 (SRTP)	G.726 (SRTP)	G.729ab (SRTP)
G.711	1.00	1.68	2.69	1.12	1.00	1.00	1.24	1.00	2.11	2.69	1.12	1.04	1.25
G.722	1.68	2.65	3.71	2.14	1.85	1.98	N/S	1.93	3.08	3.71	2.14	1.96	2.28
G.722.2	2.69	3.71	4.78	3.24	2.94	3.08	N/S	2.69	4.15	4.78	3.24	2.94	3.08
G.723.1	1.12	2.14	3.24	1.63	1.35	1.48	N/S	1.12	2.58	3.24	1.63	1.35	1.48
G.726	1.00	1.85	2.94	1.35	1.04	1.18	N/S	1.00	2.28	2.94	1.35	1.04	1.23
G.729ab	1.00	1.98	3.08	1.48	1.18	1.31	N/S	1.28	2.41	3.08	1.48	1.32	1.55
T.38	1.24	N/S	N/S	N/S	N/S	N/S	1.91	1.55	N/S	N/S	N/S	N/S	N/S
G.711(SRTP)	1.00	1.93	2.69	1.12	1.00	1.28	1.55	1.21	2.36	2.69	1.18	1.28	1.57
G.722(SRTP)	2.11	3.08	4.15	2.58	2.28	2.41	N/S	2.36	3.52	4.15	2.58	2.39	2.72
G.722.2(SRTP)	2.69	3.71	4.78	3.24	2.94	3.08	N/S	2.69	4.15	4.78	3.24	3.03	3.18
G.723.1(SRTP)	1.12	2.14	3.24	1.63	1.35	1.48	N/S	1.18	2.58	3.24	1.63	1.35	1.48
G.726(SRTP)	1.04	1.96	2.94	1.35	1.04	1.32	N/S	1.28	2.39	3.03	1.35	1.26	1.55
G.729ab(SRTP)	1.25	2.28	3.08	1.48	1.23	1.55	N/S	1.57	2.72	3.18	1.48	1.55	1.92

Note: Densities assume VAD on (60% silence during call), RTCP on, RFC2833 on, and 20ms packet size for all codecs (except 30 ms for G.723.1), G.722.2 at 12.65 kbit/s, RTP(unless specified with SRTP).

DSP MATRIX FOR TDM-IP OPERATING MODE

The following table provides resource mapping for TDM/Analog capabilities. The resource requirements are cumulative for simultaneous TDM/Analog/IP usage. The SBC 2000 supports FXS, and T1/E1 TDM ports.

TDM/Analog to DSP resource Mapping	
Interface	**DSP Resources required**
24 FXS	24 DSP Resources
1 T1/E1	25 DSP Resources
2 T1/E1	50 DSP Resources
3 T1/E1	75 DSP Resources
4 T1/E1	100 DSP Resources
5 T1/E1	125 DSP Resources
6 T1/E1	150 DSP Resources
7 T1/E1	175 DSP Resources
8 T1/E1	200 DSP Resources

Note: Densities assume VAD on (60% silence during call), RTCP on, RFC2833 on, and 20ms packet size for all codecs (except 30 ms for G.723.1), G.722.2 at 12.65 kbit/s, RTP(unless specified with SRTP), and standard Line Echo Canceller.

SBC 2000 CONFIGURATIONS AND DSP RESOURCE TO DSP SKU MAPPING

The SBC 2000 Investment Protection Configurations are pre-populated with DSP capacity. Depending on configuration there are either one, two, four, or six DSPs. (Note expansion of DSP Resource capability is non-linear.)

Number of DSPs to DSP Resource Mapping	
Number of DSPs	**Number of DSP resources**
1	200
2	400
4	700
6	984

Investment Protection SKUs and DSP Mapping			
SKU	Number of DSPs	Number of DSP Resources	SBA
SBC-2K-1	1	200	No
SBC-2K-S-1	1	200	Yes
SBC-2K-2	2	400	No
SBC-2K-S-2	2	400	Yes
SBC-2K-4	4	700	No
SBC-2K-6	6	984	No

The SBC 2000 provides two expansion slots. The following options are available.

- SBC-2K-CRD-T1E1 provides T1/E1 expansion with licensable growth to 8 T1/E1.
- SBC2K-CRD-24FXS provides 24 FXS

The two slots can be populated based on individual requirements, with two of the same cards, one of each, only one card, or not at all.

CALCULATING THE DSP RESOURCE REQUIREMENT

To determine the appropriate configuration and the number of DSPs you will need, please follow these steps:

1. Determine the number of IP-IP sessions you need. Be sure to consider future growth.
2. Determine the IP-IP DSP multiplication factor from the appropriate table above
3. Multiply the IP-IP session count with the multiplication factor to get your DSP resource requirement number.
4. Repeat steps 1-3 for different IP-IP session scenarios to be used in this unit at a given time.
5. Determine the number of TDM-IP sessions you need.
6. For simultaneous TDM and IP usage, add all DSP resources from steps 3 and 5, otherwise pick the larger DSP resource requirement of the two.
7. If using multiple low-bit rate codecs, apply 20% uplift to the DSP resource requirement number calculated in step 6.
8. Refer to the DSP resource to DSP SKU mapping table to determine how many DSPs will be needed to support your needs.

Example - Calculating the DSP resource requirement

1. I need 200 IP-IP sessions
2. I want to transcode from G.711 (SRTP) to G.729ab. My multiplication factor is 1.36
3. My IP-IP DSP resource requirement number is 200 * 1.36 = 272
4. No additional IP-IP session scenarios

5. I also want 2 E1. This requires 50 DSP resources
6. Simultaneous usage – so my total DSP resource requirement is 272 + 50 = 322
7. I don't need multiple low-bit rate codecs
8. Based on the mapping table, I need 2 DSP.
9. Choose an SBC 2000 configuration with 2 or more DSPs. You will also need an SBC-2K-CRD-T1E1.

BEHAVIOR WITH DSP MODE VERSUS RTP PROXY (MEDIA PASS THROUGH)

RTP Proxy was introduced on the Sonus SBC 1000 and Sonus SBC 2000 with Release 3.1. In the case of RTP Proxy media passes through the SBC and does not use the DSP. For clarity of understanding in this document the term media pass through mode is used and is the same as RTP Proxy.

- DSPs convert between media types (codecs, packet size, SRTP, in-band/out of band, etc.).
- Media pass through calls are not processed by the DSP. Hence, there is no conversion.
- Signaling groups can be configured to either use a DSP mode or a media pass through mode.
- In addition beginning with Release 4.0, one can also set a preference where either DSP mode or media pass through mode is preferred but not required.
    - In the case media pass through is configured as preferred by both signaling groups the call proceeds media pass through.
    - In the case DSP Mode is configured as preferred by both signaling groups the call proceeds in DSP mode.
    - In the case one signaling group is configured as DSP mode preferred and the other signaling group is configured as media pass through mode preferred, the selection of mode is based on the preference of the signaling group associated with the party initiating the call. In the case DSP mode is preferred but there is no available resource for the initiating party, the initiating party will fall back to attempt the call using media pass through mode.
    - After a media path is established between the phone and the SBC 1000 or SBC 2000 in either DSP mode or media pass through mode, there is no support for a mid-call dynamic switch to change mode, this includes the case of call transfer and conference. This is not necessarily a limitation. It simply means that the network deployment/architecture needs to be understood.
    - In the case DSP is preferred but not required: If the other signaling group is configured for media pass through only, the call then goes through using media pass through. The advantage this provides is that we can potentially better preserve DSP resource for those calls where the resource is truly needed. However, it is again important to keep in mind that there is no support for a mid-call dynamic switch to change mode, this includes the case of call transfer and conference. This is not necessarily a limitation. It simply means that the network deployment/architecture needs to be understood.

- If DSP mode is either required or preferred and a media pass through route is not possible, the SBC must have available DSP resource. Otherwise the call will fail.

Fax

- Fax pass through is defined as G.711 with silence suppression turned off and depending on the speed of the fax echo cancellation may also be automatically turned off.
- Call comes in TDM SBC terminates the TDM. Once the fax tones are detected the SBC ensures the call is negotiated to either fax pass through or T.38 based on SBC configuration and far-end capabilities. T.38 is more reliable than fax pass through and also uses less bandwidth. However, in some cases the far end may not support T.38.
- The signaling group can be associated with either T.38 or fax pass through. T.38 can also be configured to fallback to fax pass through.
- If the call is IP to IP configuration can be either DSP mode or media pass through mode. The use case for DSP mode is if there is a incompatibility in the network that requires the SBC to perform translation between T.38 and fax pass through.
- With Release 4.0 SG3 to SG3 fax reliability has been substantially improved. SG3 to SG3 faxes can now be transmitted using T.38. (The speed of the fax remains that of G3 but the transmission will be T.38.)

DTMF

- Several alternatives,
    - Call comes in TDM SBC terminates the TDM and transmits G.711. Other codec types may also be used. However, some such as G.723.1 may be less reliable.
    - Call comes in TDM SBC terminates the TDM and transmits the signal out of band RFC 2833/4733 or out of band using the INFO message.
    - The signaling group can be associated to transmit in band as voice, RFC 2833/4733, or INFO. There is no fallback function.
    - In the case of media pass through mode the DSP does not process the DTMF.