WHITE PAPER

Are Software SBCs Ready for the Cloud Era?

audiocodes

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After all, the use of cloud infrastructure eliminates the need for spending huge sums of money on buying hardware and maintaining it.

In the telecommunications industry, one excellent use case for cloud-based technology currently attracting a lot of interest is virtual, or software, session border controllers (SBCs).

Software SBCs are gaining momentum as more and more organizations are moving their voice and unified communications infrastructure into the cloud. There are considerable advantages to using software SBCs, such as reduced CAPEX and OPEX, longer lifecycle, quick deployment and greater flexibility around usage. However, there are also many challenges to overcome, such as the increasing number of complex services that SBCs are being asked to manage as well as concerns around security, interworking and scalability.

Bearing all this in mind, it seems fair to ask if software SBCs can fully replace hardware SBCs and if they are appropriate in all deployments.

This white paper examines the question of whether software SBCs are ready for the cloud era, and in which situations they are most appropriate to replace their hardware SBC counterparts.

Defining a Software SBC

What, exactly, is a software SBC? A software SBC is an SBC application running on a dedicated common off-the-shelf x86 server or, alternatively, an SBC application running on a virtual machine on top of a hypervisor.

Hardware SBCs, on the other hand, are proprietary hardware products purposely built for SBC applications. Hardware SBCs usually include a network processor for handling the data layer, DSPs for implementing transcoding and, occasionally, an x86 CPU for the signaling layer as well.

Advantages of the Software SBC

The advantages of using pure software-based products (including SBCs) for the telecom segment have been stressed by the Network Function Virtualization [ETSI Specification Group](#).
According to the NFV, the advantages include:

- Reduced operator CAPEX and OPEX through reduced equipment costs and reduced power consumption
- Reduced time-to-market to deploy new network services
- Improved return on investment from new services
- Greater flexibility to scale up, scale down or evolve services
- Openness to the virtual appliance market and pure software entrants
- Opportunities to trial and deploy new innovative services at lower risk

In addition to the above, software SBCs are likely to enjoy a longer lifecycle since the software can be installed on a new server if the underlying server has reached its end-of-life.

How Do Software SBCs Compare to Hardware SBCs?

To reap the software-related benefits listed above, we need to determine whether the software SBC's effectiveness in terms of the different layers of SBC functionality can fully replace its hardware counterpart.

In addition to comparing capabilities and feature sets between these two SBC implementations, we also need to take into consideration the total cost of ownership for comparable configurations.

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The Signaling Layer

The signaling layer (sometimes called the control layer) handles SIP signaling. It takes care of all the SIP interoperability functions, routing, denial of service protection, NAT traversal, SIP encryption and more. Software SBCs utilize x86 CPUs, which are highly capable of handling SIP messages. In fact, many of the hardware SBCs also use an x86 CPU for the same purpose. Intel's high CPU frequency, large caches, advanced pipelines and hardware accelerators make them ideal for tasks such as large table lookups, hashing, parsing etc. which are required for signaling layer processing.

Another signaling layer task that SBCs are required to handle is encryption (exp. SIP over TLS). Network processors and Intel x86 both offer accelerators which optimize these highly complex encryption operations.

The Data Layer

The data layer deals with the handling of the RTP packets which traverse the SBC. The SBC is required to replace IP and RTP headers (for example, for topology hiding), fork an incoming RTP stream into two or more streams (for example, when using cognitive services or for recording), and route the incoming streams to different targets. Traditionally, this area has been the bread and butter of network processors. However, Intel has substantially improved its data layer throughput over time, enabling software SBCs to compete on equal terms with their hardware-based cousins.

RTP packets are handled by multiple means, one of which is bypassing some of the Linux operating system's 'heavy lifting' networking code (which is usually unnecessary with simple packet switching, as in the case of the SBC data layer). By using network acceleration techniques such as SR-IOV and ENA, the data layer is no longer a bottleneck for software SBCs.

The Media Layer

The third layer, which is probably the most challenging, is the media layer. This layer is in charge of handling the RTP payload and performs tasks such as voice codec transcoding, DTMF detection and injection, etc.

Hardware SBCs use Digital Signal Processor chips to handle media layer activities and are highly optimized for this application. DSPs also perform mathematical filters on the voice samples, which involves vector arithmetic where a vector is a series of numbers.

DSPs support very long vectors and also wide and fast memory buses to ‘feed’ these vectors and prevent memory access bottlenecks. These make DSPs optimal media handling devices.

Intel x86, on the other hand, is a general-purpose CPU which, in addition to doing vector calculations, supports a wide set of additional instructions unrelated to the handling of media. As such, the x86 is generically less efficient, both power and performance wise, as compared to DSPs.

Intel has been strengthening the vector arithmetic capabilities on its recent CPU architecture evolutions. Vector arithmetic engines have evolved over time, using technologies such as AVX and AVX2, up to the latest AVX512.

Intel cores are also unbalanced when comparing their signaling and media throughput with their transcoding throughput. A single Intel core can handle 10 times or more SBC sessions (which include SIP signaling and RTP) than the number of transcoded voice sessions.

When Is a Software SBC the Right Choice?

SBC applications can be divided into three main categories: enterprise SBCs, service provider access SBCs and service provider peering SBCs. Today’s software SBCs can fit almost any voice and unified communications use case.

Starting with **enterprise SBCs,** these usually require no more than a few hundred sessions. Full session transcoding is required when the carrier’s SIP trunk uses a different vocoder than the one on the LAN side. A typical transcoding use case would be Microsoft Teams Direct Routing, where G.711 needs to be transcoded to the SILK codec.

In other cases, most service providers offer G.711 SIP trunks which are compatible with all IP phones served on the LAN side. As a result, full session transcoding is not required (some transcoding may still be needed for remote workers that use a different vocoder, but these require transcoding on only a small portion of the calls). Software SBCs, especially virtualized ones, are a good a fit in this case.

Service provider access SBCs, in most cases, do not require transcoding, mainly because they enforce the service provider media policy rather than convert the media coming from the customers. Since these SBCs are mostly large, they make an excellent fit for software SBCs that can scale out horizontally by adding more virtual resources.

In contrast, **service provider peering SBCs** do require transcoding in many cases, as different service providers may use different vocoders and fax transports. In such cases where transcoding is a must, a software SBC with a scalable media cluster makes a good choice.

As mentioned, a main performance factor determining a software SBC fit or unfit for an application is the need for transcoding. The advent of technologies such as WebRTC and Microsoft Teams introduces additional vocoders, specifically Opus and SILK, into widespread use. This means that large-scale transcoding will still be needed in the foreseeable future.

Cloud-Based Elastic SBCs Are Changing the Game – and Cutting Costs

A newer type of software SBC, called an elastic SBC, can strike a balance between the requirement to transcode the media and the cost of the x86 compute resources that are needed for the task.

With an elastic SBC deployed in the cloud, the amount of resources the SBC consumes can change dynamically over time, depending on the traffic needs. When traffic increases, the SBC allocates more virtual resources (CPUs, memory and bandwidth) to sustain the load. Conversely, at low-traffic times these resources are released so you are not charged for them. AudioCodes has entered the elastic SBC market with its Mediant Cloud Edition (CE) model, which is fast becoming a popular option for organizations moving their voice infrastructure to the cloud.

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For more information on the Mediant Cloud Edition (CE), please visit our website at https://www.audiocodes.com/solutions-products/products/session-border-controllers-sbcs/mediant-ce-sbc

About AudioCodes

AudioCodes Ltd. (NASDAQ, TASE: AUDC) is a leading vendor of advanced communications software, products and productivity solutions for the digital workplace. AudioCodes enables enterprises and service providers to build and operate all-IP voice networks for unified communications, contact centers, and hosted business services. AudioCodes offers a broad range of innovative products, solutions and services that are used by large multi-national enterprises and leading tier-1 operators around the world.

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