# Ribbon Session Border Controller

Byrne, John

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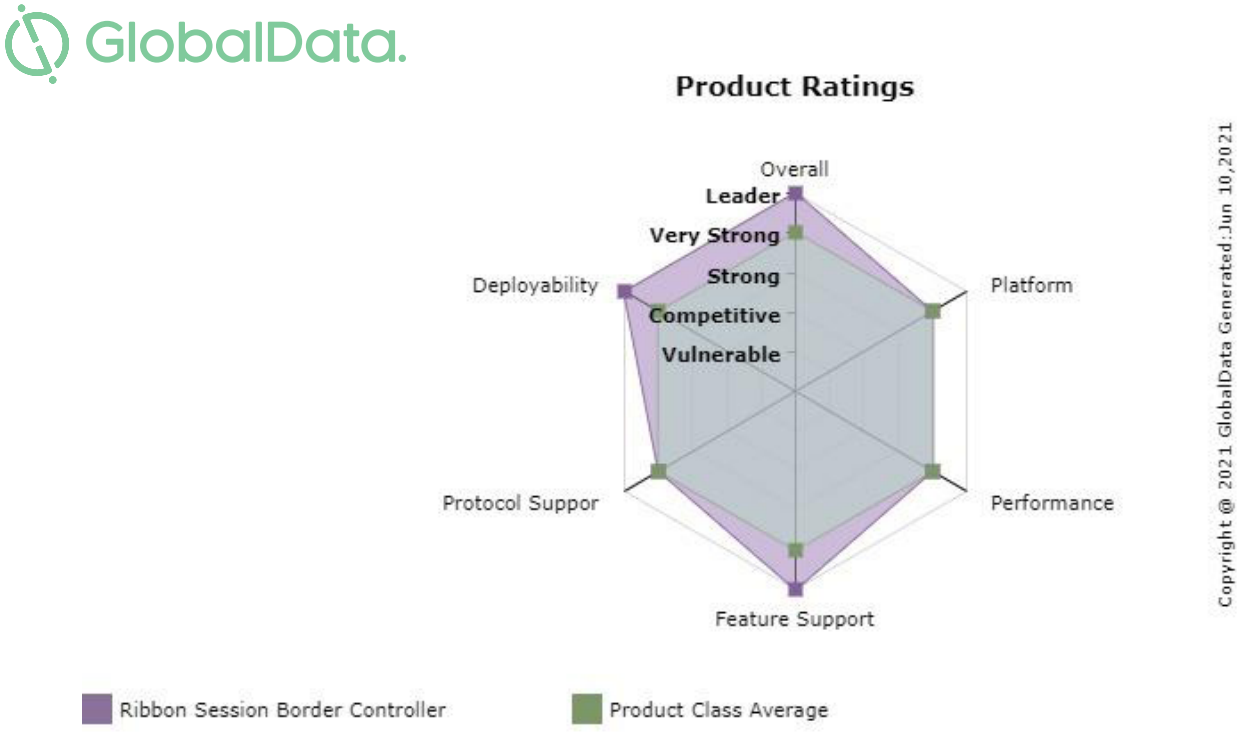
## PRODUCT ASSESSMENT REPORT - SESSION BORDER CONTROLLER

## REPORT SUMMARY

Ribbon was early to embrace Microsoft Teams Direct Routing, an opportunity that has blossomed during the pandemic. Recent traction in the company's cloud-native 'software edition' SBC point to a company hitting a lot of right notes.

## SUMMARY



## WHAT'S NEW

- **March 2021:** Ribbon Communications announced that solutions from its eSBC portfolio have been certified with Twilio Elastic SIP trunking to enable Microsoft teams direct routing, and allows Microsoft teams users to adopt preferred service provider for incoming and outgoing calls.
- **February 2021:** Ribbon Communications Session Border Controller software edition (SBC SWe) was deployed by Emily Tel. This solution delivered enhanced encryption and security services, certified Microsoft Teams direct routing and simplified SIP trunking for business customers.
- **January 2021:** Ribbon Communications announced that Datora Telecom is upgrading its network with cloud-native SBC software edition (SBC SWe) to enable secure, reliable international peering and enhanced quality of service (QoS).
- **January 2021:** Ribbon Communications' SBC software edition selected by Claro Brazil to expand and secure its voice over IP network. This solution delivers flexibility in terms of allocating virtual resources on demand and minimizes the CapEx used for unused capacity.
- **October 2020:** Ribbon Communications announced that its SBC SWe supports Pay-As-You-Go licensing model in AWS marketplace.
- **October 2020:** Ribbon Communications' intelligent Edge SBC portfolio certified to provide carrier-grade premises and cloud-based zoom phone services. The portfolio includes Ribbon Edge Marc Intelligent Edges, SBC 1000, SBC 2000, and SBC Software edition (SWe) Lite.

## PRODUCT OVERVIEW

| Product Name | Ribbon SBC Series |
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| **Description** | Ribbon developed its family of session border controllers (SBCs) to provide security, simplified interoperability, advanced session management, and carrier-grade reliability in public or private cloud deployments for fixed, mobile, cable, and interconnect/wholesale service providers, as well as enterprises.<br><br>Ribbon's SBCs are designed to deliver deployment flexibility that enables security and service quality for applications such as SIP trunking, contact centers, unified communications, VoLTE, VoWiFi, RCS, and OTT. Ribbon targets its SBCs at IP interconnections for IP exchange (IPX), IP peering, intra-network, and international interconnects for the world's largest networks. |
| **Components** | Ribbon's SBC portfolio consists of:<br><br>• Session Border Controller Software Edition (SBC SWe)<br>• Session Border Controller Software Edition Lite (SBC SWe Lite)<br>• Session Border Controller 1000/2000/5400/7000<br>• Q21 Session Border Controller<br>• EdgeMarc- Intelligent Edge 2900/6000/7000 |

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| **Key Customers** | • Algar Telecom (Brazil)<br>• América Móvil (Claro Brazil)<br>• Bandwidth (U.S.)<br>• Bell Canada<br>• Datora Telecom<br>• NICE Incontact<br>• Nuwave Communications (U.S.)<br>• Prairie Grove Telco (U.S.)<br>• Telefônica (Vivo Brasil)<br>• Verizon (U.S.) |
| **Key Rivals** | • Ericsson<br>• Huawei<br>• Metaswitch<br>• Nokia<br>• Oracle<br>• AudioCodes<br>• ZTE |

## ESSENTIAL ANALYSIS

### Strengths

- **Public Cloud Deployments:** Ribbon's public cloud support accelerates operator time-to-market for new services. Ribbon now offers pay-as-you-go licensing options and is public cloud-friendly, including a close alignment with AWS and Microsoft Azure communication applications.
- **Strong in Security:** Ribbon has been a proponent of the SBC as a crucial element in preventing fraudulent calling, particularly in the U.S. market as part of STIR/SHAKEN solutions.
- **Network Edge:** Ribbon's EdgeMarc portfolio forms the foundation of an expanding focus on the "intelligent edge." The EdgeMarc 6000 in particular offers an elegant path from physical to cloud-native deployments for many companies.

### Limitations

- **Trails in Endorsements:** Ribbon provides less evidence of the number of SBC customers and multi-vendor IMS core interoperability partners than most other vendors.
- **Portfolio Gaps:** Ribbon lacks adjacent telco software portfolio items such as IMS and PCRF/5G PCF. Some operators may prefer to work with vendors that are better positioned to supply a number of products rather than seek out best of breed partners by domain.

# CURRENT PERSPECTIVE

**LEADER**

The Ribbon SBC series is a leader in our compared set of session border control solutions. The company's acquisition of Edgewater has served as a foundation point for pivoting Ribbon's focus to emerging enterprise edge and core use cases, enhancing those assets with Ribbon strengths in analytics and security. Ribbon has established public cloud credibility and is building a solid bridge for enterprises to embrace containerization and cloud-native architectures at their own pace.

Ribbon has been one of the most prolific supporters of Microsoft Direct Routing, which enables enterprises to connect on-premises telephony infrastructure seamlessly to Microsoft Teams. Its early support proved prescient when COVID-19 accelerated work-from-home requirements that in turn created an enormous catalyst for Microsoft Teams. However, the lengthening list of vendors now supporting Direct Routing for Teams, as well as Microsoft's new Operator Connect service, mean Ribbon needs to create differentiation for its Microsoft-related offerings.

Ribbon continues to distinguish itself with the introduction of new software and as-a-service offerings, giving it multiple on-prem, public/private cloud, and managed consumption models to cater to many different operator and enterprise types. Ribbon can also point to a portfolio that encompasses telecom software and hardware assets as well as IP optical elements, thanks to its ECI acquisition.

# COMPETITIVE RECOMMENDATIONS

**PROVIDER**

- **Clarify Analytics Role:** As it continues to expand into the enterprise and SMB segment, Ribbon can do more to clarify the role of its analytics portfolio in enabling more efficient operations and to enhance its security credentials.
- **Clarify Ribbon/Microsoft Value Prop:** As additional vendors get certified for Direct Routing for Teams Calling and Microsoft's new Operator Connect offerings, Ribbon will need to double down on differentiation. Ribbon will need to be proactive in offering new services such as its Teams Survivable Branch Appliance introduced in February 2021, to make the case that it can out-innovate even Microsoft-owned Metaswitch.
- **Analytics + Fraud Prevention Expansion:** Ribbon should differentiate from other call fraud-STIR/SHAKEN offerings by emphasizing the power of its network analytics combined with a growing data lake of call data to identify malicious actors and detect and mitigate fraudulent calling activity more effectively than competitors. Ideally this could take the form of quantifying operator benefits from deploying Ribbon's STIR/SHAKEN solutions.

**COMPETITORS**

- **New SBC Use Cases:** Most vendors can and should carve out differentiation by advocating for a more active role for the SBC in enabling new use cases that go beyond basic media processing and transcoding. In particular, SBC-as-a-service models can enable cloud-based deployments to address, e.g., network edge security without requiring significant upfront costs.
- **Channel Expansion:** With the SBC spotlight focused increasingly on work-at-home enablement including smooth integration with Zoom and Microsoft Teams, competitors may wish to consider beefing up their partner/channel strategy to more effectively mine opportunities in new regions or smaller market segments.
- **Raise GPU Concerns:** All SBC rivals can point to improved CPU performance and the value of relying on well-established processing methods as opposed to the somewhat more challenging move to GPU-based processing, especially for audio transcoding applications.

**BUYERS**

- **Operator/Enterprise Balance:** Operators should evaluate Ribbon's product development to ensure that the company is maintaining an aggressive development strategy for operator-centric SBC products even as Ribbon continues to delve deeper into developing enterprise- and SMB-oriented SBC, UCaaS, and SIP trunking products and services.
- **GPU Roadmap Definition:** With operators slowly warming to the idea of utilizing GPUs to address certain workflows, operators should press Ribbon for a more consultative approach that can selectively deploy GPU when conditions warrant but preserve existing investments in CPU-based processing.

## Metrics

| PLATFORM CAPABILITIES | |
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| **Rating:** | Very Strong |
| **Product/Series Name/ Release:** | SBC family of products addressing both enterprise and service provider markets, based primarily on capacity. SBC 5400, SBC 7000, and the SBC SWe (virtual SBC) all share common software. |
| **Date of Availability:** | June 2012 |
| **Operating System:** | Linux |
| **IMS Compliance:** | Operators can, at their own pace, activate IMS functionality with Ribbon SBCs through a simple provisioning change. Transitioning from pre-IMS to IMS-compliant architecture is supported in a live, traffic-bearing network. Furthermore, Ribbon SBCs support both IMS and pre-IMS (or NGN) traffic simultaneously in the same chassis. The Ribbon SBC portfolio members functionally map into the following IMS elements: P-CSCF, I-CSCF, E-CSCF, I-BCF, I-BGF, THIG, ATCF, EATF, and IWF. The Ribbon PSX provides the BGCF function. |
| **vSBC Product Name:** | SBC Software Edition (SBC SWe) and SBC SWe Lite |
| **Date of Availability (vSBC):** | SBC SWe was introduced November 2013. Full cloud support was introduced in July 2016. SWe Lite introduced in September 2016. |
| **vSBC Functional Architecture:** | The SBC SWe can operate in either an integrated or distributed SBC configuration in which signaling, media, and transcoding can be implemented independently. The choice is completely up to the customer on whether they choose an integrated or distributed model. |
| **vSBC VNF Architectural Decomposition:** | The SBC SWe implements a microservices architecture where it is possible to independently scale signaling, media, and transcoding for the highest possible capacity and most efficient use of resources in any environment. The Signaling (S-SBC), Media (M-SBC), and Transcoding (T-SBC) planes all scale independently, yet when implemented in an integrated configuration, logically come together to act as a single SBC. The S-SBC is deployed with 1:1 redundancy using 2 x VNFCs (1 for active, 1 for standby). The M-SBC and T-SBC can be deployed with up to 4:1 redundancy using 5 VNFCs (4 for active, 1 for standby). |

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| **vSBC VNF Manager:** | Ribbon provides a VNF Manager (VNFM) along with the Ribbon Insight Element Management System. In addition, Ribbon has proven interoperability for VNF orchestration with HPE NFV Director, Juniper Contrail, ADVA Ensemble, Dorado Redcell, Cisco NFVO, Ericsson Cloud Manager, Fraunhofer FOKUS Open Baton, Opennet Weaver, and RIFT.io's RIFT.ware. |
| **NFVI Support:** | Ribbon has conducted interoperability testing with Red Hat, Wind River, Canonical, ADVA, Ericsson, and Intel, running on Dell, HP, and Lenovo hardware. |
| **NFVIM Support:** | The Ribbon SBC SWe supports Open Stack, KVM, and VMware. |
| **vSBC Media Plane Acceleration Technologies:** | Media acceleration in the Ribbon SBC SWe can be done using Intel's DPDK, SR-IOV, as well as implementing specific recommendations for a dozen OpenStack configuration settings to optimize data plane performance and mitigate media latency and throughput. The Ribbon SBC SWe supports the use of graphic processor units (GPUs) for transcoding, enabling a dramatically higher scale compared to using CPUs for transcoding. |
| **vSBC High-Performance Media Processing Implementation Support:** | The Ribbon vSBC supports media acceleration at multiple layers. On the SBC application layer, DPDK acceleration is implemented to bypass kernel interrupts in Ribbon's Operating System (OS). Network layer acceleration can be achieved by either using pass-through technologies like SR-IOV or accelerated virtual switching technologies like OVS-DPDK. The microservices architecture supports independent scaling of signaling, media, and transcoding, so a single SBC will consist of a cluster of instances supporting those functions. |
| **vSBC Feature Enhancements:** | The SBC SWe is integrated with Ribbon's Network Wide Licensing model enabling dynamic licensing across any of the Ribbon SBC platforms. The SBC SWe supports a data agent running with each instance of the SBC VNF that provides traffic KPIs and health metrics to Ribbon's Analytics portfolio. Lifecycle management of the SBC VNFCs is provided by Ribbon VNFM and/or third-party orchestration solutions that support ETSI or ONAP frameworks. |
| **Virtualized SBC (vSBC) Load Balancing Strategy:** | Ribbon provides load balancing for clustered SBC instances in a cloud/virtual deployment. When instantiating the SBC as a VNF, Ribbon solutions can distribute traffic between multiple instances in a cluster, ensuring traffic is evenly distributed. For a SBC application, Ribbon's load balancing solution has real-time knowledge of session persistence and session load to enable scaling to very high traffic volumes. |
| **Virtualized SBC (vSBC) High-Availability Strategy:** | The Ribbon virtual SBC supports high availability with service, subscriber, and call resiliency. The SBC VNFCs can be paired 1:1 or 4:1 and the redundancy framework on both the active and standby systems continuously monitor the active instance. Ribbon supports seamless failover in order to achieve call resiliency when deployed on a public cloud. |

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| **Virtualized SBC (vSBC) Scaling Strategy:** | Ribbon SBC SWe supports a microservices architecture in which it is possible to independently scale signaling, media, and transcoding for the highest possible capacity and most efficient use of resources in any environment. The signaling SBC (S-SBC), media SBC (M-SBC), and transcoding SBC (T-SBC) can all scale at their own pace, depending on network traffic profile and traffic demand. |
| **Hybrid SBC Interworking:** | 100% interoperable. The SBC SWe will interwork with Ribbon's physical SBCs (5400 and 7000) because they use identical application software and they can be jointly managed with the same Element Management system. For example, in a distributed SBC model, a Signaling SBC will be able to interwork with the SBC 7000 for transcoding. |
| **vSBC Public Cloud Integration Support:** | The Ribbon virtual SBC supports deployments in Amazon Web Services (AWS), Google Cloud Platform (GCP), and Microsoft Azure. |

## PERFORMANCE

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| **Rating:** | Very Strong |
| **vSBC Performance Characterization:** | The Ribbon virtual SBC portfolio has a core and edge version.<br>• Core version (SBC SWe): Minimum configuration is 4 vCPUs, 4 vNICs, 10GB of memory, and 100GB of HDD.<br>• Edge version (SBC SWe Lite): Minimum configuration is 1 vCPU, 1 GB of memory, 2vNICs, and 5GB of HDD. |
| **vSBC Configuration Management:** | The SBC SWe can be configured as an integrated SBC or distributed SBC (D-SBC) where signaling, media, and transcoding are separate. vCPU, memory, and other virtual resources are configured at instantiation time for each VNF. |
| **Third-Party SBC Validation:** | Independent performance testing reports from Miercom for the SBC 7000 (June 2015), SBC 5400 (May 2017), SBC 2000 (July 2013), and SBC 1000 (October 2017) are available. |
| **Third-Party vSBC Validation:** | Independent performance testing reports from Miercom for the SBC SWe (June 2016) are available. |

## FEATURE SUPPORT

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| **Rating:** | Leader |
| **Standards Support:** | The SBC supports the following communication services standards:<br>* GSMA IPX; GSMA IR.92 (VoLTE); GSMA IR.94 v10 (ViLTE);<br>* IR.51 v2.1 (VoWiFi)<br>* SIPConnect 2.0<br>* multiple 3GPP IMS standards<br>* RCS (GSMA RCC.07 v 6.0) |

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| **Routing Intelligence:** | Ribbon provides several options for routing intelligence: centralize the routing via Ribbon PSX (policy/routing server); utilize local policy capability, the Embedded Routing Engine (ERE), in the SBC; or combinations of the above. The PSX supports a variety of service and routing functions and is provisioned through the Ribbon Insight Element Management System (EMS); both GUI and open standards APIs are supported. The PSX receives signaling information from the call control and signaling functions located within the Ribbon SBC, performs services processing (such as digit/parameter analysis, screening and blocking, number translation, two-stage dialing, and traffic control), and instructs the Ribbon SBC how to route calls. In addition, local routing intelligence is supported on the Ribbon SBCs and does not require access to external systems. |
| **Bandwidth Management:** | At the higher protocol layers, ingress and egress bandwidth management is enforced via call admission control (CAC). IP Trunk Groups enable the Ribbon SBC portfolio members to provide the same call management functions for packet-to-packet communications as have traditionally been afforded to PSTN (circuit) trunk groups. Items that are rate limited include maximum concurrent bandwidth used, maximum concurrent calls, and call setup rates (steady-state; burst modes). |
| **Access Control:** | The Ribbon SBC portfolio members support multiple approaches to IP Access Control Lists (ACL): The Ribbon SBC supports configuration of input filters that permit or deny packets originating from certain sources or terminating on certain TCP/UDP ports. Rogue RTP protection: The SBC detects and mitigates the impact of rogue RTP streams. RTP Relay can be configured to perform the functions of a pinhole firewall, silently discarding all media packets that are not part of a properly originated call. It passes only those packets for which the Source Address Filter (source address & port; destination address & port) fully matches that signaled in a successful call attempt. The Ribbon SBC also validates media packets with respect to proper VLAN tags. |
| **DoS/DDoS Prevention:** | Ribbon SBCs perform IP traffic policing through a configurable facility to block, identify, and report denial-of-service (DoS) and distributed denial-of-service (DDoS) IP attacks within the processing flow on all ports simultaneously. Packet discard rate thresholds and durations are defined for recognizing an attack, and dynamic blacklisting restricts traffic from endpoints/peers based on specific events, e.g., receiving excessive traffic from these entities. For access/residential VoIP configurations, the Ribbon SBC supports a dynamically adjusting trust model. |
| **Topology Hiding:** | Ribbon SBC portfolio members perform as a SIP B2BUA and all signaling and media streams are terminated and regenerated, so internal core network topologies are never revealed. |

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| **Call/Session Admission Control:** | Ingress and egress bandwidth management is enforced via call admission control (CAC). The manifestation of CAC at peering points is performed by the SBC using IP trunk groups (IPTG). IPTG enable the Ribbon SBC to provide the same call management functions (services processing, routing, call admission and traffic management controls, accounting, reporting, etc.) for packet-to-packet communications as have traditionally been afforded to PSTN (circuit) trunk groups. Items that are rate-limited include maximum concurrent bandwidth used, maximum concurrent calls, and call setup rates (steady-state; burst modes). Per-device CAC is also supported. |
| **Transcoding Avoidance:** | Ribbon SBC can be configured to relay voice sessions transparently without performing transcoding. When transcoder-free-transparency mode is enabled, SBC will let 'offer answer' happen end-to-end and not augment the codecs in the relayed INVITE. Also, SBC supports flexible Service Profile configurations, which can control policy on specific transcoding combinations to be invoked for the call. |
| **Blacklisting:** | Ribbon SBC supports static as well as dynamic block lists of malicious endpoints. Endpoints can be put on block or allow lists by configuring appropriate ACL. Dynamic block lists enable the blocking of offending endpoints based on events such as receiving excessive traffic from these entities, number of authentication failures, etc. Dynamic blocking is used more as a mechanism to deal with misbehaving entities. |
| **Emergency Services:** | Ribbon's SBC portfolio provides emergency services call support. Calls to emergency numbers are prioritized and can be routed based on origination. This is supported for calls originating on fixed as well as mobile networks, including VoLTE access with IMS support for Emergency Call Session Control Function (E-CSCF) and Emergency Access Transfer Function (EATF). Ribbon SBCs also handles call prioritization based on GETS (for government use) and E911. |
| **Regulatory Support:** | The Ribbon SBC portfolio provides full support for CALEA/Lawful Intercept. SBCs support obtaining audio streams (call content), as well as real-time call-identifying information (call data). Ribbon supports an Open Lawful Intercept API for integration with third-party Intercept servers. Ribbon supports integration with multiple vendors including Verint's STAR_GATE Lawful Intercept product suite, Subsentio, and Utimaco. Also, Ribbon has verified with Subsentio the delivery of a virtualized lawful surveillance solution that aligns with evolution of the telco network to the cloud.The Ribbon SBC portfolio also provides full support for Secure Telephone Identify Revisited / Signature-based Handling of Asserted Information Using Tokens (STIR/SHAKEN) for applying digital signatures that validate the telephone identity of the calling party (STIR) and confirm to the industry standard framework for interworking VoIP-based calls (SHAKEN). This capability helps carriers mitigate robocalls, spoofed calls, unwanted calls or spam phone calls making up the most significant source of customer complains. |

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| **Service Assurance:** | Ribbon provides service-level assurance in multiple dimensions. The Ribbon SBC provides live monitoring and troubleshooting of network traffic from its management interface. Ribbon also offers an Analytics portfolio which provides network-wide behavioral analytics and anomaly detection that automatically captures and scores KPIs, and analyzes call detail records (CDRs) from Ribbon network elements, including the SBC family. Enriched data is turned into actionable information through visual reports, alerts, and automated policy. Additionally, Ribbon Analytics delivers service quality assurance through active call monitoring and analytics then presents the resulting quality of experience (QoE) data through detailed visual reports, real-time alarms, and insight into the historical performance of a Ribbon network. With Ribbon Analytics, service providers and enterprises can identify potential capacity issues before they occur, forecast bandwidth/ traffic demands, and plan for network overloads, outages, and disaster recovery. |
| **VoLTE User Experience:** | Ribbon's SBCs support VoLTE services in home and visited networks. Ribbon SBCs can take up roles of P-CSCF, E-CSCF, ATCF/ATGW, and IBCF for VoLTE users. They support optimizations like optimal media routing and wideband codecs for enhanced user experience. |
| **Reporting & Analytics:** | Full reporting and alarm capabilities: QoS reporting, server performance status (SPU, memory, etc.), alarms via SNMP, network-level stats via EMS, network and service security and operational analytics with the Ribbon Analytics suite of applications |
| **Session Visibility:** | Using the Ribbon on-board management interface allows call trace and debugging capability. SIP ladder diagrams, call detail records, and packet captures are all available. The Ribbon Analytics' Discover application can provide similar capabilities and analytics insights into network and service behaviors. |
| **Policy Control:** | Ribbon SBCs support an onboard policy engine that allows customers to combine subscriber, network, and business logic connect sessions to define routing policies. Ribbon SBCs support SIP header manipulation to allow various SIP stacks to be interworked without the requirement for new code delivery. |

## PROTOCOL SUPPORT

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| **Rating:** | Very Strong |
| **Signaling Protocols:** | The Ribbon SBC portfolio supports BGCF, Diameter, ENUM, H.248, H.323 v2/ V3/V4, HTTP, IPsec, IPv4, IPv6, Megaco/MGCP,SIP, SIP over TCP, SIP-I, SIP-T, and UPnP. |
| **Media Protocols:** | The Ribbon SBC portfolio supports RTP, RTCP, SRTP/SRTCP, MSRP, FECC, BFCP, DTMF interworking, and multiple voice and video codecs. |
| **Hardware Transcoding:** | Media transcoding is supported for a variety of deployment scenarios, spanning mobile and fixed line applications. All SBC appliances have a flexible deployment model supporting transcoding using DSPs. The SBC 5400 and SBC 7000 support the ability to add DSP cards to a fielded system that benefits the target network deployment model. |

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| **Software Transcoding Strategy:** | The virtual SBCs support multiple methods of transcoding. Virtual DSPs emulated in CPU cores provide modest scale transcoding support. GPUs can be used for transcoding as part of a microservices architecture providing significantly higher scale at lower price points. And lastly, the Ribbon virtual SBC can use transcoding resources on a RFC 4117 compliant MRF. |
| **Codec Support:** | Transcoding includes to/from G.711, G.711SS, G.729, G.729A, G.729AB, G.726, T.38, G.723.1, G.723.1/A, iLBC, iLBCSS, AMR, AMR-WB (G.722.2), G.722, Opus, EVRC, and EVRC-B. |
| **Signaling Encryption:** | Support for TLS and IPsec. |
| **Media Encryption:** | The Ribbon SBCs can relay encrypted media SRTP (SDES), DTLS-SRTP, IPsec, and VLANs. They can relay or interwork it into unencrypted media. |
| **VoLTE Roaming Support:** | The SBC supports the RAVEL architecture and the Transit and Roaming Function (TRF) and applies TRF procedures as defined for a looped back RAVEL call. In addition to supporting direct media between endpoints residing in the same media zone, the SBC also supports Optimal Media Routing (OMR) procedures and allows bypassing the Transition Gateways (TrGWs). OMR enables media path optimization by allowing intermediate nodes to be bypassed for media anchoring. The SBC supports OMR procedures in IBCF and P-CSCF roles. |
| **VoWiFi Security Support:** | Protection from denial of service (DoS) and distributed denial of service (DDoS). Transport layer security (TLS) and Secure Real Time Protocol (SRTP) encryption and conversion. P-CSCF for authentication of native devices using IMSAKA. Topology hiding and Network Address Translation (NAT) traversal to keep IP addresses private. |
| **WebRTC Support:** | The Ribbon Core SBC supports SIP signaling from WebRTC endpoints over a WebSocket transport. The SBC provides security functions like policing, call admission control and secure WebSocket (wss) to relay and interwork SIP over WebSocket to SIP over UDP/TLS/TCP etc. Customers can also leverage opensource clients and/or SDKs like jssip, doubango, etc. The Ribbon SBC will interwork with any client using standard SIP over WebSocket implementation. |
| **SDN Controller Support:** | With support of a microservices architecture, where the signaling functions are be independent of media handling, it is possible for the media plane to be under the control of an SDN controller. Ribbon is investigating direct vSBC - SDN controller interactions based on REST API. |
| **API Support:** | The primary programmatic interfaces used to access the SBC are via CLI or a REST API CLI: The traditional method to configure systems from any machine with network access using a secure shell (SSH) client terminal emulator. REST API: The methods used by developers are standard HTTP methods such as GET, PUT, POST, PATCH, and DELETE. |

| DEPLOYABILITY | |
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| **Rating:** | Leader |
| **Product Platform Portfolio:** | Appliance (SBC 5400, 7000, 1000, 2000), EdgeMarc 2900, EdgeMarc 6000, EdgeMarc 7301, SBC SWe (virtual), and SBC SWe Lite (virtual) |
| **Configuration Options:** | The Ribbon SBC 1000, SBC 2000, EdgeMarc 2900, EdgeMarc 6000 and EdgeMarc 7301 platforms can be configured as a session border controller, a TDM media gateway, or both- simultaneously. The SBC 7000, 5400, SBC SWe and SBC SWe Lite are optimized for IP only applications such as session border controller or IMS/TISPAN elements (P-CSCF, I-BCF, I-BGF). They can be configured as an access SBC, a peering SBC, or both. |
| **Platform Customization:** | Proprietary, COTS |
| **Operations & Management:** | The SBC Embedded Management Application (EMA) is a web-based interface management system for configuring Ribbon Session Border Controllers (SBCs). As an embedded management system, EMA supports configuration, fault, and security management functions through an intuitive, easy-to-use, browser-based user interface. Ribbon's EdgeView SCC works in tandem with EdgeMarc Intelligent Edge devices to provide a complete view of your network. EdgeMarc provides EdgeView SCC the data source for network edge performance monitoring, assistance with troubleshooting, and reporting. This environment provides greater insights on both WAN and LAN issues and access endpoint diagnostics. Using zero-touch provisioning, EdgeView SCC can speed installations and improve accuracy. |
| **Licensing Model:** | Ribbon supports multiple licensing models including:<br>• Perpetual node locked licenses tied to specific hardware of software platforms<br>• Network wide licenses that can be shared across multiple SBC platforms<br>• Subscription-based, as-a-service licenses for consumption-based deployments |
| **SBC Deployments:** | Several hundred operators, thousands of enterprises. |
| **SBC IMS Deployments:** | Not disclosed |
| **SBC IMS Core Interoperability:** | Not disclosed. Ribbon tested against multiple IMS core vendors, but have not disclosed publicly at this time |

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| **SBC-as-a-Service:** | Ribbon supports SBC as a Service (SBCaaS) business models using either SBC SWe or SBC SWe Lite as the virtual CPE, depending upon customer traffic requirements. Two deployment models are expected, one with the managed service provider providing virtual SBC functionality in a vCPE platform on the customer's premises/private or public cloud/datacenter, the other with the managed service provider hosting all virtual SBC functions in their own Cloud/datacenter with only a physical connection to the customer. Subscription-based licensing models enabling SBC-as-a-Service are supported as well. |
| **Multivendor vVoLTE Support:** | Not disclosed at this time |
| **NFV MANO Deployability:** | Ribbon has completed testing with a Tier 1 wireless carrier using HPE. |
| **Third-Party NFV Ecosystem Participation:** | Ribbon participated in 2015 New IP Agency interop testing event and 2016 ETSI Plugtest events. Ribbon is an active member in NIA. Moreover, Ribbon is a member in the Linux Foundation where the company is an active participant in OPNFV, ONAP, and OpenDaylight projects. Ribbon has done one-on-one testing with at least 10 other ecosystem partners. |
| **Date of First Deployment (vSBC):** | December 2013 |
| **Virtualized SBC Deployments (Telco Private Cloud):** | Live deployments in multiple Tier 1 service providers, including Verizon Wireless, Claro, and Vivo in Brazil. |
| **Virtualized SBC Deployments (Public Cloud):** | Bandwidth (U.S.) |
| **Virtualized SBC Deployments (Vendor Cloud):** | Not disclosed, but in unannounced live deployments |