Essentra™ BAX

Product Description

VocalTec

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Introduction

Essentra BAX is a carrier grade turnkey solution that offers service providers a cost-effective entry into the world of broadband VoIP services, with the capability of scaling up to millions of subscribers. Essentra BAX supports traditional subscriber calling features (e.g., call waiting, call forward), as well as a wide range of innovative features including call screening, click to dial and anonymous call rejection. For enterprise customers, Essentra BAX supports VoIP VPNs and a wide range of IP Centrex features. A web-based subscriber self-provisioning interface enables subscribers to control their own services, thereby allowing service providers to offer their customers increased control over their service while at the same time reducing their OpEx.

Essentra BAX is a member of VocalTec's Essentra Product Suite, a modular set of open and highly flexible softswitch products for next generation network operators. Essentra BAX can be deployed with other Essentra products to create the basis for future Class 5 alternative solutions for residential and SOHO/SME subscribers.

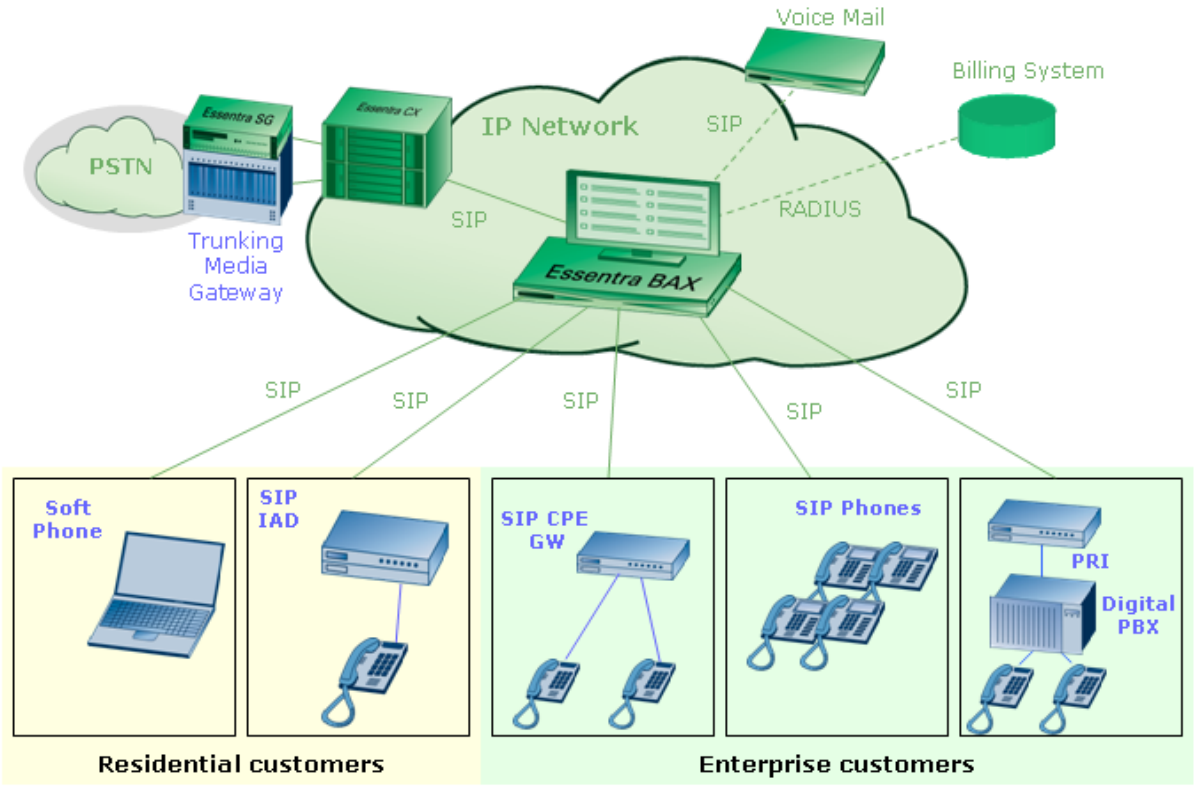

Figure 1-1: Broadband VoIP Solution based on Essentra BAX

Essentra Product Suite

Essentra™ BAX is a member of VocalTec's Essentra™ Product Suite, a modular set of open and highly flexible softswitch products for next generation network operators. The Essentra products can be deployed individually or in any combination of groupings in order to provide tailored and cost-effective solutions for each carrier's specific service needs. Using the Essentra Product Suite, carriers can seamlessly integrate state-of-the-art network components from VocalTec and third party vendors to create best-of-breed network solutions.

Other members of the Essentra product suite include:

- Essentra™ CX – Core Control Softswitch
- Essentra™ EX – Peering Manager
- Essentra™ OSS – Operational Support Server
- Essentra™ TMS – Traffic Monitoring System
- Essentra™ SG – SS7 Signaling Gateway

Essentra BAX Functionality

Essentra BAX is a SIP based softswitch platform designed to support broadband residential VoIP and Hosted Enterprise. Through its support for the SIP and H.248 protocols, Essentra BAX is interoperable with a range of subscriber endpoint devices as well as Access gateways and softswitches. In addition, Essentra BAX can interwork via SIP with other Essentra products and third party application servers to broaden the functionality of the system.

SUBSCRIBER CALLING FEATURES

Essentra BAX enables subscribers to make and receive telephone calls over their existing broadband and/or narrowband IP connection. Calls can be made to and from other subscribers of the same Essentra BAX network as well as to any PSTN subscriber.

Essentra BAX supports a wide range of subscriber calling features for residential and enterprise users. These calling features can be activated or deactivated by the subscriber using the self-provisioning web interface and/or via activation codes entered through the subscriber's handset.

Among the features supported are:

- Call waiting – enable / disable
- Call forward:
  - Unconditional
  - On busy
  - On no answer
  - Offline
- Caller ID sending/blocking
- Three-way calling
- Voice Mail
- Call Screening including:
  - Do not disturb
  - Priority Calls
  - Selective Call Rejection
  - Anonymous Call Rejection
- Automatic redial

- Call return
- Wakeup Call
- Hot line
- Malicious call
- Self Call restriction
- Message Waiting Indication

Other call features and services (such as prepaid calling cards, conferencing, etc.) can be supported through integration with third-party application servers.

The system supports announcements and tones via an integrated announcement server. Announcements are stored in .WAV format and can be modified by service providers to meet their specific requirements.

HOSTED ENTERPRISE FEATURES

Essentra BAX supports hosted enterprise VoIP services including VoIP VPNs and IP Centrex. A single BAX system can support services for multiple enterprise customers whose networks may be distributed over a wide geographic area. Each enterprise can configure its own private numbering plan allowing for on-net and off-net calling. Locations with existing traditional PBXs can benefit from the Essentra BAX network through connection via a SIP-based VoIP gateway.

VoIP VPNs

Essentra BAX supports VoIP Virtual Private Networks (VPN) enabling service providers to offer hosted inter-office calling between multiple branches of an organization. Essentra BAX manages the dialing plans for multiple enterprises on the same platform. Hundreds of VPNs can be supported on the same BAX platform. Each VPN is independent of other VPNs and is managed by its own administrator.

BAX VPN service includes support for regular E.164 dialing, locality based dialing as well as extension dialing.

VPNs

A VPN represents an enterprise entity, or a closed user group. An enterprise entity can have multiple office locations and cost centers. The VPN concept can also be used to define a reseller in a wholesale environment.

All subscribers that belong to a specific VPN share the common properties of that VPN, and can dial each other using a defined extension number.

BAX VPN supports users who are connected to BAX directly via a SIP phone or IAD, as well as those who are connected via a legacy PBX. The PBX connects to BAX via a multi-port digital or analog CPE gateway that does not perform SIP registration with the BAX. BAX supports interconnection to both SIP and Megaco gateways.

Private Numbering Plans

VPN is implemented through the use of dialing plans, associated to PBX extension numbers in an organization. This enables calling between different corporate branches (intra-organizational), using PBX extensions.

In configurations where a single BAX system manages several VPN dialing plans with extension numbers in the same ranges, the extension numbers may be preceded by a prefix (single digit or other short branch prefix) in order to distinguish between the phone numbers ("Virtual Prefix").

Multiple VPN Support

A single BAX system can support the dialing plans for multiple corporate VPNs. The private numbering plan of each VPN is viewed by BAX as an independent entity so that it is possible for more than one VPN in the BAX network to share the same extension numbers.

Supported Calling Modes

Essentra BAX support both On-net and Off-net calling for VPN users. An explanation of both of these call modes is given below.

On-net calls

In a geographically distributed corporate environment, a caller from one location can call a user at another location using an extension number. "Virtual extensions" can be assigned to VPN users not connected to a PBX (e.g. home workers), in addition to their assigned E164 number at which they can be contacted by callers from outside the VPN.

Off-net calls

A caller from a corporate location can call external, regular PSTN numbers, via a gateway hosted by the carrier.

Offnet calls as well as on-net calls are dialed as relative numbers. The Essentra BAX knows to route the call to the correct number on the BAX or on an offnet gateway according to the locality defined for the subscriber making the call.

Every CDR created for a VPN call (both On-net and Off-net) includes a field with the ID of the VPN and location with which the caller is associated. This enables the service provider to bill VPN customers for all calls made within the VPN service.

Supported VPN Scenarios

BAX supports a wide range of VPN scenarios, including:

- DDI and non-DDI extensions.
- Overlapping extension ranges in different VPNs and different locations within the same VPN.
- Incoming phone numbers can be in the form of short numbers (extensions), local numbers, or national numbers with a long distance access prefix and area code.

Hosted Enterprise Features

BAX also supports a wide range of Hosted Enterprise calling features including the following (in addition to residential features):

- Attendant Console
- Auto Attendant
- Click 2 Dial
- 3 way calling
- Multi-party ad-hoc and meet me conferencing
- Repeat Dial
- Call return (*69)
- Call transfer
- Call hold
- Find me
- Follow me
- Hunt group – serial or parallel
- Speed dial – Personal or VPN assigned
- Music on hold
- Call pickup – dedicated or group based
- Boss secretary
- Billing codes
- Authorization codes

ATTENDANT CONSOLE

Essentra BAX comes with an optional Attendant Console feature, which runs on the Essentra BAX server. The Essentra™ Attendant Console is a digital telephone switchboard with a graphic user interface for increased usability. The Attendant Console allows telephone operators within an organization to control incoming calls, transfer them to the relevant destination and create new calls with a simple mouse click.

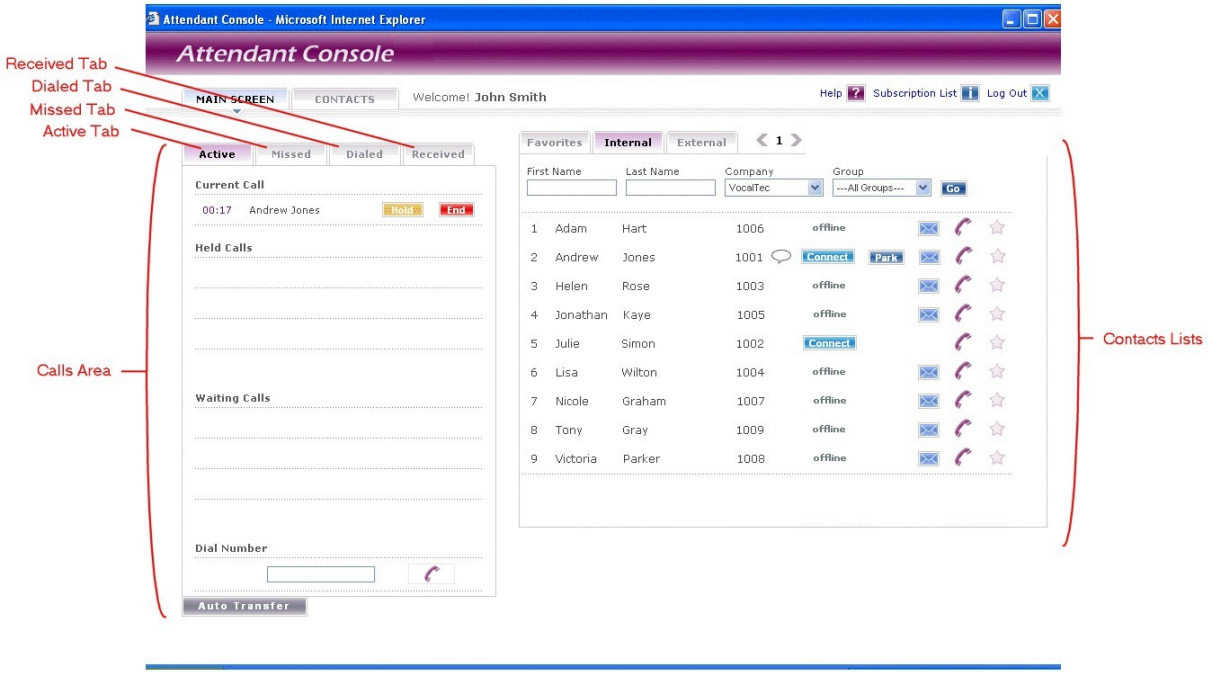

Figure 2-1: Attendant Console screen

AUTO ATTENDANT

The Auto Attendant service is a VXML-based IVR system internal to the Essentra BAX. It can be used in an Enterprise VPN to direct callers to the correct extension, based on menu selections or a dial-by-name directory. The Auto Attendant prompts are fully configurable. The administrator can assign different prompts depending on predefined time plans, to support Holidays, weekends or after hours requirements.

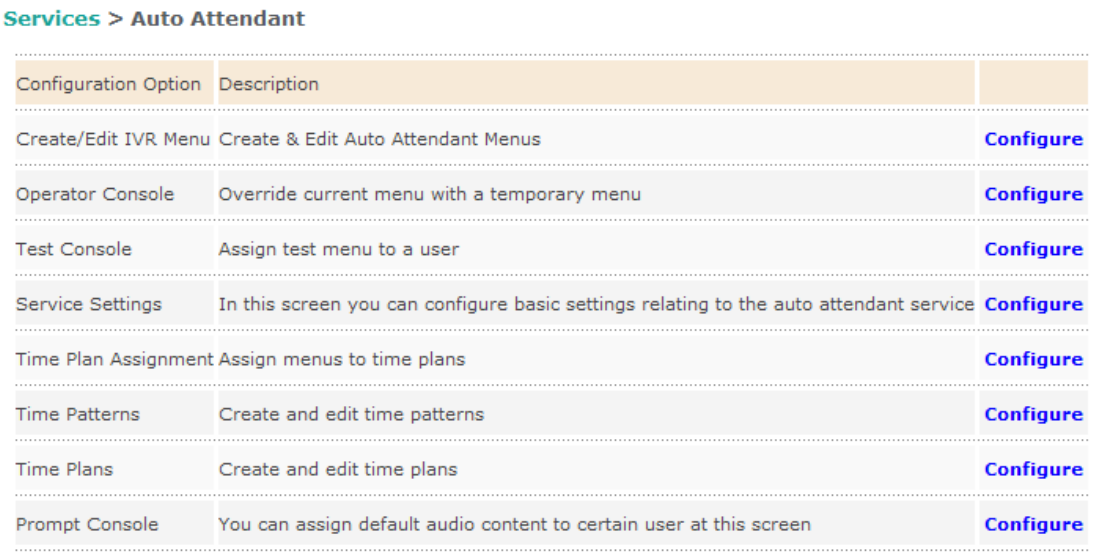

Figure 2-2: Auto Attendant main configuration screen

VOICE MAIL

Essentra BAX comes with an optional voice mail system, which runs on a dedicated server. The voice mail system includes support for the following functionality:

- Subscribers can define when to forward calls to their voice mail (no answer, busy, unconditional).
- System administrators have full control over the voice mail service.
- Subscribers can access their voice mailboxes by dialing an access number (defined by the system administrator). Access is available from endpoints registered to BAX and from external lines.
- Support for DTMF control of the voice mail menu.
- Subscribers can personalize their greeting message.

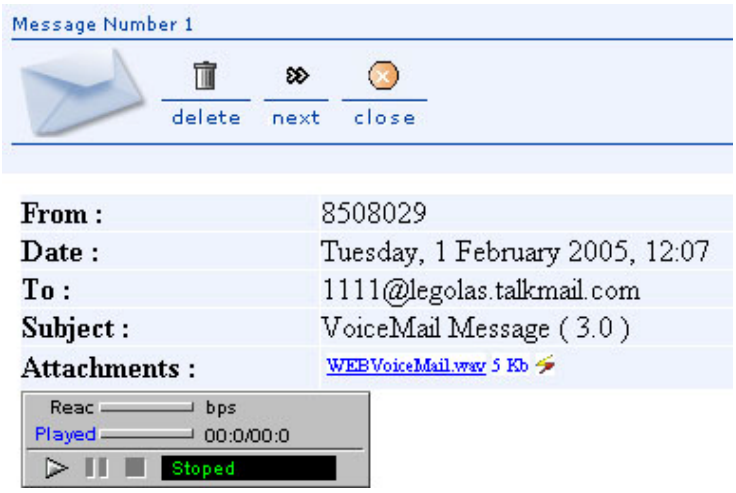

Figure 2-3: Voice Mail with e-mail integration

BAX supports MWI (Message Waiting Indication) for user agents (subscribers) according to RFC-3842.

BAX acts as a statefull proxy regarding SUBSCRIBE/NOTIFY SIP messages:

- User agents that support MWI subscribe for the message waiting according to their configuration, by sending a SIP SUBSCRIBE request to BAX.
- BAX forwards the SUBSCRIBE request to the voice mail server.
- The voice mail server sends a NOTIFY event about messages waiting to BAX, which forwards the NOTIFY request to the user agent.

Most user agents that support MWI can disable MWI and configure the re-subscribe interval. User agents can unsubscribe to the message waiting service as well.

SIGNALING STANDARDS SUPPORTED

SIP

Essentra BAX supports the SIP protocol, performing the functions of Proxy Server, Back-to-Back User Agent (B2BUA), and Registrar. Essentra BAX is compliant with the relevant RFCs, including RFC 3261 Session Initiation Protocol and RFC 2327/3264 Session Description Protocol (SDP).

MEGACO

In addition to SIP, Essentra BAX supports the MEGACO (H.248) protocol, for subscriber gateway call control functionality. Essentra BAX is compliant with the H.248.1, H.248.2 and H.248.8 specification.

INTEROPERABILITY

As a fully compliant SIP Server and Registrar, Essentra BAX is interoperable with many SIP endpoints, including the following devices (among others):

- Integrated Access Devices (IADs)/Analog Telephone Adapters:
  - Sipura SPA-1000
  - Cisco ATA 186
  - Grandstream Handytone 486/488
  - Addpac AP 200/300
  - AudioCodes MP1xx
  - Patton Smartnode SN4112/SN4552
- SIP Phones:
  - Grandstream Budgetone 100/102
  - Cisco 7912/7940/7960
  - PingTel
  - Sipura SPA 841
  - GXP-2000 Telefone,
  - Swissvoice IP10S
  - Clarisys I750H
  - SNOM 320 & 360
- Soft Phones:
  - X-Ten XPro
  - X-Ten Xlite

- EyeBeem
- SJPhone 1.6
- Adoresoftphone.com
- Phoner 1.9
- MS Windows Messenger

For direct interconnection with the PSTN via SS7, Essentra BAX is interoperable with the following SIP gateways:

- AudioCodes Mediant 1000, 2000 (for PRI interconnect).
- Cisco – AS5300, AS5350, AS5400, AS3600, AS3640, AS2600, AS2620
- Patton – SmartNode 4960

Essentra BAX provides interworking with other elements of the Essentra Product Suite for interconnection with the PSTN and other VoIP networks, as well as integration with external application servers.

Table 1-1: Interworking with Other Elements of the Essentra Product Suite

ADDITIONAL FUNCTIONALITY REQUIRED	ADDITIONAL COMPONENTS REQUIRED
Interconnect to NLD, ILD wholesale PSTN/SS7networks Call control, routing and networking with PSTN/SS7 networks Integration with Packet Tandem softswitch	• Essentra CX • Essentra SG • Trunking Media Gateway
Interconnection with other VoIP networks (H.323 or SIP) Security / Enhanced routing	• Essentra EX
Integration with third-party application servers (e.g., prepaid, conferencing, billing)	• Third-party application server

MULTI-TIERED SERVICE PROVISIONING & MANAGEMENT

Essentra BAX provides web-based management at the following levels:

- System administrator

System administrators are able to set up services and VPNs, add, delete, and modify subscribers, monitor system statistics and call logs and provision Lawful Interception administrator and mediation device.

- Lawful Interception administrator

  Lawful Interception (LI) administrators are able to add, delete and modify targets for surveillance and list the current surveilled targets.

- VPN administrator

  VPN administrators can be created for each VPN and sub-VPN in the lower levels of the hierarchy. VPN administrators control only the elements in the network belonging to their own VPN including VPNs created below them in the hierarchy. VPN administrators can create and manage VPNs, administrators, and subscribers within their own VPN and sub-VPNs, and view statistics and call logs.

- Subscribers

  Subscribers are able to view and modify their own service settings, activate and deactivate services, view call logs, etc. In addition, service activation and deactivation can be achieved by dialing special activation codes from the subscriber's telephone set. The graphical user interfaces (GUI) of the system administrator and subscriber management systems are fully customizable and provide support for multiple languages.

SCALABILITY

Essentra BAX runs on a high scale Intel-based IBM X Server platform running the Linux operating system. Several different hardware platform options are available to meet customer requirements in terms of performance, redundancy, and environmental requirements.

HIGH AVAILABILITY

To provide high availability, Essentra BAX can be deployed in a 1:1 active/standby configuration. The high availability configuration ensures that the service continues uninterrupted even in the event of the failure of one BAX server.

High availability is achieved by deploying two BAX servers in a cluster configuration. In this configuration, one server is defined as "active" and the other as "standby". The two servers appear as one device to the outside world through the use of a "floating IP address", which remains the same even in the event of a switchover. The standby server has all the necessary processes up and running at all times, and heartbeat messages are

constantly sent between the two servers with information about their status. In addition, data at several levels is replicated between the servers to ensure that if the active server fails, the standby server can seamlessly take over, retaining the critical system information. Replication takes place at the following levels:

- Call states and CDRs – ensuring that CDR information is correct even if active/standby switchover occurs mid-call.
- Database cache and registrations – ensuring that in the event of a switchover, the standby server's database is not suddenly overloaded.
- Subscriber Database – replication between the server's databases is also carried out to make sure that they are synchronized.
- RTP Relay data – active port bindings are replicated, ensuring that calls using RTP relay are not affected by the switchover.

SECURITY

The system implements standard SIP Digest method security to ensure secure communications between endpoints and the Essentra BAX platform.

Communication with the management interface for both system administrators and subscribers is based on secured HTTPS.

LAWFUL INTERCEPTION

The system implements PacketCable Lawful Interception (LI) specifications for monitoring Call Data and Call Content. Call Data information is transferred to a Mediation Device using RADIUS protocol based on PacketCable EM specifications. Call Content is sent to the mediation device as encapsulated RTP.
It is the responsibility of the Mediation Device to interface with the LEA (Law Enforcement Agency) and provide the required Information including correlation of Call Data with Call Content. Surveilled targets are provisioned by the LI administrator using dedicated secure web access.

PacketCable based LI support enables Essentra BAX to use standard mediation devices to comply with ETSI, CALEA and SORM requirements.

NAT TRAVERSAL

Essentra BAX supports various methods to overcome the problems caused by Network Address Translation (NAT) devices. These include media relay and built-in STUN server.

Media relay is supported in two configurations. In the first configuration media relay module is collocated with the call processing functionality, supporting up to 1000 concurrent media sessions. The second configuration is built around the media relay module on a separate server (BAX-R). In this configuration, each server can perform up to 2,000 concurrent media relay sessions. BAX-R servers can be stacked to support high scale media relay of up to 12,000 concurrent sessions.

BILLING & ACCOUNTING

Essentra BAX supports postpaid and prepaid billing models. CDRs are created for every call made in the system. CDRs are stored on the Essentra BAX server, from where they can be extracted via FTP for external processing.

Essentra BAX also includes a built-in RADIUS client for interworking with external billing systems. Via the real-time RADIUS interface, BAX supports both prepaid and postpaid services. For prepaid services, the RADIUS interface supports automatic call disconnect with an appropriate announcement when the subscriber's credit is exhausted.

Integration is currently available with the EyeBill®, Aradial and MIND billing systems. Integration with other billing systems requires relevant interoperability testing.

Specifications

PROTOCOLS

SIP

- SIP B2BUA, SIP Proxy, SIP Redirect
- RFC 3261 Session Initiation Protocol
- RFC 3262 Reliability of Provisional Responses in SIP
- RFC 3264 An Offer/Answer Model with the Session Description Protocol
- RFC 3265 SIP-Specific Event Notification
- RFC 2327 Session Description Protocol (SDP)
- RFC 2976 The INFO Method
- RFC 3326 The Reason header field for SIP
- RFC 3842 A Message Summary and Message Waiting Indication Event Package for SIP

Megaco/H.248

- IETF RFC 3525 (base protocol), ITU-T H.248.1 (base protocol)
- H.248.2 (fax packages)
- H.248.8 (error code and service change reasons)

Other Related Protocols

- T.38 fax relay
- DTMF RFC 2833, in-band and out-of-band
- RADIUS call detail records (CDRs)

Interoperability

- Multi-vendor interoperability including support for a wide variety of SIP and H.248 based endpoints: IADs, SIP Phones, Soft Phones and gateways

CALL FEATURES

Subscriber Call Features

- Call waiting
- Call forward
  - Unconditional
  - On busy
  - On no answer
  - Offlilne
  - Selective

- Caller ID sending/blocking
- Caller Name
- 3-way calling
- Repeat Dial
- Call Return
- Call screening
  - Do not disturb
  - Anonymous Call Blocking
  - Outbound Call Restriction
  - Selective Call Rejection
  - Priority calls
- Find Me/Follow Me
- Speed dial
- Personal Speed Dial
- Peer-to-peer video calls
- Click-to-dial
- Emergency Call support
- Wakeup Call
- Call Restrictions
- Self Call Restrictions
- Hot line
- Malicious call
- Message Waiting Indication

Hosted Enterprise Features

VoIP VPNs

- Private Numbering plans
- VoIP Trunking for existing PBX locations

Calling Features

- Call Transfer
- Call Hold
- Music on Hold
- Hunt Groups
- Call Park/Pickup
- Boss/Secretary Filtering
- Selective Call Rejection
- Personal Speed dial
- VPN Speed Dial
- Peer-to-peer video calls
- Click-to-dial

- Billing codes
- Password modification
- Remote control

Applications

- Attendant Console for operator positions
- Multi-party ad-hoc bridge conferencing
- Integrated Automated attendant system
  - User configurable flows and announcements
  - Time-based call flows
- Pre-paid services

ROUTING

Policies

- Route selection: source-based, time/date-based, prefix-based
- Routing policies: random, random weighted, longest prefix, locality
- Different routing plan per VPN

Number Analysis

- Calling party and called party number analysis

CAPACITY

- 20,000 subscribers (on single server)
- 20 CAPS
- Up to 1000 concurrent media relay sessions with built in media relay
- Up to 2000 concurrent media relay sessions using BAX-R configuration.
- Up to 6 BAX-R per cluster

ESSENTRA BAX VOICE MAIL SYSTEM

Optional voicemail server

- Calls routed to voicemail under defined conditions:
  - No answer, busy, subscriber off-line/unreachable
- Administrator control over voicemail boxes
- DTMF controlled voicemail menu
- Personalized greetings
- Message waiting indication

Management and Accounting

Configuration and maintenance

- Web-based Management
  - System level
  - Reseller level
  - Enterprise level
- Web-based self provisioning portal, fully customizable
- Multi-level call logs and statistics
- Class of Service definition
- Multi-lingual interface with pre-installed support for English and Russian

CDRs and Billing

- CDRs for successful and unsuccessful call attempts
- Built-in RADIUS client for real-time integration with prepaid and postpaid billing systems

Lawful Interception

- Complies with PacketCable CALEA requirements for Call Data and Call Content delivery (PKT-SP-EM-I12-040113 and PKT-SP-ESP-I03-040113).
- Special web page used to configure targets for surveillance.

Carrier Grade

High Availability

- Carrier-grade 99.999% availability
- 1+1 high availability
- No downtime and no call loss
- No single point of failure
- NEBS compliant

Hardware Components

Essentra BAX Host

- IBM BladeCenter
- IBM xSeries 3550