SBC Workshop

Bogota May 14, 2014

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Agenda

- Introduction to SBC concepts
- Sangoma SBC immersion
- Product specifics and use cases
- Conclusions Q&A

Session Border Controllers

The history of Sangoma Technologies and the Introduction to the SBC

CONNECT WITH SANGOMA

Inside this Module

- About Sangoma Technologies
- B2BUA explained
- What is an SBC and why Session Border Controllers
- Best practices

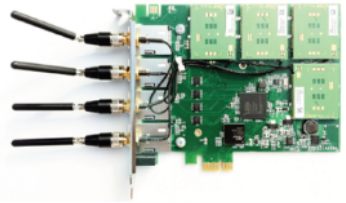
About Sangoma Technologies

About Sangoma

- Industry pioneer with over 25 years of experience in communications hardware and software
- Publicly traded company since 2000 (TSXV: STC)
- Mid-market sized firm with just under 100 staff in all global territories
  - Offices in Canada (Toronto), United States, EU (UK), Asia Pacific (India), CALA (Miami)
- World wide customer base
  - Selling direct to Service Providers and OEMs
  - Selling to the enterprise through a network of distribution partners

World Class Products

- Voice Telephony Cards
  - Analog FXO/FXS
  - Digital T1/E1,
  - GSMdigital/hybrid, WAN, ADSL
- VoIP Gateways
  - NetBorder Carrier Gateways
    - SS7, PRI, R2
  - Vega Enterprise Gateways
    - PRI, R2, Analog, BRI
- Session Border controllers
- Call Center Software
  - NetBorder Express, Call Progress Analyzer
- STM1 Fiber connectivity
- Microsoft Lync Server 2013 Qualified



Vibrant Ecosystem of Clients & Partners

Open Source Telephony
Ready to use drivers for Sangoma cards

Asterisk
FreeSWITCH
Lync
BARRACUDA NETWORKS
hp
AASTRA
Unify your Communication with ESCAUX www.escaux.com
Solutions by Fonality
FORTINET
caliweaver
elastix FREEDOM TO COMMUNICATE
yate
trixbox

Proprietary PBX
Plug-in to major soft-PBX

Contact Center / IVR
OEM Integration with major software suites

inConcert
Genesys
NOBLE SYSTEMS CUSTOMER CONTACT TECHNOLOGIES
INTERACTIVE INTELLIGENCE
digivox
ORACLE
USAN

Carriers, Cloud, Data Networks
Proven Infrastructure Technology

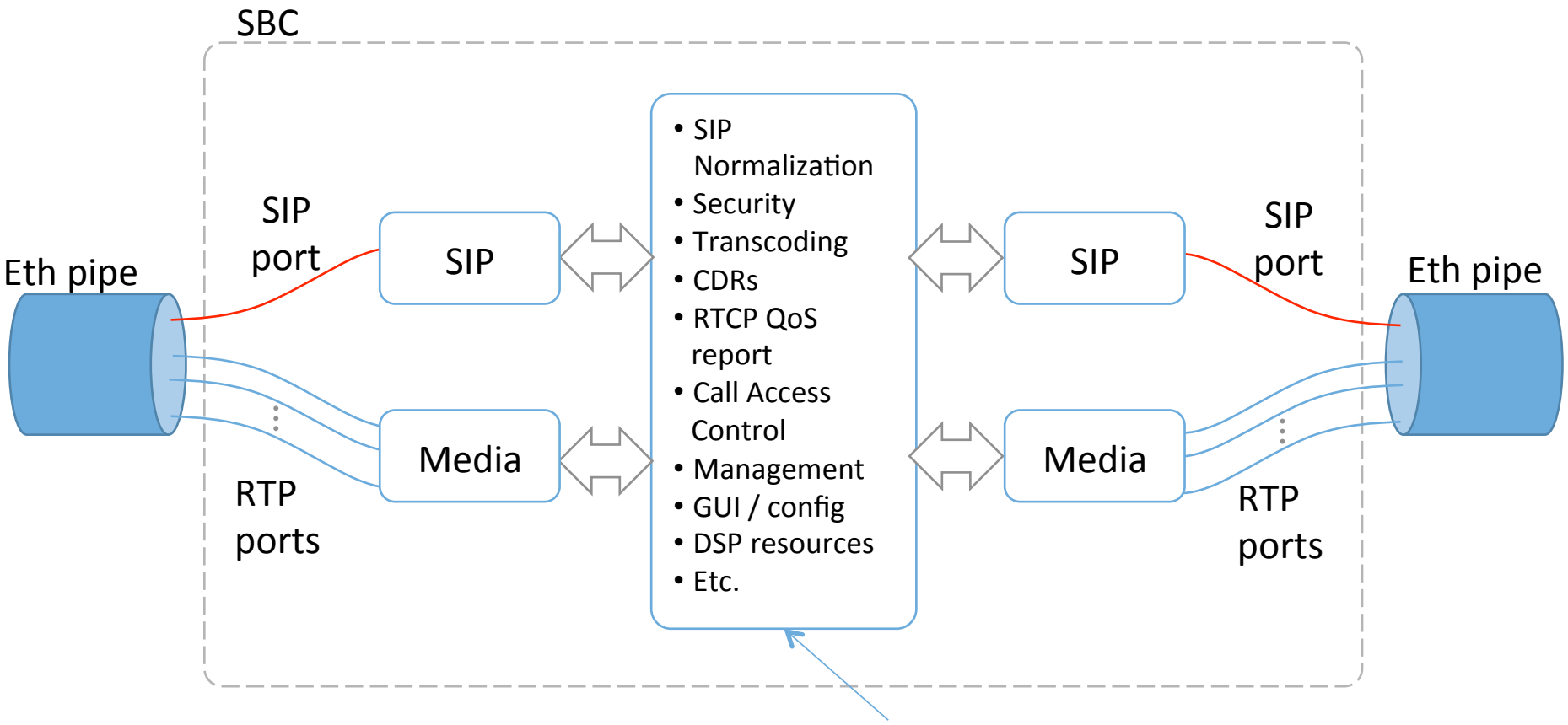
ROGERS
MTT
BT
SAGEM
windstream communications
ERICSSON
RUGGEDCOM A Siemens Business

B2BUA Explained

B2BUA Explained

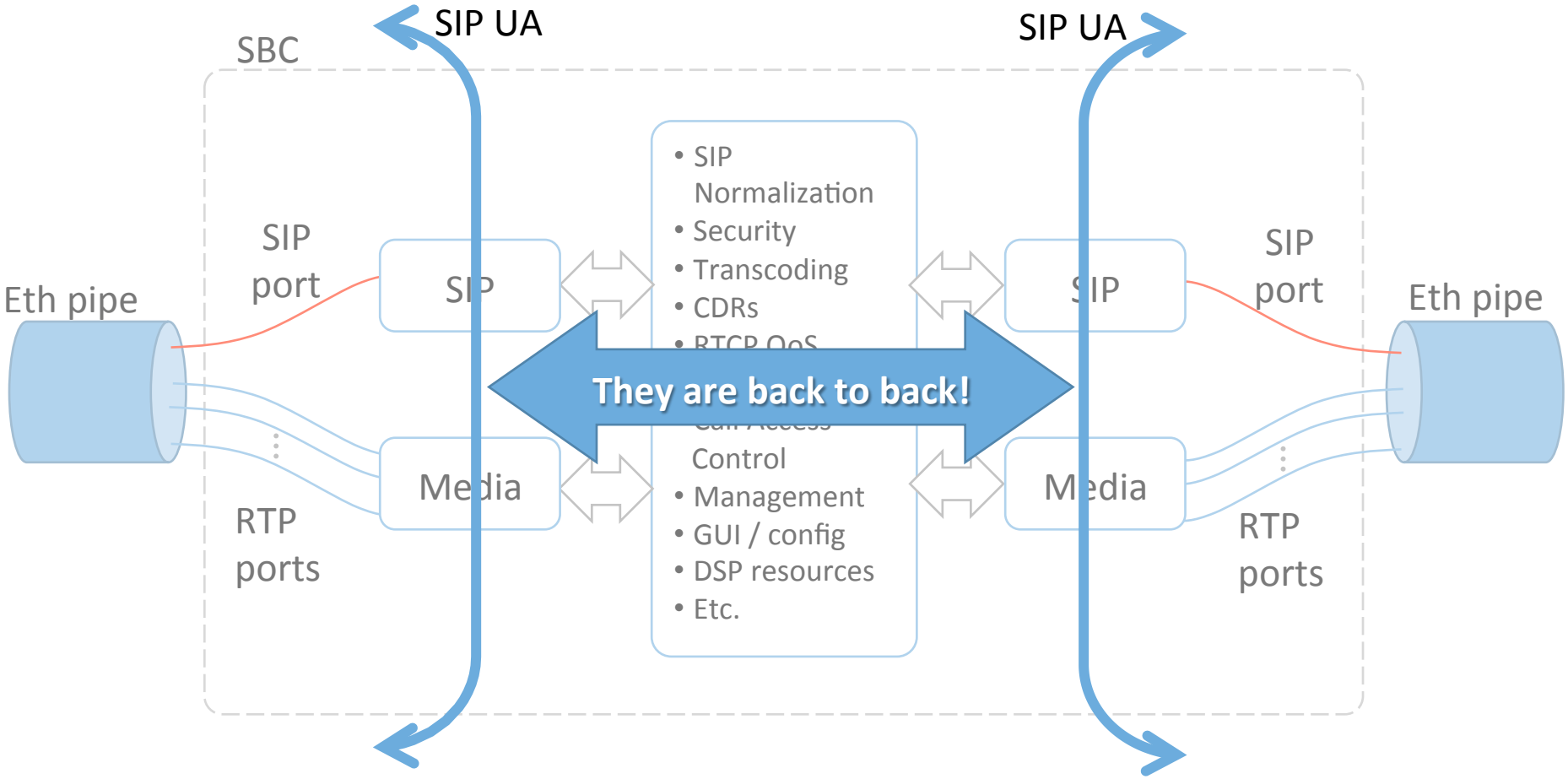
- A back to back user agent (B2BUA) is a logical network element in the Session Initiation Protocol (SIP) applications.
- It operates between two endpoints in a communication session and divides the communication channel into two different call legs.
- It mediates SIP signalling between both ends of the call
- B2BUAs are often implemented within media gateways.

B2BUA Explained



Because the SBC 'sees' all SIP and RTP traffic coming from both sides, it can analyze, fix, control, etc.

Where are the User Agents (UA)?



B2BUA Functions

- A B2BUA may provide the following functions:
  - Call management
    - Billing
    - Automatic call disconnection
    - Call transfer
  - Network interworking
  - Hiding of network internals (topology hiding).

What is a SBC and why Session Border Controllers

Why Session Border Controllers?

- SBC are installed at the edge of VoIP Networks to facilitate end to end VoIP transmission without compromising network security
- Several reasons:
  - New security issues introduced with SIP protocol
  - Fix Interoperability issues
  - Implementation of UC/Collaboration feature
- SBC are typically implemented as Back to Back User Agents (B2BUA)
  - All SIP and Media (voice) traffic transit through SBCs

Initial Drive for Session Border Controllers

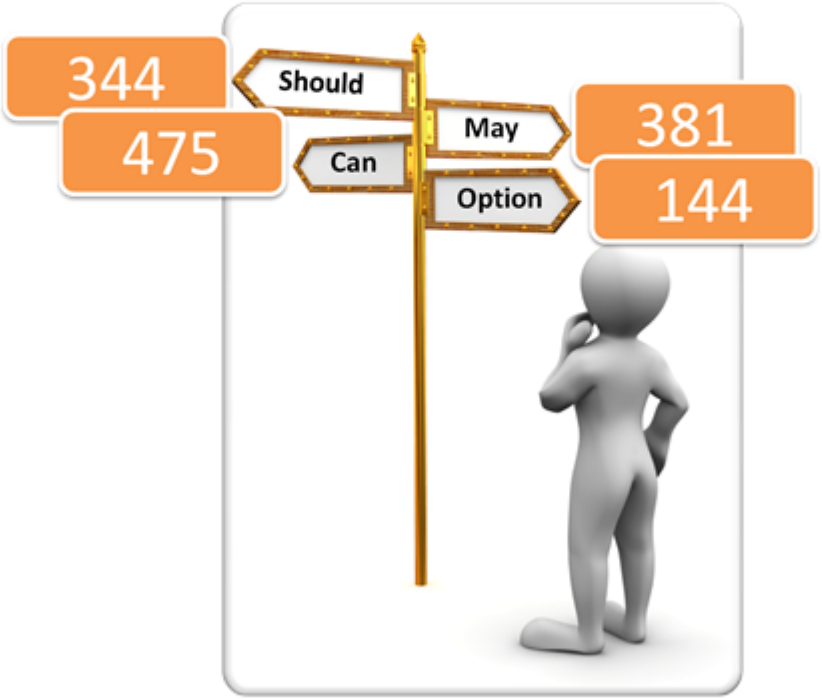
- Traverse firewalls for end-to-end VoIP telephony
  - SIP protocol does not work through NAT functions in firewalls
- Without SBCs
  - Forward SIP/RTP ports on firewalls
    - Opens up security issues
  - Set-up VPNs
    - Costly to manage/Bandwidth limitations/subscriber mgmt.
  - Firewall Application Layer Gateways (ALG)
    - OK, brings other limitations for other SIP issues
- SBCs fix this issue by remapping IP and Ports in SIP Messages and RTP port addressing

Security Issues

- Connectivity to other IP Networks introduces security issues
  - Denial of Service (DoS) attacks
  - Toll Fraud by manipulating media
  - Topology hiding (SIP via's, hops, etc.)
- Firewalls cannot act on all these security issues unless it is SIP aware (SIP ALG)
  - Some firewall vendors offer SIP ALGs, but it is not enough

SIP Interoperability Challenges

- SIP RFC3261
  - Largest RFC
  - Not a tight specification like ITU specs for instance
  - Uses Should, Can, May, Option a lot
  - It is a recommendation, not a hard rule, lots of room for interpretation
- Result
  - Everyone is compliant to RFC3261
  - But hard time to interop!
- For end to end VoIP Interworking, SBCs come to the rescue by 'fixing' these differences



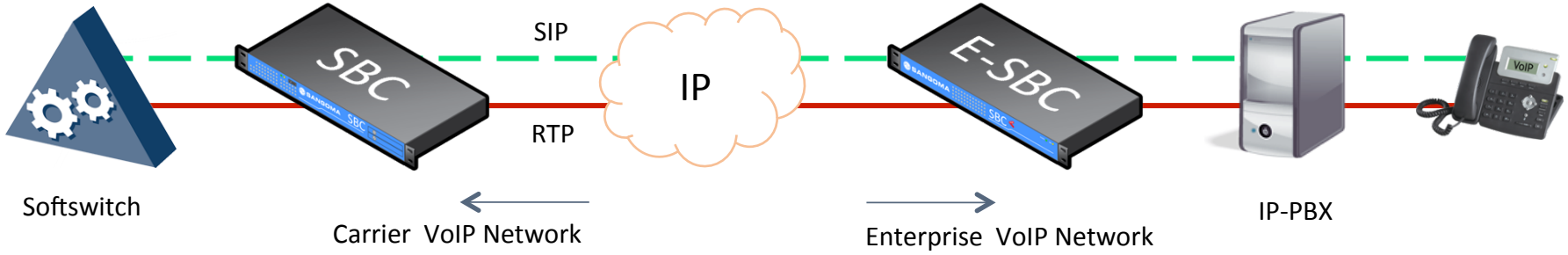
Additional Interop Challenges

- It's not just SIP signalling
- Media can also need fixing for end to end communications to become possible:
  - Codecs mismatch
  - Fax T.38/Inband Fax
  - RFC2833/INFO/Inband DTMF Methods
  - RTP and SRTP
- IPV6 vs IPV4
- UDP vs TCP (example with MS Lync)
- TLS/SRTP interop with SIP/RTP
- Firewalls cannot address these – do not have DSPs to process media

Best Practices

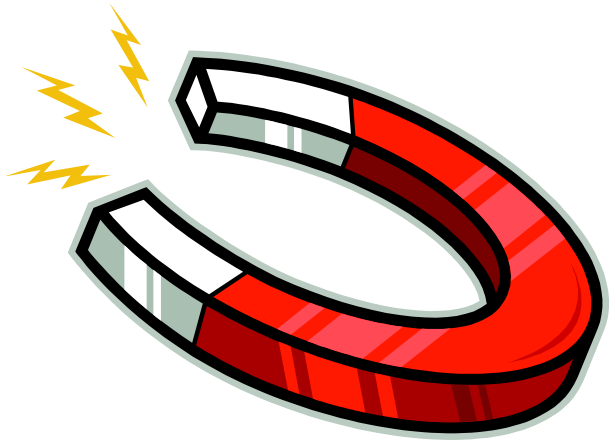
Rule of Thumb/Best Practices

- Everywhere a VoIP Network needs to interface to another VoIP Network, you need and SBC
- Same rule with IP Network and Firewalls really
- SBC are required in both Carriers and Enterprise Networks



Integration at the Edge has its Advantages

- Because SBC 'sees' all traffic, they have evolved to be much more than interop/security devices
- Migration – Intelligent call routing for VoIP
- Lawful intercept – call forking for recording devices
- Quality of Service reporting
- Billing
- Intrusion Management
- Session Border Controllers have become essential in VoIP networks



Recap

- Sangoma Technologies is a provider of premium IP telephony equipment.
  - Wide range of products.
- A B2BUA divides the communication channel into two different legs and mediates both ends.
  - A Session Border Controller is a B2BUA
- Session Border controllers were created to protect the IP telephony network
  - Example: Topology hiding to hide all equipment behind the SBC

Session Border Controllers Use Cases

The Sangoma SBC

Inside this Module

- Product portfolio of Session Border Controllers.
- Business applications and use cases (Vega ESBC).
- Carrier/Service provider applications and use cases (NetBorder SBC).
- Sangoma SBC load balancing and failover techniques.

Product portfolio of Session Border controllers

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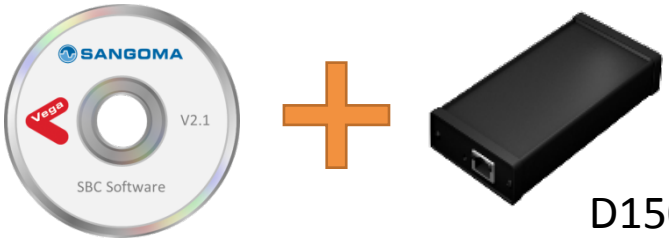
Vega Enterprise SBC

- Appliance
  - 25-250 Sessions
  - H/W DSP acceleration
  - 1U/2 x 1 GE ports
- Software Version
  - 25-500 Sessions/Self-Contained ISO
  - VM requirements
    - 1 Core/1 GB RAM/Bridged
- Software/Hybrid Version - UNIQUE
  - 25-500 Sessions/Self-Contained ISO
  - VM requirements
    - 1 Core/1 GB RAM/Bridged
  - H/W DSP acceleration



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NetBorder Carrier SBC

- Appliance
  - 250-4000 Sessions
  - H/W DSP acceleration
  - 1U/2 x 1 GE ports
  - RAID 1
- Qualified for Microsoft Lync 2013

Product Highlights – All SBCs

- Ease of Use
  - WebGUI configuration, operation, backup and restore, REST API
  - Simplified licensing, field upgradable, all features one sku.
- Session Policy and Media
  - Advanced WebGUI or XML Header manipulation, Upper Registration
  - NAT Traversal, Call Forking
- Security
  - DDOS Attack protection, Advanced Firewall for Signaling and Data
- Advanced Call Routing
  - Advanced WebGUI or XML dialplan, Database Routing, Load balancing
- Troubleshooting
  - PCAP Signaling and Media capture on the SBC, Email Notifications
- Redundancy/HA
  - Active - Active or Active - Standby

Ease of Use

- WebGUI configuration, operation, backup and restore
  - Golden master configuration used to configure multiple SBCs
- REST API
  - Integrate Sangoma SBC into a business process.
  - Programmatic SIP trunk and User configuration
- Simplified licensing, field upgradable,
  - All features one sku. No feature limitations.
  - Transcoding, SRTP, Voice Quality features all included
  - Sessions are software upgradable from 20 to 250 sessions
- Email Notifications
  - Notifications on error conditions, failures, security or capacity

Session Policy

- Advanced Header Manipulation
  - GUI or XML based manipulation of any SIP header on any SIP packet. INVITE, 180,183,200 etc…
- Upper Registration – Remote Users
  - Pass-through registration with in and/or out of dialog support.
  - Advanced call flow scenarios to support remote users.
- NAT Traversal
  - Auto IP detection.
- Call Forking
  - Multiple outgoing dialogs per call.
    - First 200 Ok receives the call, rest of the calls get hung-up.
    - Support for busy, unregistered or inactive user agents.
- Unlimited SIP Interfaces
- Unlimited SIP Trunking
- SIP and Media Transports
  - TCP, UDP, TLS, RTP, SRTP

Media and Networking

- Hardware Media Processing
  - Sangoma SBC's use hardware network DSPs to process RTP
  - Low latency media pass through
  - High capacity any to any Transcoding and Encryption
  - Voice Quality Enhancements
    - Echo cancellation, Noise reduction, Auto Gain Control
- Networking
  - Single IP address for Signaling and Media
  - Separated Signaling and Media planes
  - VLAN and Ethernet Bonding

Security

- Signaling Security
  - Adaptive and time based firewall blocking based on SIP flood attacks.
    - Malformed packet, Registration storms, Invite floods, Authentication errors.
  - SIP scanner detection and blocking
  - Rule based detection and blocking
    - Using standards based rules and known exploits and blacklists
- Media Security
  - RTP media port pin hole based on active session.
    - RTP ports are only opened when session is active.
  - RTP port overload detection. In case of RTP flood attack on a specific port
- Data Firewall
  - Advanced state full data firewall.
  - Port forwarding and NAT
- DDOS
  - Adaptive and time based firewall blocking based on IP flood attacks.
  - Detection of known IP sniffers and DDOS attack generators

Advanced Call Routing ('Softswitch')

- Advanced GUI or XML Dialplan
  - Route calls based on any sip header or did or ip
  - Nested dialplan support with advanced regex matching
- Database Routing
  - Routing based on remote database lookup using HTTP/HTTPS
  - Routing based on ODBC database connection
  - Mongo DB support
- Load Balancing
  - Weighed or Round Robin load balancing between multiple SIP interfaces within a domain.
- Least Cost Routing
  - Support for local LCR database. GUI LCR Import/export.
- DNS/SRV Routing
- DHCP Options

Troubleshooting

- GUI Error Reporting and Notification
  - GUI Dashboard with time based graphing
  - System, Session, Capacity Errors
  - Error message counts
- PCAP Tracing
  - Ability to trace both Signaling and Media on the SBC.
  - No need to use external port mirrors or hubs. Self contained troubleshooting.
  - Decode PCAP files using Wireshark.
  - Huge disk space to store large circular PCAP buffer for long term debugging.
- RTCP Search
  - Search for calls with bad RTCP thresholds. Email notifications on each bad RTCP call.
- SSH and CLI Console
  - Ability to perform real time log analysis and tracing on the console.
  - Multiple screen support
- Logging
  - Extensive logging per call tagged using UUID.
  - Remote syslog support
- Hardware Crash Protection
  - Automatic reboot on system lockup or hw fault

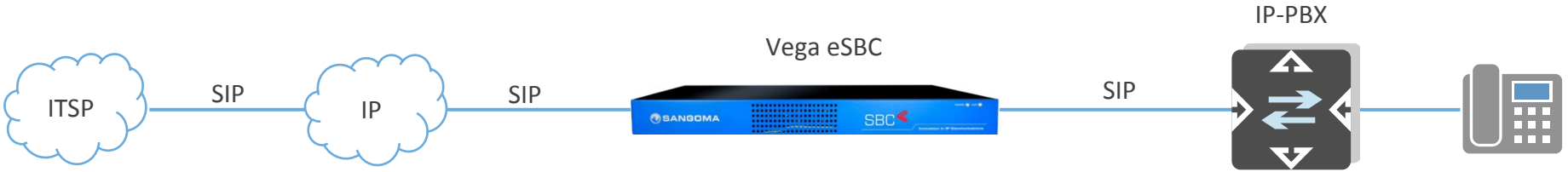
Business Applications and Use Cases

Vega Series SBC

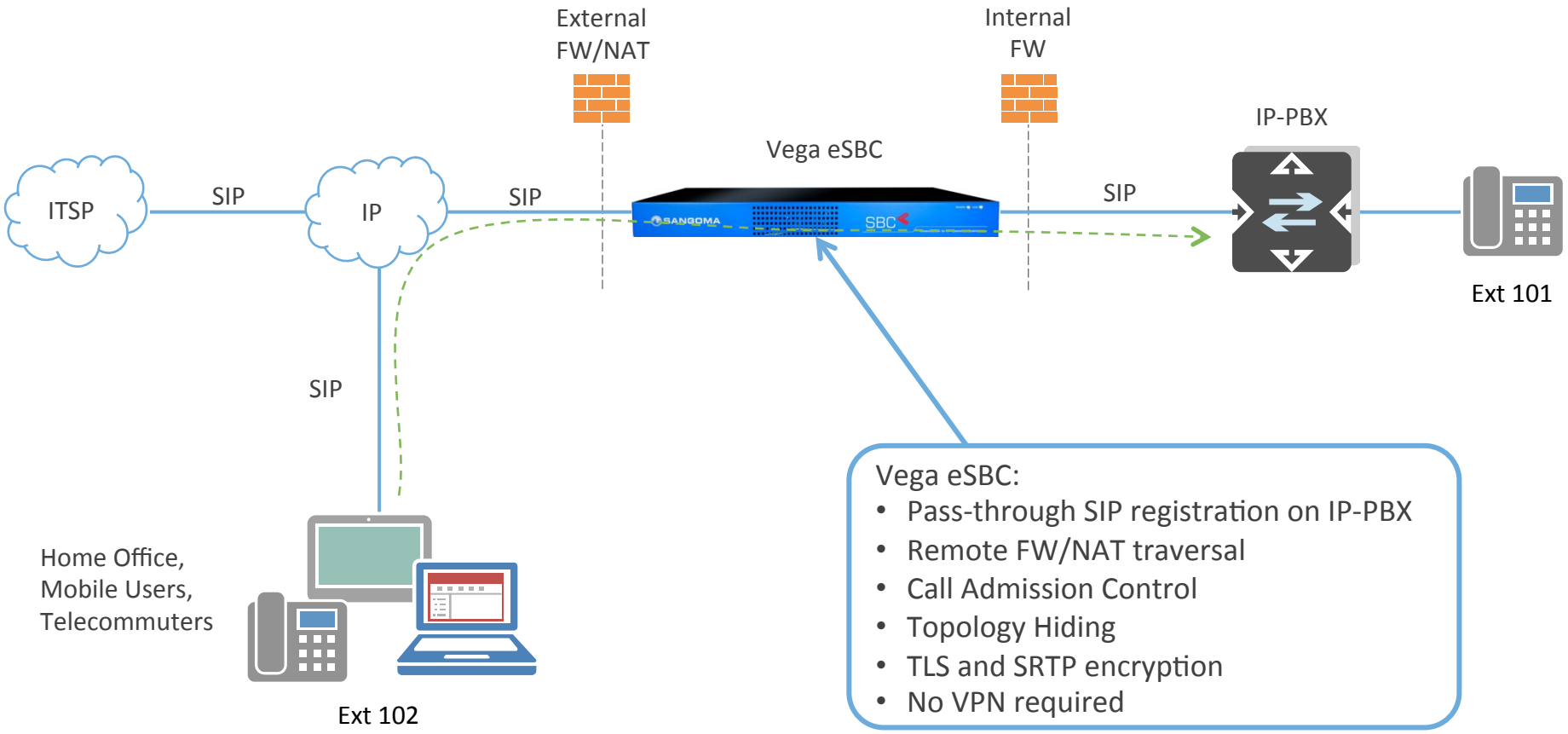
Enterprise SIP Trunking

DMZ Deployment

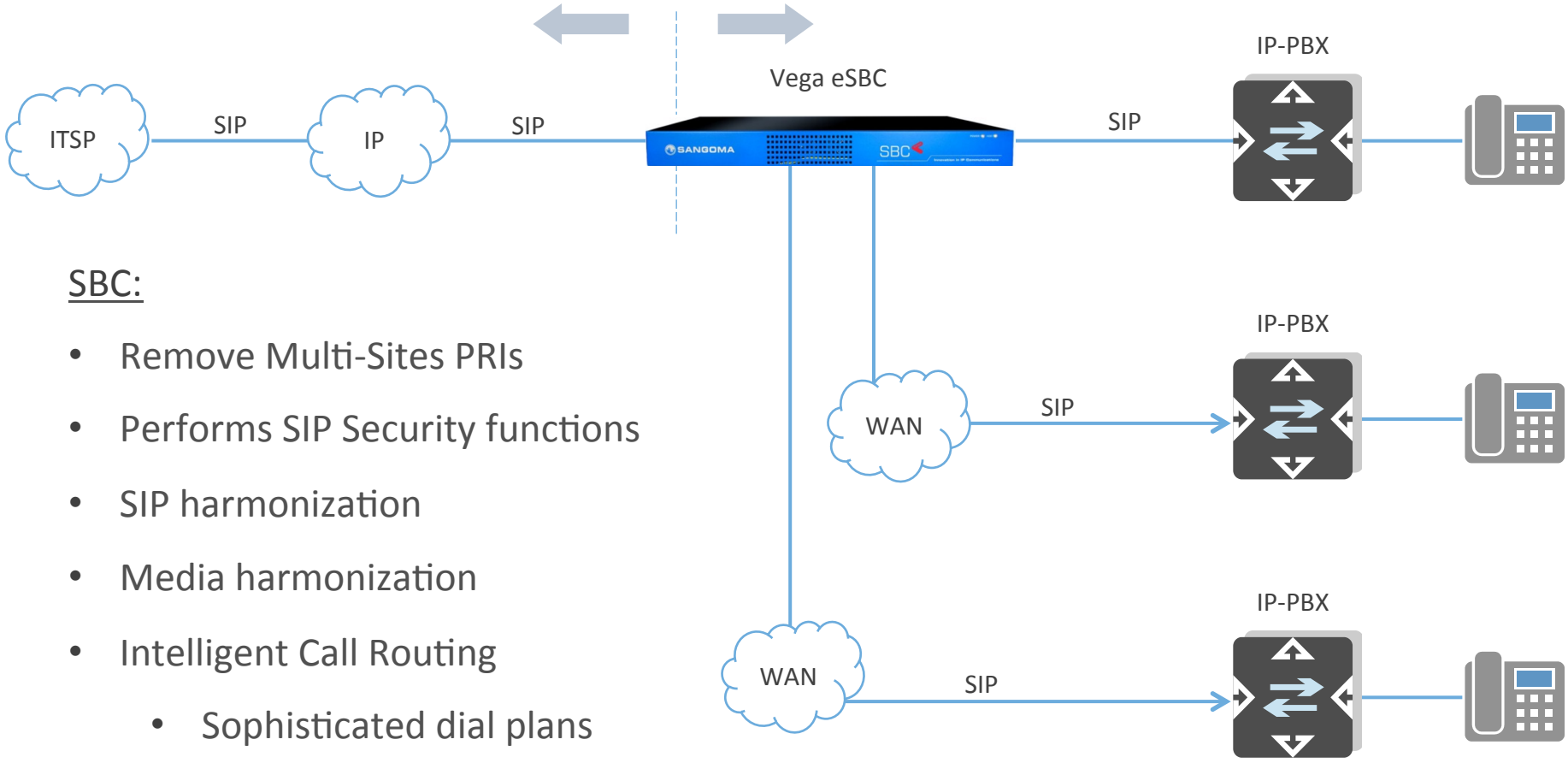
Direct Deployment on Public IP address



Secure Access Control for Remote Users or Telecommuters



Multi-Site Consolidation

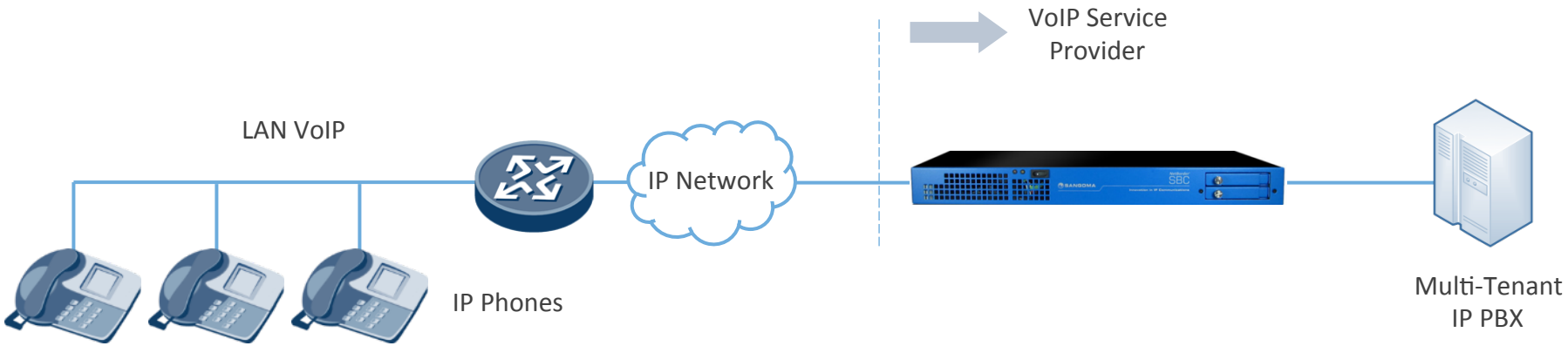


SBC:

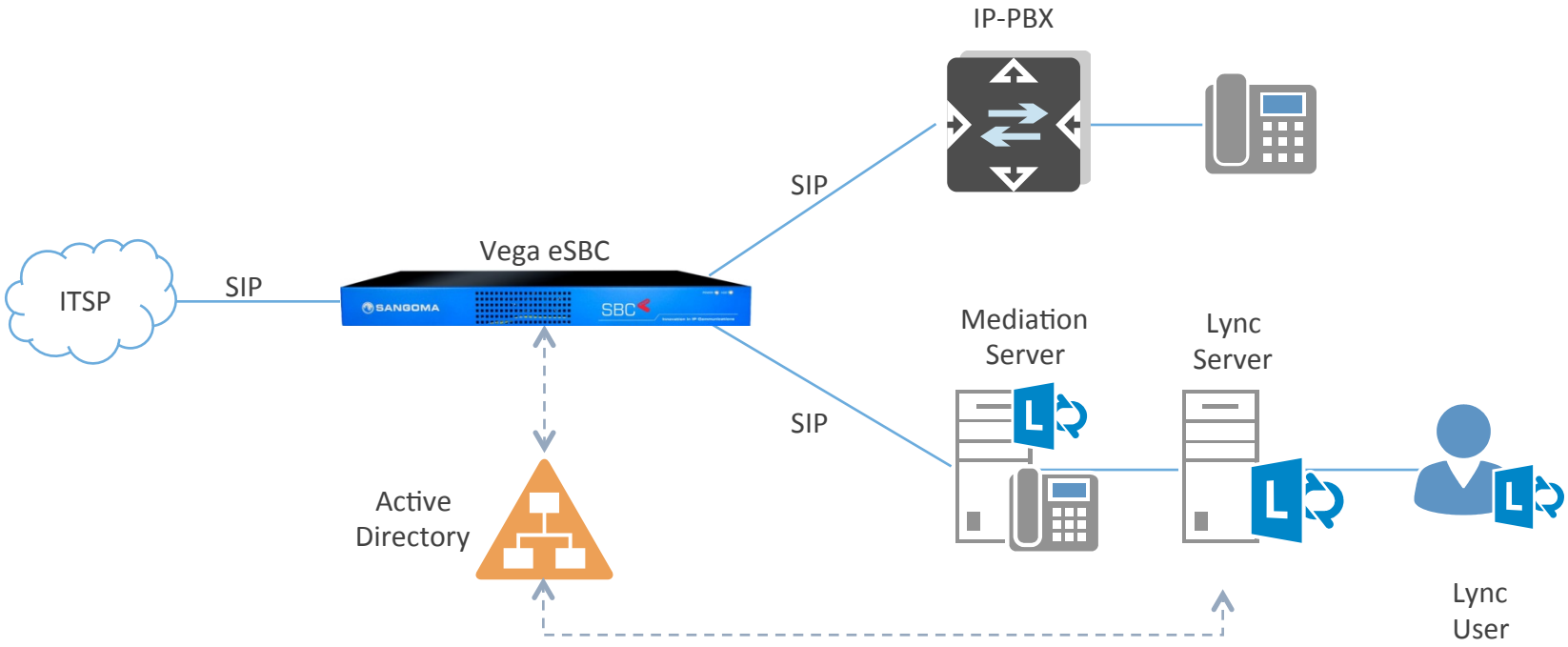
- Remove Multi-Sites PRIs
- Performs SIP Security functions
- SIP harmonization
- Media harmonization
- Intelligent Call Routing
    - Sophisticated dial plans

Carrier SBC For Hosted PBX

- Advantages
  - Known demarcation point
  - Reduces interoperability issues/resource with core
  - Transcoding if required



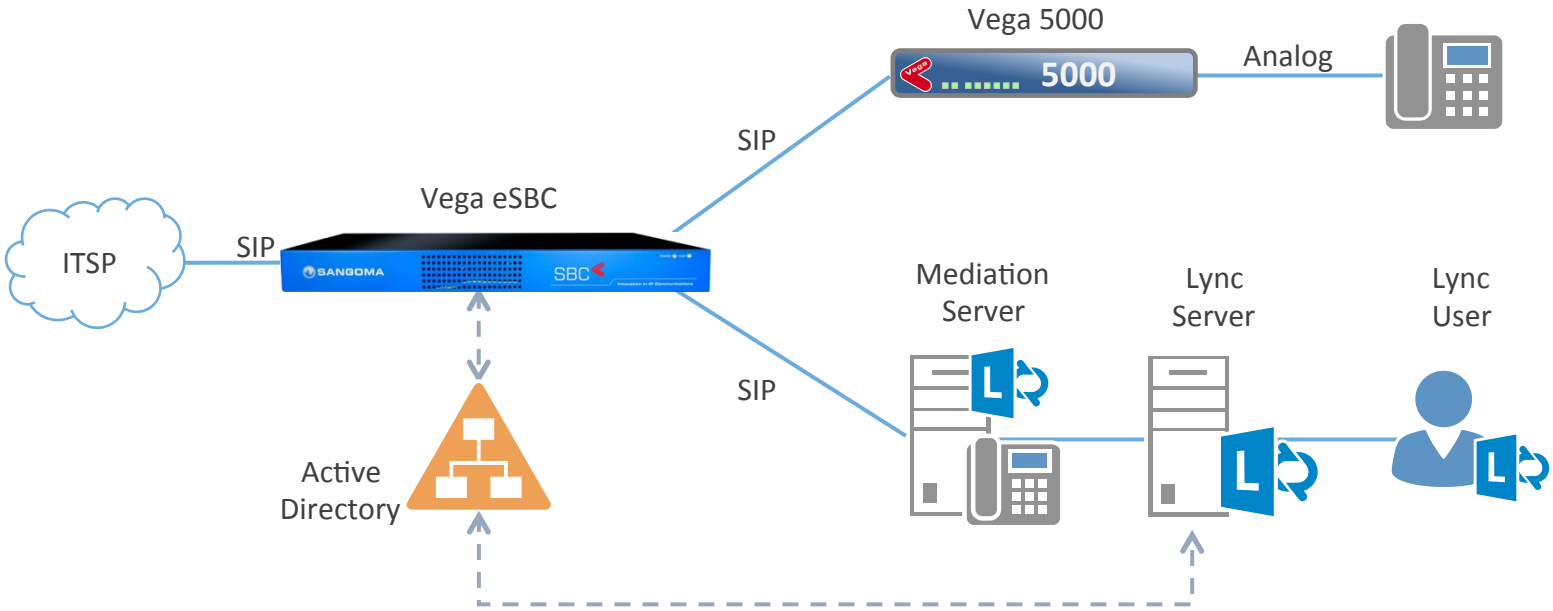
Legacy PBX Migration to Microsoft Lync



SBC:

- Performs SIP Security functions
- UDP/TCP Translation
- SIP harmonization
- Media harmonization
- Intelligent Call Routing
  - Active Directory Routing
  - Unified Dial Plan

Microsoft Lync Transition with Analog Lines

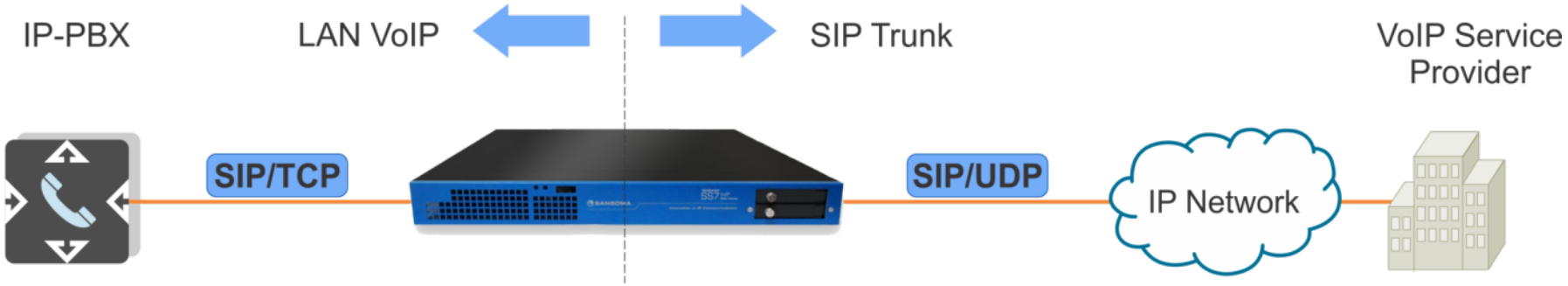


SBC:

- Performs SIP Security functions
- UDP/TCP translation
- SIP harmonization
- Media harmonization
- Intelligent Call Routing
  - Active Directory Routing
  - Unified Dial Plan

SIP Signaling Conversion

- Convert SIP over TCP to SIP over UDP
- Some devices require SIP/TCP
  - e.g. Microsoft Lync



Carrier/Service Provider Applications and Use Cases

NetBorder Series SBC

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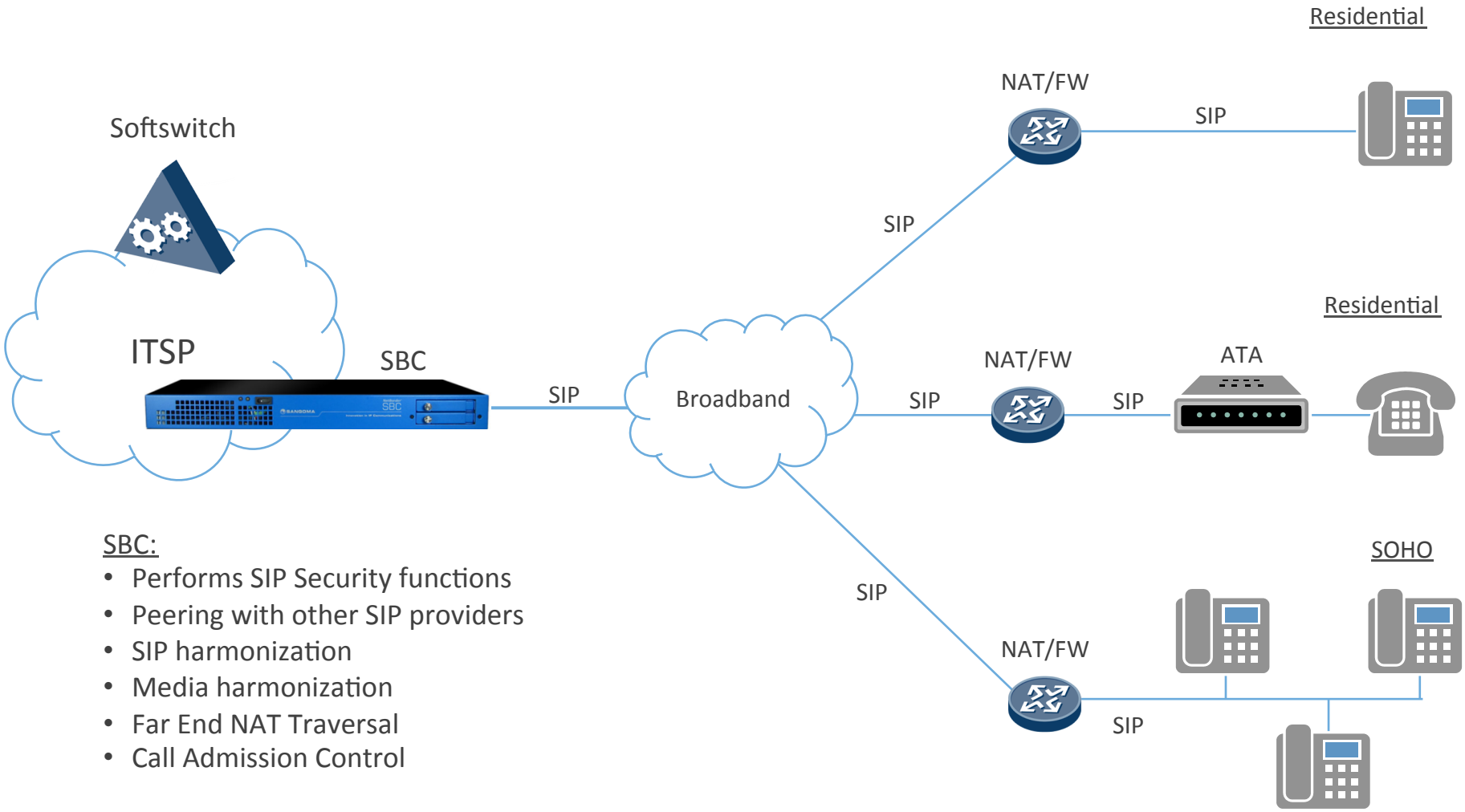
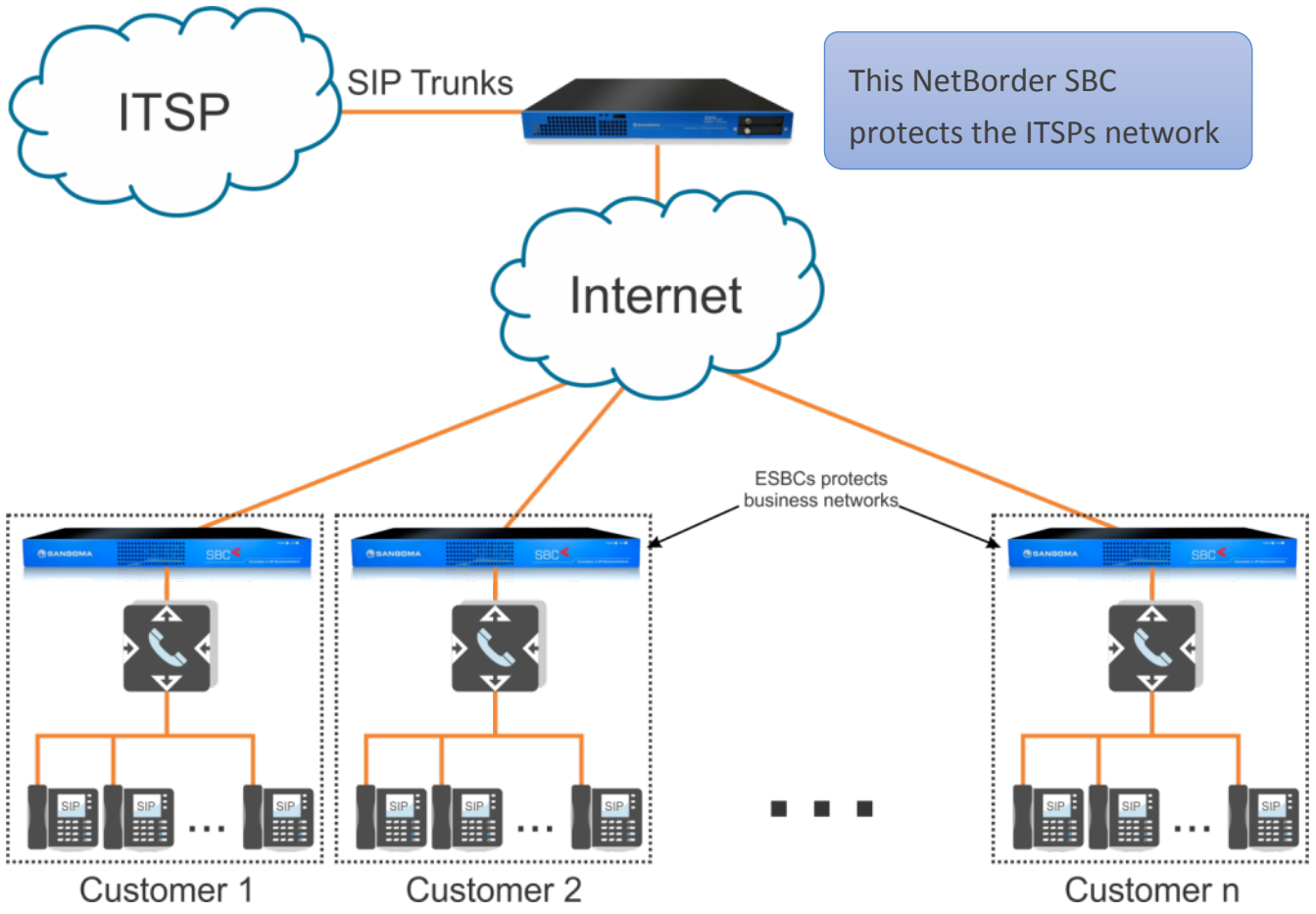
Carrier SBC for SIP 'Dial Tone'



SBC:

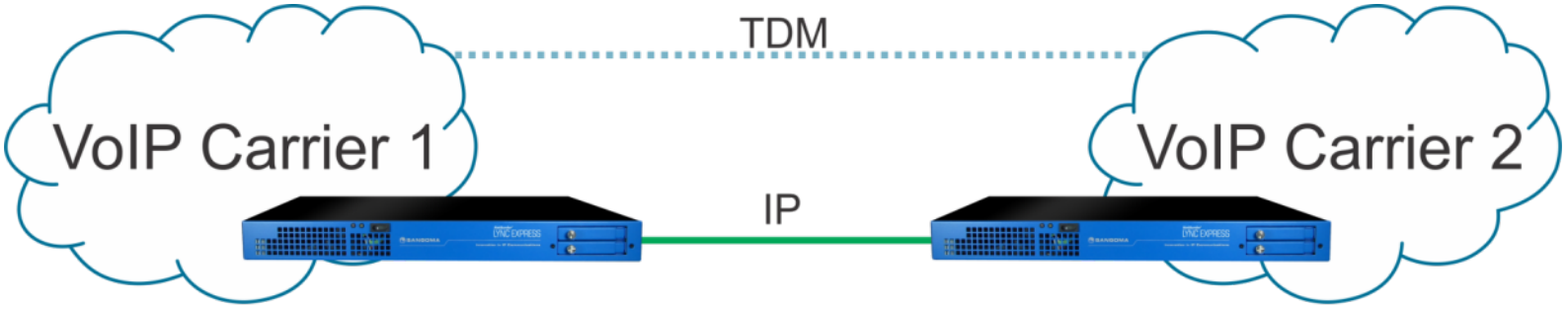
- Performs SIP Security functions
- Peering with other SIP providers
- SIP harmonization
- Media harmonization
- Far End NAT Traversal
- Call Admission Control

SIP Trunking



SIP Network Peering/ IP Carrier Interconnect

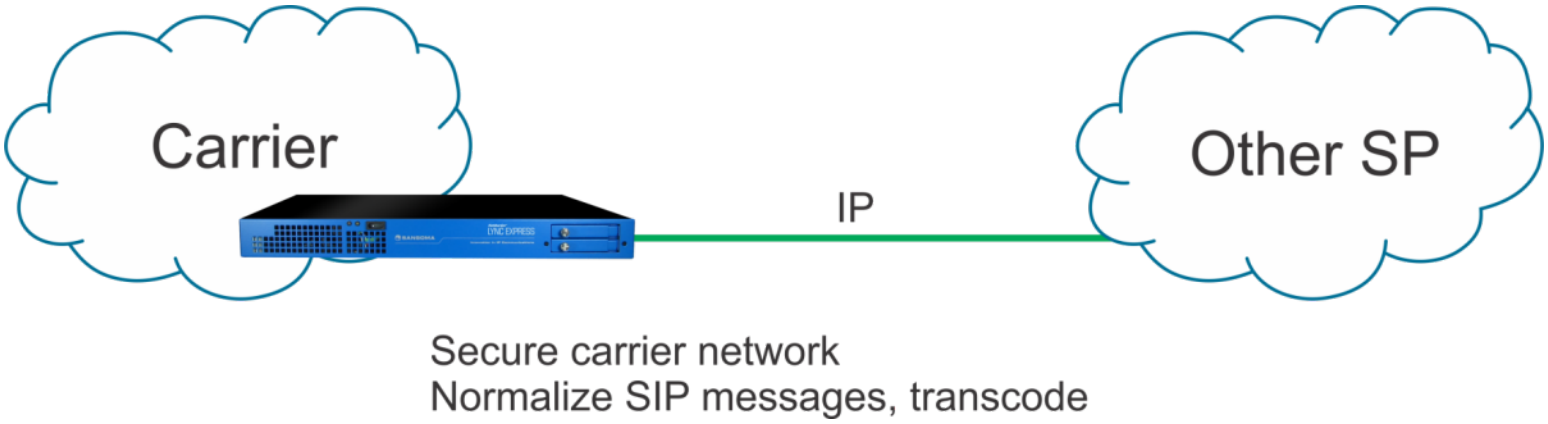
- Use IP for inter-carrier links
- No TDM conversion required:
  - Decrease complexity
  - Better voice quality, less delay, less transcoding



Move from VoIP islands to
all IP communication between carriers

Carrier Interconnect Mediation

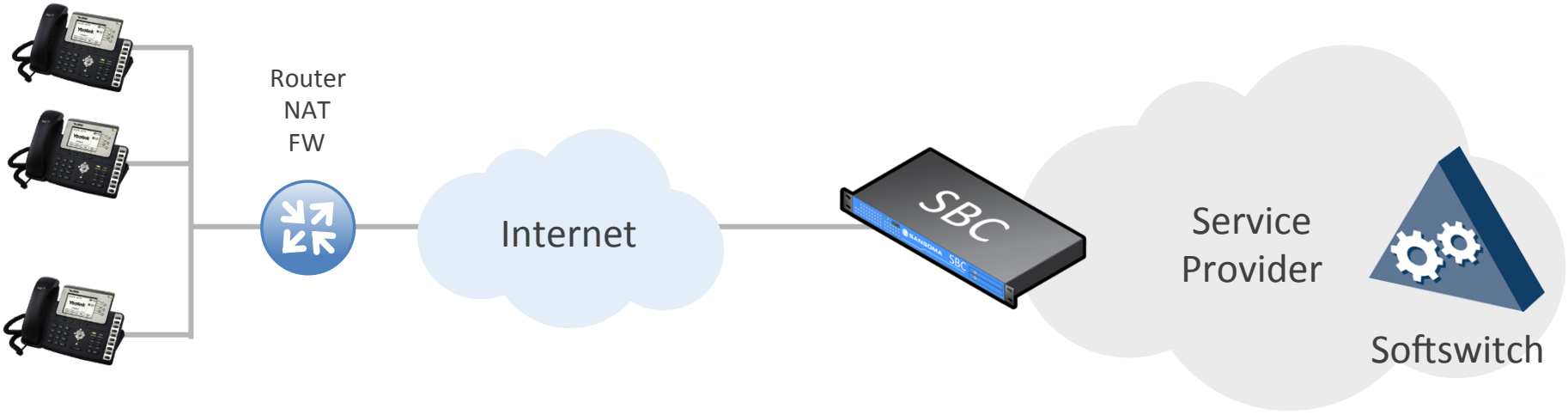
- Secure carrier network
- Normalize SIP messaging (easy interop)
- Transcoding between carriers



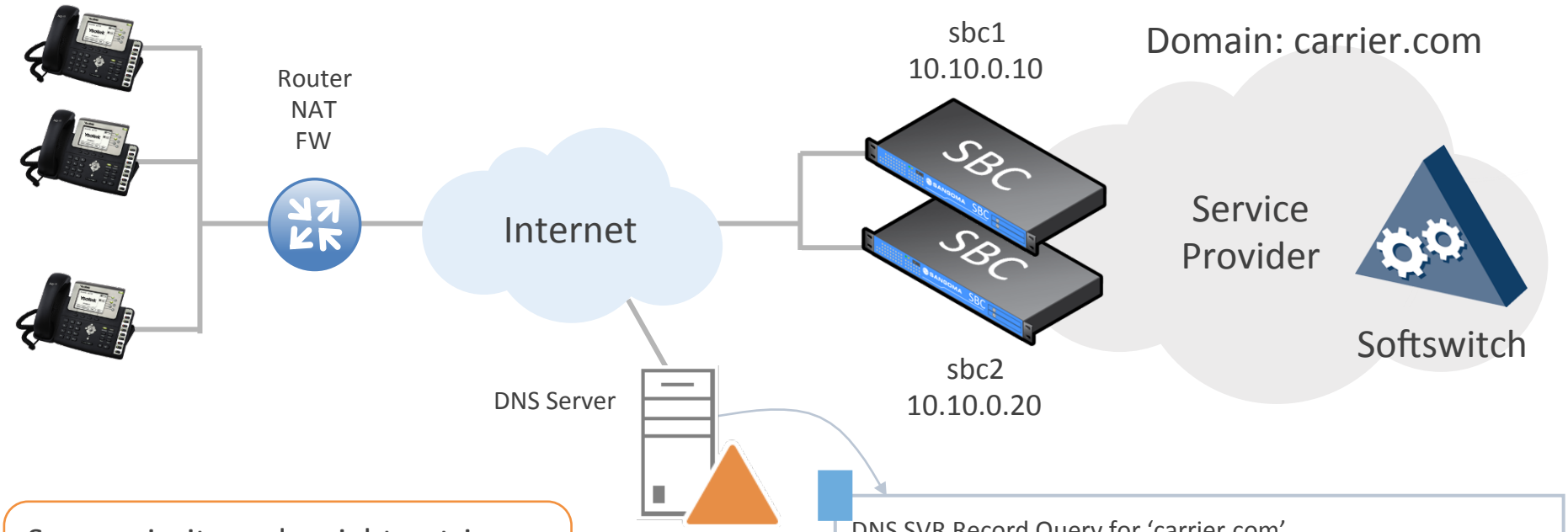
SBC Load balancing and failover techniques

Typical Service Provider SBC Deployment

- Hosted PBX Service
- SBC Protects SP's Network; performs far end NAT traversal, etc.
- Each VoIP Phone sends all SIP protocol messages to SP's Softswitch via SBC (phone's outbound proxy settings)
- SBC is critical; if it fails no service for 1000s of users



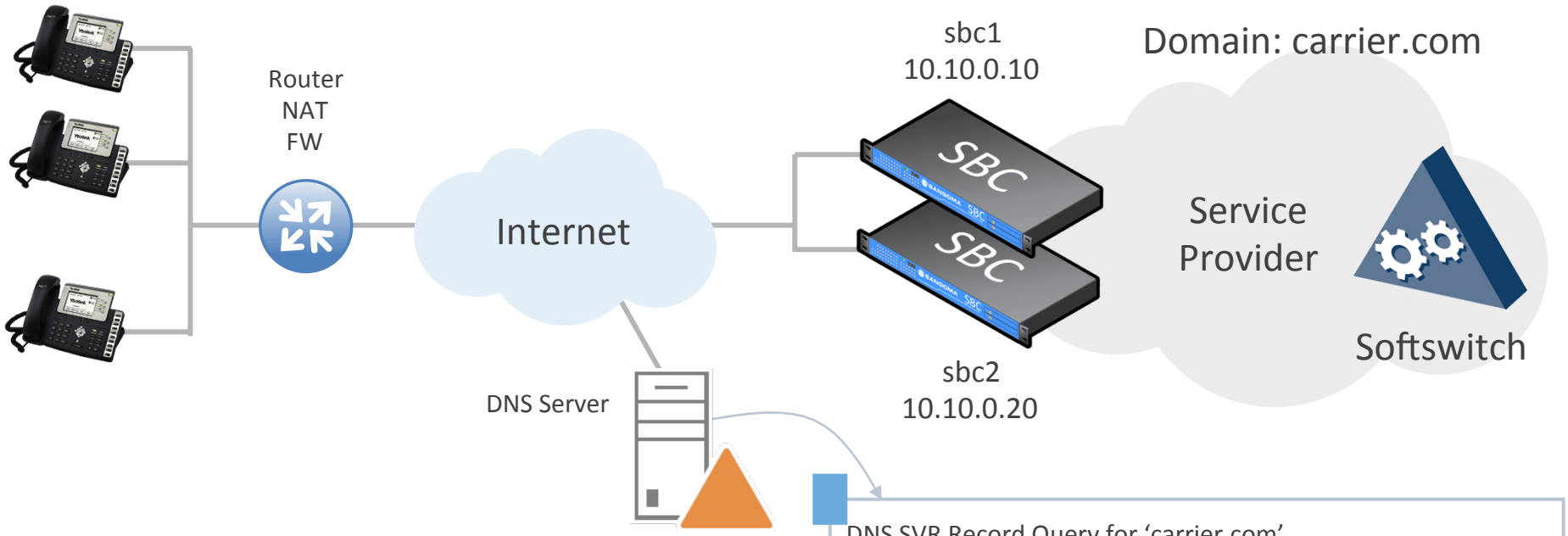
Load Balancing SBCs with DNS SRV



Same priority and weight entries:

- sbc1 and sbc2 would each get 50% of the traffic load
- If one SBC becomes unavailable, remaining machine takes the load

Failover SBCs with DNS SRV



- Different Priorities
- Lower Priority tried first:
  - sbc1.carrier.com
- If sbc1.carrier.com unavailable:
  - sbc2.carrier.com

DNS SRV: Countless Other Scenarios

- DNS SRV records not limited to 2 lines
- Could implement several scenarios:
  - M-ways load balancing
  - M-ways load balancing; N-way failover
- Example:

  - _sip._udp.carrier.com 60 IN SRV 10 60 5060 sbc1.carrier.com
  - _sip._udp.carrier.com 60 IN SRV 10 20 5060 sbc2.carrier.com
  - _sip._udp.carrier.com 60 IN SRV 10 10 5060 sbc3.carrier.com
  - _sip._udp.carrier.com 60 IN SRV 10 10 5060 sbc4.carrier.com
  - _sip._udp.carrier.com 60 IN SRV 20 0 5060 sbc5.carrier.com

- The first 4 SBC would share the load at 60%, 20%, 10% and 10% respectively
- If the first 4 SBCs should become unavailable, sbc5 would take the load

Recap

- The Sangoma SBC comes in various different formats
  - Physical Appliance
    - Vega ESBC
    - NetBorder Carrier SBC
  - Software only VM version
  - Hybrid VM version
    - Software VM with hardware media processing
- Various different use cases for each SBC case.
- Load balancing and failover provided by DNS (Domain Name Service) A and SRV records.

Session Border Controllers Conceptual elements

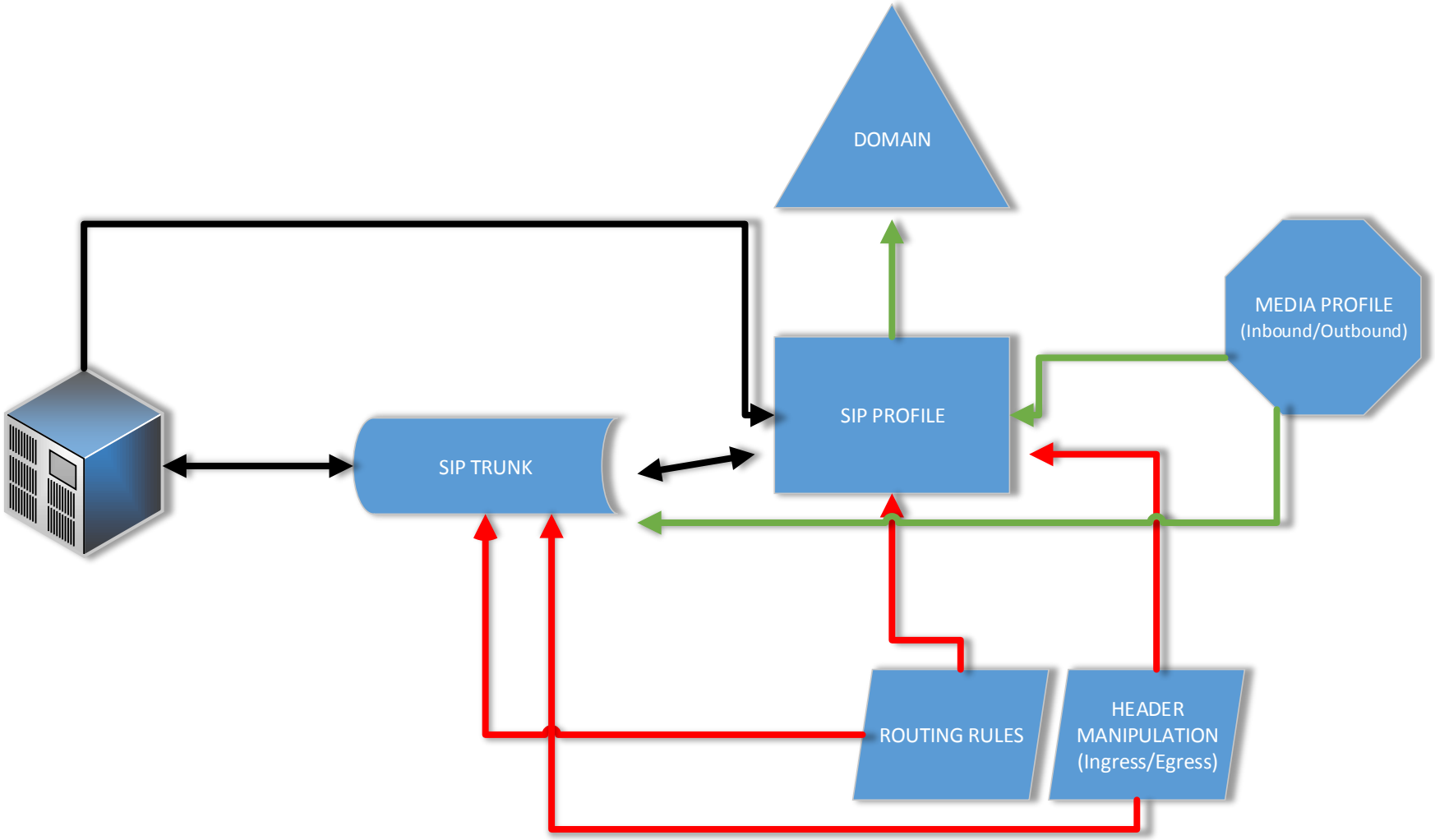
The Sangoma SBC

Inside this Module

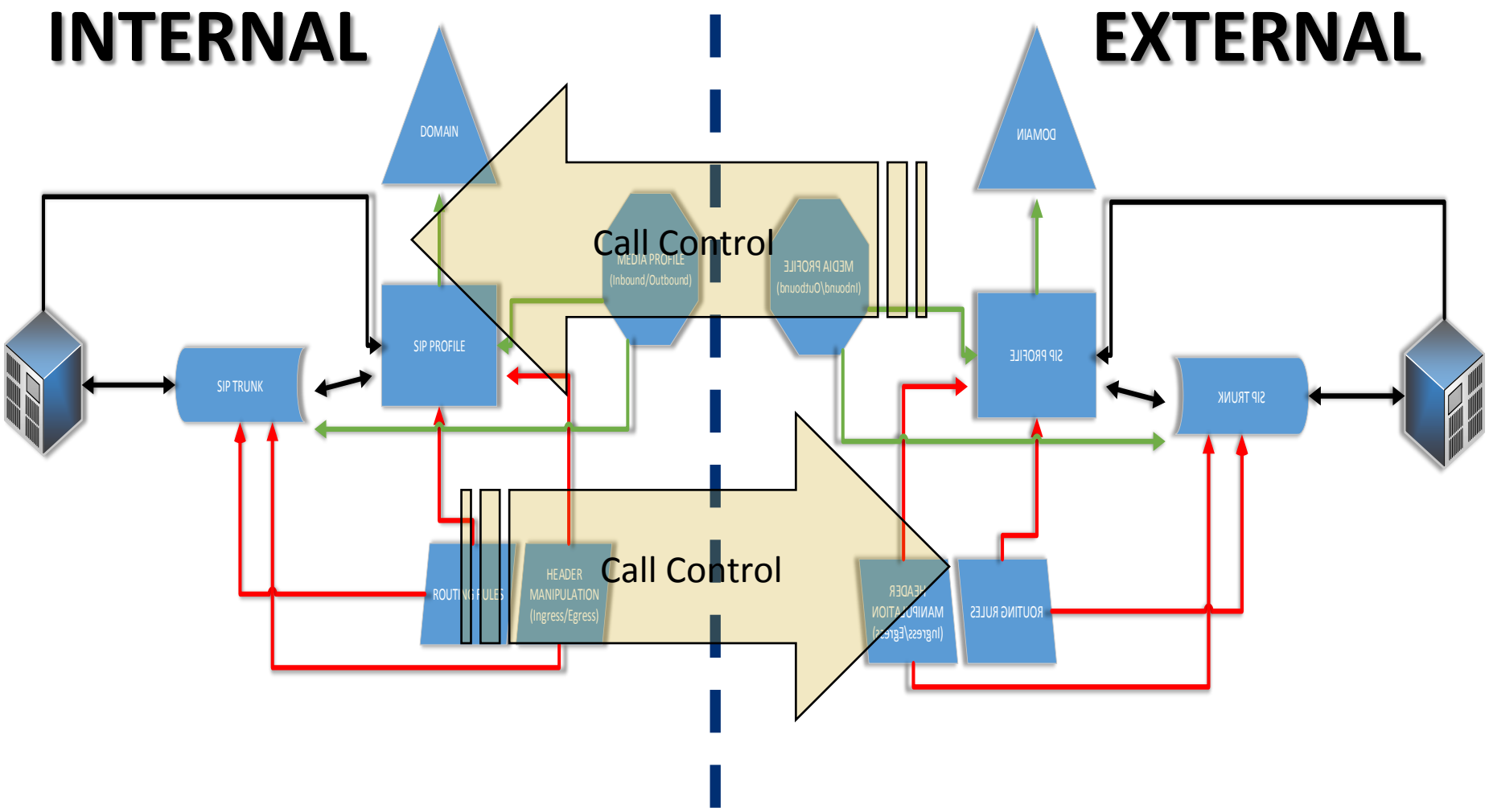
- Logical components.
- Detailed immersion on each component.
- Integrated functional view

Session Border controllers logical components

Most relevant components



Connecting the dots.....



Sip Profiles

Vega Series SBC

SIP Profile

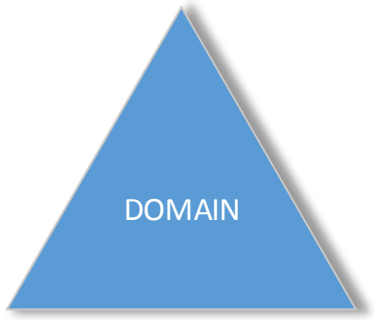
A SIP Profile is an account built on the SBC which contains a set of SIP attributes that are associated to the SBC itself.
The SIP profile is used as a configuration for how the external endpoints may connect to the SBC.
You bind an IP address, port, and other SIP related features to a SIP profile.
You also bind call routes, domain profiles, media profiles, and SIP trunks to SIP profiles.

- Listens SIP from end points
  - Inbound registration
  - Bidirectional calls.
- Traditionally is termination point for SIP trunks coming in the SBC
- Call control:
  - A routing plan is associated to all incoming traffic to the SIP profile
  - Ingress and egress header manipulation can optionally be added for incoming or outgoing calls.
- It can be bind to one or more Domains for local or pass thru registration/authentication.
- It has associated Inbound and outbound media profiles
- When you need a SIP Profile?:
  - When receiving SIP Requests is needed
  - When Sip Trunks are needed, a SIP Profile must be associated to it.
- Load limits can be established to concurrent calls, and CPU usage.

Domains

Vega Series SBC

Domain



A domain, or a SIP realm, is a component within SIP which is used to authenticate users within the SIP registration process.

Domain profiles are used to define the way users will authenticate with the SBC.

Local authentication is used when users will register with the SBC.

Upper registration is used when users will register to a softswitch or a IP-PBX through a SBC.

This enables topology hiding so that no one outside of the corporate network knows about the equipment sitting behind the SBC.

If using IP authentication, you will not require a domain profile.

- A Domain is needed to associate Authentication to SIP Requests.
  - Registrar
  - Invites
  - Any other SIP request
- Upper registration/authentication can be enabled and forwarded to an external entity (registrar Server, IPPBX, etc..)
- Any SIP Profile that receives SIP Requests where authentication is needed, will need to Bind a Domain. (Inbound)
- Upper registration/authentication needs to be associated to a SIP profile
- With upper registration enabled, one and only one registrar server can be associated (outbound)

SIP Trunks

Vega Series SBC

SIP trunks

SIP trunks are used to create a communication path between 2 SIP aware endpoints.
Trunks can be used to communicate with SIP carriers or with IP-PBXs.

It is the description of how the SBC will communicate with that endpoint.

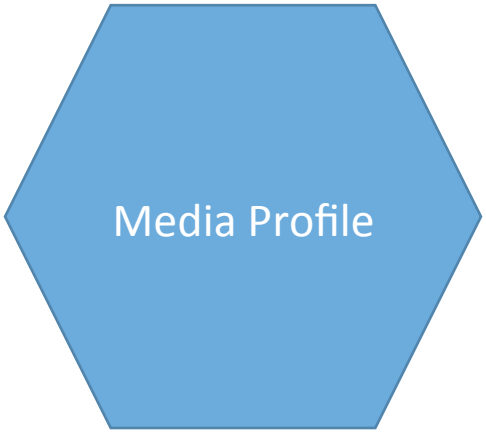
Example: IP address, port, etc.

- A SIP Trunk is a SIP destination entity where Traffic can be routed and traffic can came from
- It could be configured for registration at the destination point.
- It will always be associated to a SIP profile.
- It can have it's own Dial Plan for inbound, or inherits the one defined in the associated SIP profile.
- It can have its own Ingress and egress header manipulation rules, or it can inherit from the associated SIP profile.
- It can have admission call control to limit concurrent sessions and sessions request per unit of time.

Media Profiles

Vega Series SBC

Media Profile



- A media profile defines a set of up to 5 codecs, from the 29 available in the system.
- Allows to enable Silence Suppression
- Defines Codec Negotiation
- Defined DTMF Mode
- Every Sip Profile has a media profile associated.
- Every Sip Trunk has a Sip profile associated
- Different profiles can be associated to Inbound or outbound

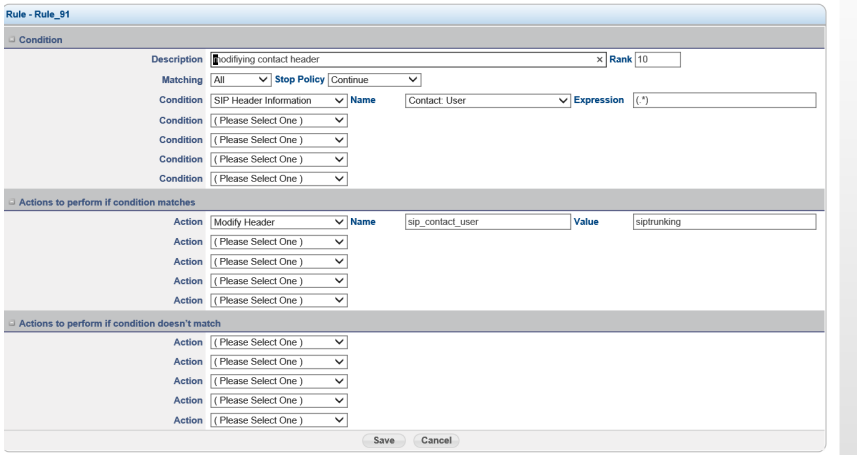
Call Control:

Header Manipulation
Call Routing

Vega Series SBC

Header Manipulation

- Can be used in SIP Profiles or SIP trunks
- Separated Ingress and Egress
- Used to allow SIP mediation between two SIP entities
- Two modes:
  - Wizard
  - XML Advanced

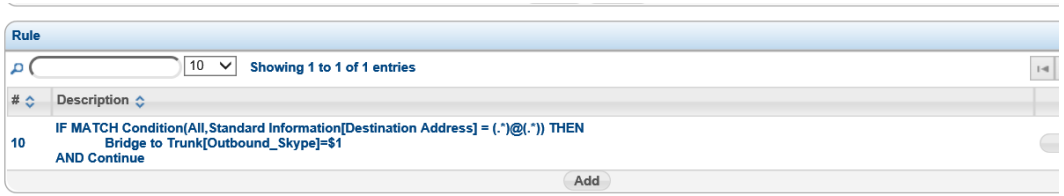


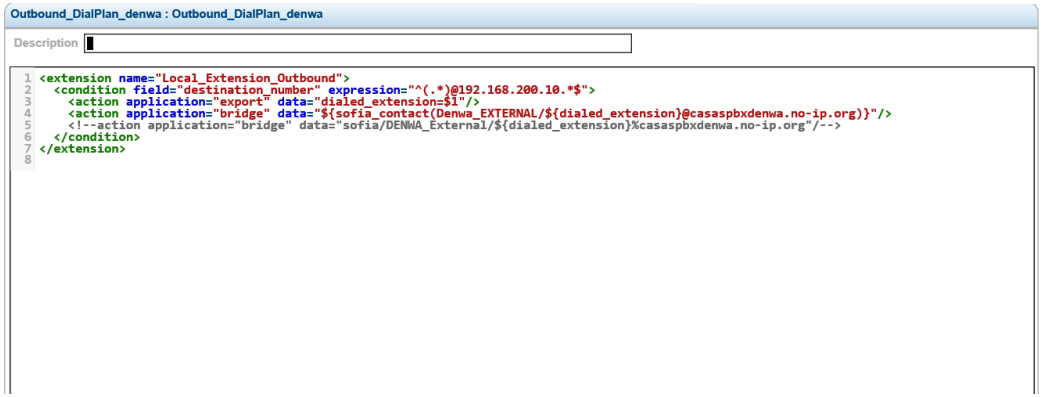
Call Routing

- Can be used in SIP Profiles or SIP trunks

  (At least one dial plan must exist)

- Separated Inbound and Outbound
- Used to match call attributes and route to a destination based on success
- Two modes:
  - Wizard
  - XML Advanced

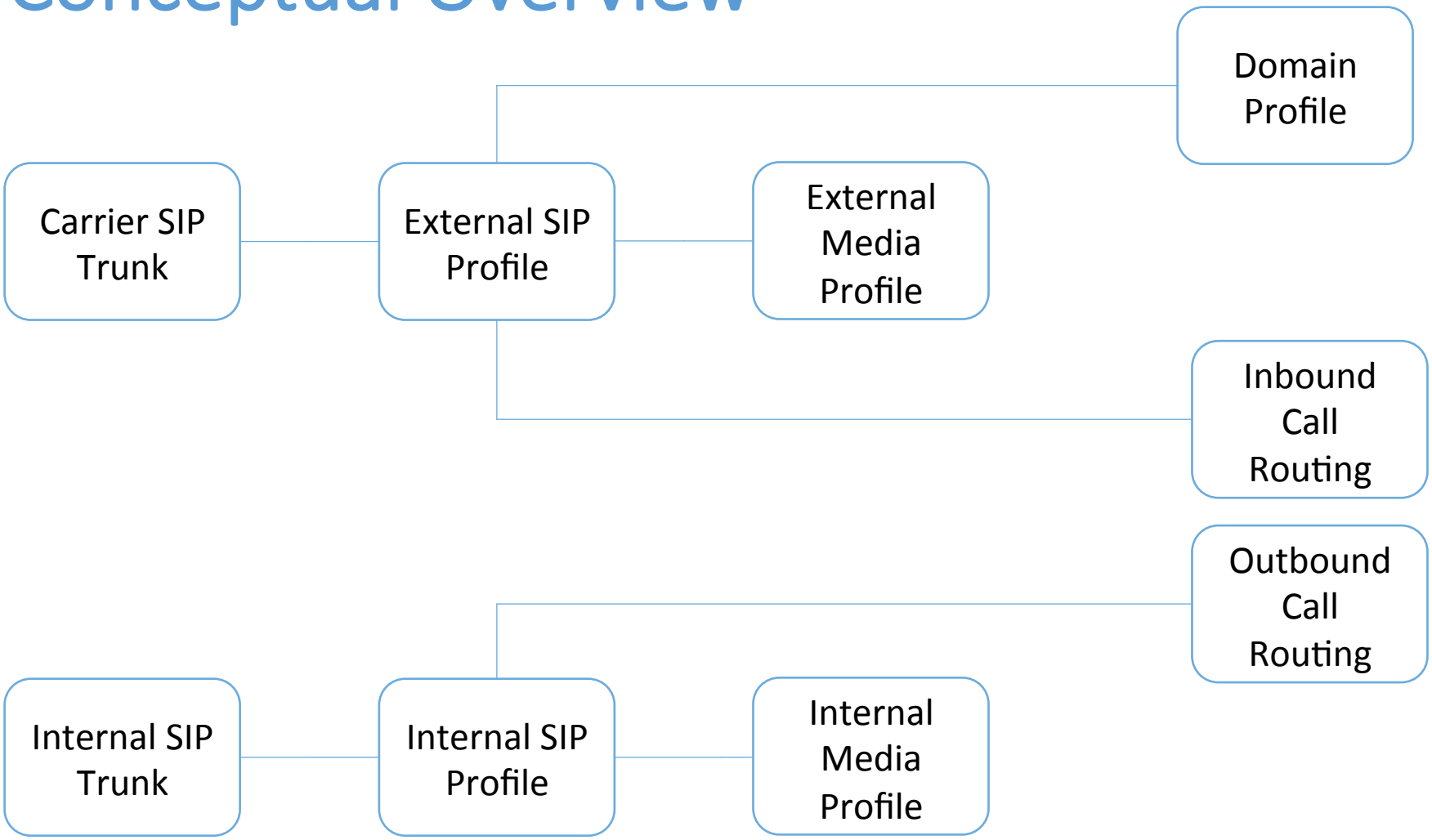




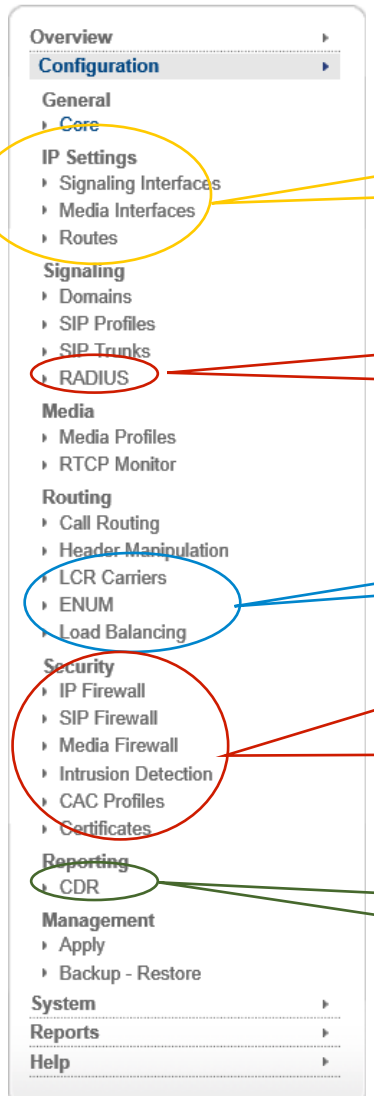
Integrated View

Vega Series SBC

Conceptual Overview



Additional key components



Configure IP addresses, Virtual IP's and VPN. IP addresses for media processing, Static Routes

Support to RADIUS for Accounting

Least Cost Routing
ENUM
Load Balancing

Security: IP Firewall, SIP Firewall, Media Firewall, Intrusion Detection, Call Access Control, Certificates

Call Detailed records, Local or HTTP

Quick Diving

Live review

Interesting Links:

http://wiki.sangoma.com/NetBorder-Session-Controller

http://wiki.sangoma.com/NSC-Configuration-Guides

http://wiki.sangoma.com/NSC-Download

http://wiki.sangoma.com/nsc-security

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