Building a Hosted, Multi-Tenant Contact Center Environment for Thousands of Agents

Presented by

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Project Requirements

- Scalable architecture for inbound, outbound and blended call centers
- Redundant and fail-over components
- Target call centers with 5 or more agents
- Dedicated telephony hardware per client
- Pluggable hardware and software add-ons
- High-density server co-location installation
- Multiple-carrier telco termination
- Pre-paid telco time billing
Scalable/Redundant Architecture

- RAID-1 or RAID-10 everywhere (except archive [RAID-6])
- Telco termination services
- Database services
- Web services
- ViciDial Call Center telephony services
- Icinga system and network monitoring software
- Internal network architecture
RAID-1 or RAID-10 Everywhere

- RAID-1 Redundancy if a drive fails on telephony server or web server
- RAID-10 for redundancy and speed on database servers
- RAID-6 for archive servers only, too slow for all other purposes (Never RAID5 or 6 your database server!!!)
- Use of SSD drives for database servers together with LSI Logic MegaRAID cards greatly improves database performance
Telco Termination Services

- Multiple outbound carriers
- Tier 3 data centers provide multiple data carrier paths to telco carriers
- Multiple OpenSIPS servers operating on independent local databases with outbound dialing fail-over to the other OpenSIPS servers
- Each OpenSIPS server can route thousands of concurrent calls per minute
Database Services

- MySQL(MariaDB) Master/Slave replication for fail-over in case of total hardware failure
- Incremental backups conducted from the slave servers, to not interrupt operations
- Large amounts of RAM on database servers to allow for more in-memory queries
Web Services

- Apache load balancing with apache mod_proxy module
- Vicidial's web interfaces do not require session stickiness for agent or admin web sessions, making load balancing simpler and faster
Vicidial Call Center

- Each client has their own instance of Vicidial
- Multi-server capable
- Inbound and outbound call load balancing
- Agent phone load balancing and fail-over across servers
- Asterisk 1.4 and Asterisk 1.8 based
Icinga Monitoring

- Sends warnings through email and control panel

- Monitors:
  - Server accessibility
  - Network integrity
  - System load
  - Asterisk live channels
  - Web connectivity
  - MySQL(MariaDB) connectivity and slave replication integrity
Internal Network

- All internal network infrastructure is using HP switching equipment
- Dual 10GB connections to Tier 3 datacenter networks
- Dual bridged connections to second level data network switches for redundancy
Call Path Diagram:
Dedicated Telephony Hardware

- A problem with many hosted multi-tenant call center services is control of resource allocation
- Poor audio quality and reduced total capacity of hardware if you use Virtual Machines
- Use of Amfeltec PCIe hardware timer for better audio quality at high load
- On-server audio recording
- 5-70+ agents per server (depending on type of call handling)
- Add more servers to scale a single client to hundreds of seats in their own cluster
Small 1U Telephony Servers

- Single quad-core Intel CPU with 8GB RAM
- Software RAID-1 for redundancy of drives
- 1U form factor, 10 inches deep
- All ports in front except for power plug
- We add extra fans for better ventilation
- Very low power usage
Hardware Add-ons

- Amfeltec PCIe timer module
  - For hardware timer to give better audio quality at higher loads

- Sangoma D100 Transcoding cards
  - For clients or carriers wanting G729 codec use
  - Includes licenses
  - Multiple channel capacities
Proprietary Software Add-ons

- Cepstral Text-to-Speech
- Sangoma Call Progress Analysis (Lyra)
- QueueMetrics Statistical Analysis
- DNC.com cellphone filtering batch files
- Zoiper webphone
Cepstral Text-to-Speech

- Broadcast outbound campaigns
  - Personalized message
  - Order status changes
- Inbound dynamic IVRs
  - Payment processing
  - Order status
  - Account balance
Sangoma Lyra (CPA)

- Pre-Answer signal analysis
  - SIT tones
  - Disconnected numbers

- Answering Machine Detection
  - Very fast detection
  - End of message detection
QueueMetrics Statistics

- Visually oriented call stats package
- Uses a different method of logging than Vicidial
- Separated system with no access to Vicidial administration
• **DNC.com Cellphone Filtering**

  • Recently added option that works with DNC.com prefix and number portability batch files

  • Updated daily

  • Allows for compliance with TCPA FCC regulations for not auto-dialing cellphones in the USA without explicit permission (Going into effect October 16, 2013)
Zoiper Webphone

- No configuration needed on agent workstation
- Soft-phone that can be embedded in the ViciDial screen
- SIP or IAX protocol
- Windows agent only
Agent Screen with Embedded Phone

Hello and thank you for calling ACME Widgets. My name is Admin, can I schedule an appointment for you to review our lovely widgets?

Appointment Date: 2010-08-09

Appointment Time: 12:44

Favorite Color:
- Red
- Blue
- Green
- Purple

Discussion Topics:
- Price
- Color
- Texture
- Shipping

Contact ID: 7275551113

Nearest City: Chicago
High-Density Co-Location

- Tier 3 Co-location facilities in Tampa, Florida and Northern Virginia
- Double-racked small 1U servers allows for 74+ servers per rack
High-Density Server Installation

- Similar to how many large data centers like Google are set up on a per-rack basis
- Center hot-air-column exhausting out the top
Multiple Carrier Telco Termination

- Several outbound carriers are used for placing outbound calls
  (most carriers do not like high volume or rapid outbound dialing)
- Calls can fail on one carrier then retry on another carrier depending on the return code
- For inbound there are not too many options for multi-carrier. Some clients have inbound numbers on more than one carrier, or use providers that distribute calls to multiple inbound numbers
- OpenSIPs is used for all telco termination routing to and from the ViciDial servers
Pre-Paid Telco Time Billing

- All customers' inbound and outbound calls can be selectively allowed or denied traffic.
- Logging of call length is done at the OpenSIPS layer for the best accuracy.
- Clients have an account on our hosting web portal that allows them to check their balance, add to their balance and download CDRs.
- Inbound, outbound and international calls can all be billed at different rates, and even different rates within the USA.
Thank you!

For more information, go to:

http://www.vicidial.org