Building an Enterprise-Level Call Center with Asterisk

by
Matt Florell
President – eflo.net

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What is Enterprise-Level?

- For a standard PBX “Enterprise” usually means 1000+ extensions
- For a call center “Enterprise” usually means 100+ agent seats
- Line utilization for 100 seat call center is actually higher than for the average 1000-extension corporate PBX
Step 1: Define Requirements

- How many seats needed? (inbound/outbound/blended)
- How many incoming/outgoing lines? (what is the desired lines/agent ratio)
  - Inbound, usually 1/1 to 2/1
  - Outbound, anywhere from 1/1 to 10/1
- Level of recording and live monitoring needed?
- What telco/data infrastructure is available?
- Agent workstation hardware/software
- What reporting is needed?
Step 2: Choose Platform - Asterisk

- If inbound-only or no blended necessary, native Asterisk Queues/Agents can be used.
- Functional limits of around 300 agents on a single very-high-end Asterisk server
- For multiple queues, adding servers can help reduce main server load.
- Using native SIP or IAX transfers can help reduce load.
- Using same codec for audio prompts, trunks and clients can help reduce server load
Step 2: Choose Platform - VICIDIAL

- Inbound/outbound/blended capable
- Load balancing and scaling is possible
- Open Source (GPLv2, no cost per seat)
- Web-based agent and manager interfaces
- Integrated recording
- 3rd and 4th party calls with consultative transfers
- Scheduled CallBacks (Agent-only and Anyone)
- Remote agent capability
Step 2: Choose Platform - Proprietary

- Closed-source
- Per seat and/or per feature licensing
- More advanced functionality
- Solutions available:
  - Aheeva, Aspect, Contaque, DACX, DragonSuite, Indosoft, Presence, SineDialer, SkyyDialer, OmegaDial
Step 3: Native Asterisk Recording

- Works on all channel types
- Writing to hard drive directly has functional limit of 50-70 channels on a single server
  - Small 44-byte chunks causes lots of drive activity
- Writing to RAM drive extends limit to over 250 channels on a single server and will lower server load
- Always try to copy recordings off of server as soon as possible
Step 3: OrecX Recording

- SIP passive recording of streams through network tap on the switch or through the Asteirsk server
- Sangoma T1/E1 recording at kernel level
- Audio is stored on OrecX archive server
- Core OrecX technology is Open Source
- Paid add-on utilities available
Step 4: Live Monitoring Options

- T1/E1 monitoring through ZapBarge
- All-channel-type monitoring through ChanSpy
- VICIDIAL monitoring and barge-in available without ChanSpy on all channel-types, because VICIDIAL uses meetme
- OrecX offers live monitoring through OrecX interface of SIP or Sangoma-Zap channels
Step 5: Data Infrastructure

- **Internet connectivity**
  - If using VOIP lines, always over-estimate requirements, especially if using public Internet
  - Fiber or co-located servers are best option

- **LAN connectivity**
  - Gigabit ethernet for backbone with 100Mb sub-switches for client machines/phones
  - Server Gb ethernet recommended for more than 300 phones/lines of capacity
Step 5: Data Infrastructure

Basic 200-Seat Call Center LAN Diagram
Step 6: Telco Infrastructure - T1/E1

- If using T1/E1 lines directly you will need a telco interface card from Digium, Rhino or Sangoma.
- Cards are PCI or PCIexpress and are available with 1, 2, 4 or 8 ports.
- Cards available with optional hardware-based echo-cancellation.
- There are no Asterisk-compatible, direct DS3 interface cards currently available, so T1/E1s are required.

More information on Telco cards: http://www.eflo.net/presentations.php
Step 6: Telco Infrastructure - VOIP

- For on-premises equipment, use fiber DS3 or higher, preferably on the same backbone as provider, if not point-to-point.

- To save on bandwidth, put servers in a data center and use a lower-bandwidth connection to where the agents are located.

- For Enterprise-level call centers it is always recommended to have a backup, either duplicate servers in another location, or another set of T1s or extra internet connection.
Step 7: Agent Workstations - Asterisk

- Asterisk-only Queues does not require an agent computer
  - Add-ons can run an Agent web page pop-up on call connect
- Phone can be hard-phone or soft-phone
- Packages like OrderlyQ can add Queue functionality like customer-leave-callback
Step 7: Agent Workstations - VICIDIAL

- Minimum PIII 500MHz with 128MB RAM
- Windows, Linux or Mac
- Modern web browser (Firefox, Opera or IE)
- Soft-phone, SIP or IAX (may require faster CPU)
  - USB headset is recommended
- Hard-phone (VOIP or Channelbank-connected)
  - No effect on agent station CPU load
  - More reliable and more consistent audio quality
Step 7: Agent Workstation - Proprietary

- Many different options, Some platforms require Windows XP and P4 – 2GHz CPU – 512MB RAM minimum
- Some platforms allow only their proprietary soft-phones
- Some platforms are capable of doing full agent screen capture
- Some platforms do call recording on the agent computer instead of on the server side
Step 8: Reporting Options - Asterisk

- QueueMetrics proprietary reporting solution
- AsteriskGuru Queue Analyzer
- OrderlyStats
- Custom text-file or database queue_log parsers
Step 8: Reporting Options - VICIDIAL

- Integrated web-based reports included
- QueueMetrics compatibility with outbound
- Direct MySQL/ODBC access to raw call and agent logs
- Custom queries through programs like PHPMyAdmin and Crystal Reports
Step 8: Reporting Options - Proprietary

- Many of these platforms come with extensive call activity analysis tools, statistical reports and call forecasting modules
- Commercial analytics add-on packages available
- Some allow ODBC access to raw logs
Case Study: Existing Infrastructure

- 150 seats across 7 different systems
- Existing Dialer/PBX infrastructure was ASCII-terminal based with all analog extensions
- Inbound and outbound systems were not connected
- Wiring was all analog with 66-blocks to phones and serial cables to terminals
- All data in and out went through flat files only
Case Study: New System Capacity

- All 150 agent seats capable of recording all calls and inbound/outbound/blended call handling
  - Greatly increase flexibility without outgrowing office
- Calls load-balanced across the entire system with a 3/1 lines to agent ratio
  - Adds 50% more lines than existing system
- Existing RBS, D4/AMI E&M Wink T1s changed to PRI/5ESS
  - All T1s are Bi-Directional with inbound/outbound
  - T1 PRIs allow for dynamic CID setting per campaign
Case Study: New System Stations

- Existing CAT5 serial wiring was reused for agent station ethernet
  - Saves tens of thousands of dollars in wiring
- Existing phones and wiring reused with T1 channelbanks
  - Less equipment to purchase, staff was already familiar with existing phones and wiring
- 150 used P4 workstations purchased for agent stations, loaded with Ubuntu Linux
  - Largest single expense of the entire project
Case Study: New System Servers

- Asterisk/VICIDIAL Load-Balanced Solution:
  - 6 Asterisk/VICIDIAL servers with quad-T1 card
    (Asus Board/Intel Core2-Duo/2GB RAM/SCSI-RAID/Sangoma a104)
  - 1 MySQL database server
    (Asus Board/Intel Core2-Quad/8GB RAM/SCSI RAID)
  - 1 Apache/PHP/eaccelerator server
    (Asus Board/Intel Core2-Duo/1GB RAM)
  - 1 Recording Archive server
    (Asus Board/Intel Core2-Duo/4TB SATA RAID/1GB RAM)

All systems use Slackware Linux with custom 2.6.17.11 Kernel
Case Study: New Data Transfer

- ODBC greatly simplified integration with existing Sales and CRM data exchange
- Loading of leads directly into database
- Loading of Website-generated leads immediately into Dialer for callback
- New real-time reports and ability to much more easily make new reports
Thank you!

Call Center panel tomorrow at 2:00PM and VICIDIAL sessions tonight and tomorrow night

For more information, go to:
eflo.net
voip-info.org
asterisk.org