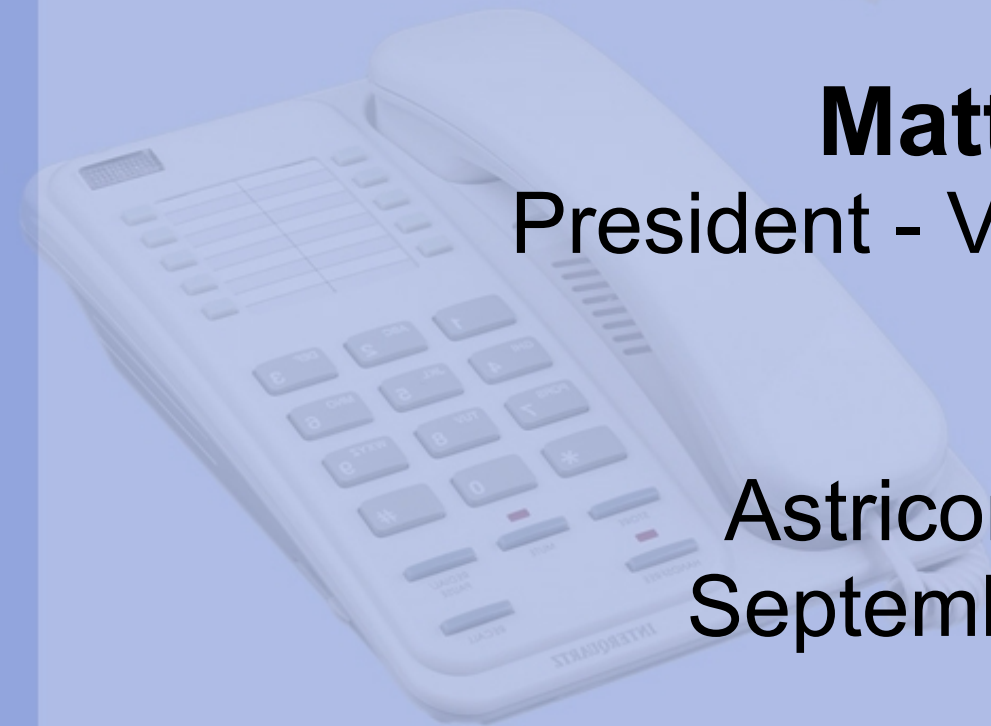# Case Study: Building a Hosted Call Center

Presented by
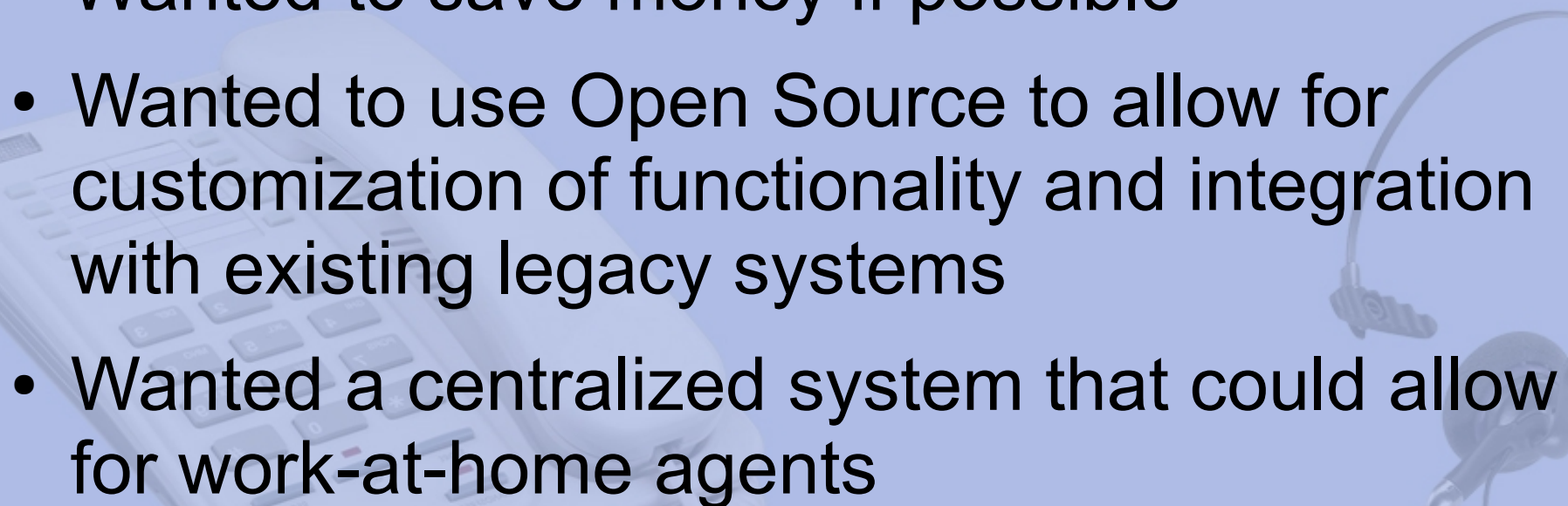
**Matt Florell**
President - VICIDIAL Group

Astricon * Phoenix
September 25, 2008

Intermedi@ Marketing Solutions

- Wanted to move to a centralized call center solution at a carrier co-location facility

- Wanted to avoid vendor-lock-in

- Wanted to save money if possible

- Wanted to use Open Source to allow for customization of functionality and integration with existing legacy systems

- Wanted a centralized system that could allow for work-at-home agents

Network Architecture

Sketch-Book
IP Trunking W/Bridging
Functional Diagram
10/14/2007
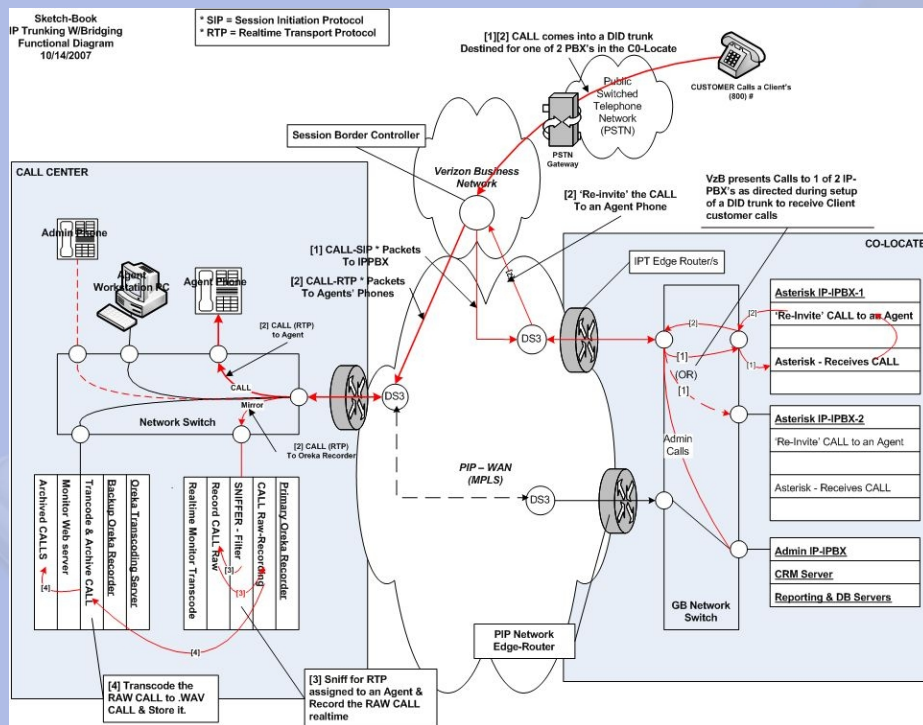
- Multi-rack cage at Verizon co-location facility

- Point-to-point data connections to call center facilities

- Verizon SIP Trunks for Inbound call center

- Verizon voice DS3 into individual T1s for the outbound call center

Inbound Call Center

- Balanced Verizon IP Trunking across two DS3 data circuits

- Multiple very-high-end servers to handle Asterisk Queues

- QueueMetrics for statistics and ACD reporting

- OrecX for recording and monitoring of agents

- Lokad for inbound call volume analysis
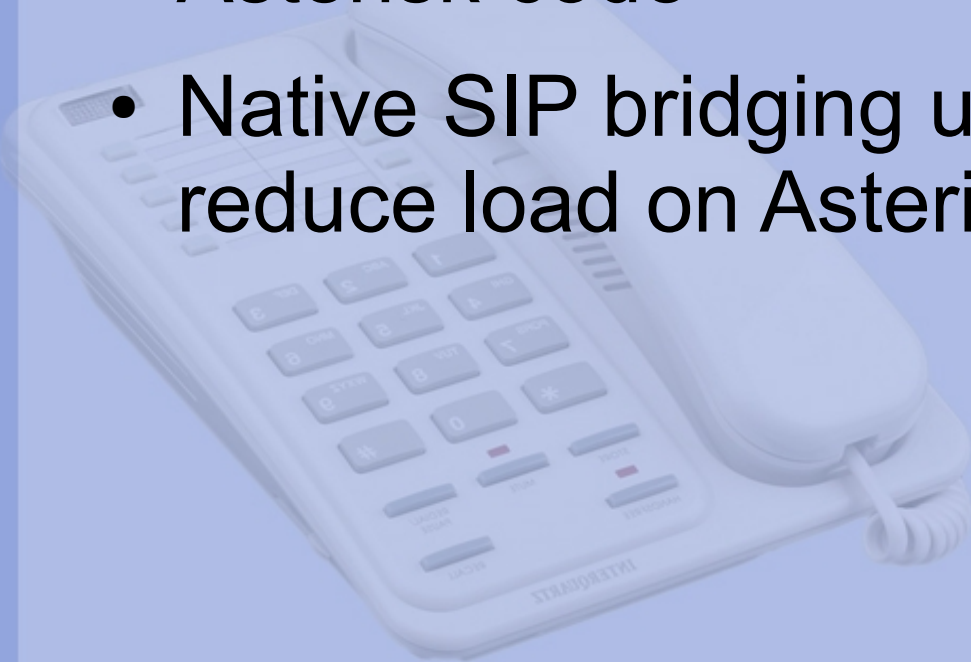
- Capacity of over 800 concurrent calls
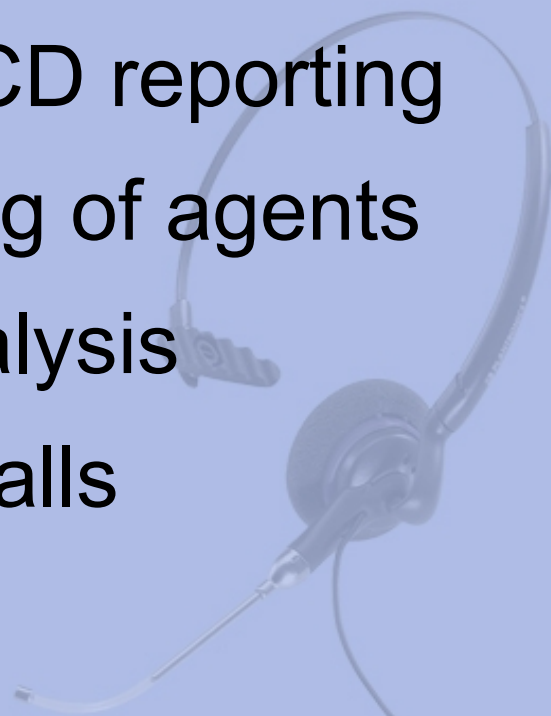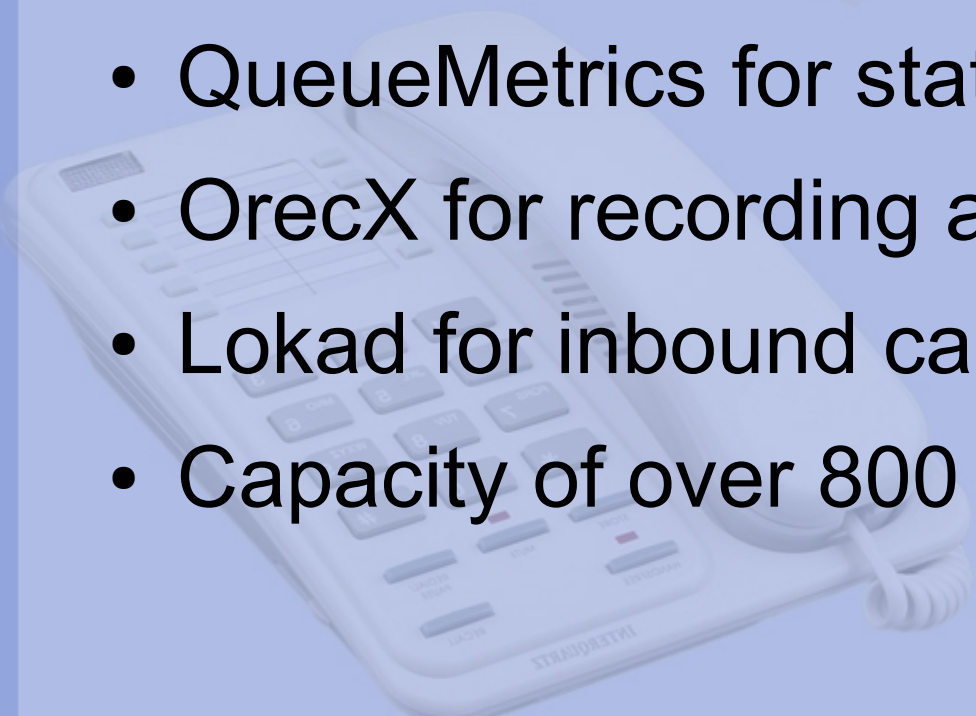
Outbound Call Center

- VICIDIAL call center suite

- QueueMetrics for integrated statistics and reports

- Six Dialing servers, one web server and one database server

- Capacity of 570 concurrent outbound calls and 300 agents
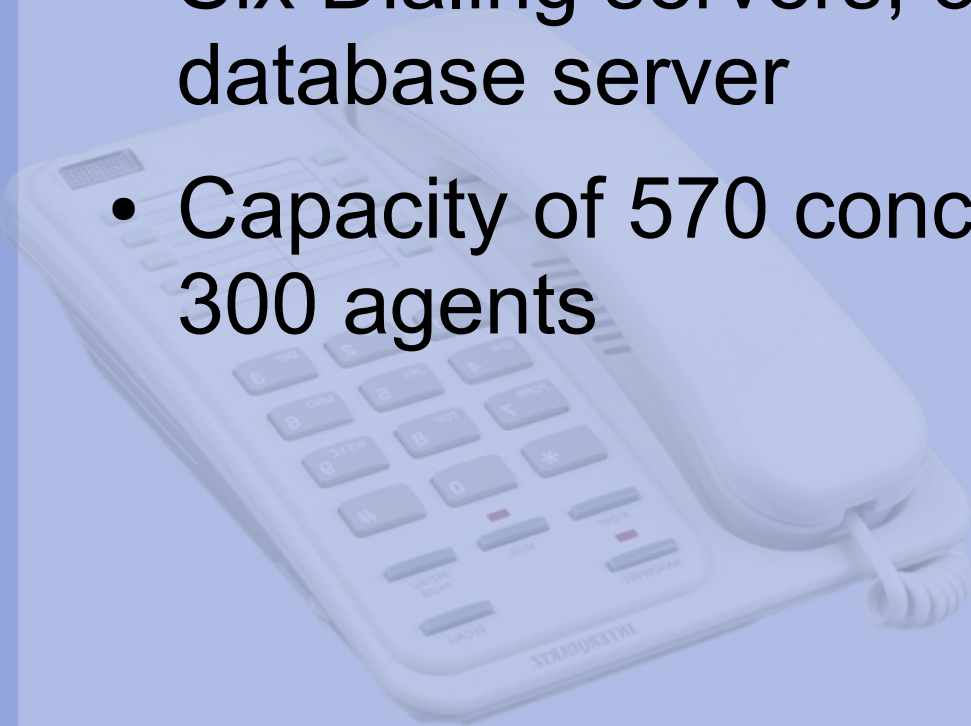
Asterisk

- Asterisk Queues handling up to 500 inbound phone calls per server

- Modified Asterisk code for extra inbound queues features and streamlining of the Asterisk code

- Native SIP bridging used wherever possible to reduce load on Asterisk

QueueMetrics

- Proprietary, Closed-Source reporting package for Asterisk Queues and VICIDIAL

- Based on Java, uses Apache-tomcat web server and MySQL database

- Comprehensive historical and real-time reports

QueueMetrics

- Chat client for firefox sidebar
- Client used dedicated MySQL server for database and a dedicated Apache-tomcat web server

OrecX

- Network sniffing audio recording and monitoring application

- Base recording package is Open Source, user agent is paid-for software

- For T1/E1 recording, uses Sangoma RTP-tap to get audio streams from TDM to pseudo-VOIP

- Separate servers for OrecX collection/live-monitoring and for archive of recordings

VICIDIAL Call Center Suite

- Open-Source Call Center software, written in Perl and PHP and using MySQL for back-end

- Agent and Admin are web-based interfaces

- 50 to 100 agents per server

VICIDIAL Call Center Suite

- Supports inbound, outbound, blended and broadcast-dial call handling

- Six Asterisk/VICIDIAL servers for agents/lines

- Dedicated MySQL database

- Dedicated Apache web server

Lokad Call Volume Forecasting
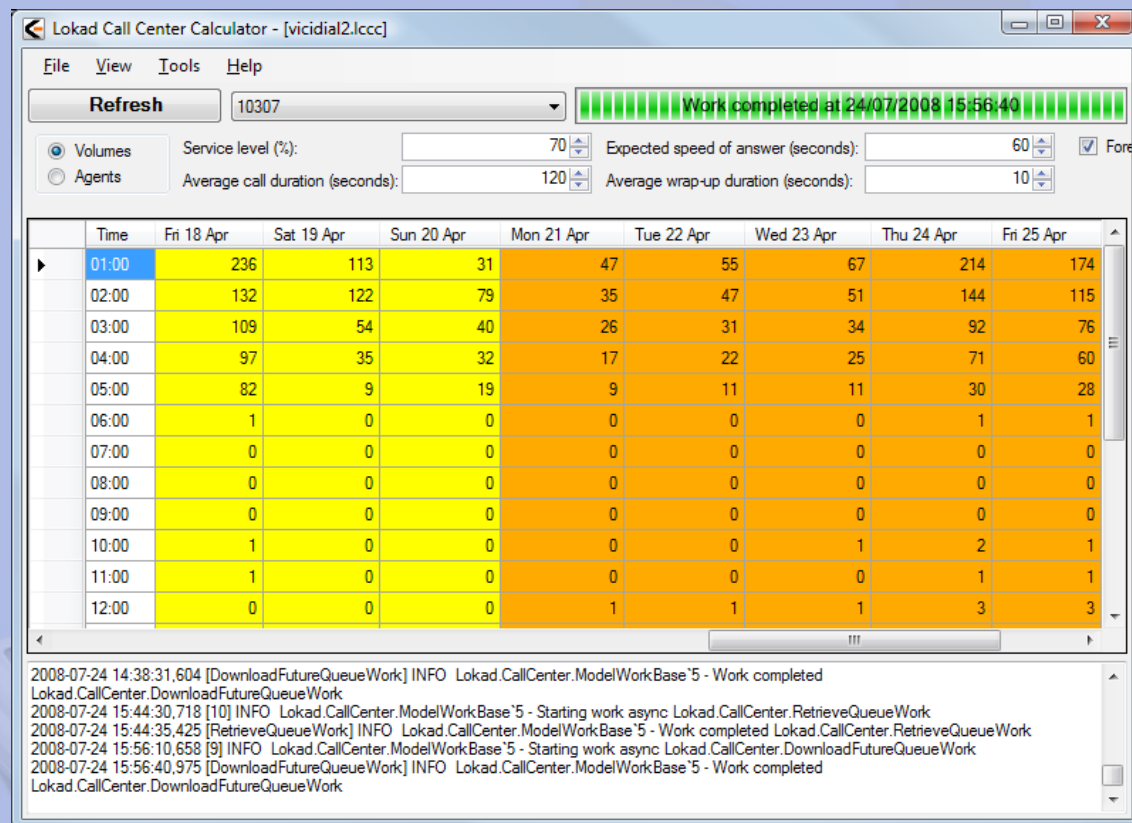
- Desktop application

- Call forecasting based upon queue_log database table records generated by Asterisk or VICIDIAL

- Erlang C staff optimization levels

Custom Integration

- Asterisk and QueueMetrics reporting changed to correspond to business rules

- VICIDIAL call handling and agent call status are logged and able to be controlled to some extent by legacy applications through the use of an API

Load Balancing

- Inbound SIP trunk calls are balanced across the two DS3 connections, which also have fail-over

- As agents log into VICIDIAL, they are logged into the server with the least number of agents on it

- Web load balancing for the VICIDIAL agent interface is simple and non-session-specific

Fail-over Procedures

- Every agent SIP phone is registered to every Asterisk server

- If a VICIDIAL server fails, then agents can log back in within seconds using one of the other VICIDIAL servers

- If one of the DS3 data connection fails, then all calls will be directed to the other DS3 data connection
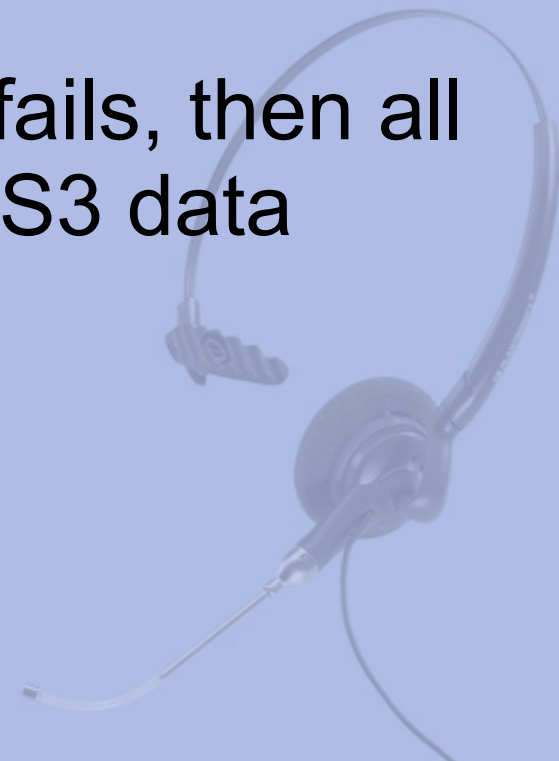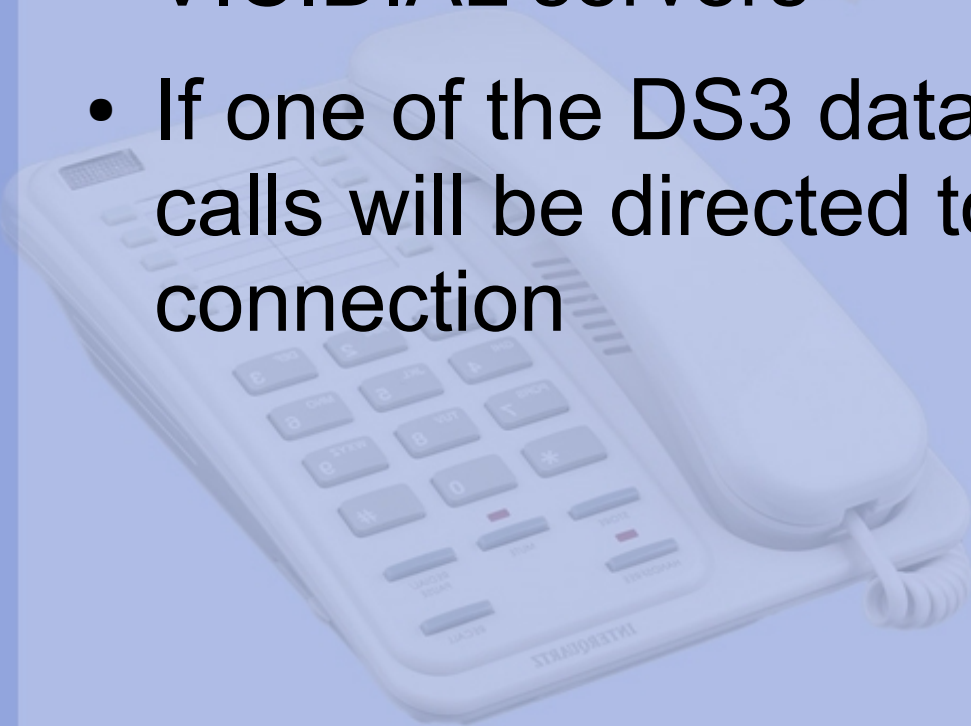
Future Projects

- Further integration with internal legacy systems

- Agent scheduling optimization with inbound ACD call volume forecasting

- Further roll-out of at-home agents

Thank you!

For more information, go to:

www.eflo.net
www.vicidial.com