Fighting False Answer Supervision and Post-Dial Delay using enhanced SIP event logging through Asterisk

Presented by

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FAS (False Answer Supervision)

- Carrier sends an Answer signal when far-end subscriber has not answered the call
- Illegal in USA, but hard to detect or prove
- Common audio received after FAS Answer:
  - Silence
  - No audio packets
  - Ringing
  - “Hello” <then silence>
  - Call rejection message

PDD (Post-Dial Delay)

- Carrier delays the sending of a call while it determines how to route the call, often caused by overloaded routing equipment
- Not Illegal, but can be very frustrating
- We have found examples of PDD of up to 40 seconds on some carriers
- Indicators can be very inconsistent and different on different carriers
- Easiest indicator is log silence after placing a call before hearing any ringing

Where Carriers Send FAS

- Disconnected numbers
- Impossible numbers
  - For example: 312-155-5555
  - Unallocated prefixes like: 201-609-XXXX
- Busy phone calls
- Random percentage of calls

Detecting FAS: Abandoned Patent

- Abandoned USA patent application:
  US20110033032 (Detecting false answer supervision)
  - Filed by iBasis employees Shuping Zhang & Manpreet Singh in August of 2009
  - iBasis is bought by KPN in December of 2009, application is abandoned soon after
  - December 5, 2018: Manpreet Singh(still working for iBasis) gives presentation at SIPNOC on how they do FAS detection

https://patents.google.com/patent/US20110033032
https://www.sipforum.org/download/handling-voice-fraud-an-ipx-carriers-perspective/

Detecting FAS: Methods

- Very fast INVITE to 200OK SIP messages gap
- Immediate 200OK after 180/183 SIP messages
- Logging of audio packets on Answered calls and compare in/out
- Analysis to CDRs and above data to find patterns

Detecting FAS: Implementaion

- Logging of relevant SIP messages with high-resolution timing
- Detection of audio packets on Answered calls
- Logging the above data and recording of all calls to allow for further data analysis to find patterns

Asterisk Modifications

- Asterisk 13.21.x and higher
  - chan_sip patch
    to send at least the following SIP events to the Manager Interface
    output:
    INVITE, 100, 180, 183, 200
  - app_amd patch
    to detect no-audio data

http://download.vicidial.com/asterisk-patches/sip_logging.patch
http://download.vicidial.com/asterisk-patches/ast13_amd_noaudio.patch

VICIdial Modifications

- SIP event listener/logger on AMI
- Pattern match check on agent screen and auto-dial routing process to log and/or automatically hang up calls
- Reports to show and analyze data

Other Helpful Applications

- HOMER
  - SIP message logging
  - Allows SIP capture of a specific call to be sent to a carrier
- OpenSIPS
  - High-volume SIP call routing
  - Allows you to route around specific phone exchanges and send to a different carrier

AMI Output Examples

```
Event: SIPInvite
Privilege: call,all
Timestamp: 1559063934.425579
Channel: SIP/proxy-000045be
Uniqueid: 1559063934.53768
SIPCallID: 1c8e4edf500518432095e02b366aa31e02@192.168.1.1:5060
CallerIDName: V52813185200518048 11
ConnectedLineName: V52813185200518048 11

Event: SIPResponse
Privilege: call,all
Timestamp: 1559063934.502945
Response: 100
Channel: SIP/proxy-000045be
Uniqueid: 1559063934.53768
SIPCallID: 1c8e4edf500518432095e02b366aa31e02@192.168.1.1:5060
CallerIDName: V52813185200518048 11
ConnectedLineName: V52813185200518048 11
```

Example SIP Event Data

```
Call: V02509064006465555582          UniqueID: 1572008800.4725
Post-Dial: 0.437936    Ring-Time: 0.081297    Total-Dial: 0.519233
Channel: SIP/proxy1-000003e1    Server IP: 192.168.1.14
SIP Call ID: 7caas8d7f6qv9f87qwe9rtew96t876e06b@192.168.1.1:5060
```

#	Date Time Microseconds	Event	Length
1	2019-10-25 09:06:40.767649	INVITE	
2	2019-10-25 09:06:40.768288	100	0.000639
3	2019-10-25 09:06:40.768539	100	0.000251
4	2019-10-25 09:06:41.205585	183	0.437046
5	2019-10-25 09:06:41.286882	200	0.081297
			0.519233

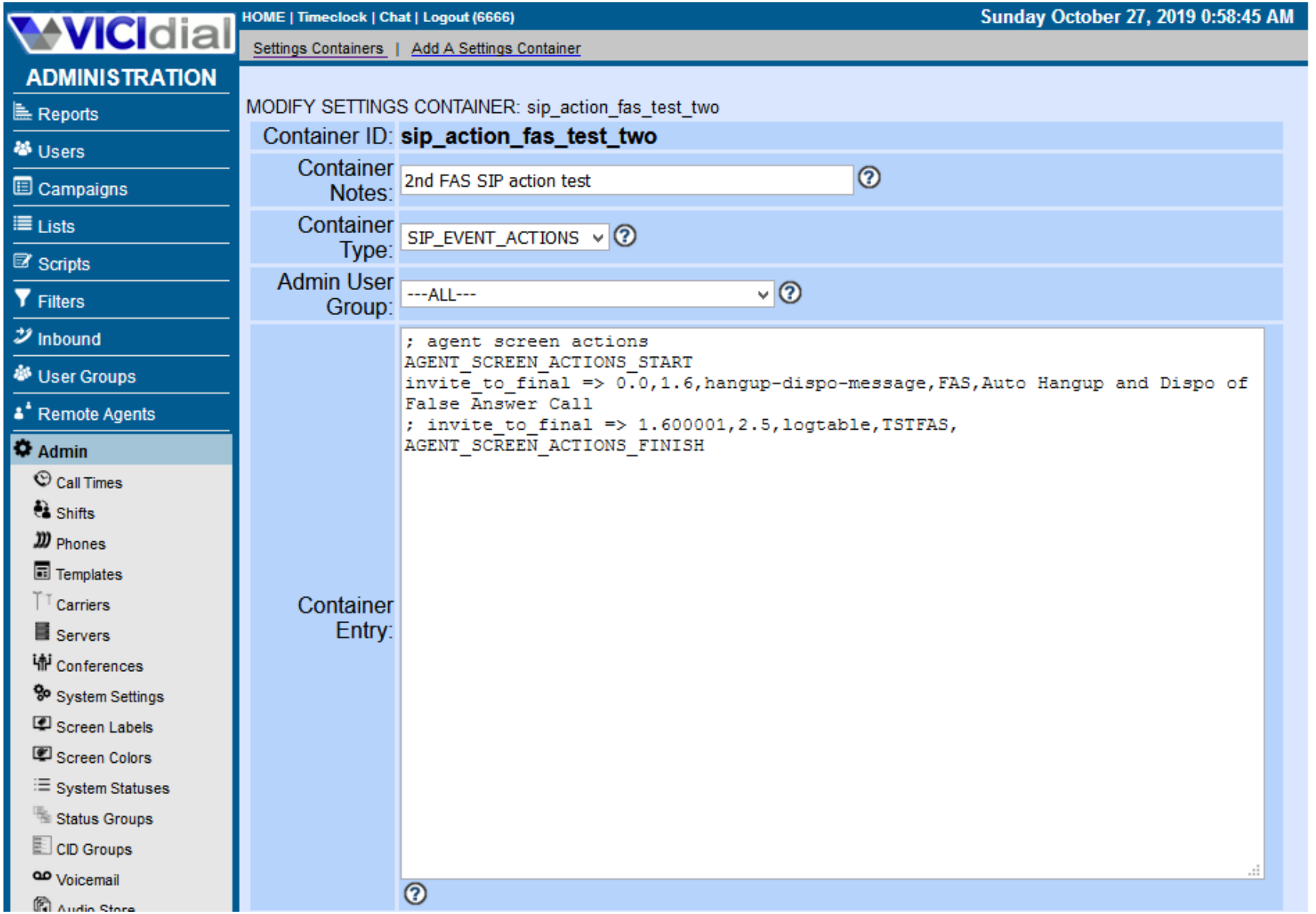
SIP Event Observations

- The only guaranteed events on Answered calls are INVITE and 200
- Can receive multiple 100's, 183's per call. I once found over one hundred 183 events for the same phone call
- For residential calls in the USA, we've never found a human answer that was Answered within 1 second of the INVITE (I've listened to hundreds of recordings, and clients have listened to thousands)

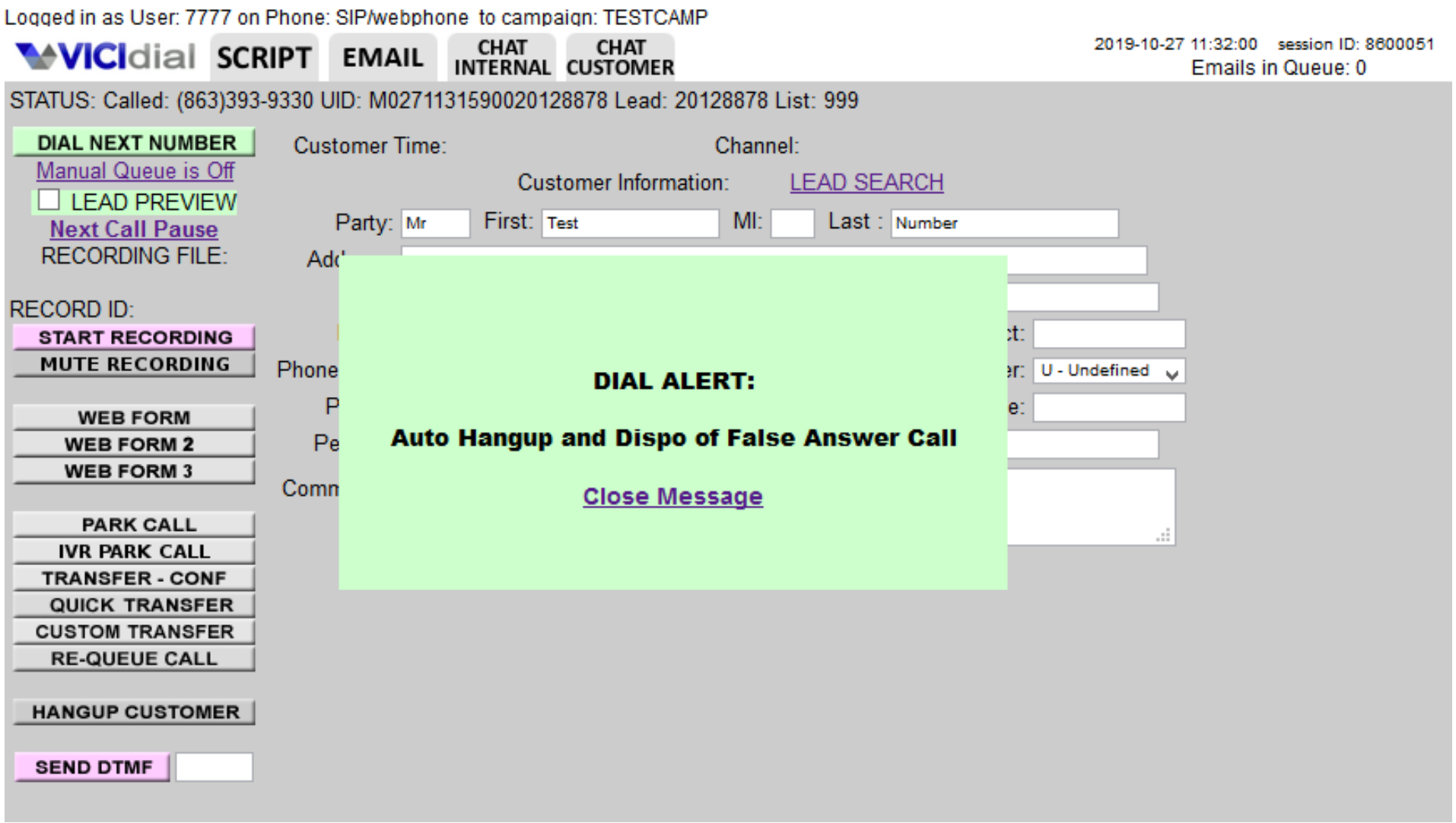
Post-Dial Delay Observations

- Not easily detectable on all carriers
- Delay from INVITE to 180/183
- Delays can vary depending on region and change over time
- Voice packet analysis: can cause delay in all voice packets or only a delay in ringing, depending on the carrier
- Best to verify with manual-dial calls

VICIdial SIP Actions Configuration



VICIdial Agent Screen SIP Action



VICIdial AMD Report

Date: 2019-10-25

00:00:00
to
23:59:59

Server IP:
- -- ALL SERVERS --
- 192.168.1.11 - ViciHost dialer11

AMD Status:
- -- ALL AMD STATUSES --
- HANGUP
- HUMAN
- MACHINE
- NOTSURE

AMD Response:
- INITIALSILENCE
- LONGGREETING
- MAXWORDLENGTH
- MAXWORDS
- NOAUDIODATA

Display as: TEXT

SUBMIT

--- AMD BREAKDOWN FOR 2019-10-25, 00:00:00 TO 23:59:59 - ALL servers

AMD STATUS	AMD RESPONSE	COUNT
NOTSURE	NOAUDIODATA	25
	TOTAL	25

--- AMD LOG RECORDS FOR 2019-10-25, 00:00:00 TO 23:59:59 - ALL servers , - ALL AMD statuses , AND AMD respons(es) NOAUDIODATA
--- RECORDS #1-25 [DOWNLOAD]

CALL DATE	CALLER CODE	LEAD ID	UNIQUE ID	CHANNEL	SERVER IP	AMD STATUS	AMD RESPONSE	AMD CAUSE
2019-10-25 09:13:46	V02509133700015895750	15895750	1572009220.5620	SIP/SIPproxyx-1-00000733	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:14:03	V02509133700016341618	16341618	1572009221.5641	SIP/SIPproxyx-1-0000073a	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:14:35	V02509142500016325374	16325374	1572009268.6143	SIP/SIPproxyx-1-000007d7	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:15:19	V02509145400016035439	16035439	1572009296.6446	SIP/SIPproxyx-1-00000834	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:16:10	V02509155300016342380	16342380	1572009360.7168	SIP/SIPproxyx-1-00000916	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:17:04	V02509163500016342472	16342472	1572009397.2822	SIP/SIPproxyx-1-000003b5	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:17:27	V02509171700015908747	15908747	1572009438.7975	SIP/SIPproxyx-1-00000a15	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:17:59	V02509172900016341202	16341202	1572009450.3067	SIP/SIPproxyx-1-00000405	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:25:07	V02509245600015966168	15966168	1572009899.12792	SIP/SIPproxyx-1-00000fed	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:28:19	V02509280600015995713	15995713	1572010092.14827	SIP/SIPproxyx-1-0000126f	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:33:02	V02509325500015985916	15985916	1572010375.7380	SIP/SIPproxyx-1-0000098e	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:35:55	V02509354400015985184	15985184	1572010548.8150	SIP/SIPproxyx-1-00000a8a	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:36:59	V02509363600016098402	16098402	1572010601.20232	SIP/SIPproxyx-1-00001908	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:37:05	V02509365600016018699	16018699	1572010616.20387	SIP/SIPproxyx-1-00001939	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:38:14	V02509375500015956001	15956001	1572010678.8883	SIP/SIPproxyx-1-00000b7a	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:38:39	V02509380200016000772	16000772	1572010692.21219	SIP/SIPproxyx-1-00001a3e	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:46:40	V02509463100015897084	15897084	1572011194.25313	SIP/SIPproxyx-1-00001f34	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 09:54:15	V02509535900015953520	15953520	1572011639.28639	SIP/SIPproxyx-1-00002355	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 10:22:47	V02510221700016098877	16098877	1572013338.17237	SIP/SIPproxyx-1-0000164b	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 10:40:37	V02510400500016097918	16097918	1572014411.42549	SIP/SIPproxyx-1-00003438	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 10:42:00	V02510415300016099911	16099911	1572014514.20838	SIP/SIPproxyx-1-00001b05	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 14:23:24	V02514225700016000772	16000772	1572027777.84410	SIP/SIPproxyx-1-00005fd7	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 14:59:39	V02514590900016099784	16099784	1572029951.39738	SIP/SIPproxyx-1-000033fc	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 15:04:10	V02515034200016098931	16098931	1572030222.103520	SIP/SIPproxyx-1-000076e8	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0
2019-10-25 15:11:51	V02515112800016099844	16099844	1572030689.41092	SIP/SIPproxyx-1-000035cc	192.168.1.11	NOTSURE	NOAUDIODATA	NOAUDIODATA-0

VICIdial SIP Event Call Report

SIP Event Report

Date: 2019-10-25 Sort: Total-Dial DOWN ☑ Search archived data REPORTS

SUBMIT

00:00:00
to
23:59:59

SIP Event Report : Total Records: 368706 Starting Record: 0 2019-10-26 01:20:27 (M)
Time range: 2019-10-25 00:00:00 to 2019-10-25 23:59:59

Displaying Records: 1000 NEXT

Date Time Microseconds	Caller Code	Post-Dial	Ring-Time	Total-Dial	UniqueID	Server IP	Lead ID	sec	Phone	Status	Call Ct
2019-10-25 09:53:05.733059	V0250953030648691489	0.000000	0.000000	0.358893	1572011585.40321	192.168.1.11	648691489	0	5615555427	FAS	1
2019-10-25 16:43:58.206586	V0251643540647785485	0.000000	0.000000	0.407031	1572036238.371619	192.168.1.11	647785485	0	9155555336	FAS	2
2019-10-25 09:24:54.134290	V0250924510648652370	0.000000	0.000000	0.439928	1572009894.18483	192.168.1.11	648652370	0	3055555754	FAS	1
2019-10-25 14:53:17.319730	V0251453130647511626	0.000000	0.000000	0.448099	1572029597.288017	192.168.1.11	647511626	0	7245555553	FAS	2
2019-10-25 11:03:43.573609	V0251103400646770117	0.000000	0.000000	0.458855	1572015823.95015	192.168.1.11	646770117	0	5705555274	FAS	2
2019-10-25 13:45:27.767821	V0251345250646891202	0.000000	0.000000	0.491857	1572025527.237555	192.168.1.11	646891202	0	5705555043	FAS	2
2019-10-25 09:06:19.329774	V0250906170646877305	0.000000	0.000000	0.505760	1572008779.4417	192.168.1.11	646877305	0	5705555860	FAS	2
2019-10-25 15:33:02.607786	V0251533000647420219	0.253939	0.255082	0.509021	1572031982.316766	192.168.1.11	647420219	0	6155555692	FAS	2
2019-10-25 09:06:40.767649	V0250906400646844682	0.437936	0.081297	0.519233	1572008800.4725	192.168.1.11	646844682	0	7055556156	FAS	2
2019-10-25 16:28:12.730482	V0251628100647802677	0.000000	0.000000	0.521303	1572035292.363218	192.168.1.11	647802677	0	7185555015	FAS	2
2019-10-25 11:32:39.883774	V0251132390648678427	0.504824	0.020267	0.525091	1572017559.75891	192.168.1.11	648678427	0	5615555011	FAS	1
2019-10-25 09:06:11.903181	V0250906090646853028	0.000000	0.000000	0.529799	1572008771.4299	192.168.1.11	646853028	0	7405555061	FAS	2
2019-10-25 11:05:20.626906	V0251105150646909270	0.000000	0.000000	0.531653	1572015920.95694	192.168.1.11	646909270	0	5235555986	FAS	2
2019-10-25 09:48:39.834314	V0250948380646837414	0.000000	0.000000	0.534722	1572011319.36578	192.168.1.11	646837414	0	5705555017	FAS	2
2019-10-25 09:04:59.543394	V0250904570646725166	0.000000	0.000000	0.536119	1572008699.3373	192.168.1.11	646725166	0	2015555269	FAS	2
2019-10-25 11:36:42.679263	V0251136380646870822	0.519119	0.020439	0.539558	1572017802.119727	192.168.1.11	646870822	0	9735555075	FAS	2
2019-10-25 09:16:46.015524	V0250916450646854152	0.427974	0.112438	0.540412	1572009406.12344	192.168.1.11	646854152	0	6785555858	FAS	2
2019-10-25 15:18:22.513464	V0251518210647745023	0.000000	0.000000	0.554740	1572031102.304738	192.168.1.11	647745023	0	4055555071	FAS	2
2019-10-25 11:33:41.425208	V0251133410646859265	0.560247	0.000349	0.560596	1572017621.76416	192.168.1.11	646859265	0	6035555570	FAS	2
2019-10-25 11:17:24.750183	V0251117230646733839	0.523481	0.040547	0.564028	1572016644.105037	192.168.1.11	646733839	0	4045555950	FAS	2
2019-10-25 13:10:23.173826	M0251310230641628436	0.000000	0.000000	0.564749	1572023423.205446	192.168.1.11	641628436	3	9105555901	FAS	1
2019-10-25 11:31:36.140282	V0251131330646886684	0.000000	0.000000	0.570815	1572017496.115939	192.168.1.11	646886684	0	7325555417	FAS	2
2019-10-25 12:40:23.022064	M0251240220641598827	0.000000	0.000000	0.571190	1572021623.173941	192.168.1.11	641598827	9	9285555627	FAS	1
2019-10-25 09:54:49.368265	V0250954460646860823	0.437101	0.142638	0.579739	1572011689.41475	192.168.1.11	646860823	0	6035555457	FAS	2
2019-10-25 10:01:24.899559	V0251001240646866657	0.000000	0.000000	0.583482	1572012084.46432	192.168.1.11	646866657	0	4105555144	FAS	2

The Results: Client A

For one client placing about 2 million manual dial calls per day across all of their clusters on a single carrier, with about 40% of those calls being Answered: With the new FAS-detection features, 1-2% of Answered calls were detected as being FAS using these methods. That may not sound like much, but since these were manual dialed calls, the auto-hangup process alone ended up saving them up to 100 man-hours per day. That's the equivalent of 13 full-time employees.

The Results: Client B

For another client placing about 60,000 calls per day on a single carrier, they were receiving from 10-30% of their Answered calls as FAS with no audio packets. The new features allow for logging of every FAS call so that we could send hundreds of examples easily every day to their carrier and the issue that had been going on for weeks was fixed quickly with a routing change at the carrier level. Now they get less than 0.01% of their Answered calls with no audio packets, and they can easily monitor for this issue using a report.

Availability and ISO Installer

- All of the involved software, patches and enhancements are Open-Source and free:
  - VICIbox – http://www.vicibox.com
    (Installs Asterisk 13[with patches], MariaDB, Apache, PHP, VICIdial, etc...)
  - HOMER - https://www.sipcapture.org/
  - OpenSIPS - https://www.opensips.org/

Thank you!

For a PDF copy of this presentation, go to:

www.vicidial.org