

Finding and debugging signal
quality problems on asterisk
interacting with carriers and "carrier-
grade" equipment

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Who are we?

- Attractel NV is a group of nice people doing anything for the right amount of money
- Attrafax
- Zoiper
- Asterisk consultancy

whoami

- Sysadmin
- Debugger of ugly problems
- Played with such things in the last three years
- Background in system administration, HA, security, OSS, etc.
- The only one from the company that hasn't gone to Astricon before :)

Thanks

- Astricon
- My colleagues
- The alcohol industry

What's this all about

- Issues found when debugging VoIP quality
- Issues found while debugging faxing
- Useful tools and techniques
- A few „fun“ cases
 - Well, they are, if you're looking from far away

Tools

- Asterisk
 - + app_sndrec
- Usual OSS tools – Audacity, Wireshark, GnuPlot
- Proprietary blob – PESQ
- Some small tools from us
 - smptowav, wavtosmp, meter_test

Problems

- Echo
 - So much has been written on it that I'll just drop it
- Drops/frame slips
- Gain/strength problems
- Phase shifts

Drops/slips

- Frame slips
- Delayed packets
- Jitterbuffers

A PCAP with drops

- Wireshark RTP stream analysis

Forward Direction | Reversed Direction

Analysing stream from 192.168.4.130 port 12262 to 10.2.2.2 port 16788 SSRC = 0x34D15169

Packet .	Sequence	Delta (ms)	Jitter (ms)	IP	BW (kbps)	Marker	Status
10	42788	0.00	0.00		1.60		[Ok]
11	42789	20.58	0.04		3.20		[Ok]
12	42790	19.46	0.07		4.80		[Ok]
13	42791	20.46	0.09		6.40		[Ok]
14	42792	19.40	0.12		8.00		[Ok]
15	42793	20.83	0.17		9.60		[Ok]
16	42794	19.43	0.19		11.20		[Ok]
17	42795	19.41	0.22		12.80		[Ok]
18	42796	20.49	0.23		14.40		[Ok]
19	42797	19.56	0.25		16.00		[Ok]
20	42798	20.46	0.26		17.60		[Ok]
21	42799	19.62	0.27		19.20		[Ok]
22	42800	20.40	0.28		20.80		[Ok]

Max delta = 0.120242 sec at packet no. 187
Total RTP packets = 746 (expected 761) Lost RTP packets = 15 (1.97%) Sequence errors = 3

Save payload... | Save as CSV... | Обновяване | Скоч до | Graph | Next non-Ok | Затваряне

A pcap with no drops...

Forward Direction

Reversed Direction

Analysing stream from 204.11.192.21 port 13564 to 204.11.192.24 port 32172 SSRC = 0x3A4B3166

Packet	Sequence	Delta (ms)	Jitter (ms)	IP	BW (kbps)	Marker	Status
43	16185	0.00	0.00		1.60		[Ok]
3188	17727	0.76	2.37		80.00		[Ok]
60	16188	13.89	0.39		6.40		[Ok]
17284	24688	17.04	0.51		80.00		[Ok]
28466	30218	17.15	1.04		81.60		[Ok]
29166	30567	17.20	0.36		81.60		[Ok]
28502	30236	17.22	0.94		81.60		[Ok]
28512	30241	17.29	1.29		80.00		[Ok]
28520	30245	17.29	1.32		80.00		[Ok]
29229	30598	17.30	0.27		81.60		[Ok]
28496	30233	17.32	0.73		81.60		[Ok]
28508	30239	17.33	1.10		80.00		[Ok]
28526	30248	17.38	1.40		81.60		[Ok]

Max delta = 0.039264 sec at packet no. 3187

Total RTP packets = 14575 (expected 14575) Lost RTP packets = 0 (0.00%) Sequence errors = 0

Save payload...

Save as CSV...

Обновяване

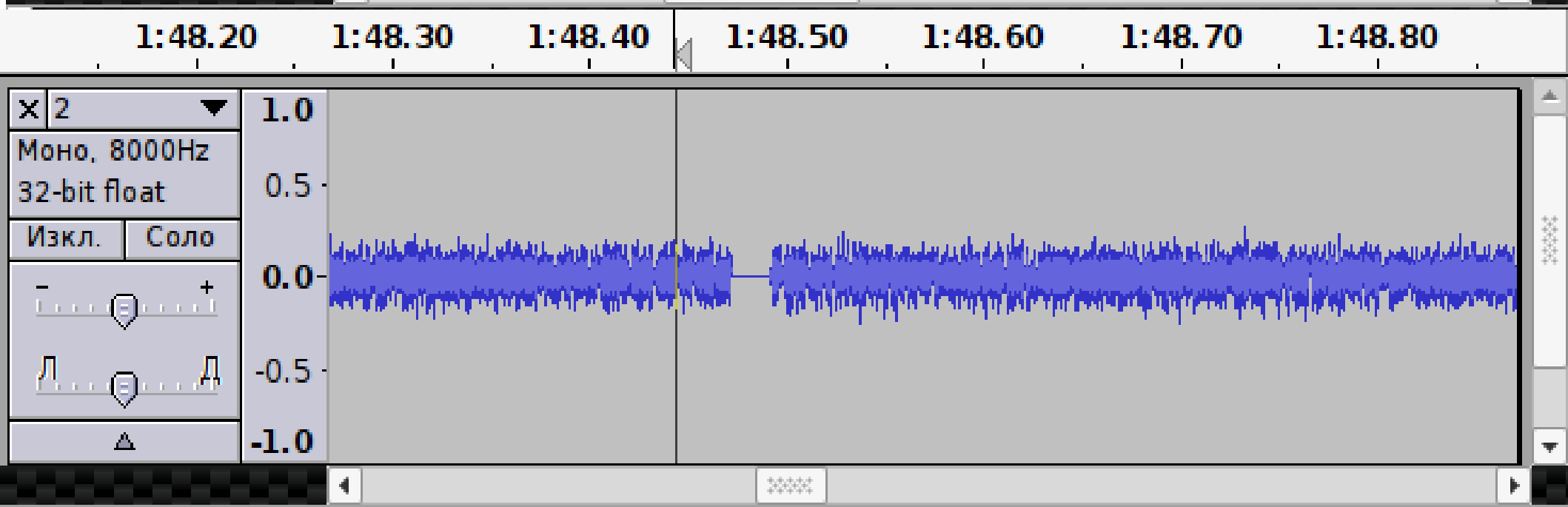
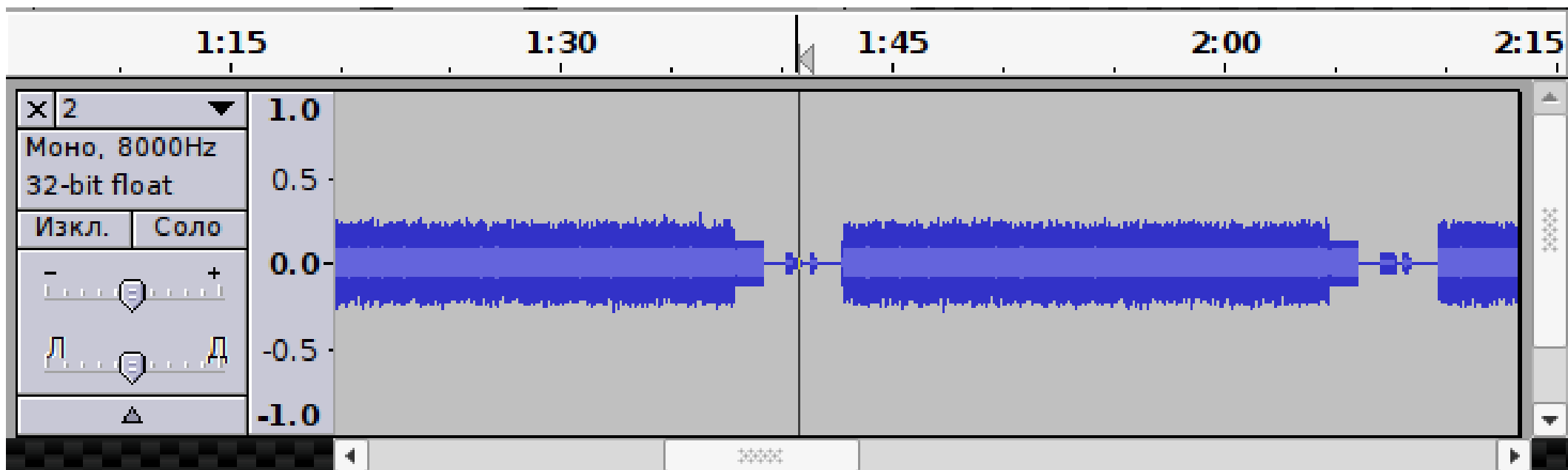
Скок до

Graph

Next non-Ok

Затваряне

... but with holes



carriershow output

```
$ ./carriershow < ../samples.in|grep -i CARR
...
0      0      CARRIER      28786      1:38.596
0      0      NO CARRIER   45893      1:44.333
0      0      CARRIER      153        1:44.352
-----
0      0      NO CARRIER   128804     2:00.452
...
```

app_sndrec

exten => 12,1,Answer()

exten => 12,n,Sndrec(/tmp/rec,80000)

exten => 13,1,Answer()

exten => 13,n,MilliWatt()

Channel: Zap/2/13

MaxRetries: 0

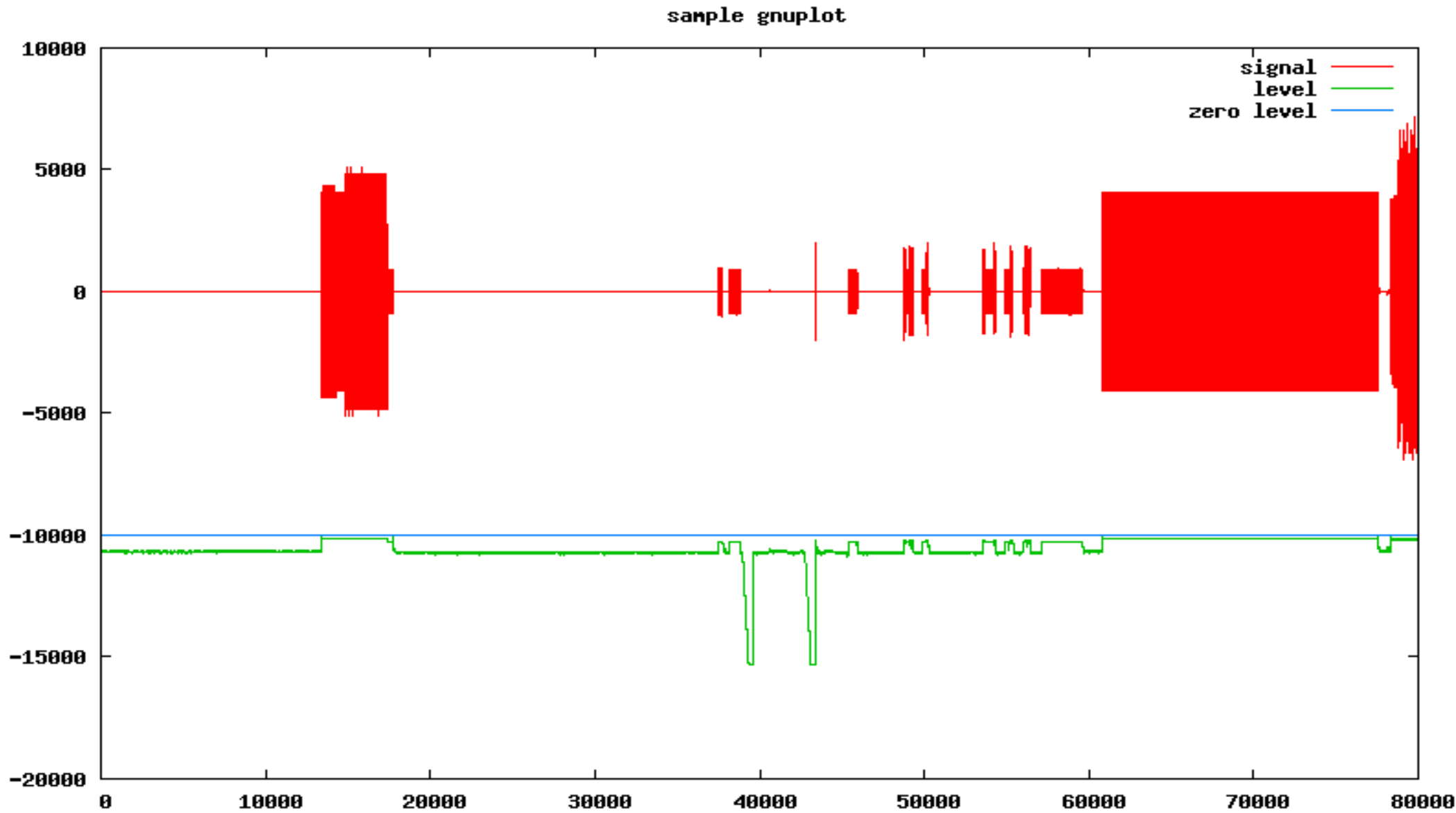
RetryTime: 10

WaitTime: 30

Application: SNDREC

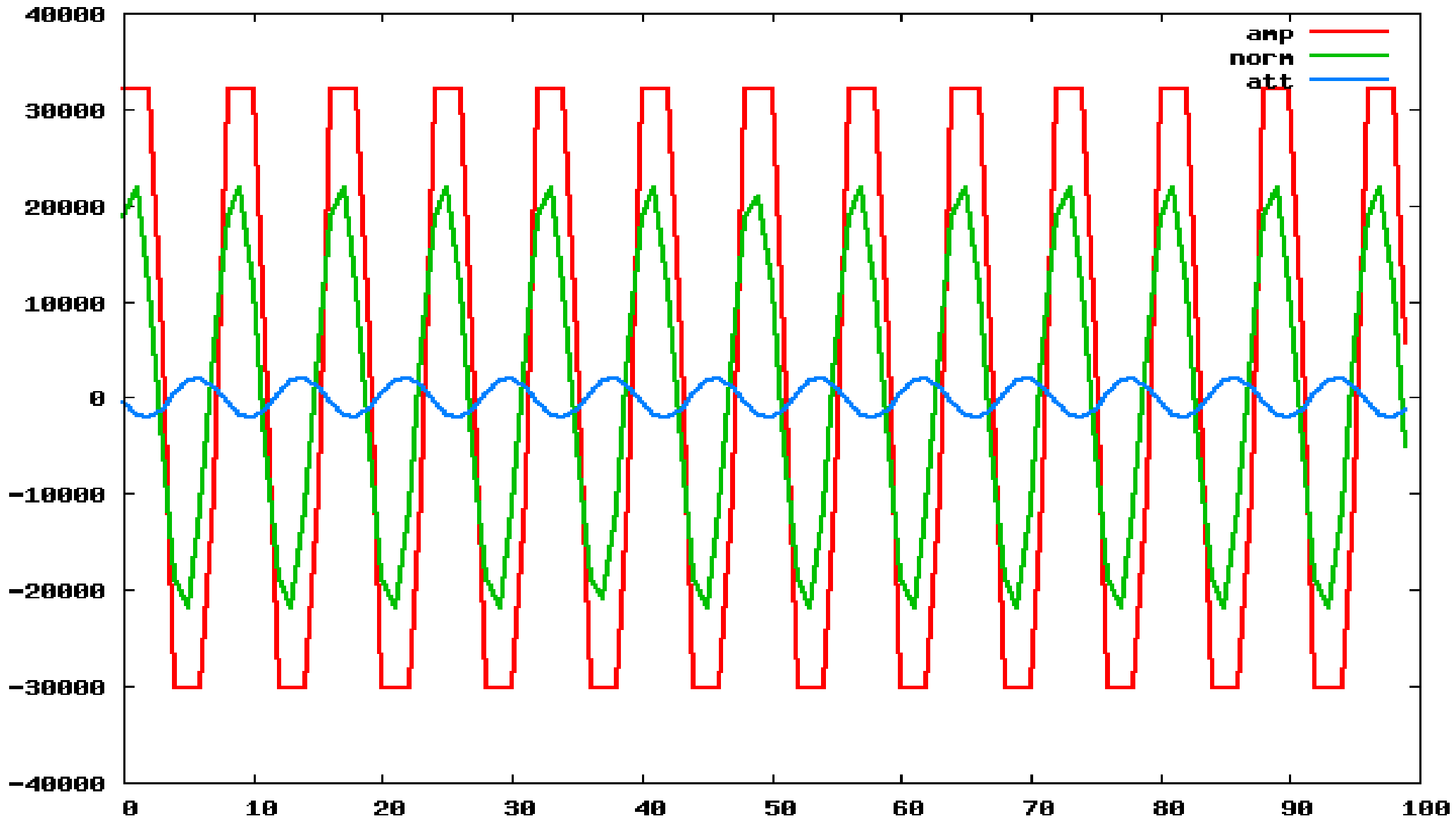
Data: /tmp/samples|80000

A bit of gnuplot



gnuplot/milliwatt

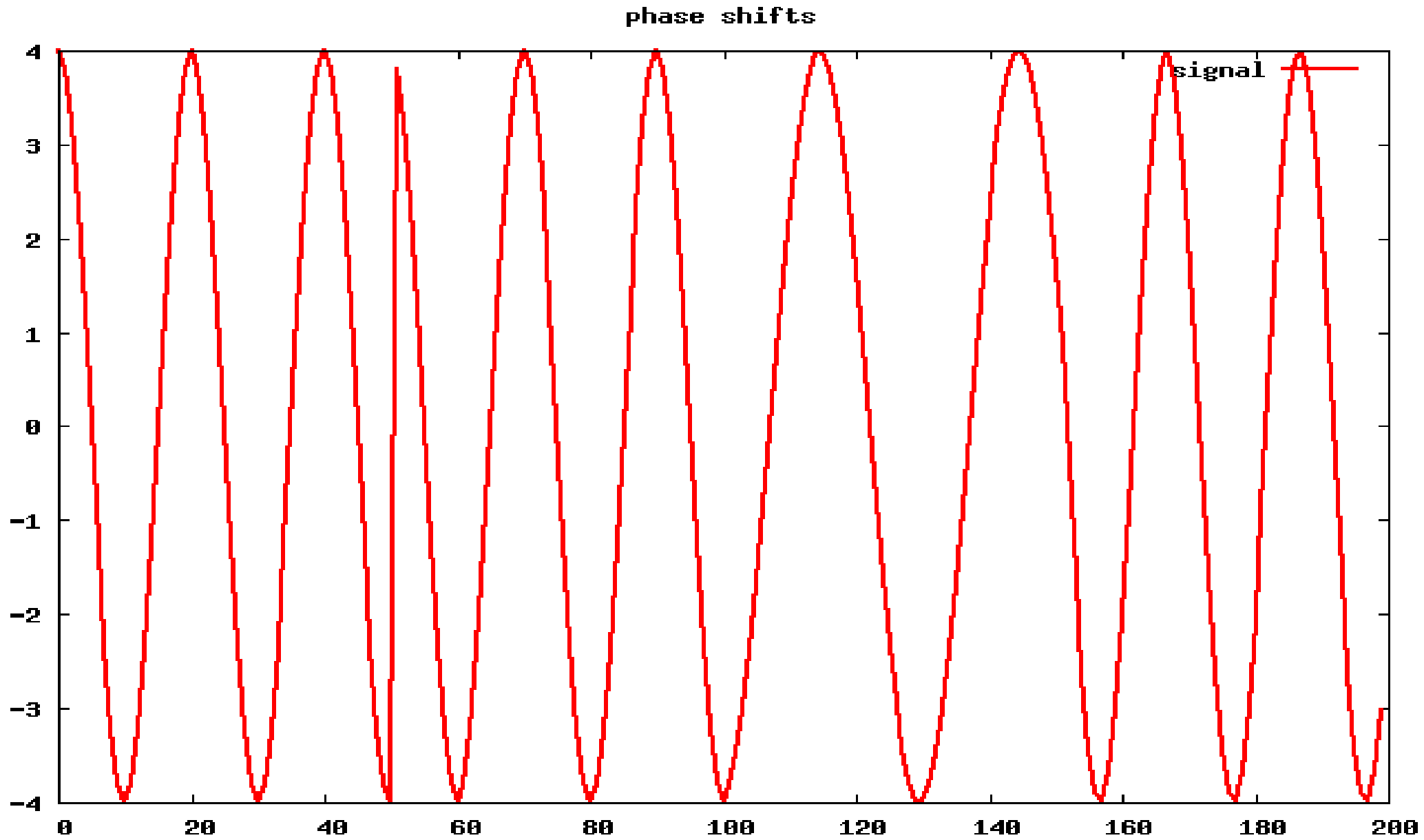
milliwatt signal



A note on retransmission

- $T = T_{\text{frame}} + \text{RTT}$
- RTCP ?
- RFC 4588

Phase shifts



Causes – our part

- IP network issues
- QoS
- Timing
- IRQ issues
- One small helpful thing

Causes – someone else

- LARTs and their usage in VoIP
- Inter-domain routing
- Interoperability

Simple tests

- A repetition from before:

```
exten => 13,1,Answer()  
exten => 13,n,MilliWatt()
```

```
Channel: Zap/2/13
```

```
MaxRetries: 0
```

```
RetryTime: 10
```

```
WaitTime: 30
```

```
Application: SNDREC
```

```
Data: /tmp/samples|80000
```

Simple PESQ test

- A few scripts available at ...
 - Files go into /home/monitoring/qcheck/...
 - A notify is posted in \${exten}.done

```
exten => tst1,1,Set(svexten=${EXTEN})
```

```
exten => tst1,n,Goto(pb,1)
```

```
exten => pb,1,Monitor(wav|/home/monitoring/qcheck/${svexten})
```

```
exten => pb,n,Playback(or114)
```

```
exten => pb,n,Hangup()
```

```
exten => h,1,System(/bin/touch  
/home/monitoring/qcheck/${svexten}.done)
```

Plans for the bright future

- Frequency analyzer
- RTCP
- Internal asterisk stats

Thanks!

Any questions?

Everything is at
<http://attractel.com/astricon2008.tgz>