

# Fun with the Asterisk PBX and Perl

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## What is Asterisk?

*Asterisk is a complete PBX in software. It runs on Linux and provides all of the features you would expect from a PBX and more. Asterisk does voice over IP in three protocols, and can interoperate with almost all standards-based telephony equipment using relatively inexpensive hardware.*

Source: <http://www.asterisk.org/>

## Features of Asterisk

- ▶ **Open source: GPL 2**
- ▶ Fully-loaded voice mail
- ▶ Auto attendant
- ▶ Conferencing
- ▶ Call queuing
- ▶ Logging calls for billing, etc.
- ▶ Protocol bridging
- ▶ Loaded call features: music on hold, call waiting, caller ID, call forwarding, transfers, parking, remote pickup.

## Old-school telephony support

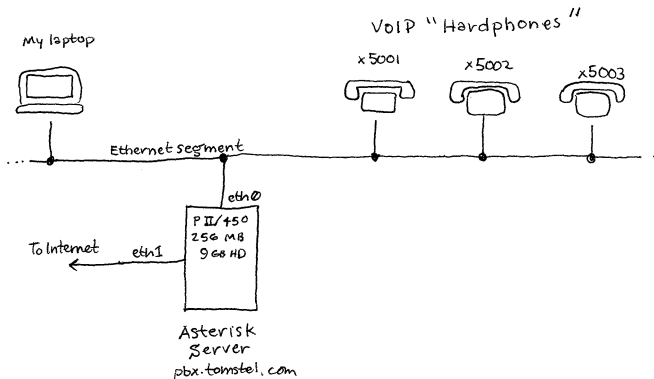
- ▶ **Robbed Bit Signaling Types:** FXS and FXO, Loopstart, Groundstart, Kewlstart, E&M, E&M Wink, Feature Group D
- ▶ **PRI Protocols:** 4ESS, Lucent 5E, DMS100, National ISDN2, EuroISDN, BRI (ISDN4Linux)

# Voice over IP support

- ▶ SIP ← emerging de-facto VoIP standard
- ▶ Inter-Asterisk Exchange protocol (IAX)
- ▶ H.323

Let's take Asterisk for a spin!

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# Calling

- ▶ Caller: Just pick up and dial.
- ▶ Callee: Just pick up and talk.

Let's take Asterisk for a spin!

## “Blind” transfers

- ▶ Callee: Just dial # and then the party to receive the call.
- ▶ Caller: You'll go on hold until the other party picks up.

## Parking

Parking is great for those times when you need to transfer a call to somebody, but you don't know whom at the time.

- ▶ Transfer to 700. Asterisk announces that the call is parked on *extension*.
- ▶ Figure out who can handle the call.
- ▶ Call that person, and tell them they have a call on *extension*.
- ▶ That person dials *extension* and is connected to the original call.
- ▶ If you forget to hand off a parked call, Asterisk will ring you back.

Let's take Asterisk for a spin!

## Conferences

- ▶ Dial 8000, which adds you to conference room 8000.
- ▶ Hang up to leave conference.
- ▶ Others may come and go as they choose.

# The dialplan makes it all happen

The dialplan is configured in `extensions.conf` and defines how calls should be handled.

- ▶ Each call has a *context*.
- ▶ The rules in its context define how it is handled.
- ▶ Rules are composed of commands like `Answer`, `Dial`, and `Hangup`.

The dialplan makes it all happen

## Simple, horrible syntax

```
[default]
```

```
exten => s,1,Goto(default,5001,1)
```

```
exten => 5001,1,Dial(SIP/5001,10,t)
```

```
exten => 5002,1,Dial(SIP/5002,10,t)
```

```
exten => 5003,1,Dial(SIP/5003,10,t)
```

```
exten => 8000,1,MeetMe,8000
```

```
exten => 8000,2,Hangup
```

```
exten => 8500,1,VoicemailMain(${CALLERIDNUM})
```

```
exten => 8500,2,Hangup
```

## Crude macro facility

```
[macro-stdexten]
;   ${ARG1} - Extension
;   ${ARG2} - Device(s) to ring
exten => s,1,Dial(${ARG2},10,t)      ; Ring the interface
exten => s,2,Voicemail(u${ARG1})    ; If unavailable
exten => s,3,Goto(default,s,1)
exten => s,102,Voicemail(b${ARG1}) ; If busy
exten => s,103,Goto(default,s,1)
```

```
[default]
exten => 5001,1,Macro(stdexten,5001,SIP/5001)
exten => 5002,1,Macro(stdexten,5002,SIP/5002)
exten => 5003,1,Macro(stdexten,5003,SIP/5003)
```

## Perl and Asterisk

- ▶ Asterisk Gateway Interface `Asterisk::AGI`  
Main way of integrating with and extending the dialplan
- ▶ Other Perl modules (`Asterisk::Outgoing`, etc.)  
Used to automate chores, billing, etc.

# AGI

- ▶ Modeled after CGI
- ▶ Language-independent
- ▶ Unlike CGI, allows for back-and-forth conversations

## Overview

- ▶ AGI commands are called from the dialplan:  
`exten => 1000,3,Agi,agi-program|args`
- ▶ Live in the `/var/lib/asterisk/agi-bin` directory
- ▶ Are called with `$ARGV[0]` set to `args` string
- ▶ Read Asterisk environment from STDIN
- ▶ Send commands on STDOUT
- ▶ Read command results on STDIN
- ▶ Terminate to resume execution of dialplan

## AGI commands

- ▶ **Call:** Answer, Hangup
- ▶ **Interaction:** Stream file, Wait for digit
- ▶ **Control:** Channel status, Set context, Set extension, Set priority
- ▶ About 30 commands in all.

# AGI examples

- ▶ Text to speech
- ▶ Dial the weather

## Adding text-to-speech capability to Asterisk

- ▶ Let's use Festival's text-to-speech magic for our PBX
- ▶ Want to be able to do this in the dialplan:

```
exten => s,1,Answer
```

```
exten => s,2,Wait(1)
```

```
exten => s,3,Agi,say-text.pl|I can talk. ← Spoken!
```

```
exten => s,4,Wait(5)
```

```
exten => s,5,Hangup
```

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exten => s,2,Wait(1)
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```
exten => s,3,Agi,say-text.pl|I can talk. ← Spoken!
```

```
exten => s,4,Wait(5)
```

```
exten => s,5,Hangup
```

- ▶ Try it: Dial 1000.

## Dial the weather

- ▶ Use `Geo::Weather` to get the weather for Pittsburgh.
- ▶ Use our `say-text.pl` AGI to announce it.
- ▶ Put it all behind a simple dialplan:

```
exten => s,1,Answer
exten => s,2,Wait(1)
exten => s,3,Agi,say-text.pl|Checking the weather.
exten => s,4,Agi,say-weather.pl
exten => s,5,Wait(5)
exten => s,6,Hangup
```

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exten => s,3,Agi,say-text.pl|Checking the weather.
exten => s,4,Agi,say-weather.pl
exten => s,5,Wait(5)
exten => s,6,Hangup
```

- ▶ Try it: Dial 2000.

## Placing outgoing calls

- ▶ `Asterisk::Outgoing`
- ▶ Used to initiate calls.
- ▶ Useful for application-controlled dialing, web interfaces, etc.

## Web call setup

- ▶ Web form asks for *From* and *To* extensions.
- ▶ CGI uses `Asterisk::Outgoing` to place the call between the two.

## Web conference setup

- ▶ Web form asks users to check off extensions from list.
- ▶ CGI uses `Asterisk::Outgoing` to place a call between *each* extension and a MeetMe conference room.

## For more information

Asterisk home page

<http://www.asterisk.org/>

Asterisk on VoIP Info Wiki

<http://www.voip-info.org/wiki-Asterisk>

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