

# Open Source Telephony Projects as an Application Development Platform

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# About this presentation

- For newcomers to Asterisk
- For long time CTI developers
  - Considering a move from locked-in API tools
  - Considering a move from expensive telephony hardware

# About me

- 20+ years in telecom
- I started my career engineering monolithic central office switching (DMS, 5ESS)
- Implemented 2G GSM networks
- Was involved in CT – IML, Dialogic, NMS
- Survived telecom downturn of 2000!
- Now part of Sangoma, active contributor to open source telephony ecosystem
- Exciting times / lots of opportunities!

# Who is Sangoma?

- Based in Toronto (HQ) and Montreal, Canada
- Founded in 1984 - Manufacturer of Communication cards and software for PC's
- Products Installed in ~140 countries around the world
- Active in the following markets (open source or not):
  - PBX/IVR
  - Contact Center
  - Service Providers
  - Data Networking

# Sangoma AFT Hardware Series



A200: Mix and Match FXO/FXS, Scales to 24 ports



A100: 1, 2, 4 and 8 T1/E1



A500: Up to 6 BRIs (12 ch) Modules of 2 BRIs (TE/NE)



B600: 4 FXO, 1 FXS, 1 E1/T1  
1 single Server slot



B700: Up to 4 BRIs (8 ch)  
Up to 2 FXO or FXS

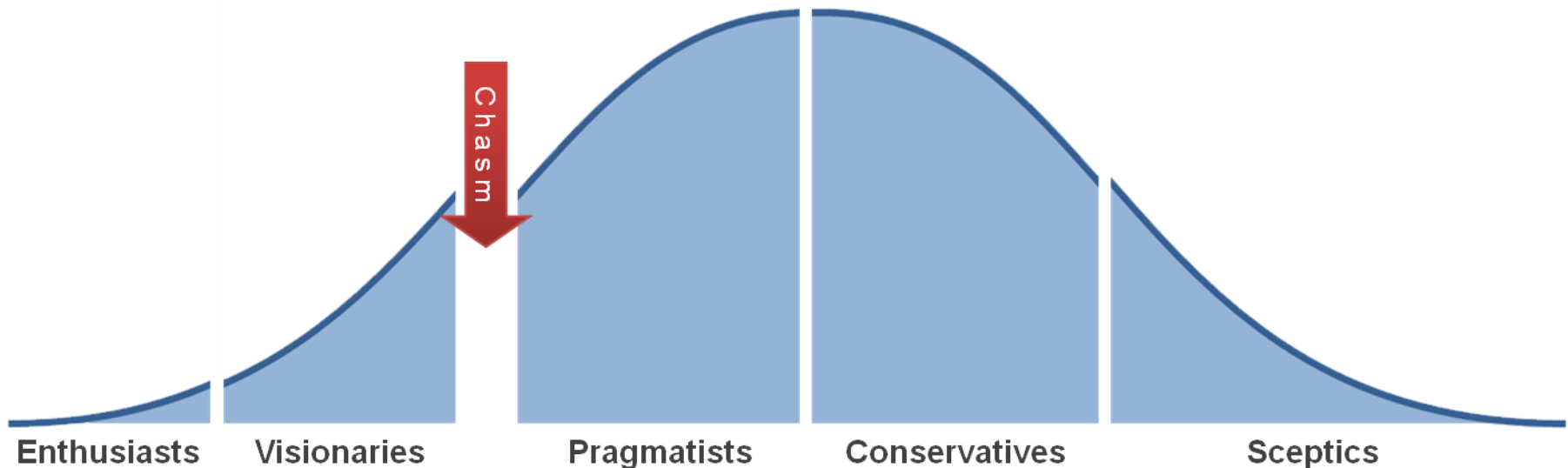
# Asterisk as an Application Platform

- Asterisk is one of the most powerful, flexible, and extensible piece of integrated telecommunications software available
- Leverages confluence of opensource, Linux OS and powerful PC and servers
- Being used as core switches in sophisticated applications:
  - PBX, Hosted PBX (mostly)
  - IVR
  - Call Center- inbound/outbound
  - SIP Trunking
  - Interconnect
  - Pre-paid Calling



# Technology Adoption curve

- OST used by tech savvy IT managers and developers
  - Means of reducing cost, increasing control
  - Willing to live with shortfalls in features, quality, stability
  - Focused on experimental/feasibility projects



# Asterisk PBX Maturity

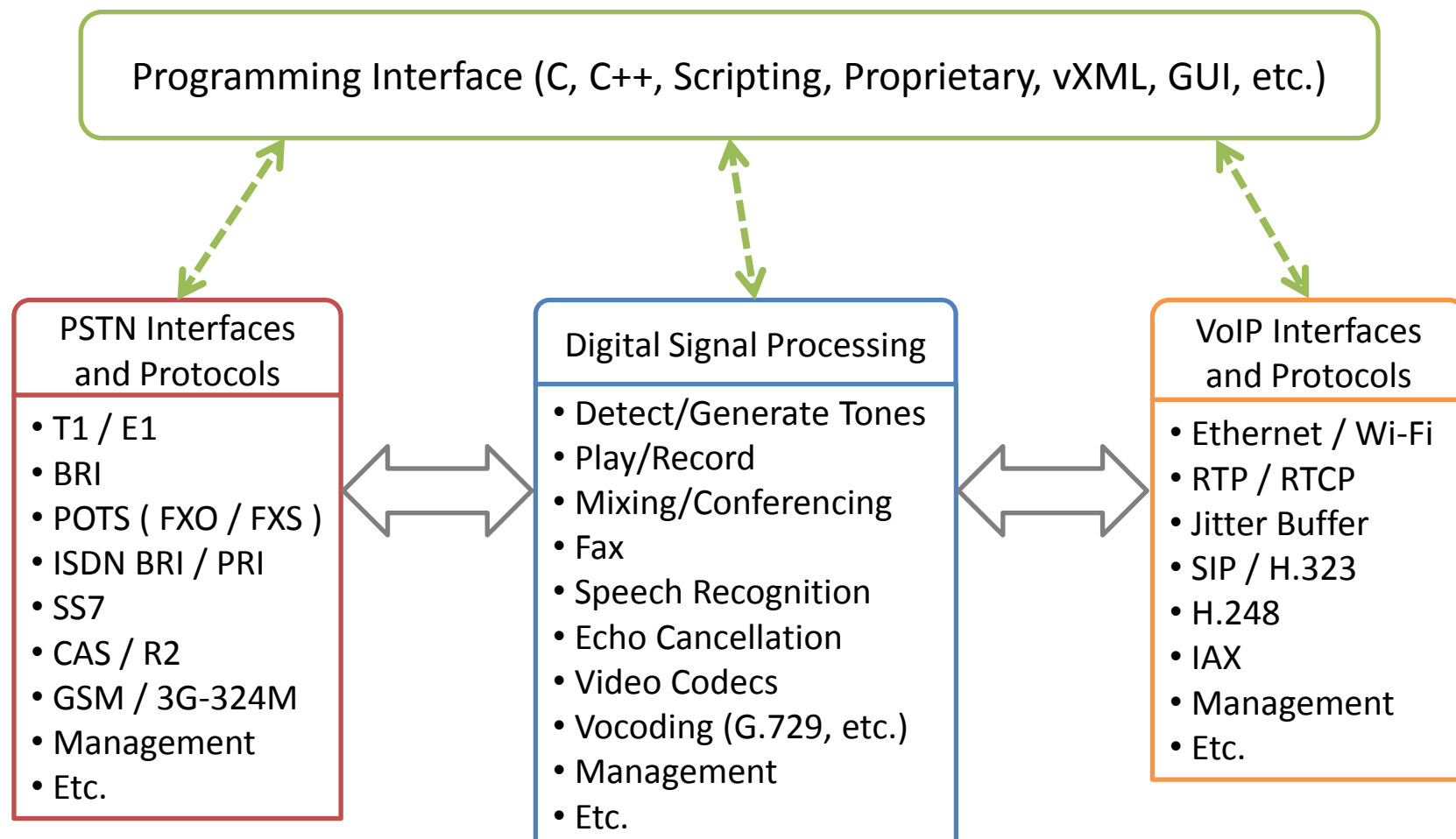
- Asterisk Started in 1999 -
- PBX is the leading application for OST
- Large number of commercial PBX systems find their base in Asterisk
- Market moving from DIY to PBX appliances
- OST PBX moving from experimental projects to mainstream business
- OST represents ~18% of PBX systems sold in NA in 2008 (Eastern Management Group)
- We've crossed the chasm (at least for the PBX part)...

# Today's OST-Based PBX Platforms

- Feature-rich PBX offerings
- Management tools and utilities
- Packaged in robust PC based appliances
- Most end users may not know, nor care, that OST is used somewhere inside the box!
- Standards based hardware



# What is needed for Telecom Application Development?



# Telecom Applications Development options



Lucent 5ESS



Nortel DMS



Meridian PBX

Up to late 80's  
 Monolithic  
 Proprietary  
 Vertically Integrated  
 Locked in  
 Accessible to few



1990's  
 Computer Telephony  
 DSP Media Processing  
 TDM buses  
 Std Operating Systems  
 Proprietary APIs  
 More Accessible



2000's onwards  
 Computer Telephony  
 VoIP and SIP  
 Host Media Processing  
 Distributed  
 Open Source  
 Open APIs / Web  
 Way Accessible!

# Telecom Applications Development



Lucent 5ESS



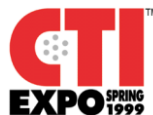
Nortel DMS



Meridian PBX



an  
microsystems



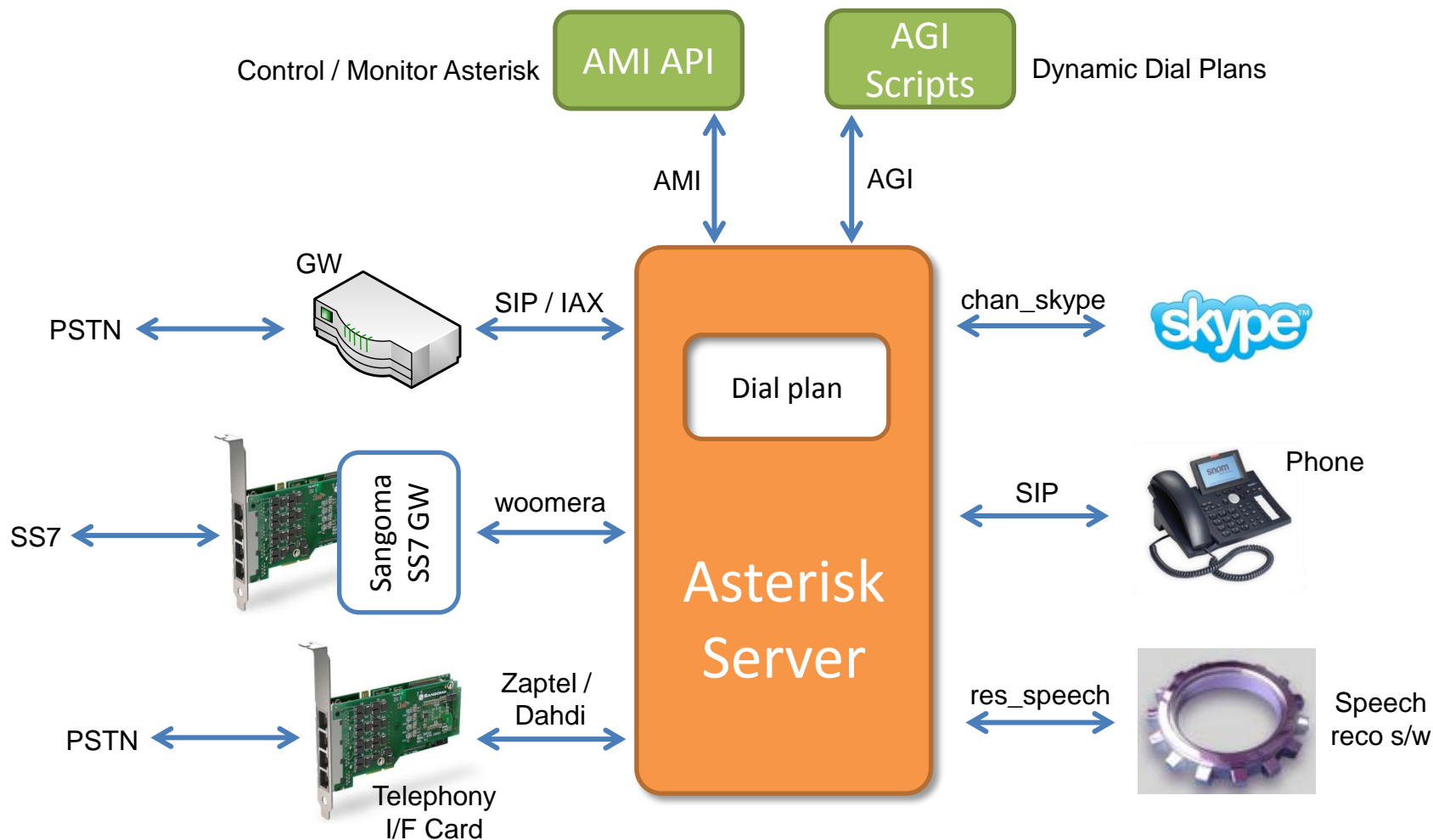
Proprietary  
Vertically Integrated  
Locked in

1990's  
Computer Telephony  
DSP Media Processing  
Std Operating Systems  
Proprietary APIs



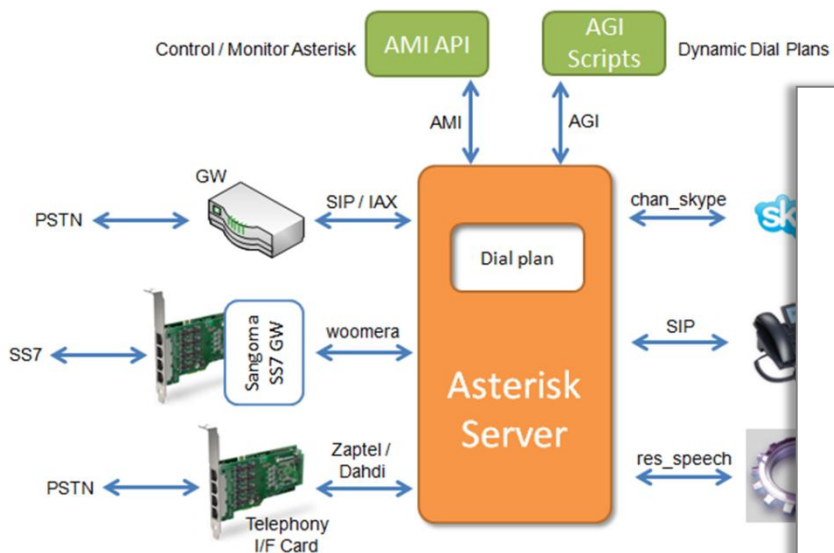
2000's onwards  
Computer Telephony  
VoIP and SIP  
Host Media Processing  
Distributed  
Open Source  
Open APIs

# Asterisk System (sample list!)

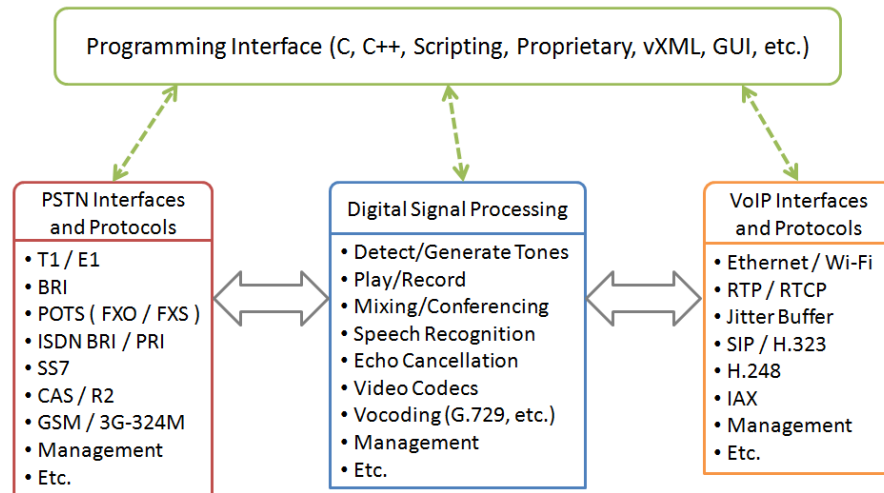


# Let's revisit these slides...

## Asterisk System (short list!)



## What is needed for Telecom Application Development?



# Asterisk Interfaces/Protocols

- Telephony
  - T1/E1/Analog
  - BRI, PRI
  - SS7
  - GSM
  - 3G-324M
  - Etc.
- SIP VoIP Gateways
  - IP Based
    - SIP, IAX
    - H.323
    - MGCP
    - Skype
    - Etc.

Extensive Ecosystem of Vendors

Mix and Match Commercial and Free solutions

# Asterisk Media Processing

- IVR
- Voicemail
- Conferencing
- Echo Cancellation
- Dialplan applications
  - Meetme()
  - Playback()
  - Background()
  - Many more!
- Codecs
  - G.729, G.723, GSM, iLBC, etc.
  - H.261, H.263, H.264
- Speech Recognition
- Text-to-speech
- Call Progress Analysis
- Etc.

Mix of Asterisk built-in and software or hardware add-ons

# Asterisk Dialplan

- The heart of any Asterisk system
- List of rules, instructions and steps guiding the flow of inbound and outbound calls in Asterisk
- *extensions.conf* file
- Divided into [Contexts]
  - Extensions, Priorities, Applications()

```
exten => 123, 1, Answer()  
exten => 123, n, Background(menu_prompt)  
exten => 123, n, WaitExten()  
...
```
- Asterisk Macro Language
  - Variables, Pattern Matching, Expressions, Operators, Branching, Mailboxes, Macros, etc.
  - Long list of applications (MeetMe(), FollowMe(), Hangup(), etc.)

# Asterisk Gateway Interface (AGI)

- External programs can control the Asterisk Dialplan
- To perform advanced logic
- To communicate with databases
- Allows Asterisk to perform complex tasks that would be hard to do with Dialplan
- Invoked from Dialplan (AGI() application)

```
    exten => 123, 1, Answer()  
    exten => 123, 2, AGI(test.agi)  
  
    . . .
```
- Uses STDIN and STDOUT channels to receive and push information to/from Asterisk Dialplan
- Any Programming Language
  - *agi-test.agi* sample that comes with Asterisk is in Perl
  - PHP, Ruby, Python, etc.

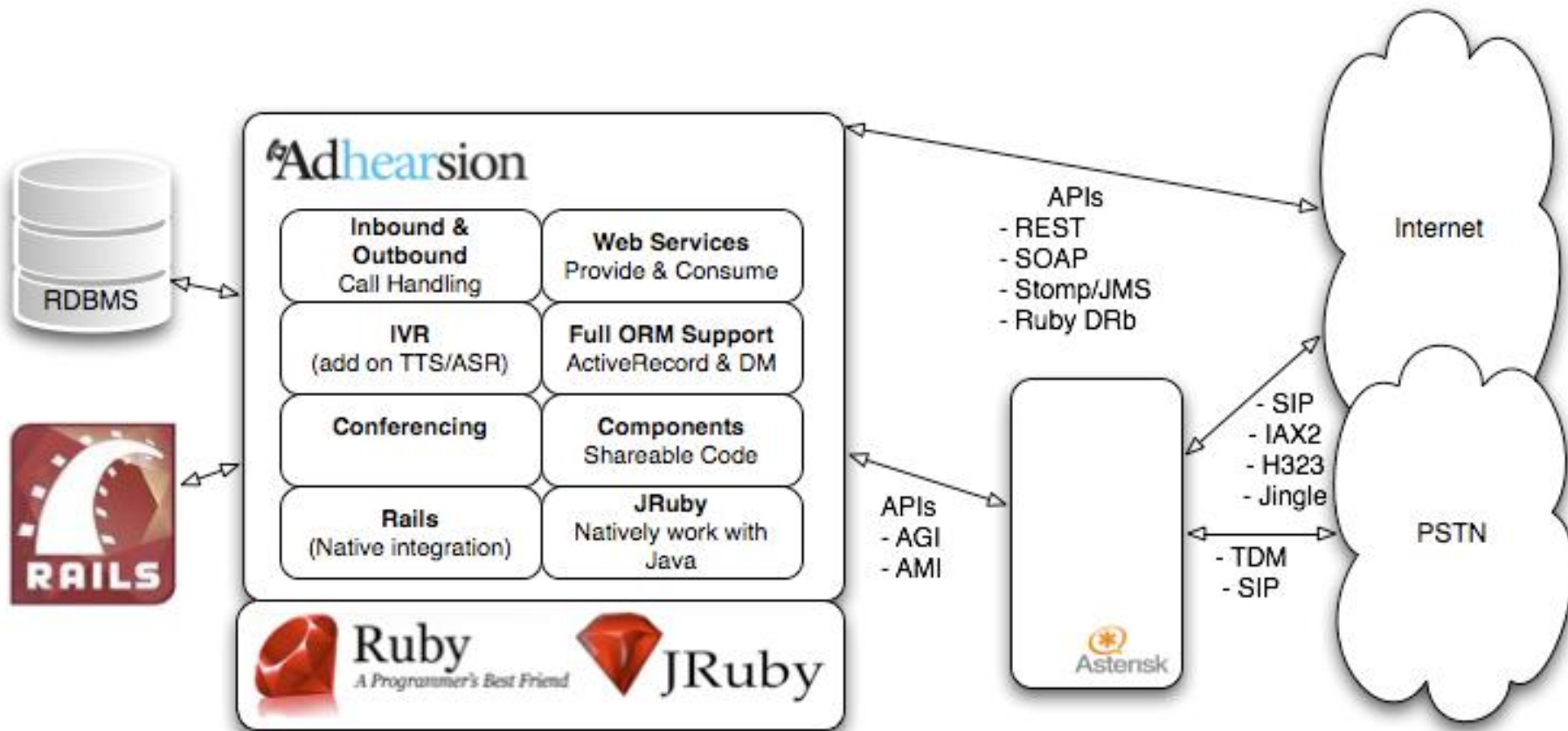
# Asterisk Management Interface (AMI)

- Allows external programs to control and monitor Asterisk
- Send commands and parameters to direct actions
- Samples
  - *Redirect*: transferring a call
  - *UpdateConfig*: add new user from a Web GUI application
  - *Originate*: Generate outbound call from CRM / click to call application

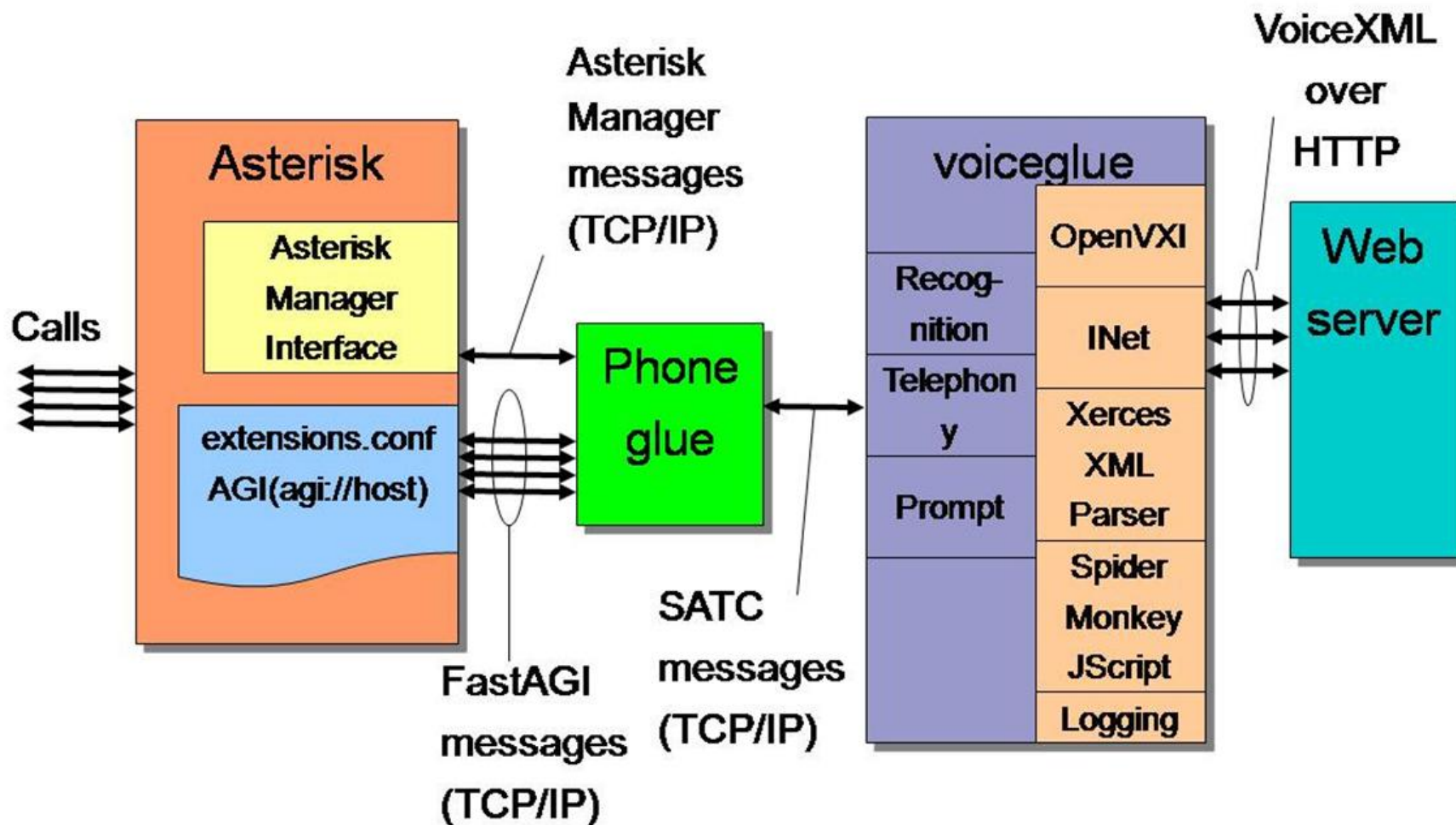
# Development toolkits

- AGI and AMI complimentary to each other
- There are toolkits / frameworks that take application development to a higher level
  - Adhearsion
    - Framework for application development
    - Uses the high level Ruby Programming Language
    - Interacts via AMI and AGI interfaces
  - Voiceglue
    - VoiceXML applications
    - Integrates OpenVXI – Open source vXML browser
    - Interact via AMI and AGI interfaces

# Adhearsion framework



# Voiceglue architecture



# Asterisk application development

- Starts with the Dialplan
- Expands with AGI / AMI interfaces
- Development Frameworks
- Just scratched the surface!

Wealth of options!

# Examples (1 of 2)



Trixbox Pro PBX



IVR platforms, 6000 ports, vXML



Carrier. Offers SIP Trunking based Sangoma cards + SS7 software



Comprehensive CC product line

## Examples (2 of 2)



Comprehensive Call Center product line



Skype Gateways

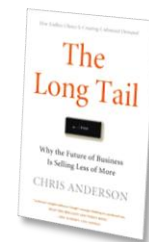


Comprehensive Call Center product line

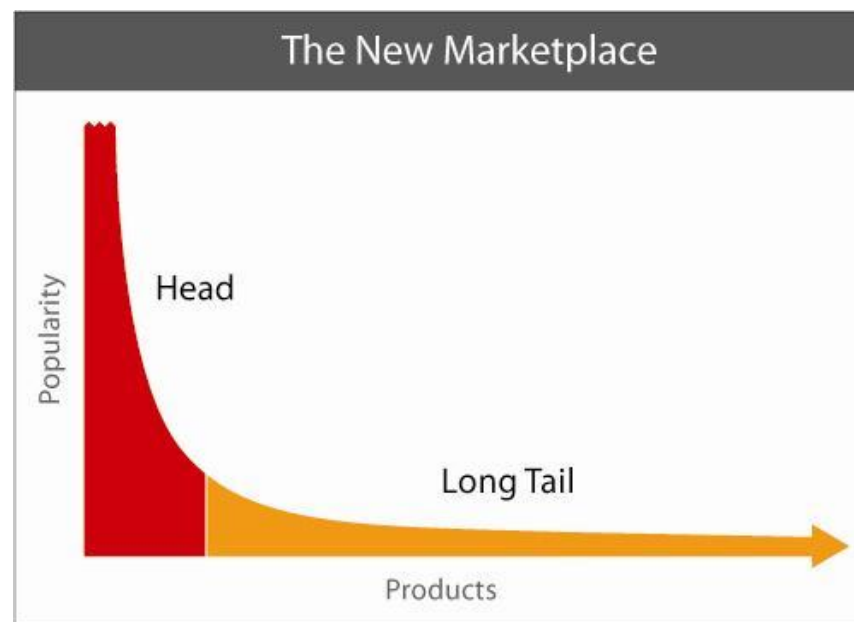


Comprehensive Call Center product line

# The “Long Tail”



- Economy shifting away from mass products
- Moving to a large number of niches
- Cost of production and distribution fall
- Less need to lump products into one-size-fits-all containers
- Producing Narrowly targeted products can be as economically attractive as mainstream fare.
- From <http://www.longtail.com>



This also now applies to telecom application development

# Asterisk + Ecosystem bring

- A wealth of choices for interfaces and protocols
  - H/W that runs on standard computers on standard operating systems
- A wide range of media processing options
  - Built-in / software or hardware add-ons
- A wealth of application development tools
  - Dialplan, Scripting, GUIs, web, etc.
- +++ it's open source!



# Merci!



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