Speechbuilder Tutorial

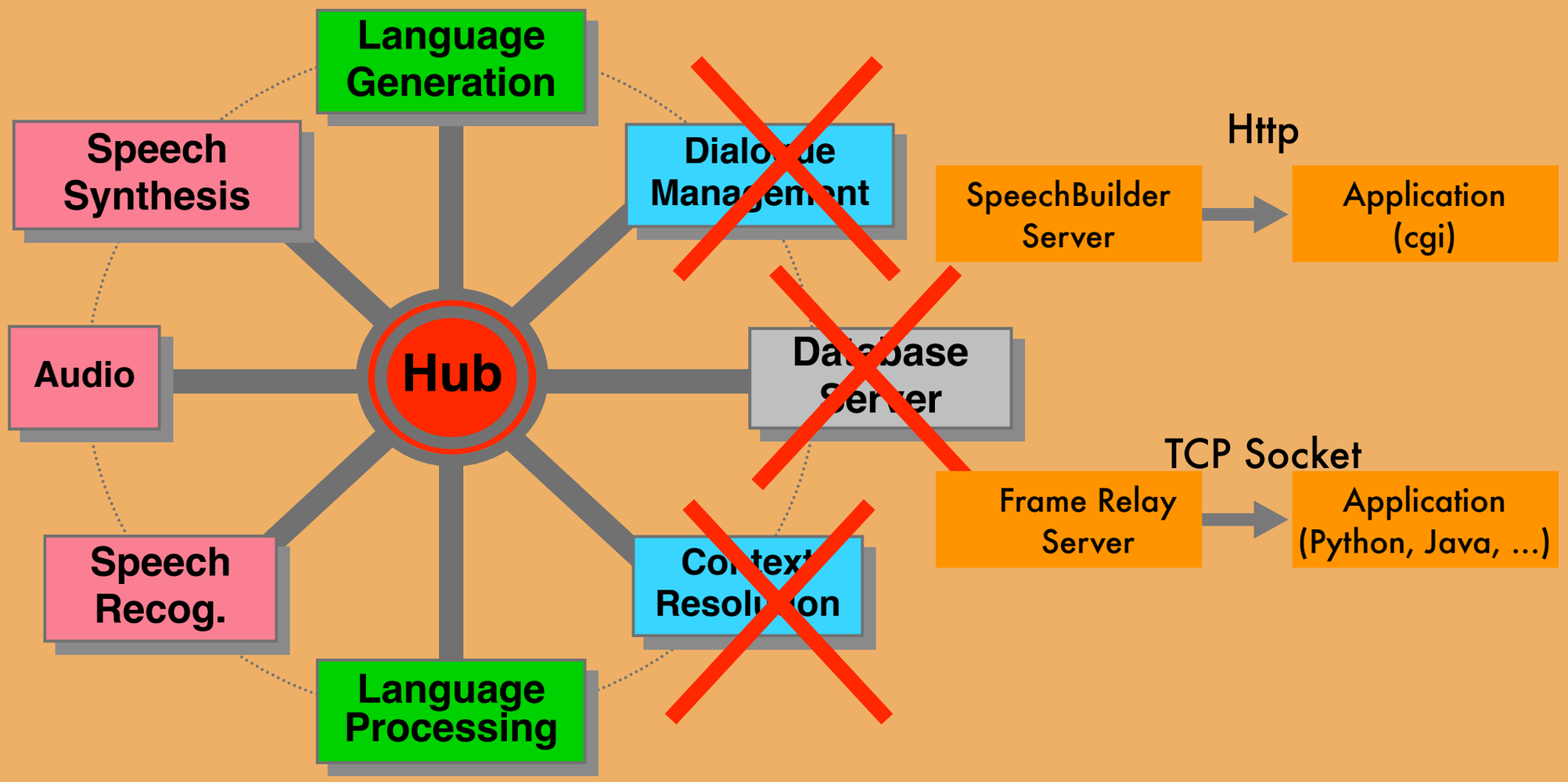
Speaker Independent; Domain Dependent

- What is a domain?
  - a vocabulary (words)
  - sentences
- How to define words?
  - English spelling and pronunciation
- How to define sentences}
  - Grammar

Speechbuilder

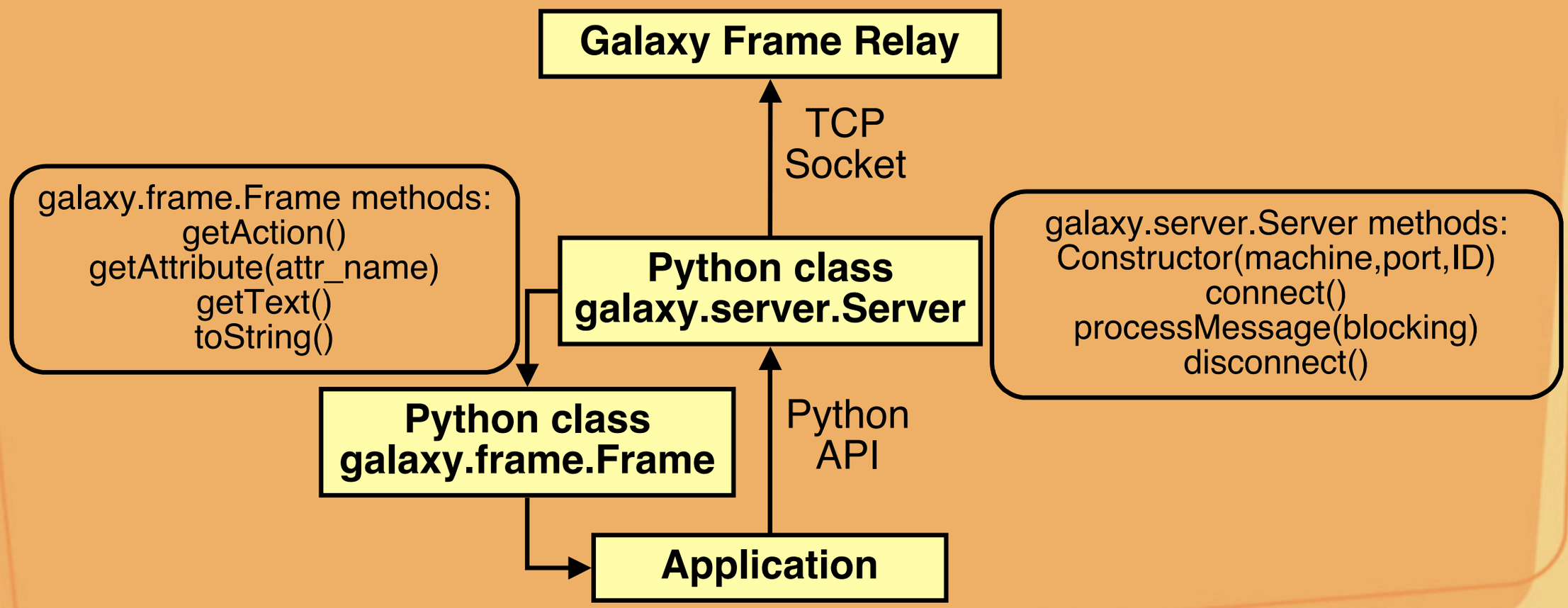
- Galaxy is the speech recognition system
- Speechbuilder is a tool to develop a domain for galaxy
- Real speech recognizers take a lot of work and detailed knowledge of all the components.
- Speechbuilder is great for prototyping

Galaxy's Components



Speechbuilder API

- Galaxy meaning representation provided through frame relay
- Applications connect via TCP sockets
- API provided in Python, Java, Perl



Grammar

- What is a grammar?
  - a set of terminals
    - A, B, ...
  - a set of rules or productions
    - <nt-1> == B | <nt-2> A
    - <nt-2> == <nt-1> | NULL
    - a sample sentence: B A A A
    - nt-1 --> nt-2 A --> nt-1 A --> nt-2 A A --> nt-1 A A ...
- Can you explain this to Grandma?
  - would probably use examples

Speechbuilder's Grammar

- Attributes
  - think of them as: terminals
    - actually, a non-terminal that goes to a terminal
  - For example
    - A set of terminals: lights, microwave, toaster, vcr, tv
    - These are all "objects"
    - So, "object" would be an attribute
  - Another example
    - dining room, living room, kitchen
    - "room" is the attribute

What does a rule look like?

- Speechbuilder calls them “actions”
  - No complicated productions
- Each action is an example sentence
  - Sentence contains
    - an “action” terminal
    - zero or more attributes
    - optional words
- E.g. Turn on the lights
  - “lights” is an example of an “object” attribute
  - “on” is an example of an “onoff” attribute
  - “turn” is an “action”

Example after reduction

All sentences for action turn	Action: turn	What gets sent to application
turn all the lights off	action=turn&frame=(object=lights, onoff=off)
turn off all the lights	action=turn&frame=(object=lights, onoff=off)
can you turn all the lights off	action=turn&frame=(object=lights, onoff=off)
can you turn off the living room lights	action=turn&frame=(object=lights, onoff=off,room=living+room)
can you turn off all the lights	action=turn&frame=(object=lights, onoff=off)
can you turn off the lights in the living room	action=turn&frame=(object=lights, onoff=off,room=living+room)
can you turn the living room lights off	action=turn&frame=(object=lights, onoff=off,room=living+room)
turn off the living room lights	action=turn&frame=(object=lights, onoff=off,room=living+room)
can you turn the lights in the living room off	action=turn&frame=(object=lights, onoff=off,room=living+room)
turn off the lights in the living room	action=turn&frame=(object=lights, onoff=off,room=living+room)
turn the living room lights off	action=turn&frame=(object=lights, onoff=off,room=living+room)

Domain XML example

```
<class name="object" type="Key">
    <entry>(television | tv) {television}</entry>
    <entry>lights</entry>
    <entry>microwave</entry>
    <entry>toaster</entry>
    <entry>v c r {VCR}</entry>
</class>
```

Domain XML example

```
<class name="onoff" type="Key">
   <entry>lit {on}</entry>
   <entry>off</entry>
   <entry>on</entry>
</class>
<class name="turn" type="Action">
   <entry>[can you] [please] turn all the lights off</entry>
   <entry>[can you] [please] turn off all the lights</entry>
   <entry>[can you] [please] turn off the (living room lights | lights in the living room)</entry>
   <entry>[can you] [please] turn the (living room lights | lights in the living room) off</entry>
</class>
<class name="status" type="Action">
   <entry>([can you] [please] tell me | do you know) (what | which) lights are on</entry>
   <entry>([can you] [please] tell me | do you know) if the (lights in the kitchen | kitchen lights) are on</entry>
   <entry>(is | are) the (dining room television | tv in the living room) On or Off</entry>
   <entry>(is | are) the (dining room television | tv in the living room) on</entry>
</class>
<class name="good_bye" type="Action">
   <entry>good bye</entry>
   <entry>later</entry>
</class>
<class name="room" type="Key">
   <entry>dining room</entry>
   <entry>kitchen</entry>
   <entry>living room</entry>
</class>
```

What happens to domain XML

- Compile the domain
  - check for errors
- Can look at reduced sentences
- DON'T click run (it will not work)
- Can download xml (if you want)
- Will start galaxy on ocha.csail.mit.edu
  - using command oxclass.cmd yes yes yes
- startup Galaudio and python on ipaq

Important stuff

- http://ocha.csail.mit.edu/SpeechBuilder/SpeechBuilder.cgi
- ipkg's
  - galaudio
    - does end of sentence detection (and a little more)
    - sends waveform to galaxy
    - receives waveform from galaxy
  - python classes for galaxy and xml
    - use pydoc to get documentation on these
    - need to register with frame-relay to get xml
  - to modify domain (advanced)
    - modify xml of domain, compile, and restart