

## Reduce Application Cost of Ownership with Conversational Dialogue

A106 Special topics in Voice Search  
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“Just Say It”





“Just Say It”



## GyrusLogic the Company

- GyrusLogic, Inc.
  - Phoenix, AZ, USA
  - Privately funded
- Technology
  - 30,000+ hours of software development
  - University projects
  - **Patents granted**
    - *Fuzzy & Exact Natural Language Dialog Processing*
    - *Conversational Dialog Application Development Methodology*



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## Challenges with Open Ended Dialogs

- Conversations and human responses can be **unpredictable**
  - In many cases, it is impossible to design a dialog flow that anticipates all user's responses.
  - Case statements, if-then-else and mix-initiative will not do the trick.
- Phrases must be well understood
  - Just picking up keywords doesn't do the trick. The **context and meaning** of the phrase must be captured.
- Must recognize the difference between a question and a response.
- Distinguishing between **exact** questions and **vague** questions
- Find the **single best response** to the question
- Must **keep track of the context** of the conversation.
  - What were we talking about, and is the user now talking about something different?
- Finish the transaction with the information we need.
- Significantly improve on the Customer Experience and Expectation
- Keep the application development and cost of ownership to a minimum.



## How Do We Address the Challenges

- Conversations and human responses can be unpredictable
  - Use AI techniques to build the **dialog on the fly**, rather than attempting to script the dialog.
- Phrases must be well understood
  - Use a combination of **semantics and syntax with computational linguistics**.
- Distinguish between a question and a response.
  - Use **multiple engines**: answer engine and a response engine.
  - A **dialog broker** recognizes which engine to use
- **Distinguish between exact questions and vague questions**
  - Use multiple grammars: automatic user generated grammars for the exact questions and the universal language grammar defining the vague phrases.
- Find the single best response to a question
  - Perform **computational linguistics** for matching the semantics of the question with the semantics of the knowledge base repository.
  - Perform **AI search techniques with heuristics** for sorting through possible answers.



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## Natural Language Understanding

- Traditional approaches for Natural Language Understanding (NLU)
  - Statistical Language Modeling (SLM)
  - Statistical Semantic Modeling (SSM)
    - *“Say Anything”* , *“Speak Freely”*
  - Transcription of 20 - 30,000 utterances
  - Procedural developments
- **GyrusLogic Platica approach for Natural Language Understanding**
  - **Robust Linguistic** approach coupled with Artificial Intelligence (no SLM)
  - **Full conversational capabilities** (no transcriptions)
  - Easy **industry standard** solution (no proprietary scripting)
  - Interfacing existing “Voice” environments (IVR, ASR, TTS, VoiceXML)
  - Declarative developments
  - **Significant less effort, with additional operational savings and more application functionality**



# Our Language Processing

## Speech Input



GYRUSLogic

Acoustic Language Models  
Word Lists



Speech Recognition

What does the speaker **say?**

Grammar  
Lexical Meaning



Speech Analysis

What does the speaker **mean?**

Discourse Context  
Knowledge about Domain of Discourse



Speech Understanding

What does the speaker **want?**

Unambiguous Understanding in the Dialog Context

## The Right Answer

Reduction of Uncertainty





## Typically Two Types of Requests

- ***A Fuzzy request:***

- They can be **spontaneous**, arbitrary, ad-hoc, and/or vague
- The majority of user queries are **fuzzy** questions
- The best approximation to satisfy the request
- User expected accuracy, completeness and an **answer the first time**

- **Do I have some bucks in my account?**
- **How much money do I have?**
- **What is the amount of the last deposit?**

- ***An Exact request:***

- **Specific transactions** don't allow for fuzzy approach, but they can still be spontaneous. (**expanded directed dialog**)

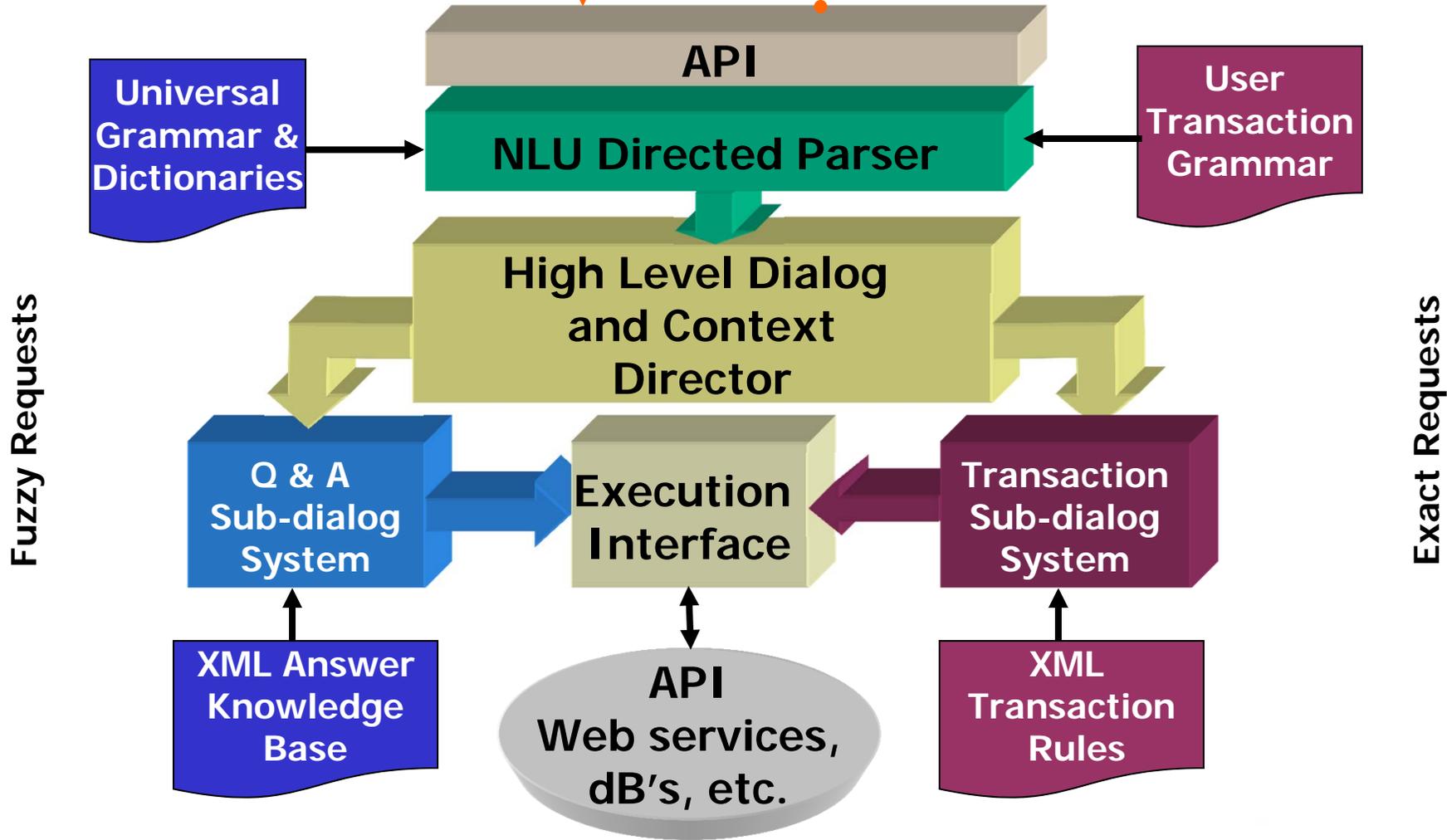
- **Transfer \$100 from checking to savings**
- **Did check number 123 clear on July 1st.?**
- **I want to travel at 3pm today from Phoenix to Burbank**



# Platica Server Architecture



N-best input  Prompts to play (TTS and/or Audio) 





## Dialog Example with GyrusLogic

**System:** How can we help you?

**User:** I would like to transfer some cash from my checking to my savings account.

Note how the user can be spontaneous and say as much as he wants

**System:** How much money do you want to transfer?

**User:** What do I have in my savings?

Interruption of dialog with any question, even if it was unrelated

**System:** The balance in your savings account is 4000 dollars.

**I apologize for asking again, how much did you want to transfer?**

**User:** Five hundred bucks please.

The system resumes the previous dialog and requests the missing information

**System:** Ok, let's review this transaction, you want to transfer 500 dollars from your checking to your savings, is this correct?

**User:** No, actually transfer a thousand dollars from savings!

User can make a correction on the fly or ask for a repeat at any point in time

**System:** Ok, let's review this request, you want to transfer 1000 dollars from your savings to your checking, is this correct?

**User:** What did you say?

The system still handles the question effectively without coding of business rules

**System:** Let's review this request, you want to transfer 1000 dollars from your savings to your checking, is this correct?



## No Dialog Flow Development or Maintenance

- The user application does not need a specification for how the logic of the dialog should look like.
- GyrusLogic's inference engines mimic human's reasoning and **build the dialog on the fly**, thereby delivering a natural conversation.
- It is a **true conversational** AI system and a true AI **declarative paradigm**.
- It allows the user to be **spontaneous** and to **interrupt** a dialog with questions outside the ongoing dialog.
- It allows the user to make **any correction** to a specific transaction, either implicit or explicit.



## VoiceXML Mixed Initiative Example

- GyrusLogic Platica more spontaneous out of the box!
- Automatic dialog interruption and implicit correction
- Exponential savings for more complex applications

10 + times  
less effort

**Agent:** Thanks for calling Acme Travel Company. How can I help you today?

**Caller:** I'd like to book a flight.

**Agent:** Okay. What is your point of origin, and where are you going?

**Caller:** I wanna fly to Boston, Massachusetts.

**Agent:** You want to fly to Boston, Massachusetts. Where are you flying from?

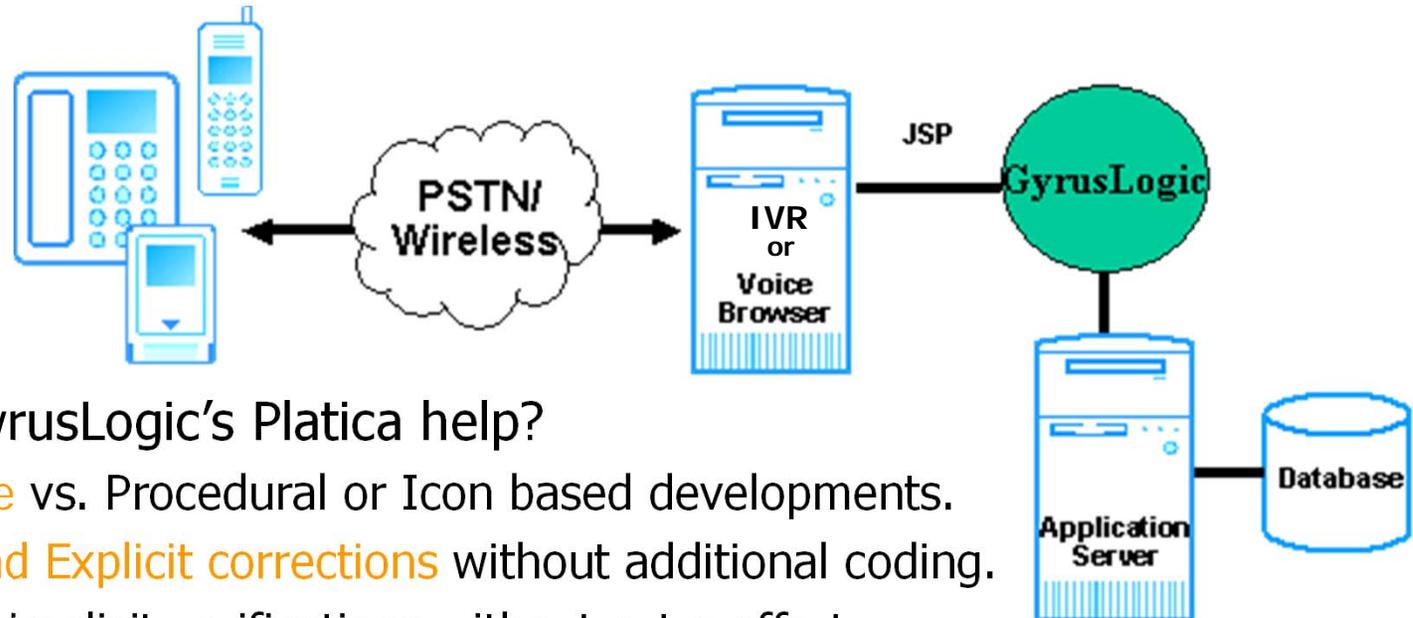
**Caller:** From San Francisco, California.

**Agent:** Okay, you'll be traveling from San Francisco, California to Boston, Massachusetts. Is that correct?

**Caller:** Yes.



# GyrusLogic Platica

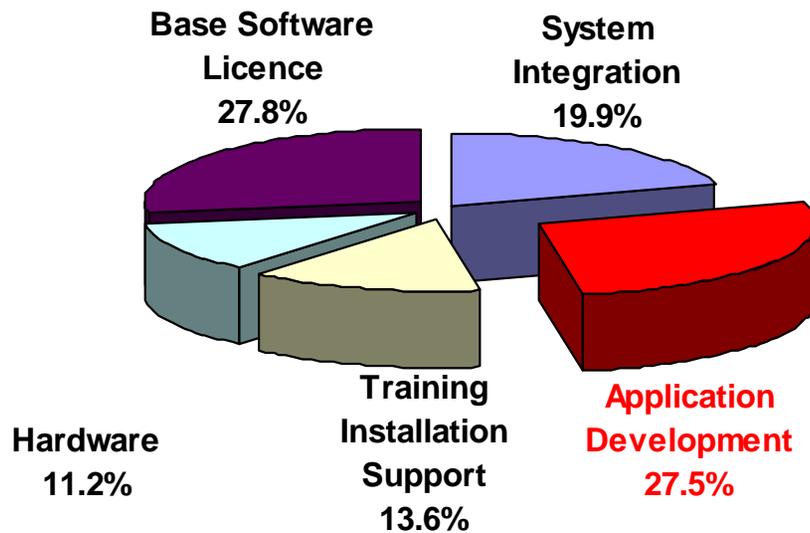


- How does GyrusLogic's Platica help?
  - **Declarative** vs. Procedural or Icon based developments.
  - **Implicit and Explicit corrections** without additional coding.
  - Automatic implicit verifications without extra effort.
  - **Spontaneous user interruptions** in call flow without additional development effort.
  - **Context and semantics** recognition.
  - The same application can be used for **Chat, Web and SMS**.
  - Significant **savings in time and money** with the deployment of our Conversational Dialog related applications.



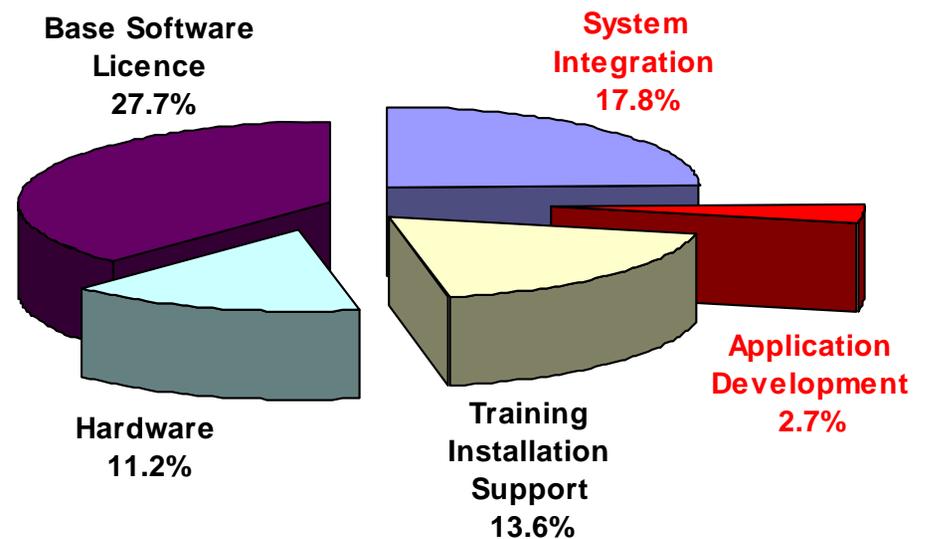
# Average Speech Project Deployment Costs

### Average Project Costs Today



### Average Project Costs with GyrusLogic NLU

> 27% project costs savings



Platica 3.x will improve your project cost of ownership savings to >32%

Source: Voice Information Associates, ASR in Telephony Applications, the World Market



## Operational savings with Conversational Natural Language Systems

- Directed Dialog
  - 1:48 avg. call
- Conversational Dialog
  - 0:57 avg. call
- Savings
  - **51 seconds per call saved**
  - Avg. 50,000 calls / day
  - Initial 20% use of conversational dialog
  - **Over 3.1 million minutes saved in initial year**

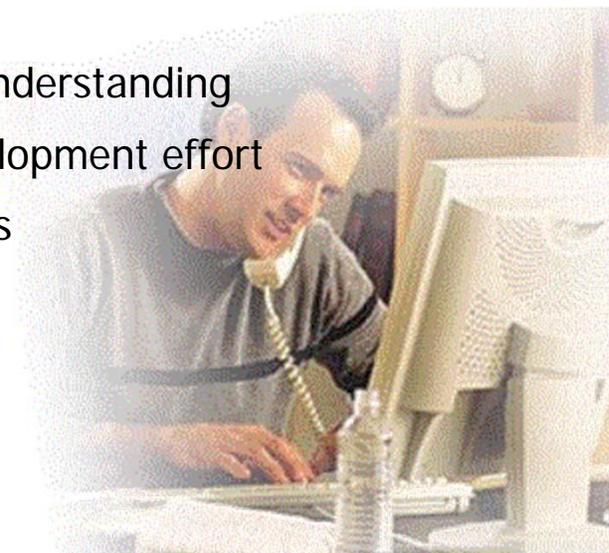




## Summary of a GyrusLogic NLU Implementation



- **Fully conversational dialog system**, based upon industry standards
- Flexible answers with enterprise variables in **XML knowledge base**
- Powerful **implicit and explicit corrections, implicit confirmation**
- **No dialog design**, minimal grammar development
- **Natural language** with context, semantics and meaning understanding
- **Spontaneous user interruptions** without additional development effort
- **Improved "recognition rates"** by resolving false positives
- Easy, XML based, implementation of a transactional dialog
- Automatic parsing for corpus development
- Back-end database and application support
- **ASR & IVR independent, VoiceXML 2.0 support**
- New language Universal Grammar development can be completed in several days
- **First contact customer resolution** for improved customer satisfaction
- **Significant savings in development and total cost of ownership**
- **Declarative paradigm**, the typical developments will be **significantly less error prone**  
**Patented context and semantics** recognition and parsing technology.





## What's new with our next release Platica 3.x

- **Wizard** for generation of Platica business transaction XML grammars
- Enhanced fuzzy parser to create an even **better customer experience and improved speech recognition rate**
- Improved automated Speech Grammar generation, **no grammars to be developed**
- Easy Conversational Dialog application **prototype generation** and testing capability





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Thank You!

Questions, trial or demo, connect with us @

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