

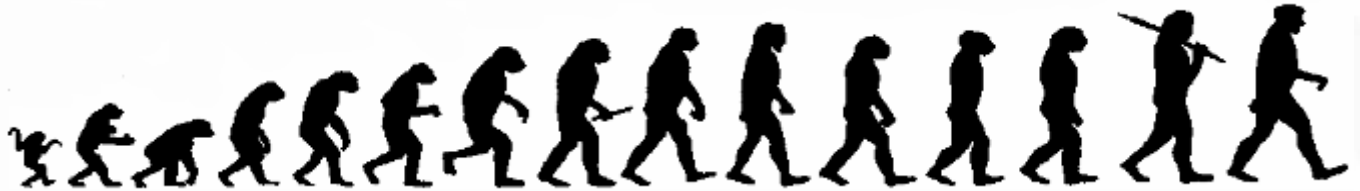
# Advanced Speech and Language Technology for Complex Customer Care Automation and Self-Service

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## SpeechCycle is the leading provider of 3<sup>rd</sup> Generation speech applications for digital service providers.

- ☉ Started in 2001; located in NYC.
- ☉ Rapidly growing software company (about 70 people)
- ☉ Telephone based automatic spoken dialog systems for complex customer care.
- ☉ Deployment models: on-demand and on-premise managed service.
- ☉ Processing millions of complex support calls every month for the largest cable and telecommunication operators in the US and Australia.
- ☉ Full automation rates up to 40%
- ☉ Experts in speech recognition, speech science, software engineering, advanced voice interaction design, and the strategic value of speech systems in the contact center.





	GENERATION		
	FIRST	SECOND	THIRD
<b>Time Period</b>	1994-2001	2000-2005	2004-today
<b>Type of Application</b>	Informational	Transactional	Problem Solving
<b>Examples</b>	Package Tracking, Flight Status	Banking, Stock Trading, Train Reservation	Customer Care, Technical Support, Help Desk.
<b>Architecture</b>	Proprietary	Static VoiceXML	Dynamic VoiceXML
<b>Complexity (Number of DMs)</b>	10	100	1000
<b>Interaction Turns</b>	A couple	5-10	More than 10
<b>Dialog Modality</b>	directed	directed + natural language (SLU) + mixed initiative	directed + natural language (SLU) + intelligent mixed initiative

- **Cost of customer care is on a steep increasing curve; this is especially true in the Digital Service Provider arena**
  - Devices and services are becoming more and more complex—more things can go wrong
  - Number of customer grows year by year
  - ...and so the number of agents needed to provide quality support
  - Outsourcing and offshoring reached a point of diminishing returns
- **Quality of customer care is on a decreasing curve**
  - Long waiting queues
  - New products and services offered every so often
  - Agents are not always up to date
  - Turnover makes agent training difficult and costly
  - Difficult to maintain consistent quality of service
  - Infrastructures are not always up to date



The switchboards were something to behold, with many, many operators sitting in long rows plugging countless plugs into countless jacks. The *cost of adding new subscribers had risen to the point unforeseen in the earlier days*, and that cost was continuing to rise, not in a direct, but in a *geometric* ratio. One large city general manager wrote that he could see the day coming soon when he would go broke merely by adding a few more subscribers.

AT&T, Early 1900s

- Value for the customer (the provider)
  - Reduced costs
- Value for the final user (the subscriber)
  - No waiting in a queue
  - Consistent quality of customer care
- Value for the technology vendor (i.e. us)
  - Revenue -> Profit

- Acquisition of knowledge
- Keeping up to date with new products and services
- Emotional state of callers
- Problem identification
- Caller mental model
- Instructing non technical savvy callers
- Uncontrolled events
- Challenging acoustic environment
- Cultural barriers against speaking to machines
- Callers do not trust automated systems can help them
- Callers are not cooperative

# SpeechCycle's Approach to Automated Technical Support

- Speech recognition over the telephone with sophisticated Voice User Interface
- Detect call reason using advanced natural language technology
- Ask simple questions when needed
- Don't ask questions...if possible. Integrate with provider's customer information systems
- Instruct caller to follow simple diagnostic and troubleshooting steps if needed.
- Perform diagnostic and troubleshooting steps automatically if possible. Integrate with diagnostic systems.
- Automated reporting and call performance classification
- Use log data to monitor and continuously improve automation and caller experience
  - Speech
  - Language
  - Logic



- Know your patients even before they talk
  - Medical records
- Let your patients talk
  - *What's your problem?*
- TAKE THE INITIATIVE
- Then ask simple clarification questions
  - *Does it hurt when you laugh?*
- Take measurements, run tests
- Prescribe cure
- If it does not work:
  - Try something else
- If it does not work:
  - Send to a specialist with an updated medical record.

# The Doctor Analogy applied to Automated Technical Support

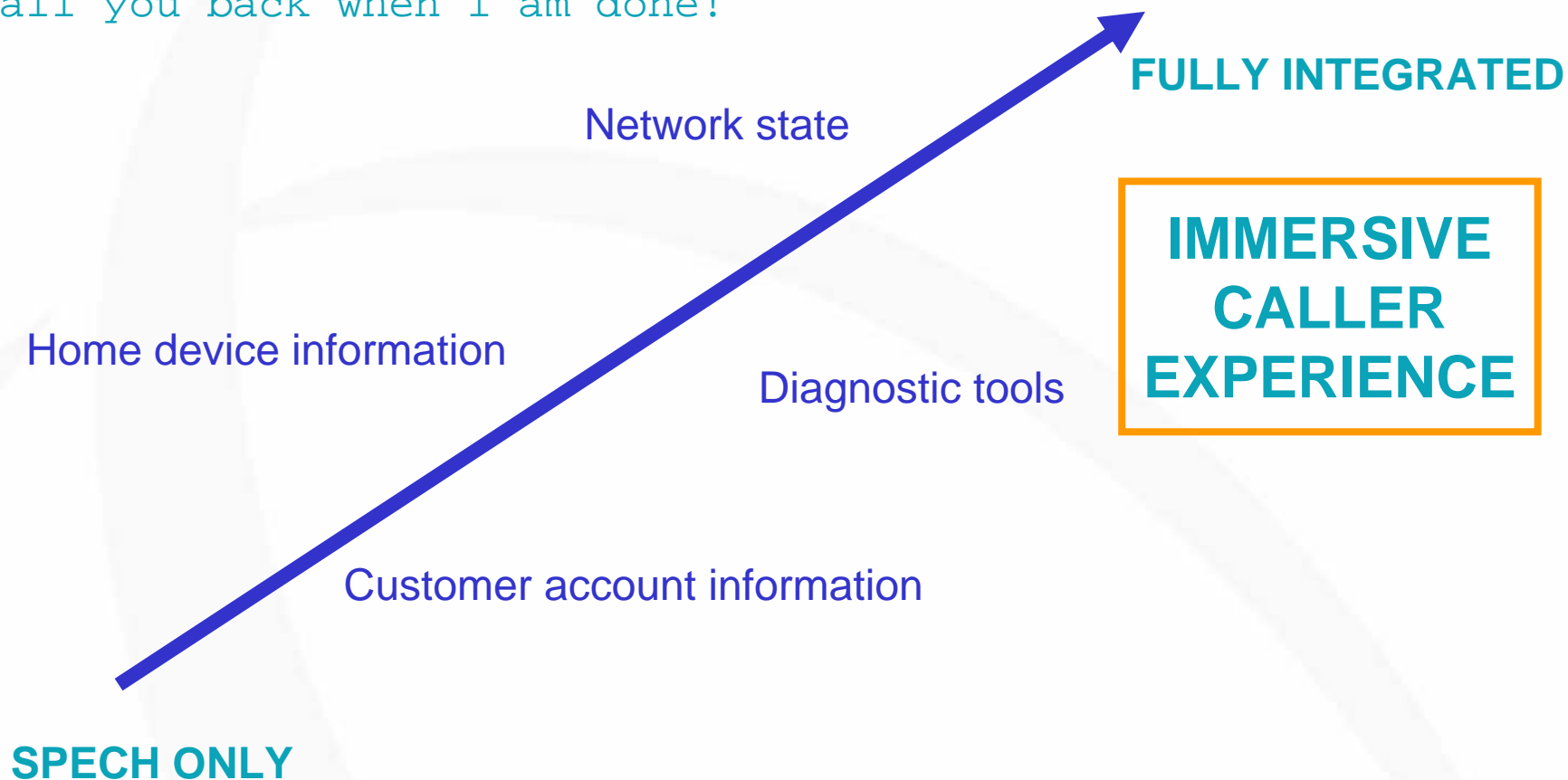
- Know your callers even before they talk
  - Integration with Customer Account DB
- Let callers talk
  - Problem identification with natural language
- TAKE THE INITIATIVE
- Then ask simple clarification questions
  - Directed dialog
- Take measurements, run tests
  - Integration with diagnostic tools
- Prescribe cure
  - Step by step resolution
- Problem solved?
  - How did we do?
- If it did not work:
  - Try something else
- If it did not work:
  - Escalate to human agent

# The long term vision for automated technical support

Please describe your problem

*My internet connection is slow*

Sit back and relax. I will fix it for you and call you back when I am done!



FULLY INTEGRATED

Network state

Home device information

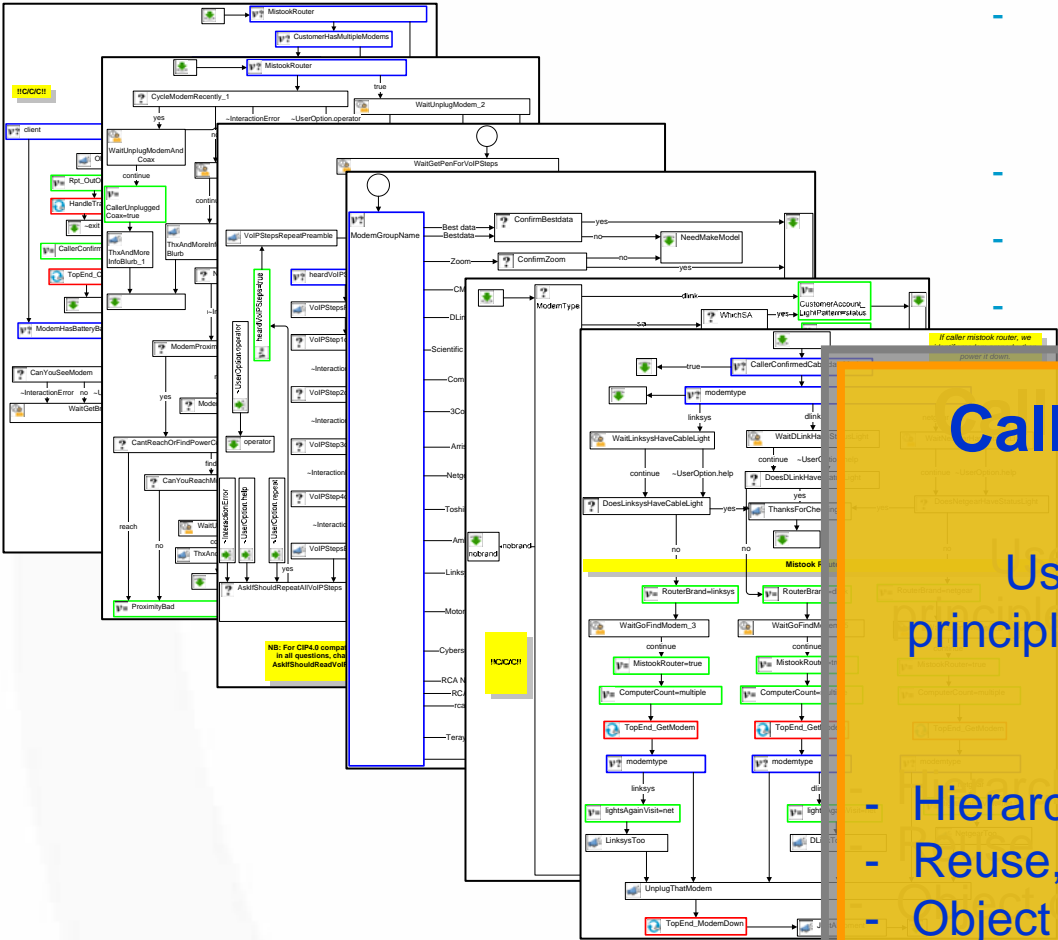
Diagnostic tools

**IMMERSIVE  
CALLER  
EXPERIENCE**

Customer account information

SPEECH ONLY





- Hundreds of pages of call-flow (300-400 for typical call flow)
- Thousands of nodes
- Several thousands of prompts
- Hundreds of grammars

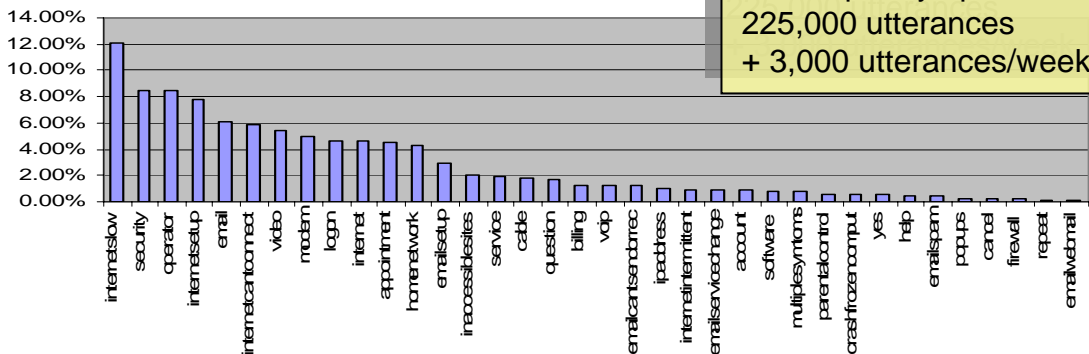
## Call Flow as Software

Use software engineering principles to create and maintain large call-flows

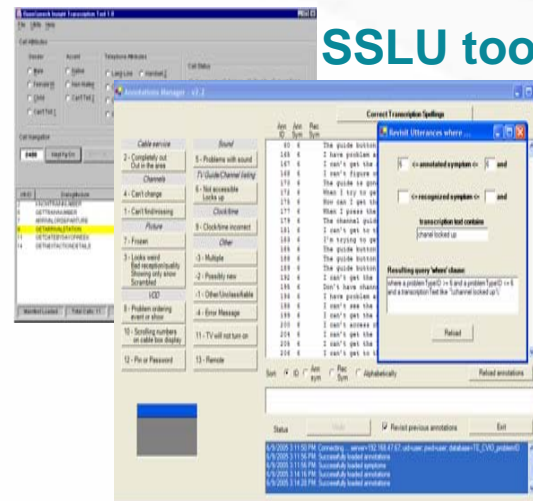
- Hierarchical structure
- Reuse, libraries
- Object oriented principles
- Configurability
- Source control

# Symptom Identification with Statistical Spoken Language Modeling (SSLU)

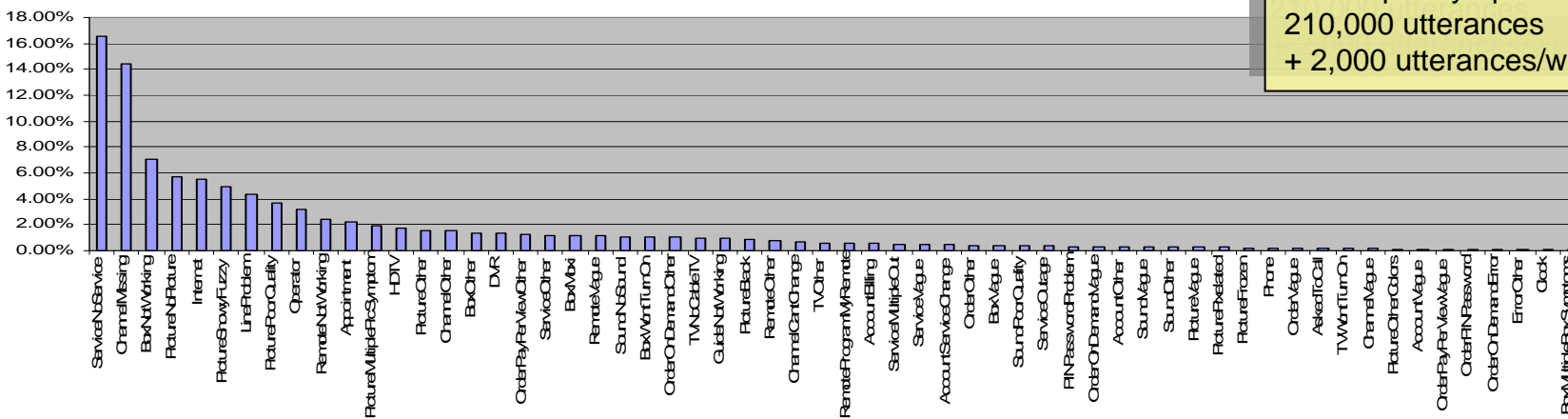
Internet Symptoms



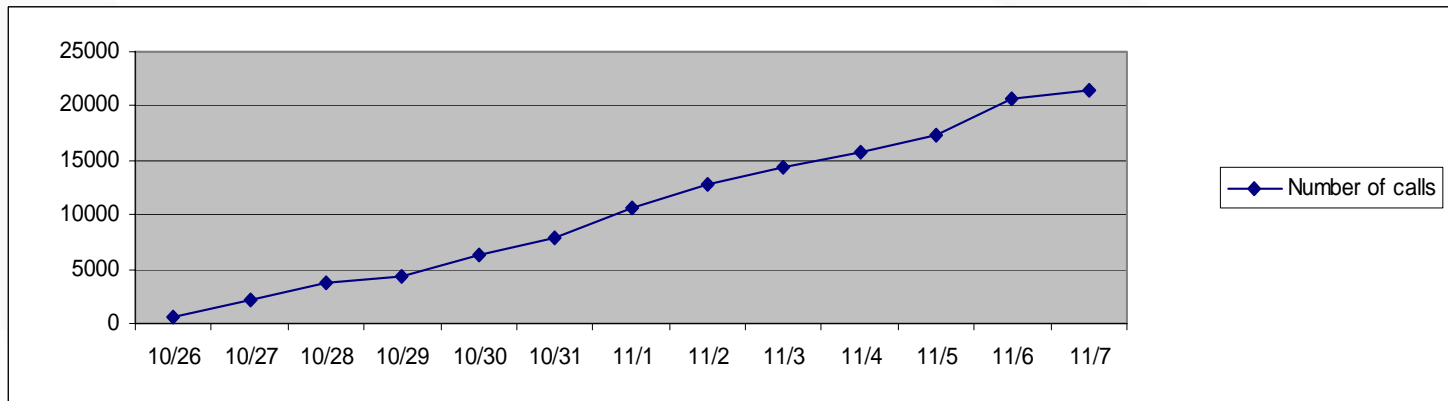
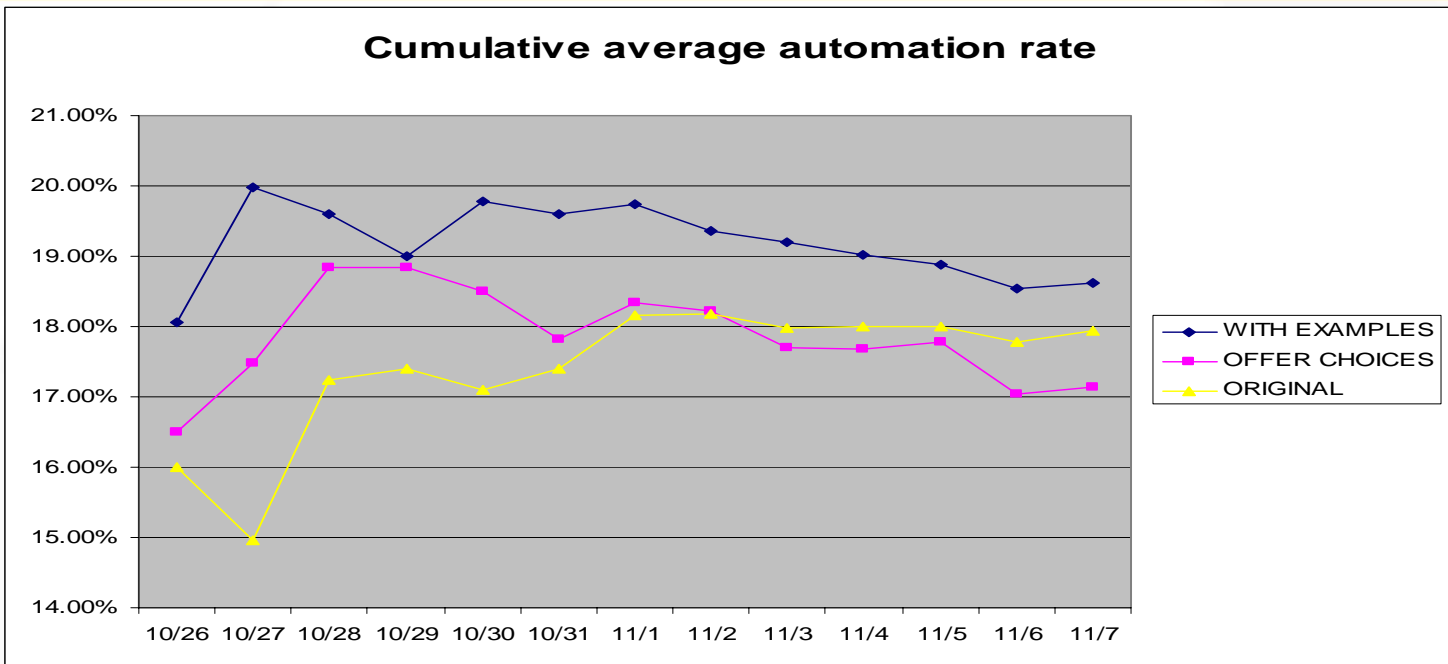
SSLU tools



Video Symptoms



# Contender: Exploring Alternative Strategies



- The third generation of dialog systems is here
- Problem Solving: not just form filling or transactions
- The doctor analogy
- The power of backend integration and data
- Call-flow as software
- Symptom Identification and SSLU
- Exploration and Learning