Defeating Social Engineering with Voice Analytics

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Where I’m coming from…

• News & Online Editor - VON Magazine
  – VoIP/IP communications
  – Security issues
  – Enterprise issues

• If you want a consultant on IT/Security issues, go hire one – not me 😊
I’m going to talk about...

- Voice Analytics (VA) – What is it?
- How features of VA are being used in the corporate sector for security purposes today
- Applying VA as a defense layer against social engineering attacks
Voice Analytics - What it is?

- Definition: Analyzing the spoken content of recorded conversations (Mostly phone)
  - Also called speech analytics
- For this presentation, includes-
  - Voice print identification
  - Word spotting
  - Emotion Detection
  - Talk Analysis
    - Combine above with call data (date, time, duration, caller ID) and statistical analysis.
- "Datamining phone calls"
“Echelon” – The Legend

- National Security Agency slurps up all overseas phone calls
- Massive computers farms scan calls for key words, voiceprints
- Speculation on capability as early as 1982 (Bamford, The Puzzle Palace)
- “Echelon” program reported 1999-2000
- 24 years of development (?)
Corporate America’s “Echelon”

- Voice print, voice analytics in use today
- Big users are call centers for:
  - Fraud detection/prevention
  - Operational efficiency
    - Training, call escalation
  - Real-time business intelligence
    - Spot competitor offers, problems in service
- Multiple vendors providing speech analytics/voice analytics solutions to the call center market
- Call monitoring also used for regulatory compliance in financial, health care industries.
Why Call Centers?

• Efficiency is everything
  – Get calls resolved faster, happier customer, lower costs
• Large data collection mechanism
  – Cheap disks, cheap processors, sophisticated software
• Voice analytics allows companies to spot competitive trends in real time.
Enabling technologies

- VoIP –
  - IP PBX - Everybody is going to bits, so voice just another data stream to manipulate
- Cheap disks, cheap processors = Store everything, analyze everything
- Software is now off the shelf
  - If you are already doing voice print in real-time or recording calls for “quality assurance purposes,” voice analytics is the next step
Where is Voice Analytics being used today?

- **Contact Centers (Call Centers)**
  - It’s datamining of the call content
- **Financial institutions**
  - Banking
  - Insurance
- **Commercial organizations wanting to insure confidentiality of data**
  - Health Care, Banking
  - Liability/Regulatory requirements – HIPPA, financial, Sarbanes/Oxley
Voice Print Identification

- Unique digital “pattern” to one’s voice
- Biometric means of identifying a person
- Multiple commercial solutions available for password replacement, such as
  – Nuance Verifier – “Speaker Verification”
  - 150 million secure calls annually
  - Financial services, telecommunications, utilities, transportation and manufacturing.
Commercial Benefits of Voice Print ID

• Reduce PIN/password admin
• Savings by reducing live agent contact (i.e. “I forgot my password/PIN”)
• Reducing potential for fraud and identity theft
• Improve customer service with a convenient means of security
How is Voice Print Used?

• Authenticate identity
  – Make “baseline” voice print or train recognition via selective vocabulary

• Insurance companies use voice print for:
  – “White list” – Authenticate customer claim
  – “Black list” – Spot known bad actor
    • Starting to be used in combination with database

• Likely see voice print start to proliferate for consumer financial use (credit card, some banking apps) in next few years.
Vendors Offering Voice Print

- Teledata Technology – White List/Password replacement
  - Voice Biometrics – "T3 Viometrics reduces expenses associated with administering password policies and manual verification methods using live agent support."
- Courion, IBM, Nuance, Vocent, VoiceVault
Word Spotting

• Parsing out word or phrase in audio stream
  – Go from speech to text, index, search
• Can look for single word, phrase, multiple phrases, depending on how detailed you want the rule set to be.
• The “Hot Tool” for Contact Centers
  – Store all phone conversations with agents
    • “Your call may be monitored” or “This call is monitored”
  – Being used to sift through customer calls today for
    • Good experience – “Wow!”
    • Bad experience – Profanity (with emotion detection)
    • Competition/competitive offers – Look for mention of competitors name, “special offer,” “great deal.”
The FedEx “Wow!”

- FedEx searches inbound calls for “Wow”
- Calls are marked and forwarded to training
- New call center agents listen to fresh calls to learn how to be better call agents
You @#$ !!!

- Look at the angry customer
- In real-time, escalate to manager/troubleshooter
- Post-call, identify problems—
  - Bad business process
  - Bad product
  - Bad customer (Just profane or highly sensitive)
  - Agent in need of improvement
Word Spotting For Real-Time Competitive Intelligence

- Inbound calls are a massive source of data on customer, market trends
- Word spotting used to look for—
  - Name/mention of competitor
  - Mention of special offer, “great offer,” other switch
- Daily run allows for real-time identification of competitive offers to steal away business
- Allows businesses to adapt their own marketing, sales strategies in near-real time -- rather than 3 months later with sales down 5-10%.
Other Voice Analytics Applications

• Generate profiles of
  – “Good” customers
    • Make special/loyalty offers/bonuses
  – “Bad”/trouble customers
    • Can pull out & examine multiple calls
      – Historical or on-the-fly
    • See if there’s a bad history of interaction
    • Identify inbound for escalation/special handling.
• Use in combination with emotion detection.
How it works – General Process

- Capture – clone/copy VoIP stream
- Storage - Put it on a server
- Retrieval – Index everything nicely
- Analysis – Set up rules and ad-hoc reports, look at the results
Profile of NICE Systems

- Traded on NASDAQ, $311 million in 2005.
- The “Microsoft” of Voice Analytics
- Based in Israel, 20 years of operation
- 23,000 customers, over 100 countries, including 75 of Fortune 100
- American Express, Citibank, FedEx, Home Depot, Nextel, Time Warner, Vodafone
- "NICE’s solutions are changing the way organizations make decisions, help them improve business and operational performance, address security threats and be proactive"
NICE - The Good, The Interesting

- Supports Nortel, Cisco Call Manager, Avaya Communications Manager.
- Can link voice with other recording tools – IM, screen lookup
- Can tie into SAS analytical models so you can do statistics to your heart’s content
- Baseline analytics package costs $100,000
  - Storing calls much cheaper.
Voice storage – Or Everyone is Storing

- Entry-level storage
  - Single (PC) box, PCI bus, Win XP, redundancy options
  - 48 recording channels per unit, usual phone interfaces.
  - Store up to 55,000 hours of audio
  - Can be scaled as a multi-site solution for distributed organizations: Branch offices, distributed PSAPs

- If not analyzing in real-time/near-real time, can at go back and “audit” interactions with software at a later date.

- Interactions don’t have to be phone
  - Radio communication
NICE’s thoughts on storage

- "These days even small and medium-size enterprises need professional voice logging - not just for reducing liability, resolving disputes or trapping nuisance callers but also for staff training, enhancing customer service or clarifying verbal instructions."
Commercial Uses of Voice Recording/Analytics

- Quality monitoring
- Liability/Regulatory
- Interactions analytics
- Looking at what is going on between call center and customers, spot trends, improve marketing, performance of agents.
Voice Analytics - Call Center Applications

• In-Call
  – To trigger direction to a specialist by phrase or emotion
    • Supervisor/escalation
    • Caller identification verification
      – Starting to database voice print
        » Use voice print to verify identity; prevent identity theft

• Post-call - Analyze trends
  – Customer mentioning offer/competitor
  – Data used to adjust marketing, sales strategies
    • Customer encountering problems with "X"
    • Use to update help desk, refine procedures
Liability/Regulatory requirements

- HIPPA, financial, Sarbanes/Oxley
  - HIPPA
    - Track communications to ensure confidentiality of information
  - Financial
    - Monitor for leakage of information, insider trading
  - Sarbanes/Oxley
    - Everyone's paranoid about requirements, skew to overkill.
    - Provides “audit trail” of calls & monitoring
Applying Voice Analytics To Defend Against Social Engineering
An interesting datapoint..

- [www.vocent.com](http://www.vocent.com)
- White paper picture/reference on their website "Social Engineering & Identity Theft: How Criminals Exploit Your Call Center"
- White paper has been **REMOVED** from their website.
Social engineering – The way in

- Outside caller impersonates “insider”
- Everyone is eager to cooperate with a friendly person.
- Easiest way to be compromised
  - Phone numbers
  - Passwords
  - Procedures/websites
- One piece of key information leads to others
  - (See Mitnick, Kevin)
- Despite written policies, user education, social engineering is still an effective way to breech corporate security.
Real-Time Defenses Against Social Engineering with Voice Analytics

- White List
- Black List
- Black List With Sharing
- Word Spotting
- Voice Analytics
  - All of the above, with computer/telephony data and statistical analytics)
Implementation

• Using existing technology
• No “blue sky” ideas, more—
  – Cut and paste (for word spotting)
  – Building rule sets/queries to combine existing real world functions
    • Combining white list/black list voiceprint with word spotting
    • Building multi-word/phrase word spotting
• VoIP/IP-PBX enables ease-of-implementation
  – It’s already bits in the machine
• (Current) Price tag likely to be a deterrent for some orgs; others will try to shoehorn in on existing licenses.
White List - Voice print identification

• "My voice is my passport"
• Most common use
• In-house use to authenticate:
  – Technicians/IT staff (already being done in some places)
  – All staff
• Becomes more important as caller ID information is spoofed
Black List – Voice print identification

- Scan for Known “Bad Actors”
- Already being done in insurance & financial sectors to detect identity fraud.
- Once spotted, flag/deny access to rest of phone system; send to voice attendant hell
- Share bad actors voiceprint in central database (optional)
Black List with Sharing

- Voice print, but with a mutually shared database
- Insurance companies are already starting to database voiceprints
- Once caller blacklisted, share the voice print in the pool
  - Akin to “The Book” in Vegas of banned gamblers
Word Spotting

• Monitor vocabulary of words
  – “User login,” “Password,” “Phone number of”---
• Cross-match with caller ID.
  – Someone off the street is calling in asking for a password, sound the alarm
• Likely have to establish baseline/threshold to prevent false alarms.
  • “I’ve forgotten my login password, can you reset it?”
Post-attack reconstruction

- Identify bad actor via voice print and word spotting
- Track back through call logs, voice print
- Can trace back--
  - Who was called
  - Identify both methods & compromised info
    - “Why did he ask for that?”
- Generate a full time-stamped audit trail as to who called, when, where (if caller ID not manipulated)
Spy vs Spy

Tactics Against Voice Analytics and Countermeasures
White List -
Tactics/Countermeasures –

• Tactics - Canned phrase from fixed vocabulary re-generated via recording
  – Sneakers - "My voice is my passport" – Tape recorder
  – These days, use a laptop to polish, iPod to play

• Countermeasure – Emote
  – "Say it angry, say it calm"
  – Canned response will only have one "flavor"/version.

• Countermeasure - "The Phrase that pays"
  – Daily randomly generated phrase analyzed on the fly
  – Much harder to spoof, especially in combination with time limit on response
Tactics And Countermeasures – Word Spotting

- **Tactics** - Avoid "hot" words if possible/known
  - Use code phrases/substitution – Thesaurus VERY useful
  - But could also be very awkward
- **If using hot words, run a slow-attack to avoid baseline/threshold.**
  - A call per day, every other day, every week
- **Alternatively, blitz! (Inside the OODA cycle)**
  - Try to get all needed information, load, fire attack, get out before security has a chance to react.
- **Countermeasures – Word Spotting**
  - More sophisticated rules
    - Match on key-word monitoring AND unique voice print
      - Immediately flag if key-word and voice outside of whitelist/company directory
Tactics/countermeasures – Black List

• Tactic - Use multiple people for social engineering attacks
  – Requires multiple people involved
  – How many people can you have involved?
    • “Three can keep a secret, if two are dead.” Ben Franklin

• Countermeasures – Shared Black Lists
  – If Black Lists are shared among companies in real time, social engineering attempts detected faster
Tactics– Hack the analytics box

- Voice Analytics Systems are Windows-based
- "Best Cast" – Denial of Service attack or crashing the server
  - Attack/crash gives you a date/time for penetration
- Worst case - If someone owns the box, and understands the software, everything is fair game
  - White List
  - Black List
  - Vocabulary of monitored phrases
- Countermeasures
  - Secure analytics box just like you would any other piece of sensitive equipment (Physically, network).
Summary

• Voice analytics is being used TODAY in call centers, government applications, Fortune 500
• Features of voice analytics are being used today as a tool to spot social engineering attacks
  – Insurance companies, fraud
• The (software) technology is not cheap, but prices are likely to decline
• First implementations in high-security/high-value organizations
Food for thought

• Echelon Sweden -- or NYC
  • Gear is cheap, software is off the shelf, multiple vendors
• Corporate/government – You have no privacy
  – “Big Brother” monitor for job search, grudge against the boss
• And if you thought DNA was bad…
  – Speeches, public conversations, phone calls, podcasting – Your voice can be found everywhere
• Google Voice
Contact

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Questions?
Reference point URLs

- [www.vocent.com](http://www.vocent.com) – Now part of RSA through PassMark
- Envision Telephony [http://www.envisioninc.com](http://www.envisioninc.com)
Others in the space

- [www.etalk.com](http://www.etalk.com)
- [www.verint.com](http://www.verint.com)
  - Communication interception and call center businesses!
- [www.witness.com](http://www.witness.com) - Witness Systems