FreeSpeech™: caller identity verification.

Real-time validation of caller identity and detection of known fraudsters.

NUANCE

FreeSpeech™ for passive caller authentication.

FreeSpeech™ 9

FreeSpeech enables fully transparent and secure voice biometric authentication within the call center. By analyzing a caller's voice during a natural conversation with an agent, FreeSpeech can validate legitimate caller identity as well as detect known fraudsters in real-time. Trusted by organizations around the world, including some of the largest financial institutions to secure high-risk transactions and telecom service providers to reduce call center operating costs, FreeSpeech delivers the ultimate customer experience through passive authentication. Callers are not required to say a passphrase to validate their identity and enrollment is also conducted passively. Organizations can deploy voice biometrics with no effort required on the part of their customers.

Key benefits

– **Improve customer experience.** Transform the call center identity verification process into a positive experience by eliminating invasive security questions – callers are verified as they speak with the agent.
– **Reduce contact center operating costs.** By eliminating the interrogation process at the beginning of each call, organizations can reduce AHT on average by 30 seconds, leading to lowered operating costs.
– **Enhance security.** Decrease fraud by verifying identity via an authentication factor that is unique to every individual instead of knowledge-based credentials than can be easily compromised.

New capabilities in v9

FreeSpeech v9 brings a series of new innovations which are designed to enhance the customer experience while strengthening anti-fraud capabilities. These include:

– **Precisio voice biometric engine.** Delivers up to a 50% improvement in accuracy over v8 FreeSpeech performance.
– **SmartAdaptation.** Enables fully automated enhancement of voiceprints based on the analysis of failed authentication attempts by legitimate users.
– **Automated Fraudster enrollment.** Prevents brute-force attacks by detecting and adding individuals to the fraudster list that attempt to access several accounts.

Identification and verification

– **Enrollment** – Enrollment is performed while the user is engaged in a conversation with a contact center agent. Once enough audio has been acquired by the system, FreeSpeech automatically generates the speaker's voiceprint and stores it in a secure database.
– **Verification** – Verification is performed in real-time in the background of the calleragent conversation. Captured samples are compared with the speaker's voiceprint. The verification score and decision are available within seconds.
– **Identification** – Identification is performed in real-time in the background of the calleragent conversation. Captured audio samples are compared with the voiceprints of a group of speakers. The identification score and decision are available within seconds. Identification can be used to disambiguate between several legitimate account holders, or to detect know fraudsters.
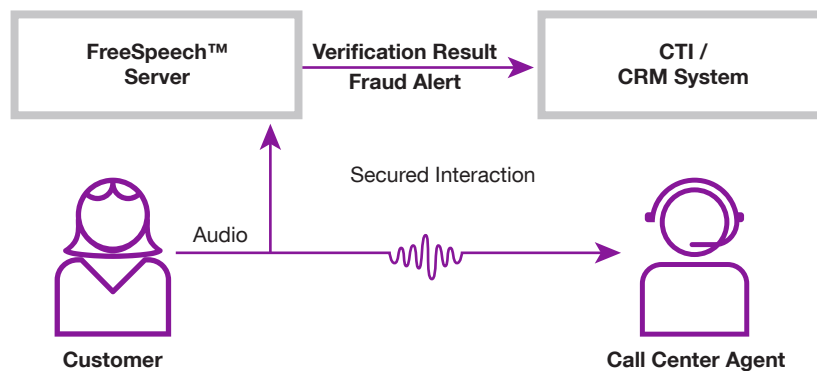
"Our people love it, our clients love it, and it is delivering improved cost to serve," said Barclays Wealth and Investment Management Vice President, Pete Mileham

BARCLAYS WEALTH

Advanced functionality

Algorithmic Capabilities
– **Crosstalk cancellation** – A unique crosstalk cancelation algorithm permits the refining of the audio sections of a certain speaker within a multi-speaker conversation, improving performance.
– **Enrollment consistency check** – This algorithmic functionality verifies that multiple enrollment utterances are consistent with one another in terms of their biometric features.
– **Adaptation** – By using new audio to update existing voice templates, FreeSpeech allows each speaker to maintain an accurate voiceprint according to changing background noises and voice tones that shift with age.
– **SmartAdaptation** – Enables fully automated enhancement of voiceprints based on the analysis of failed authentication attempts by legitimate users.

FreeSpeech™ Server — Verification Result Fraud Alert → CTI / CRM System

Customer — Audio — Secured Interaction → Call Center Agent

Detecting Known Fraudsters
Using watch-lists

– **Fraudster detection** – Nuance's award-winning fraudster detection capability allows the system to keep track of known fraudsters. This functionality analyzes enrollment/verification audio in real-time and alerts the application whenever a known fraudster is detected. Unique algorithms reduce the false alarm rate.
– **Automated fraudster enrollment** – Prevents brute-force attacks by detecting and adding individuals to the fraudster list that attempt to access several accounts.

FreeSpeech Flexibility
Customize FreeSpeech to Fit Your Needs

– **Multiple configurations and calibrations** – FreeSpeech allows for concurrent use of multiple configurations and calibrations.
– **Decision mechanisms** – FreeSpeech's built-in decision mechanisms may be customized by those designed by the customer through a custom plug in.
– **Multiple voiceprints per speaker** – FreeSpeech allows for the enrollment of multiple voiceprints per speaker, promoting security and language support.
– **Audio formats** – In addition to built-in support for several standard telephony formats, any audio format can be supported through the use of a custom decoder plug-in.

"Nuance offers an authentication solution that perfectly suits the security needs of our contact center. Our customers love the fact that they don't have to remember the answers to trick questions and we love the fact that the calls are shorter and totally focused on prompt banking transactions," said Amit Lanshiano, IT Operations Manager at Bank Leumi.

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System Architecture

FreeSpeech contains three main components: the Processing Server, the Data Repository Server, and the Audio Acquisition Server.

Customer's Voice Verified
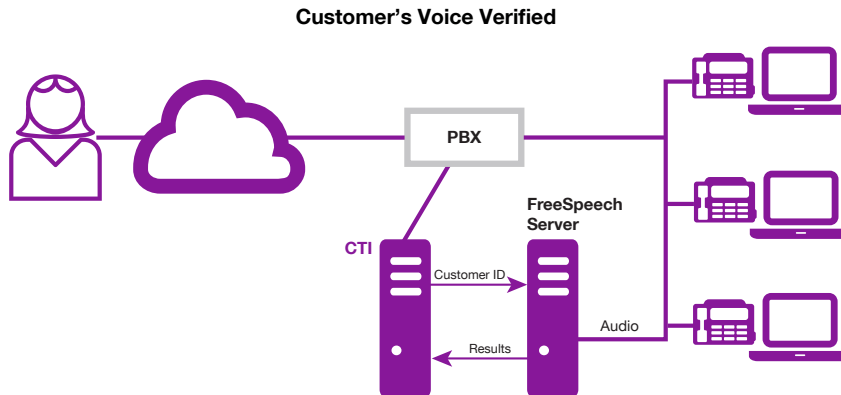
FreeSpeech's main component is called the Processing Server. It hosts the speaker verification engines, which perform algorithmic processing, control client services, and acquire audio through API calls.
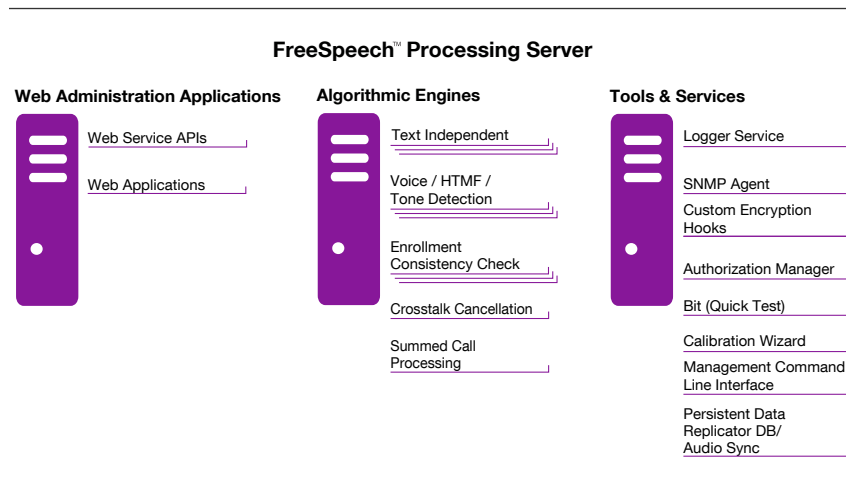
FreeSpeech™ System Components

Multiple servers can optionally be used in a redundancy scheme for high availability purposes or in a load-balancing scheme for scalability. The Processing Server also hosts the Web applications used by system adminis-trators, domain experts, helpdesk/contact center agents, etc. It is responsible for storing the system and voiceprint data in the database and file system. FreeSpeech supports the use of N synchronized databases for high availabil-ity using a dedicated service (the PDR).
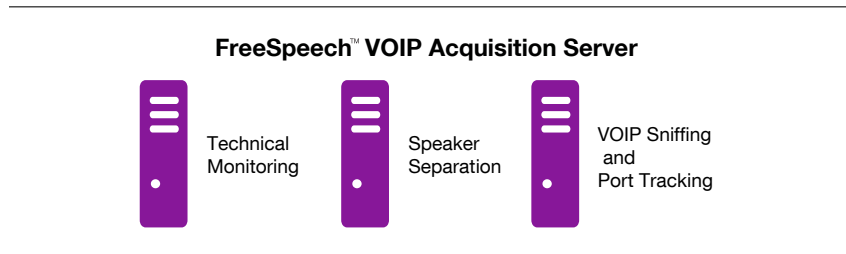
FreeSpeech™ Web Applications
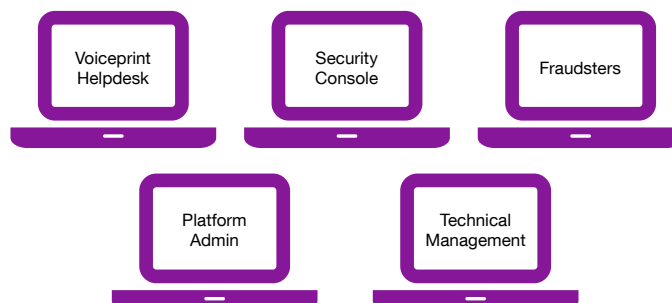
The FreeSpeech Audio Acquisition Server acquires audio for processing and streams it to the Processing Server. The Audio Acquisition Server can be one of two types:

FreeSpeech™ Processing Server

Web Administration Applications

Web Service APIs

Web Applications

Algorithmic Engines

Text Independent

Voice / HTMF /
Tone Detection

Enrollment
Consistency Check

Crosstalk Cancellation

Summed Call
Processing

Tools & Services

Logger Service

SNMP Agent

Custom Encryption
Hooks

Authorization Manager

Bit (Quick Test)

Calibration Wizard

Management Command
Line Interface

Persistent Data
Replicator DB/
Audio Sync

The Time Division Multiplexing Acquisition Server (TAS) or the VoIP Acquisition Server (VAS). The TAS is physically connected to the digital extensions and acquires audio directly from them. This solution is hardware based. The VAS acquires audio by sniffing VoIP (RTP) packets, which are directed to a designated extension or IP address (both static and dynamic) through a standard network card. This solution is software based.

FreeSpeech™ VOIP Acquisition Server

Technical
Monitoring

Speaker
Separation

VOIP Sniffing
and
Port Tracking

## Deployment and integration

Scalability
FreeSpeech scales up by utilizing multiple Processing Servers and Audio Acquisition Servers. The system's advanced Web-service APIs are con-text-aware, allowing the client applications to work with any Processing Server. Scalability is achieved using standard load-balancing tools, such as Microsoft NLB clustering service and hardware-based network load-balanc-ing solutions. Nuance's FreeSpeech was tested for stability and response times under extreme load conditions.

High Availability
Nuance's products are designed to deliver constant, stable, and reliable service, securing customer-facing applications. Through multiple Processing Servers, databases and Audio Acquisition Servers, FreeSpeech allows for a distributed architecture with no single point of failure, ensuring uninterrupted service. Configuration changes and voiceprint versioning mechanisms allow for system administration and upgrade with no disruption of service.

– **Database cluster** – FreeSpeech can operate in a database cluster architecture. This architecture is usually implemented at a single site and provides high availability by using at least two databases and highly reliable hardware and networks.

– **Multiple data repositories** – Each FreeSpeech Processing Server can work with n databases, optionally located in different sites. When the primary database is inaccessible, the Processing Server automatically switches to the secondary database in order to save the information. FreeSpeech includes a real-time synchronization module that synchronizes n databases.

– **Time Division Multiplexing Acquisition Server (TAS)** – Audio acquisition high availability for the Time Division Multiplexing Acquisition Server is achieved by doubling the quantity of servers and telephony hardware.

– **Voice Acquisition Server (VAS)** – Audio acquisition high availability for the Voice Acquisition Server is achieved through dynamic channel allocation or by multiplying the number of servers (when case static channel configuration is used).
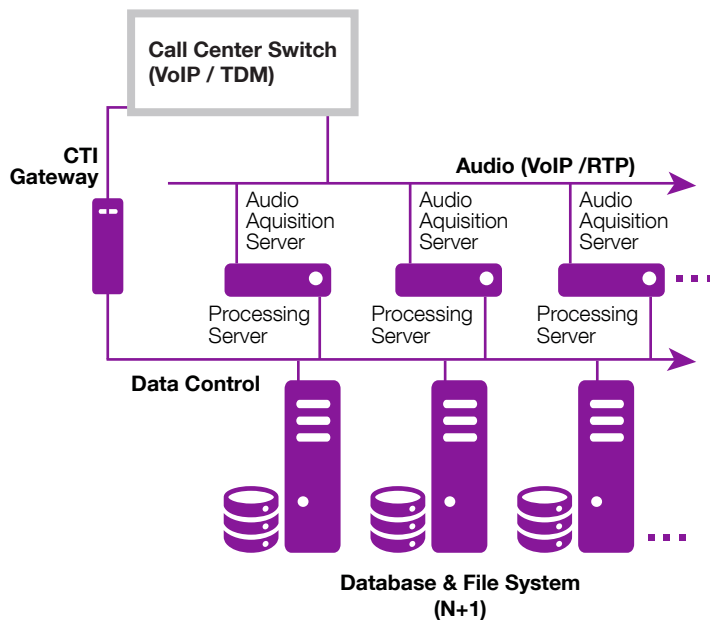

Multi-tenancy
FreeSpeech multi-tenancy capability allows for the logical partitioning of the entire system in a secure and effortless manner through the use of scopes. This allows for a clear-cut separation of the system's data, configuration, audit, roles, etc. within an organization, enabling a single enterprise to use FreeSpeech for multiple,distinct applications in different business units. Multitenancy is ideal for a hosted solution, enabling a service provider to offer FreeSpeech as a service for multiple enterprises. Regardless of which system tool is used or what API method is executed, all operations are performed in the context of a specific scope. Scopes are assigned to users by the system security administrator.

FreeSpeech Web Applications
– FreeSpeech's Platform Admin is a Web-based application that provides
  a variety of tools for properly setting up the system and its biometric
  functionality as well as managing speakers, voiceprints, and groups.
  Users can utilize this application to configure FreeSpeech, perform queries
  and reports, monitor system usage, and configure audio acquisition
  components.
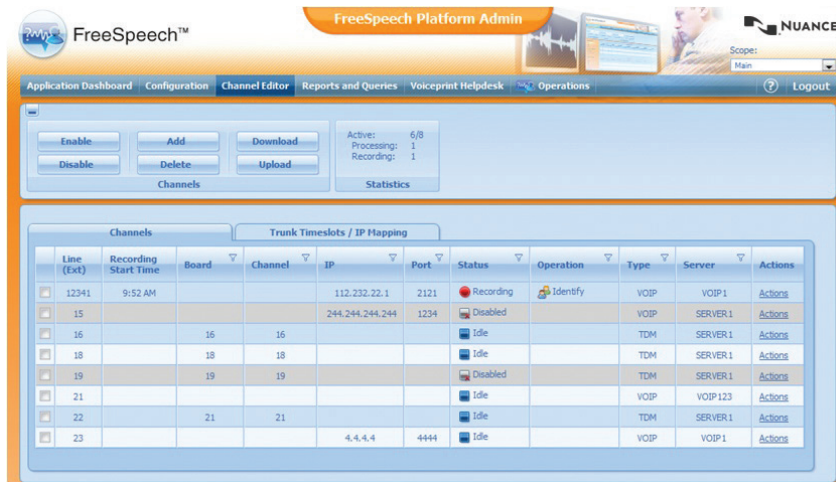
– FreeSpeech's Voiceprint Help Desk provides a set of tools that allow for the
  auditing and reviewing of a speaker's interactions with the system. Users
  can utilize help desk functions to audit verification results and decisions,
  edit speaker information, delete a speaker, edit a voiceprint, and more.
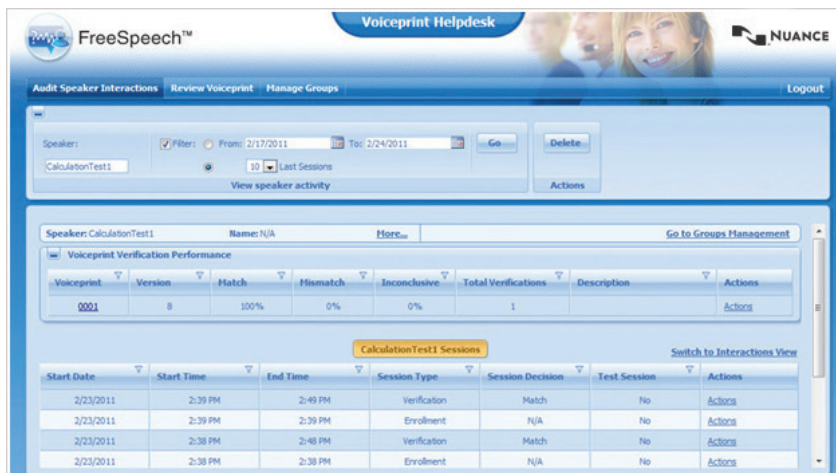
– FreeSpeech's Technical Management is an application enabling the
  technical personnel in charge of the system's health to monitor the status
  of FreeSpeech's system components, audit system-wide logs, schedule
  administrative tasks such as audio purging, upload and view system
  licenses, monitor current conversations, and more.

– FreeSpeech's Security Console is an application enabling security personnel to audit FreeSpeech operations and analyze specific verification and identification processes. The application provides tools for managing fraudsters' voiceprints and groups. In addition, Security Console collects and presents diversified security alerts.


– FreeSpeech Fraudsters application supplies all the tools needed in order to perform real-time fraudster detection when identity theft is attempted. Use the application to manage fraudster and watchlist entities, analyze suspicious audio segments, and compare them to known fraudster voiceprints. An extensive reporting mechanism is available for audit purposes.

Evaluation tools

Evaluation Studio
– Evaluation Studio is a revolutionary product that addresses the need to professionally plan, test, and analyze voice biometric systems and technologies. Nuance's Evaluation Studio is used for benchmarking various vendors' products; evaluating, piloting, and rolling out a selected product; or just researching voice biometrics technology and its underlying performance.
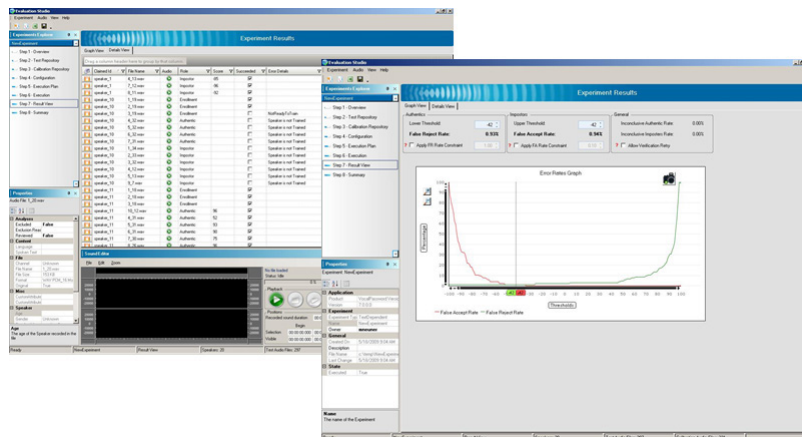
Technical Management Tools
– **QuickTest** – QuickTest is a simple application that invokes a predefined BIT (built-in-test), which includes a set of operations, simulating a complete voiceprint's life cycle.
– **SNMP Agent** – Each Processing Server has an SNMP agent service that handles SNMP get/set requests and sends SNMP traps when important system events occur. FreeSpeech monitoring can be easily added to standard SNMP-based consoles.
– **MCLI (Management Command-Line Interface)** – MCLI is an extensive set of command-line–based tools for immediate or batch system administration.
– **Calibration Wizard** – Calibration Wizard is a Windows application allowing for system calibration using customer-supplied audio files. Calibration is required to optimize system accuracy.
– **Performance Counters** – FreeSpeech utilizes Windows Performance Counters. These counters provide information as to how well the FreeSpeech system is performing. The counter data can help determine system bottlenecks and fine-tune application performance.

Interfaces
FreeSpeech uses an enhanced, open, and flexible Web-service API, ensuring smooth, platform-independent integration in any programming environment. The FreeSpeech API is context free, allowing the vast majority of operations to be concluded within a single Web method invocation.

– **FreeSpeech Server API** – FreeSpeech's Server Web-service methods are used by client applications to perform operational functions, such as enrollment, verification, identification, and voiceprint administration. Enrollment and verification audio can be supplied to FreeSpeech as part of an API call or to a previously recorded audio file as a URL.
– **FreeSpeech Manager API** – FreeSpeech Manager Web-service methods are used by the administration applications. The manager API allows for system-level operations, such as changing configurations and uploading licenses.
– **FreeSpeech Recorder API** – FreeSpeech Recorder Web-service methods are used by client applications to control telephony audio acquisition using the system's Audio Acquisition Server.
– **FreeSpeech Windows Operations** – FreeSpeech Windows Operations allow users to send audio files to FreeSpeech for processing in a straightforward manner. Available operations include enrollment, verification, and identification. For example, a user can select several audio files containing a speaker's voice from Windows Explorer and can create a voiceprint in FreeSpeech by selecting the "Enroll" option under the FreeSpeech item in the context menu. Alternatively, the user can select a folder containing hundreds of audio files and evaluate them against a stored voiceprint by initiating a "Verify" operation. Once an Explorer extension operation is selected, a corresponding pop-up message is displayed, prompting the user to enter required information. Operation status is reported back to the user as a message box in the Windows task bar. Verification and identification operations generate a result file that can be processed by standard tools such as Excel and Notepad.

"Innovations, such as Voice Biometrics, allow the bank to achieve excellent business performance," said Hua Min, CIO at China Merchants Bank (CMB).
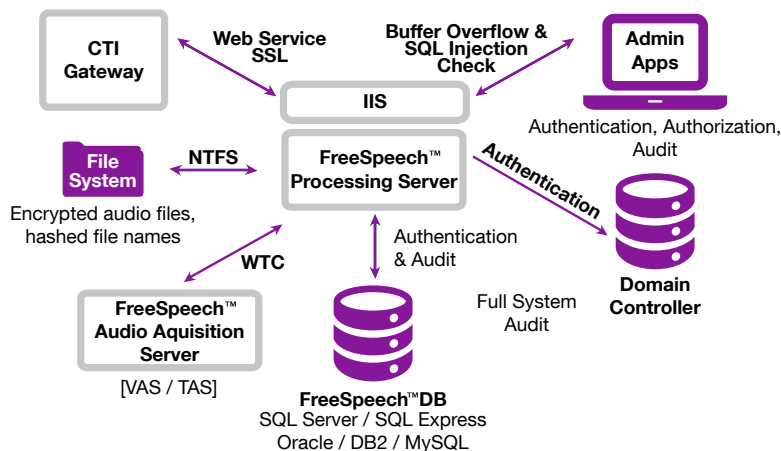
Security Features

FreeSpeech's security design and features are based on the Common Criteria Protection Profile for biometric systems and has successfully passed third-party security audits performed by customers. FreeSpeech ensures data and system protection by implementing the following security measures:

– **Role-based authorization** – Access to system applications, resources, and services is governed by roles that can be customized to meet specific security needs.
– **Database access** – Database access is protected by integrated Windows security or by using an encrypted username and password mechanism.
– **PII & audio encryption** – Personally identifiable information and Audio encryption is supported with FreeSpeech's built-in encryption mechanism, as well as with HSM (hardware security module) and custom encryption mechanisms.
– **Voiceprint security** – Voiceprints are stored in a proprietary format in the system's databases and cannot be reverse engineered. Voiceprint IDs are signed using a unique key and cannot be used outside the system or in other FreeSpeech systems.
– **Interface protection** – Access to the system service (API) is controlled using IIS6 or IIS7 security that supports SSL encryption All authentication schemes are supported: Integrated, Basic, Digest, and Certificates.
– **Audit and audit protection** – A full audit trail is stored in the system's database. All voiceprint usage and manipulation records are available and stored securely in the system.
– **Administration access control** – Administration and configuration applications utilize integrated security.
– **Input validation** –Input validation serves as protection against SQL injection, buffer overflow, and XSS attacks.

Intergrated Windows Security

CTI Gateway → **Web Service SSL** → **IIS**	**Buffer Overflow & SQL Injection Check** ← **Admin Apps**

File System → **NTFS** → **FreeSpeech™ Processing Server**

Encrypted audio files, hashed file names

Authentication, Authorization, Audit

Authentication → **Domain Controller**

FreeSpeech™ Audio Aquisition Server
[VAS / TAS]

WTC

Authentication & Audit

Full System Audit

FreeSpeech™DB
SQL Server / SQL Express
Oracle / DB2 / MySQL

Quality standard

FreeSpeech is developed by Nuance Communications, under a quality system certified as complying with ISO 9001:2008 by the international Standards Institution.

Minimum requirements

Recommended Hardware

Processor	2 X Quad Core CPU
Memory	4GB
Storage	20GB
Telephony Hardware	AI-Logix NGX
Supported PBX vendors	Alcatel, Aspect, AVAYA, Bosch (Tenovis), Cisco, EADS (Astra), Ericsson, eOn, Fujitsu (Tadiran), Harris, Inter-tel, LG, Mitel, NEC, NEC Neax, Nitsuko (now NEC), Nortel, Panasonic, Philips, Rockwell, Samsung, Siemens, Tadiran, Telrad, Toshiba

Software

Operating System	– Windows 2008 R2 – 64 bit Enterprise Edition & Standard Edition SP2 – Windows 7 – 64 bit Enterprise Edition & Professional Edition
Web Server	IIS7
Database	SQL Server 2005 & 2008, SQL Express, Oracle 11g with RAC support, DB2 9.5, MySQL 5.5
Browser	Explorer 8.0 and up, Google Chrome 25.0 and up, Mozilla Firefox 3.5 and up

Selected specification

Minimum VoicePrint Audio	30 seconds net audio, 2 sessions
Audio Format	8 bit Alaw, 8bit Ulaw, 8/16bit Linear, Custom (via audio CODEC plug-in)
VoicePrint Size	1K-50K
Mgmt. Protocol	SNMP V2
API	SOAP (XML/HTTP), HTTP (Get/Post)

Awards
FreeSpeech –
Best Implementation Awards

Speech Technology Magazine 2009 Implementation Award (First Direct Bank / Leumi Group)

About Nuance Voice Biometrics
Nuance is the global leader in voice biometric solutions, with over 30 million enrolled voiceprints and a global customer base that spans all major industries. Nuance has developed over the last 12 years unrivaled experience in delivering successful voice biometric solutions that enable organizations to improve customer satisfaction reduce costs and improve security. For more information about Nuance's Voice Biometrics solutions, please visit our Web site at **Nuance Voice Biometrics**.

About Nuance Communications, Inc.
Nuance Communications is reinventing the relationship between people and technology. Through its voice and language offerings, the company is creating a more human conversation with the many systems, devices, electronics, apps and services around us. Every day, millions of people and thousands of businesses experience Nuance through intelligent systems that can listen, understand, learn and adapt to your life and your work. For more information, please visit nuance.com.