

AGNITIO

Currently deployed field proven Biometric Speaker Identification and Verification Technology.



TeleStrategies'

ISS World Europe

Intelligence Support Systems for Lawful Interception,
Criminal Investigations and Intelligence Gathering

1-3 OCTOBER 2008 • PRAGUE, CZ

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Products' Overview

AGNITIO

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October 2008

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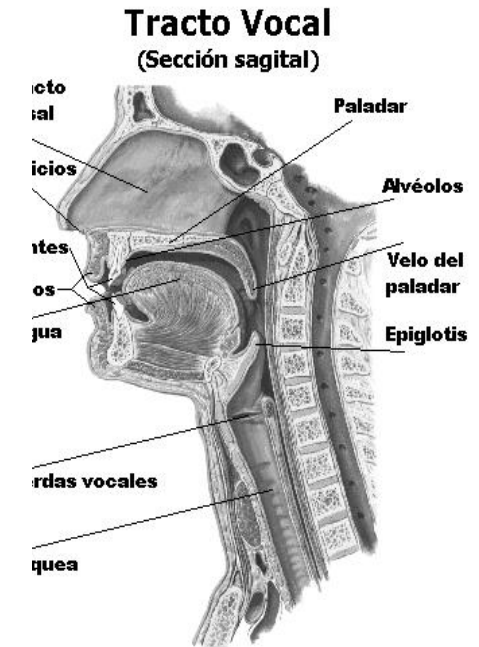
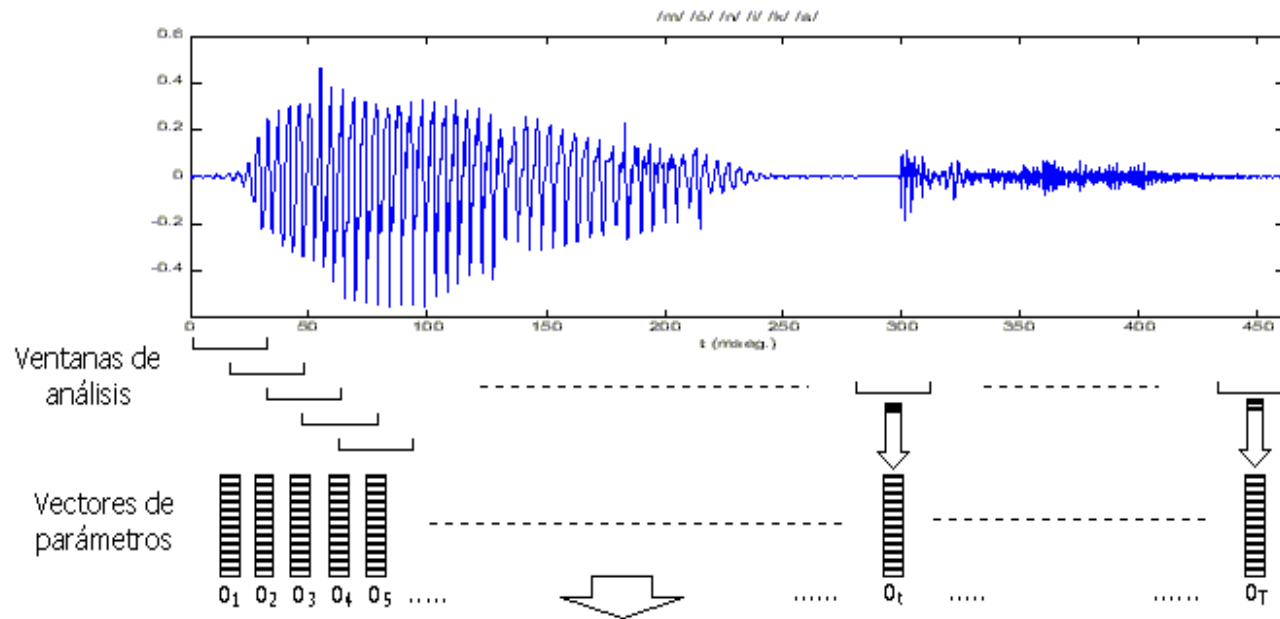
Voice Biometrics: Key Technology for Security

- Use of voice evidence in court.
- Identification of unknown intercepted voices
- Intelligence and crime prevention using phone conversations monitoring.
- Protection against Identity fraud



What is Voice Biometrics?

Extraction of unique characteristics of vocal tract, from voice sound waves.



What is in the voice?

▪ Information layer:

- What the person is saying. The content of the speech.
- Can be automatically obtained using classical speech recognition technologies.

▪ Behavioral layer:

- How do you say it? Your accent, your emotions, your culture, your country (language), the context...
- This is the level used by impersonators, and the level the brain mainly uses to identify a person (and obtain additional information)

THE BIOMETRIC LAYER:

Physical information embedded into voice waves coming from your vocal tract.

Not modified by your emotional state, the language you use, etc..

How Voice Biometrics works?

▪ Voice model (aka as "voice print")

- Using a minimum of 40 seconds of net speech, a voice model is created for each individual.
- Contains information related to vocal tract characteristics. Unique and independent of language and text.

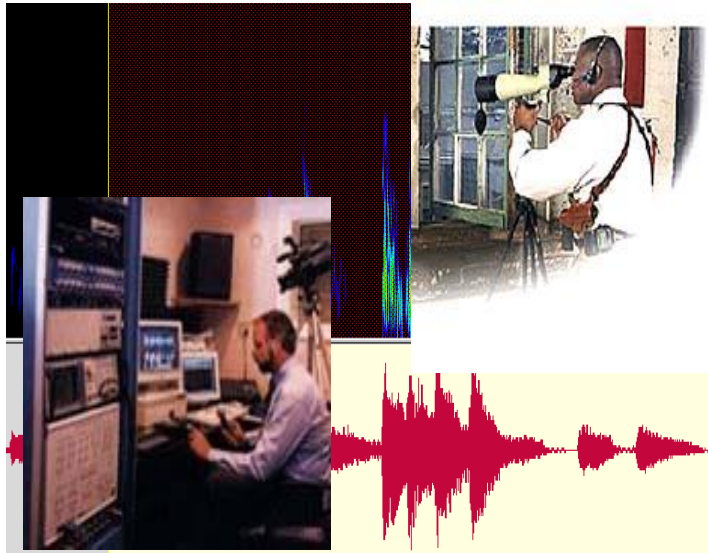
▪ Scoring or "voice match"

- Using a minimum of 7 seconds of net speech, we compare the utterance with the model and obtain a "score": The higher the score the more probable it is that the unknown voice belongs to the same person.

▪ Results

- Depending on the application, different techniques are used to "normalize" the scores (set a scale common to all individuals and channels) and set thresholds to make a decision.

Voice Biometrics: Key Competitive Advantages



Driver: Increasing international terrorism and crime using different types of phones, the Internet, and in multiple languages.

Voice is the only biometric characteristic obtained remotely

It is already available in abundance. Includes valuable information besides biometric information

Easy to integrate in existing infrastructure: Telephone networks, VoIP, etc..

Agnitio's Unique Approach

Text Independent

- Voice match is done independently of what the person is saying

Cross Language capabilities

- Voice print can be obtained in one language, and matched with voice sample in another language

Works with any voice channel

- Microphone, land line telephone, cellular phones, VoIP,..

Proven in the most demanding environments.

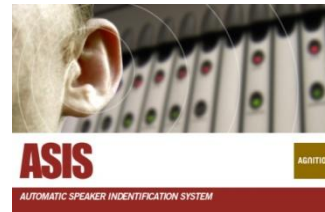
- Forensic Labs, Law enforcement, Intelligence.

Agnitio: Pioneering Products for Voice HLS Applications

Present Voice
Evidence in court



Identification of
unknown voice during
police investigation



Speaker spotting to
filter mass phone
interceptions.



1. Forensic Evidence in Court Hearings

MARKET NEED

Intercepted phone conversations are used as evidence in court. Experts are required to perform Speaker Verification

PROBLEM

Forensic Labs relying only on Phonetic and Linguistic techniques have limitations: Impossible to handle unknown languages, difficult to handle great number of calls, etc...

SOLUTION



Tool for biometric voice verification designed for Forensic Experts. It provides the precision and reliability required in court hearings

Speaker ID in Forensics

■ **Classical Approach: Linguistic/phonetics**

- An expert in languages and phonetics compares both voice samples (Suspect and unknown)

■ **Semiautomatic**

- Using computer voice analysis programs, sonograms, formants and other technical information are compared.

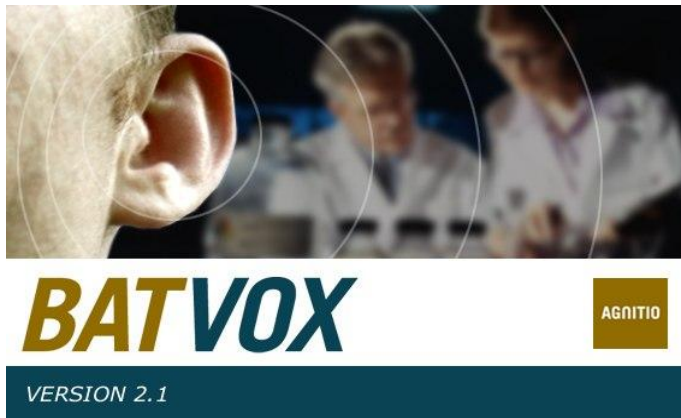
■ **Voice Biometrics**

- Computer generates voice print, unique to speaker's physical vocal tract.
- Computer compares suspect and unknown voice samples and provides a matching score.

'Added Value' of Voice Biometrics in Forensics

- **Speaker ID verification using physical characteristics of the vocal tract, instead of the way the person speaks**
 - Vocal tract "leaves" unique features in voice sound waves.
- **Voice Biometrics adds new and relevant information to classical techniques.**
 - Depending on the case (Language, unique phonetic features, ..) it is more or less relevant.

BATVOX: Pioneering Product for Forensic Laboratories



▪ Entry Product

- Widely used in Europe, Latin America and Asia
- First working system in Spanish Police (Identivox 2000)
- Expert reports presented in many courts globally

Dr. Künzel (Univ. Marburg, Germany) formerly the key expert of the German Federal Police. One of the most respected specialists worldwide.

- *"I have been using the BATVOX automatic system ...in more than 100 cases, ranging from 1 to 3400 individual voice comparisons... Looking back from today I must say that without the help of the system I would have had to decline most of the cases, especially when they involved languages unknown to me like Albanese or Turkish.."*

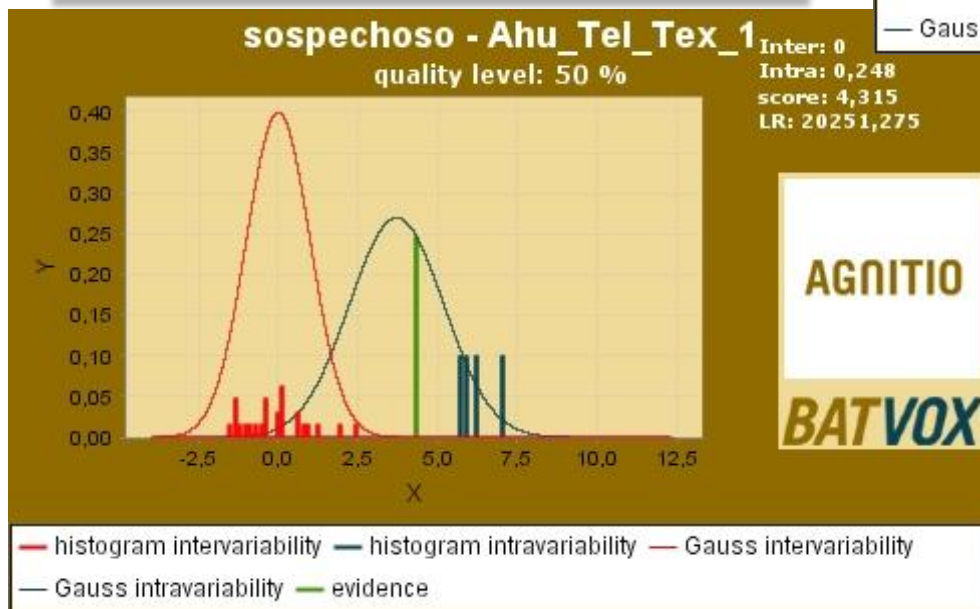
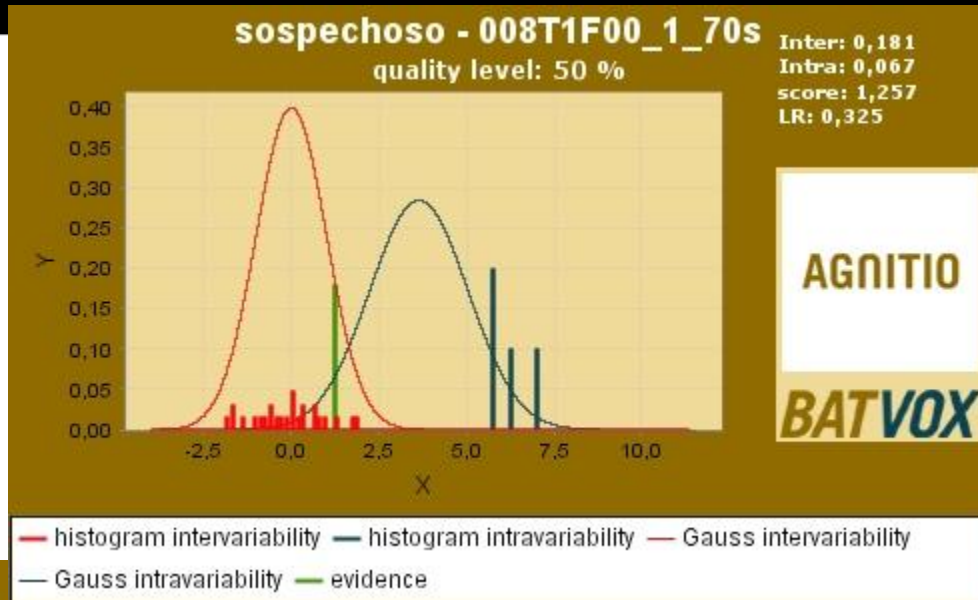
BATVOX

AGNITIO

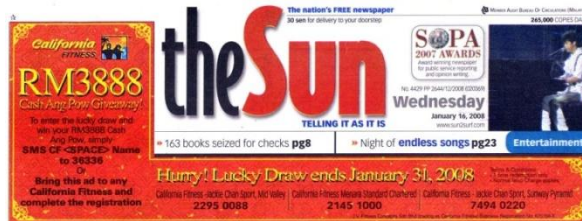
BATVOX reduces learning curve, guiding the new user with a wizard, qualifying results and helping interpretation of data

✓BATVOX provides the expert Likelihood Rate (LR) results

✓LR is the 'state-of-the-art' metric to measure evidence strength in court hearings



Success Story: Combating Corruption



WHAT THE ROYAL COMMISSION OF INQUIRY ON THE LINGAM VIDEO CLIP HEARD YESTERDAY:

'It was Ahmad Fairuz'

Yes, he did mention, it was Datuk Ahmad Fairuz. In fact, I didn't know anybody, he (Lingam) had given me the answer that he is the chief justice of Malaysia.

Based on the findings and analysis conducted on the video file, the digital forensics lab strongly believed that the video file is authentic and not tampered as the video frames were found consistent.

if you compare the copies, one version (the Anti-Corruption Agency's) does not have the highlighted part.

But Council representative Sangeetha Singh is drawing the commission's attention to a possible discrepancy between their transcript and the ACA's.

- **Prominent lawyer in Malaysia was taped brokering the appointment of top Judges**
- **Video posted on YouTube created a turmoil in Malaysian politics**

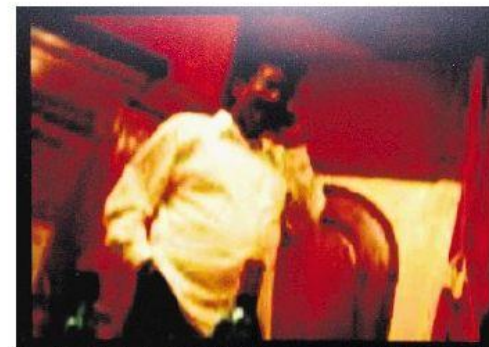
NST Online » Local News

2008/01/14

Spanish experts make a voice match

By : V. Anbalagan

Email to friend



The video clip showing Datuk V.K. Lingam purportedly talking to a senior judge on judicial appointments.

KUALA LUMPUR: Laboratory tests in Spain have proven that the voice on the so-called Lingam video clip matched that of lawyer Datuk V.K. Lingam.



Malaysian Anti Corruption Agency used AGNITIO's products and support to verify the voice identity, and present evidence in court

Success Story: Combating International Organized Crime

- **Albanian Gang acting in Germany committed identity fraud through the telephone.**
 - Affecting more than 800 German elder citizens
- **German police recorded more than 3,000 phone conversations both among the gang members themselves, and of gang members swindling their victims.**
 - Conversations were in German, English, Albanian and Sinto. Some of the gang members spoke three different languages in various taped conversations.

German Forensic Experts verified the identity of the gang members involved in the crime using AGNITIO's products, with 4 of the defendants pleading guilty after hearing the Forensic Audio evidence.

What's next?: 1: N Identification Capabilities



2. Law Enforcement: Criminal Identification using Voice

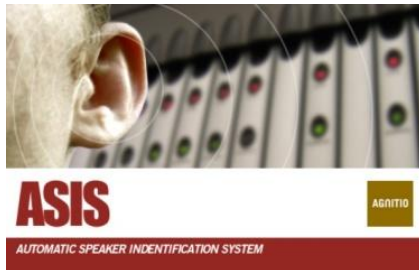
MARKET NEED

Police obtains voice from unknown person involved in crime. (Bomb threat, lawful phone interception, terrorist video). Identification is needed

PROBLEM

Police have a large amount of voices captured but identification was not possible. Traditional methods not suitable for large voice database searches. Sometimes voice is the only available personal characteristic of a criminal

SOLUTION



Tool for unknown speaker identification using voice biometrics. Automatic biometric search easy to perform with basic training

ASIS: Voice Biometric Database for Law Enforcement

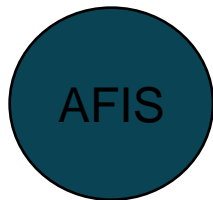
- AGNITIO follows the success of other proven biometric technologies



ASIS

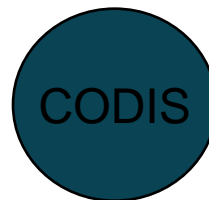
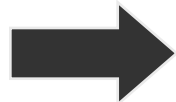
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AUTOMATIC SPEAKER IDENTIFICATION SYSTEM



Fingerprint databases

- \$500M/yr market
- 25% Annual Growth
- Almost every country



DNA databases

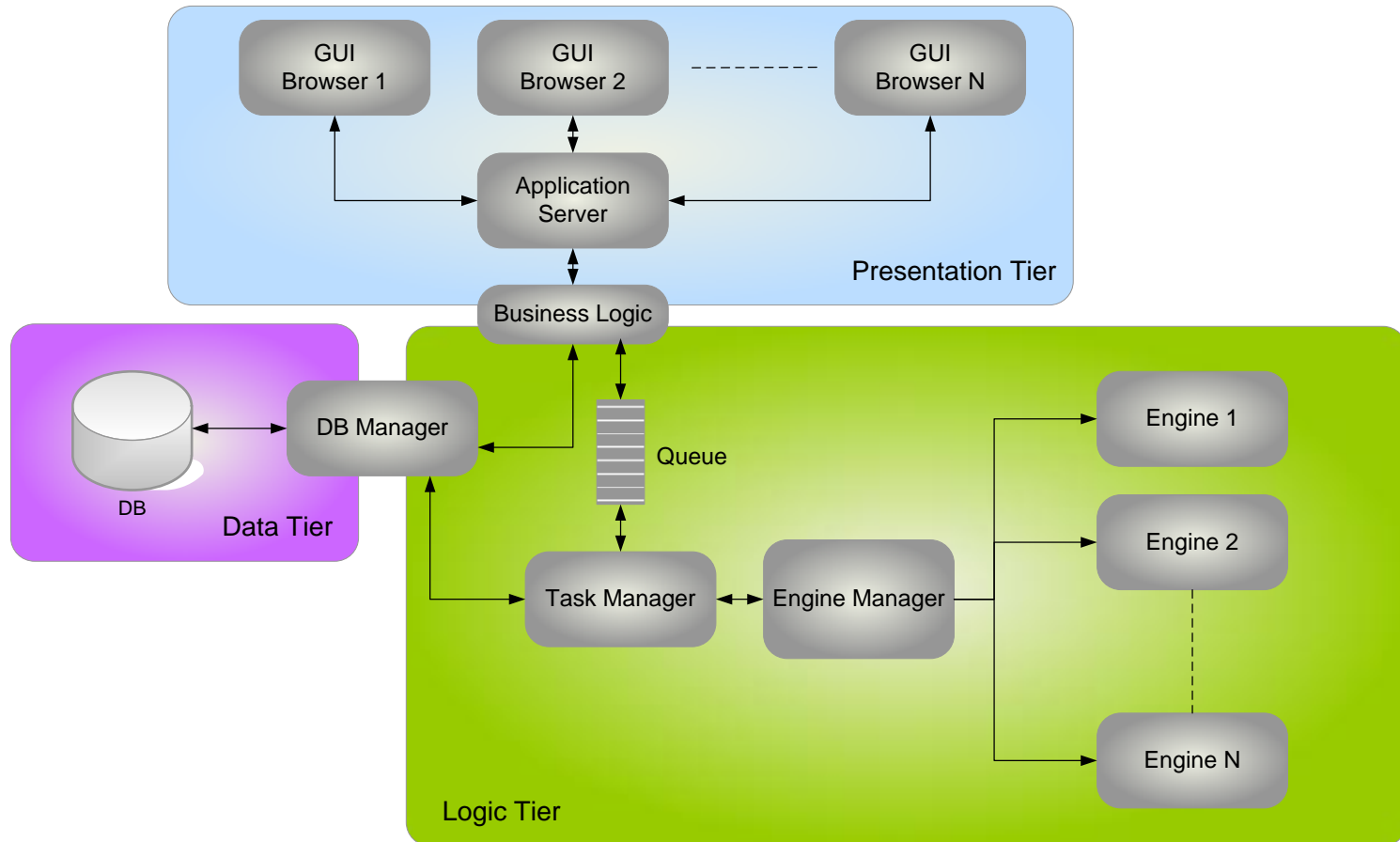
- \$130M/yr in US only
- Deployed in 25 countries



Voice Databases

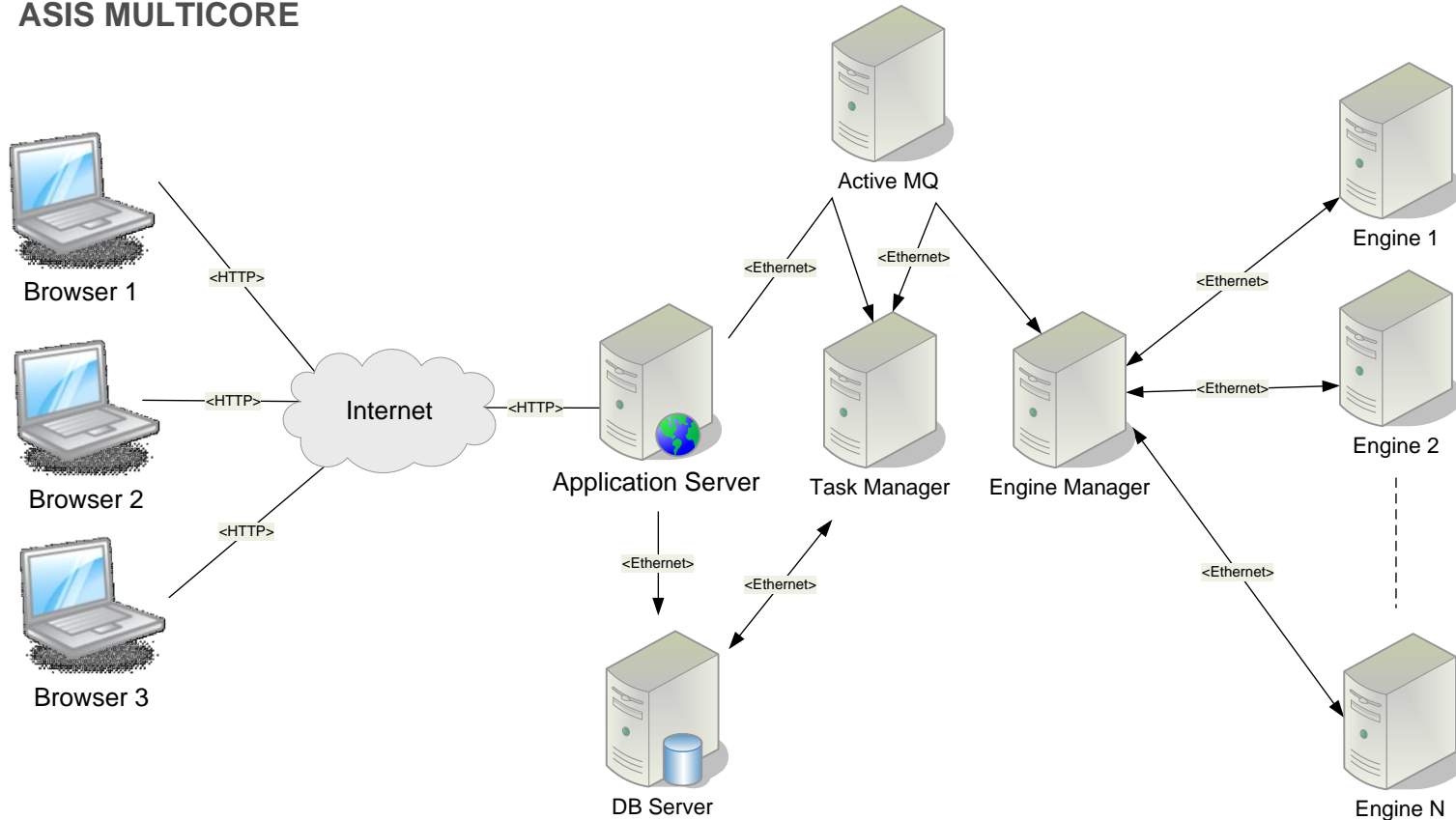
- Deployed in 3 customers, 4 more pending this year.
- In the following years 20-40 countries will deploy ASIS

ASIS: Modular and scalable



ASIS: Modular and scalable

ASIS MULTICORE



SPEED

- From 1,000 up to 100,000 voice models per minute.

Maximum capacity

- From 50,000 up to 200,000 voices stored (*Without performance degradation*)
- From 5 up to 1,000 simultaneous connections.

Hardware/OS

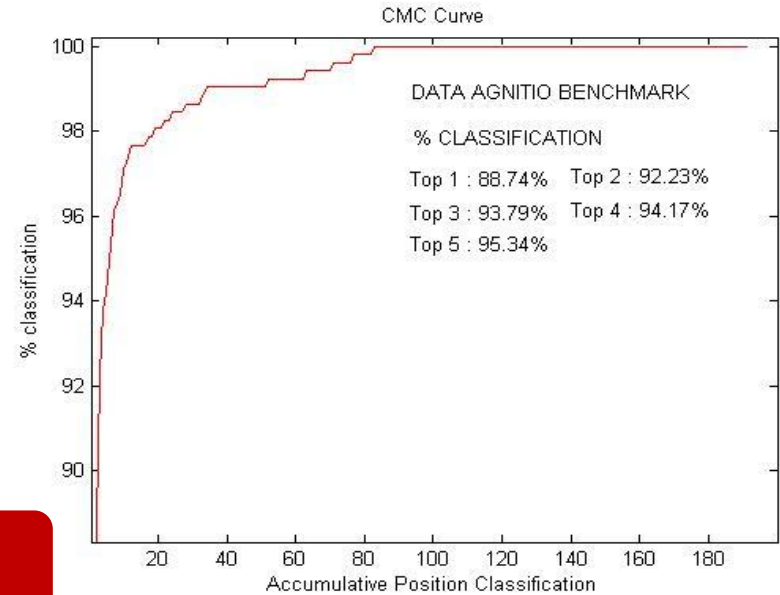
- Optimized for HP and Linux Suse
 - Engines: Proliant DL320 with Xeon Quad cores
 - Task Manager: Integrity 3600 with Itanium Dual core.

ASIS Performance: CMC

How to measure performance on 1:N systems?

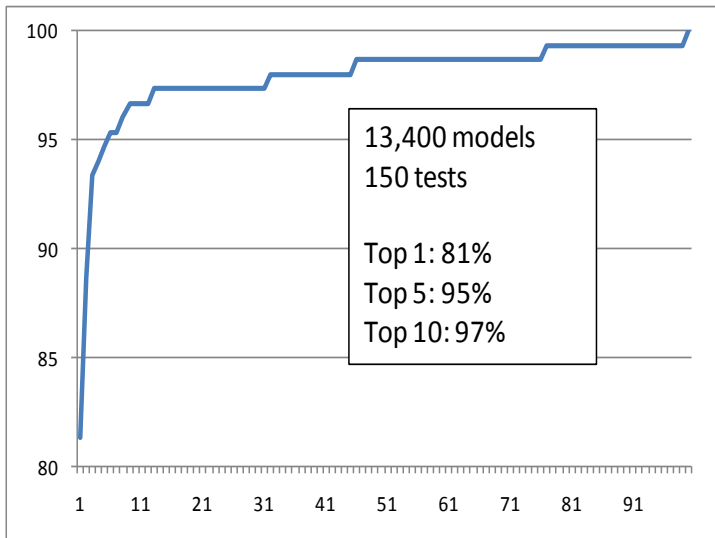
CMC: Cumulative Matching Characteristic

Probability of your target being among the first N candidates



AGNITIO's forensic bench test Database.

Customers are Starting to Test ... and to Use it...



A Latin American security organization. The largest 1-n voice test performed until now. Almost 15,000 voices and more than 1.2M trials

Top N in the list	Probability
Top 1	72%
Top 3	93%
Top 5	96%

An European police organization. Test with real forensic audios. Smaller database.

	BATVOX	ASIS
Precision	Maximum accuracy in a 1:1 verification	Obtain a list of candidate. The verification can then be refined in a forensic laboratory
Errors	Minimize false positives	Minimize false negatives
Usability	For experts with an important background in forensics	For operatives with no background in audio and biometrics
Speed	Not critical	Critical: thousands of identifications per minute

ASIS: Voice Identification

- **Launched from any authorized terminal, and user**
 - Minimum 7 seconds of speech
 - Search can be guided (over a subset) or general
- **Results**
 - Best N candidates, with scoring and a colour code, are shown to the user
 - If user is authorized, original voice can be heard
 - There is a link to the Criminal Information Database , connected to other biometric systems

3. INTELLIGENCE: Speaker Spotting

MARKET NEED

Intelligence organizations do passive interceptions that need to be filtered and classified. A key advantage is to filter by key target speakers

PROBLEM

Traditional methods are not useful for this kind of real time massive task. Speed, performance and fully automatic implementation is required

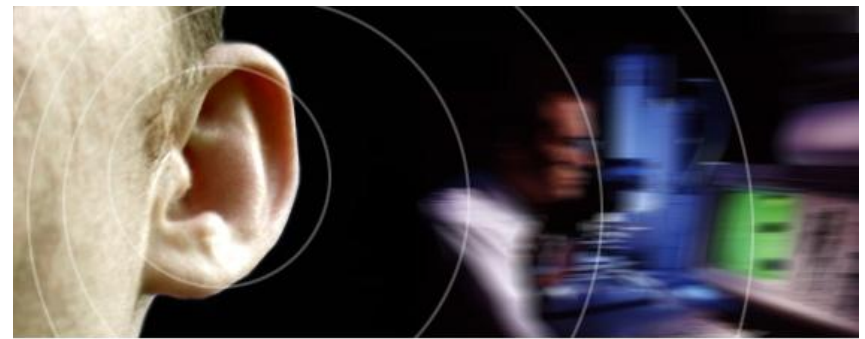
SOLUTION



Tool for biometric speaker spotting. To be integrated into passive interception systems. Detects when specific target speakers are involved in a conversation

BS3: Key filtering tool for Intelligence Agencies

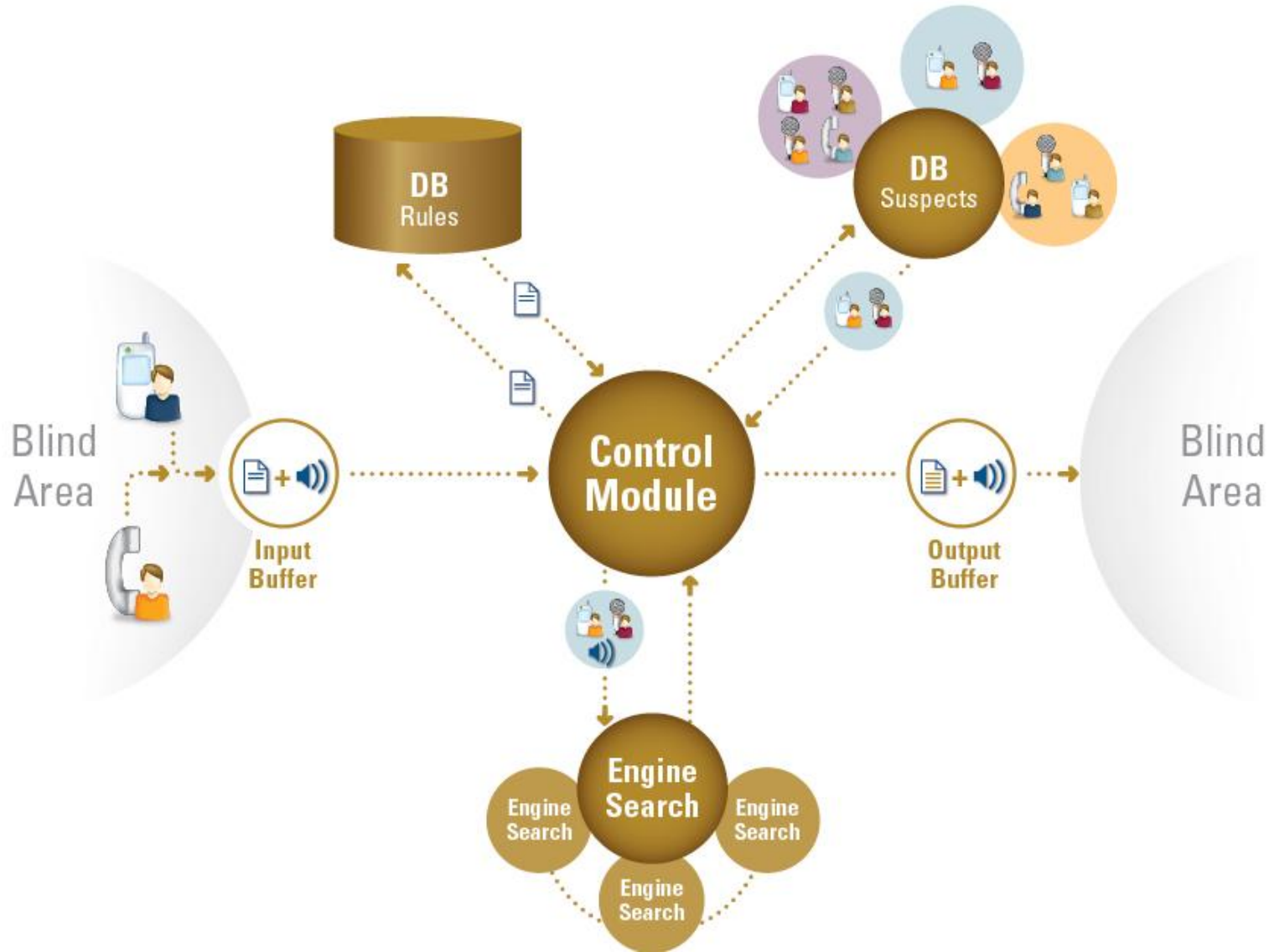
- **SPEAKER DETECTION IN MASS TELEPHONE INTERCEPTIONS**
 - Spot a particular speaker in a continuous flow of telephone conversations
 - Complement 'Keyword' spotting and other 'Artificial Intelligence' filtering systems.

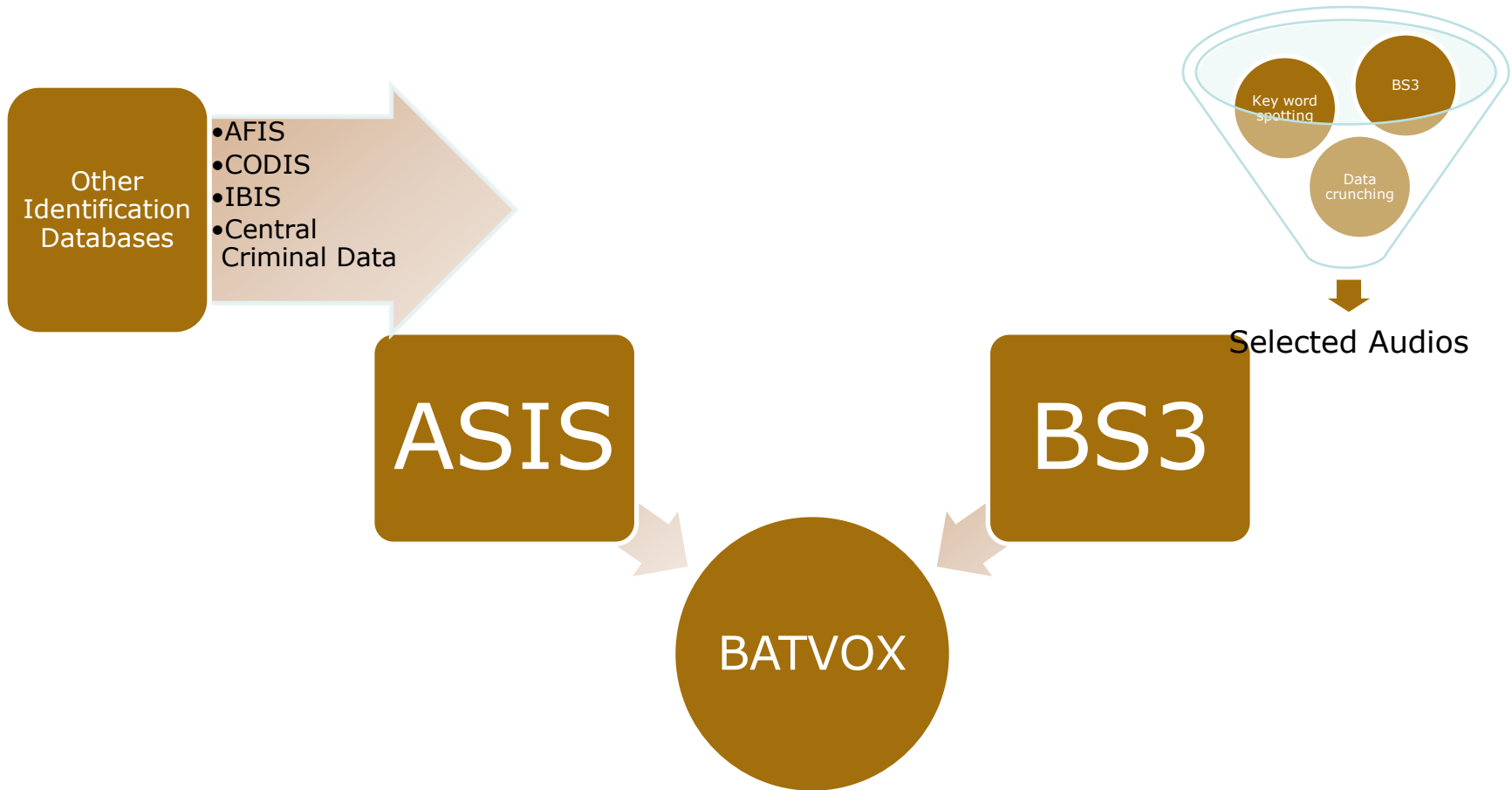


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BIOMETRIC SPEAKER SPOTTING SYSTEM

BS3 drastically reduces time spent scanning voice in mass voice interception systems.





	BATVOX	ASIS	BS3
Precision	Maximum accuracy in a 1:1 verification	Obtain a list of candidate. The verification can then be refined in a forensic laboratory	Obtain a list of candidates calls where the target is speaking.
Errors	Minimize false positives	Minimize false negatives	Minimize false negatives
Usability	For experts with an important background in forensics	For operatives with no background in audio and biometrics	For Intelligence Agencies doing criminal prevention.
Speed	Not critical	Critical: thousands of identifications per minute	Critical: Several calls per minute.

AGNITIO

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**Thanks for
your attention.**

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