

Cognitec provides FaceVACS technology licensing through use-case and platform-specific software development kits. The biometric functionality includes enrollment, verification, identification, and face image quality assessment. Facial recognition works with 2D and 3D data. A set of tools and the documentation allow for efficient development; re-deployment requires a small set of binary libraries.

### FaceVACS® technology

#### Based on the latest and best FaceVACS® technology

- incorporates B9, A15 (2D) and B6L5 (2D/3D) engines
- incorporates face tracking
- incorporates portrait characteristics algorithms face image quality assessment and compliance to ICAO/ISO 19794-5

#### Engine is robust against

- typical gesture changes
- pose (+/- 15° deviation from frontal image)
- partial face occlusion

- beard and hairstyle changes
- glasses (except reflecting sunglasses)
- lighting changes that do not cause strong shadows

#### Minimal image requirements for facial recognition

- sharp image
- inter-pupil spacing larger than 32 pixels
- at least 64 grayscales within the face area

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### Option for using intensity and shape data

#### 3D capabilities

- requires intensity and shape data (FRGC-3D format, Cognitec proprietary binary format)
- fusion intensity and shape data scores
- spike and hole detection
- filtering
- smoothing
- facial shape alignment

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### Portrait characteristics module

#### Portrait characteristics

- eye detection at predefined confidence levels
- sharpness estimation
- glasses detection
- tinted glasses detection
- exposure estimation
- closed eyes detection
- closed mouth detection
- head size and position detection
- rotation, cropping, downscaling to fit ISO 19794-5 Token Face and Full Frontal Image types
- unnatural skin tone detection
- red eye detection
- gender detection
- uniform background detection
- gaze away detection

- detection of reflections and hot spots on faces and glasses
- ethnicity detection
- age estimation
- format information extraction (e.g., color coding scheme)

#### Intensity image format support

grayscale and color image support

Reads formats:

- ISO 19794-5, JPEG, JPEG-LS, JPEG-2000, PGM, PNG, BMP

Writes formats:

- JPEG (configurable quality or predefined memory space)
- PGM, BMP
- ISO 19794-5 (configurable image type, image quality or predefined memory space)

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### Encoding module

- generates Facial Identification Records (i.e. templates) of facial biometric traits
- uses multiple facial images of one person to generate a combined template

### Face tracker module

- allows tracking of faces using an input video stream
- determines face tracks based on temporal and spatial neighborhood
- generate unique tracking IDs and delivers subsequent face locations

### Verification module

- 1:1 match of biometric trait evidence against one template created by the encoding module
- configurable score threshold
- threshold can be estimated based on targeted FAR/FRR rates and vice versa

### Identification module

- 1:many match of biometric trait evidence against a set of templates created by the encoding module
- returns a list of references to the templates ordered by score
- size of the returned match list can be limited

### BioAPI 2.0 support

fully compliant BioAPI 2.0 (ISO 19784-1:2006) implementation of a **Verification Engine BSP**:

- functions: Load/ Unload, Attach/Detach, Query, Get/Free, BirHandle, Get Header, Create Template, Process, Verify Match
- BIR opaque data format is CBEFF compliant/ISO 19794-5 compliant

### Biometric evaluation kit

- suite of tools to perform biometric evaluations on facial data residing in SQL databases (Windows only) or files (Windows and Linux)
- generation of identification match lists
- generation of similarity matrix data
- base for calculating CMC or ROC curves

### API bindings

- functionality available through multiple programming languages and software development environments
- concepts and API's are, where possible, homogenous among the different programming languages, allows for easy switching to other environments

#### C++ API

- object oriented API using advanced software patterns and idioms
- example source code and compiled binaries

#### JAVA API

- example source code and compiled examples

#### .NET API

- accessible through Visual Basic, C# and Jscript programming languages on Windows platforms
- example source code in C# and compiled binaries

#### C API

- C language covered by BioAPI implementation
- verification engine BSP

#### Redistribution

component-based redistribution possible

### Licensing

licenses can be granted for the following components, with any combination possible

#### Portrait characteristics module

determines photo-ID card relevant characteristics and performs tests following ISO 19794-5 requirements

#### Face and eye finding module

acquires faces on images and return the eye positions

#### Tracking module

tracks faces on video streams

#### Encoding module

- determines biometric sample quality to check suitability for comparison
- generates and stores biometric template from a given annotated image

#### Verification module

verifies an image and template

#### Identification module

- compares an image with set of templates
- additional parameter: size of reference template set

### Documentation

- detailed manual including API reference and user guide
- API documentation is aligned to specifically supported programming languages, like java doc for java API
- fully documented examples illustrating the main use cases and providing hints on how to create customized implementations
- manual, guides and tutorials are provided in PDF and HTML formats

## Platforms

### Windows I686

Development host/proposed hardware	Core 2 Duo CPU @ 2 GHz, 4 GB RAM, 4 GB free disk space
Development host/operating system	Windows 7 on x86 32 bit and 64 bit architectures ; Windows Server 2012 R2; Windows 8 on x86 64 bit architecture
Development host/development tools	MS Visual Studio 2010, 2012, 2013 (MSC 10.0, 11.0, 12.0)
Programming languages and APIs	C++, .Net, JAVA, BioAPI Verification Engine BSP (C -API)
Target host/minimum hardware requirements	P4 or similar @ 1.6GHz, 1GB RAM, 1 GB free disk space
Target host/operating system	same as development host
Target host/computing performance	for Intel Core -3770 CPU @ 3.40GHz, single threaded: 206.000 template comparisons per second (B9), generates 8.5 templates per second (B9T8)
Available functionality and algorithm versions	<ul style="list-style-type: none"> <li>▪ face finding: T8, face tracking: R2</li> <li>▪ portrait characteristics: P1</li> <li>▪ enrollment, verification, identification: B9, A15, B6L5(3D)</li> <li>▪ quality assessment and ISO test on multiple images</li> </ul>

### Linux I686

Development host/proposed hardware	Core 2 Duo CPU @ 2 GHz, 4 GB RAM, 4 GB free disk space
Development host/operating system	Linux on x86 32bit and 64bit architectures
Development host/development tools	GCC 4.6 (Note: forward compatible ABI available since GCC 3.4.0, consult "ABI Policy and Guidelines" of the GCC documentation)
Programming languages and APIs	C++, JAVA, BioAPI Verification Engine BSP (C -API)
Target host/minimum hardware requirements	P4 or similar @ 1.6GHz, 1GB RAM, 1 GB free disk space
Target host/operating system	same as development host
Target host/computing performance	for Intel Core -3770 CPU @ 3.40GHz, single threaded: 206.000 template comparisons per second (B9), generates 8.5 templates per second (B9T8)
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### Android

Development host/proposed hardware	Core 2 Duo CPU @ 2 GHz, 4 GB RAM, 4 GB free disk space
Development host/operating system	all operating systems supported by Android SDK
Development host/development tools	Android SDK with API 2.3 and higher (most recent recommended); Android NDK 9d (C++ development)
Programming languages and APIs	JAVA, C++, BioAPI Verification Engine BSP (C -API)
Target host/minimum hardware requirements	ARMv5 or ARMv7a @ 1 GHz RAM 1024 Mbytes (B9) or 512 Mbytes (A15)
Target host/operating system	Android 2.3 (API Level 9) or higher on devices with ARM processors
Target host/computing performance	for Tegra 3 (Cortex A9-based) @ 1.3 GHz: <ul style="list-style-type: none"> <li>▪ 10000 template comparisons per second (B7); B9 TBD</li> <li>▪ 1.35 seconds per template (B7T8); B9 TBD</li> </ul>
Available functionality and algorithm versions	<ul style="list-style-type: none"> <li>▪ face finding: T8, face tracking: R2</li> <li>▪ portrait characteristics: P1</li> <li>▪ enrollment, verification, identification: B9, A15</li> </ul>

**OS X**

Development host/hardware requirements	Intel compatible Mac
Development host/operating system	OS X Mavericks 10.9.4 or newer
Development host/development tools	XCode 6.0.1 or newer
Programming languages and APIs	C++, BioAPI Verification Engine BSP (C -API)
Target host/minimum hardware requirements	as for other desktop platforms
Target host/operating system	OS X "Lion" 10.7 or newer
Available functionality and algorithm versions	<ul style="list-style-type: none"> <li>▪ face finding: T8, face tracking: R2</li> <li>▪ portrait characteristics: P1</li> <li>▪ enrollment, verification, identification: B9, A15</li> </ul>

**iOS**

Development host/hardware requirements	Intel compatible Mac
Development host/operating system	OS X Mountain Lion 10.8.4, OS X Mavericks 10.9.x or newer
Development host/development tools	XCode 5.1.x or newer
Programming languages and APIs	C++
Target host/minimum hardware requirements	<ul style="list-style-type: none"> <li>▪ armv7, armv7s or arm64 architecture</li> <li>▪ RAM 1024 Mbytes (B9) or 512 Mbytes (A15)</li> </ul>
Target host/operating system	iOS 6.1 or higher
Available functionality and algorithm versions	<ul style="list-style-type: none"> <li>▪ face finding: T8, face tracking: R2</li> <li>▪ portrait characteristics: P1</li> <li>▪ enrollment, verification, identification: B9, A15</li> </ul>

**Biometric template**

- single intensity image enrollment template size: 1142Bytes (A15), 4461Bytes (B9)
- shape and intensity single image enrollment template size: 9505 Bytes (B6L5)

**Remote activation**

- via SafeNet HASP HL dongles
- Windows 2008 Server, Windows Vista SP1, Windows 7 (32 and 64 bit), Windows 2012 Server, Windows 8 (64 bit)
- on SLES 10 SP1, RHEL 5 SP1, Ubuntu Desktop 8.04/ 8.10 (32/64 bit)