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VeinID

An Introduction to Finger Vein Authentication Technology

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1. Generalities of Biometrics

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A large variety of application requires biometric authentication

	Private Sector	Public Sector	
Logical access	**Financial transaction**	**Confidential or Privacy Information**	**Social safety**
 IT security	 ATMs	 IT system	 Criminal Investigation
Physical access	**Personal fortune**	**Valuable things or Critical infrastructure**	**National Security**
 Door control	 condominium	 Building	 Border control

Biometric Authentication

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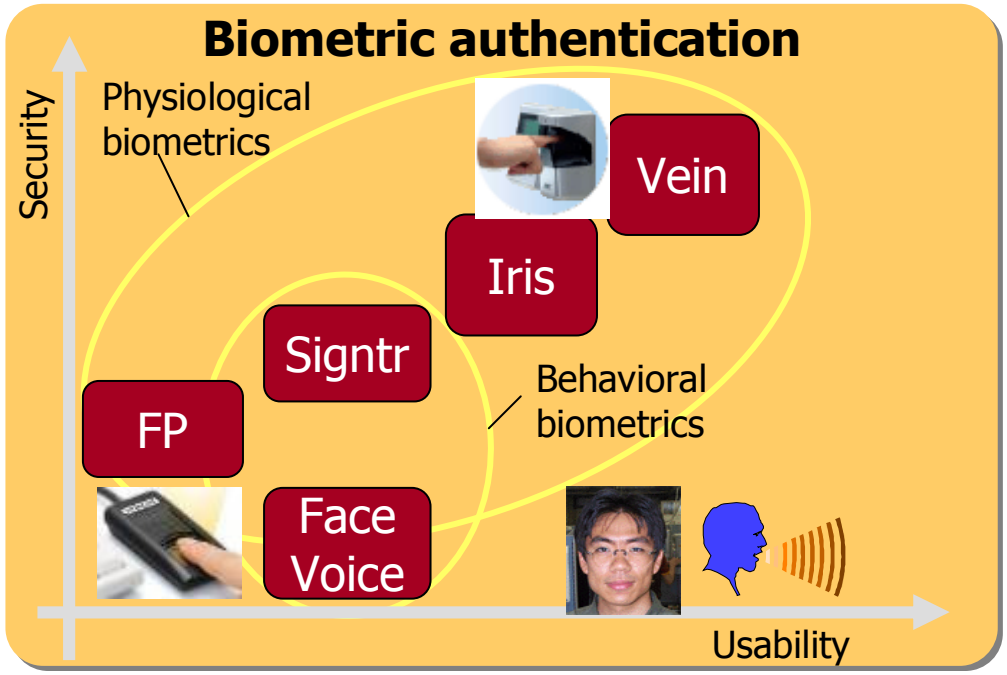
- Personal authentication method based on physiological or behavioral features of end-users.
- Never forget, never lose. Difficult to impersonate (borrowing, theft).
- Achieve a strength of security impervious to end-users' operation.

Security on Accuracy



Security on Operation

Belongings

- M-card/Key
- Smart Card（PKI）

× Forget/Borrowing/Theft

Secret information

- PIN/Password

× Forget/Borrowing/Theft

1-3 Accuracy of Biometrics

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Biometric authentication has several types of error

- False Rejection Rate (FRR) related to Usability
- False Acceptance Rate (FAR) related to Security
- Failure To Enroll Rate (FTER) related to System Operation

FRR changes depending on several conditions

- End user's age, occupation or living habit
- Environmental conditions like temperature, moisture, lighting or noise

Important to chose biometric technology considering conditions of application

2. Finger Vein Based Biometric Authentication

Door Control

ATM

IT Access control

History of Research & Development

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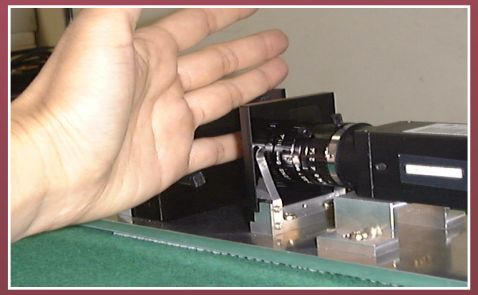
Based on R&D experience over ten years

First Phase：1997 - 2000

- Started research on "finger vein pattern" as a new biometrics technology.
- Established the original light transmission method.



Second Phase ：2000 - 2003

- R&D for higher performance technology.
- Released the first product for door access control.

Third Phase ：2003 - 2005

- Research & development for open type technology.
- Released the products for logical and financial security.

Nature of Finger Vein

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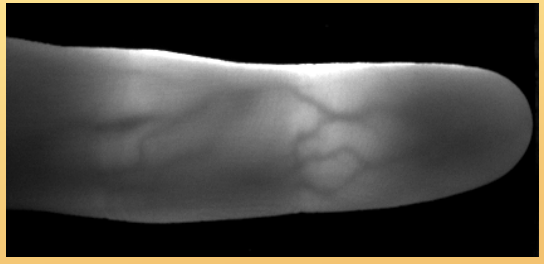
Finger Vein pattern can be used for biometric authentication

Finger vein pattern is Unique and Persistent



- Medical and Statistic perspectives represent
  - Everyone has different finger vein pattern
  - Finger vein patterns will not change in healthy adults

- Investigations in third parties
  - Uniqueness of finger vein pattern in statistical aspect
    - Yanagawa, Aoki & Ohyama(2007) (Kurume Univ., Japan)
    - https://qir.kyushu-u.ac.jp/dspace/bitstream/2324/4026/1/2007-12.pdf
  - Uniqueness and persistence in medical aspect
    - Finger vein authentication work shop in 2006
    - Medical specialists on blood vessel investigate uniqueness and persistence

Capture of Finger Vein Image

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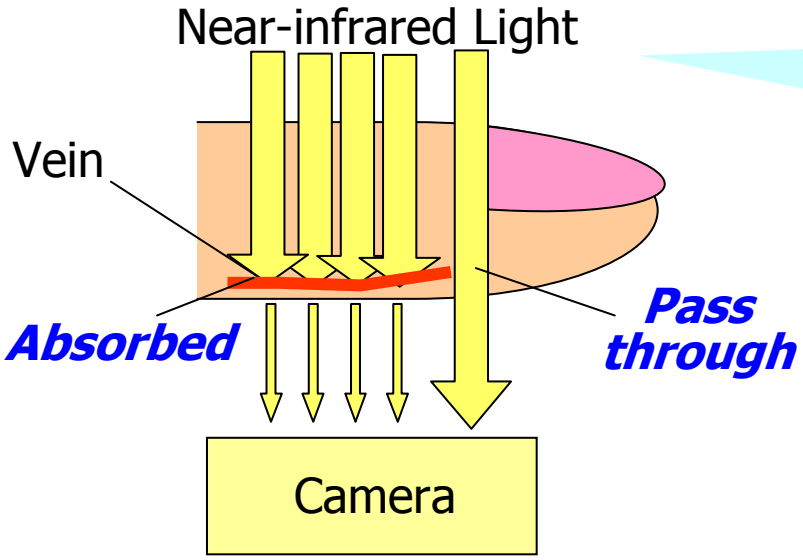
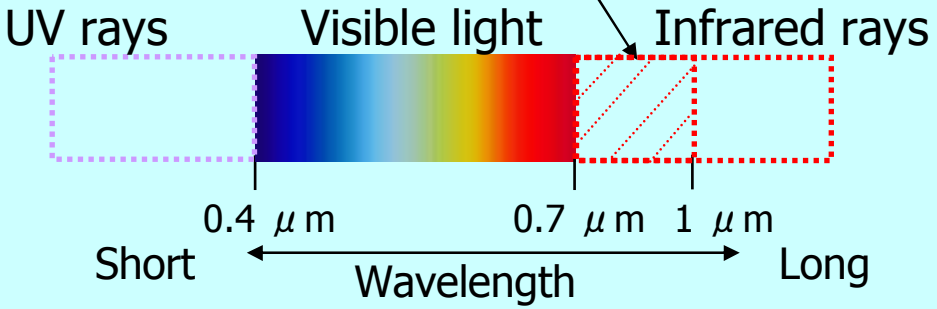
Finger vein pattern is stable and environment resistant

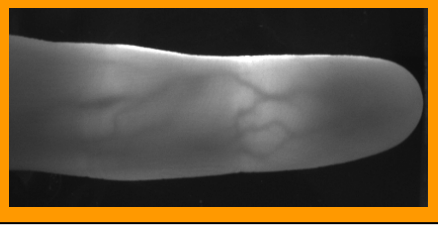
- Near infrared light is absorbed by hemoglobin in the blood and the vein pattern is captured as a shadow
- It enables to capture an inner structure of body



Near infrared light

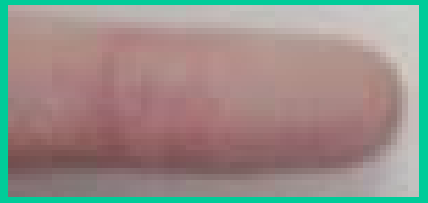
Penetration of human body begins at this wavelength





Near infrared light image

Visible light image



Advantages of Finger Vein

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The stability and environmental resistance produces a lot of advantages

High Accuracy

Easy-to-use & free from error

False Accept Rate: 0.0001%*
False Reject Rate: 0.01%*

High Reliability

Difficult to spoof by forgery

Unable to observe finger vein in everyday life

High Acceptability

Stable accuracy independent from age, occupation, living habit and environment like moisture or temperature

High Availability

Almost all of people can use finger vein authentication

Failure to Enroll Rate: 0.03%*

*internal test results from 30,000 finger vein samples

Comparison of Biometric technologies

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Finger vein authentication achieves higher security and convenience Suitable for application for general public

- **Applications for general public**
  - Huge variety of end-users' age, occupation, living habit, etc…
  - Difficult to control environmental conditions
  - Public Sectors like border control or citizen ID, or Financial Services

Biometrics	Security		Convenience				
	Anti-Forgery	Accuracy	Speed	Availability	Acceptability	Cost	Size
Fingerprint	●	●	●	●	●	●	●
Iris	●	●	●	●	●	●	●
Face	●	●	●	●	●	●	●
Voice	●	●	●	●	●	●	●
Finger Vein	●	●	●	●	●	●	●

●: good, ●: normal, ●: insufficient

2-6 Advantages Over Finger Print

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(1) Availability: Low FTER (Failure To Enroll Rate)

Finger Print	Finger Vein
FTER, the ratio of users who cannot enroll their FP, is 3 – 5%	0.03% FTER . almost all users can enroll.

(2) Acceptability: Resistance to temperature and humidity

Temperature and humidity affects the proper capturing of FP image	FV images are generally unaffected by temperature or humidity

(3) Acceptability: Resistance to skin damage in users

Skin damage or roughness directly alters FP's image	Skin damage does not affect FV images

(4) Reliability: Resistance to forgery

Easy to steal fingerprints from your daily life	Difficult to steal finger vein images from users in daily life
Easy to forge fingerprints; ex. gummy fingers	Difficult to forge finger vein patterns

3. Case Examples of Finger Vein Authentication

Door Control

ATM

IT Access control

Card Holder Authentication for ATM

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Major financial institutions (70%) in Japan are using finger vein authentication

- Japan Post Bank
- Mizuho Bank, Ltd.
- Bank of Kyoto, Ltd.
- Sumitomo Mitsui Banking Corp.
- Risona Bank, Ltd
- The Juroku Bank, Ltd.

ATM with finger vein authentication

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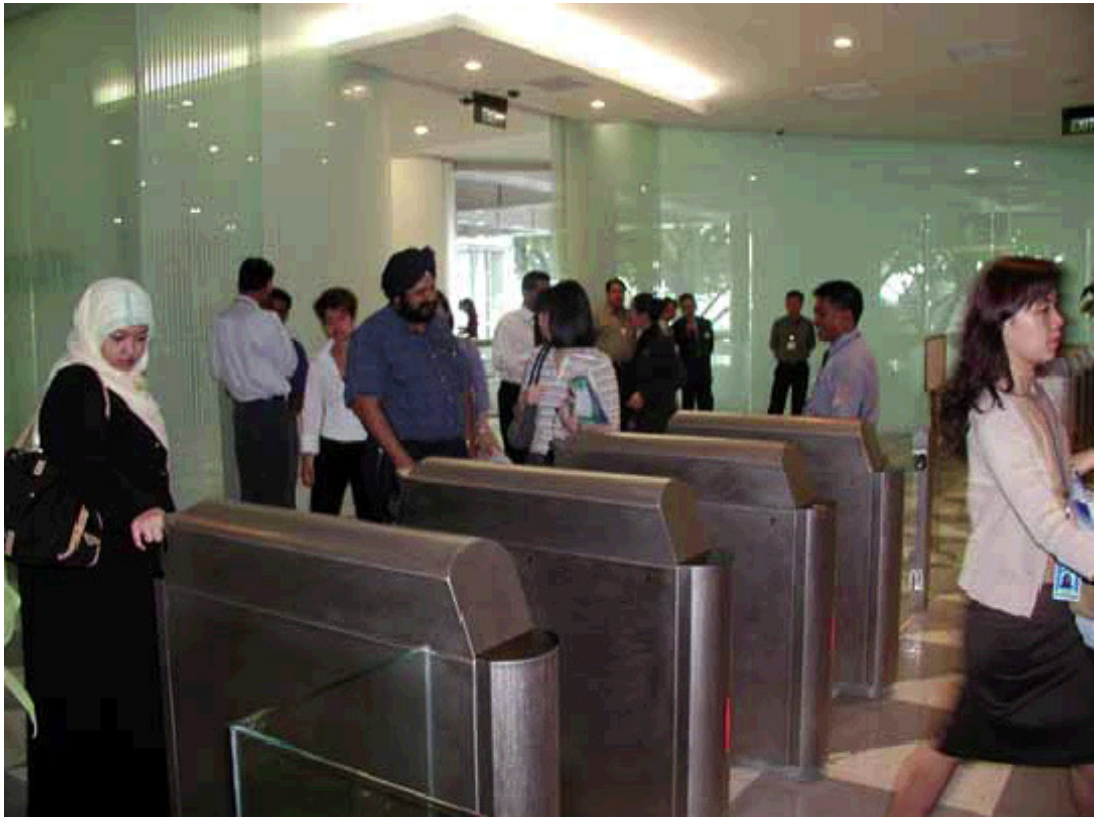
Finger Vein Authentication is used for entry control (Residents: 1,500 persons)

Hitachi Tower (Singapore)



Authentication unit is placed at the entrance gate

3-3 Door Access Control system

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Terminal(FVTC700)

Features of Hitachi's System

- Launched in 2002 and delivered to numerous customers
- Easy-to-operate push-button system for users
- Biometric Information is stored in the door controller, database server,or IC Card.
- Available conjunction with 10-key keypad or IC card

Enrollment Unit (FVN600E)

Track Record

- Units delivered: ~10,000 (~ October '07)
- Customers:
  AEON CREDIT SERVICE CO., LTD., Hitachi Tower (Singapore), Caltex Tower(Singapore), information-related companies, financial services and insurance companies, Banks, schools, apartment complexes, etc.

A Large system architecture

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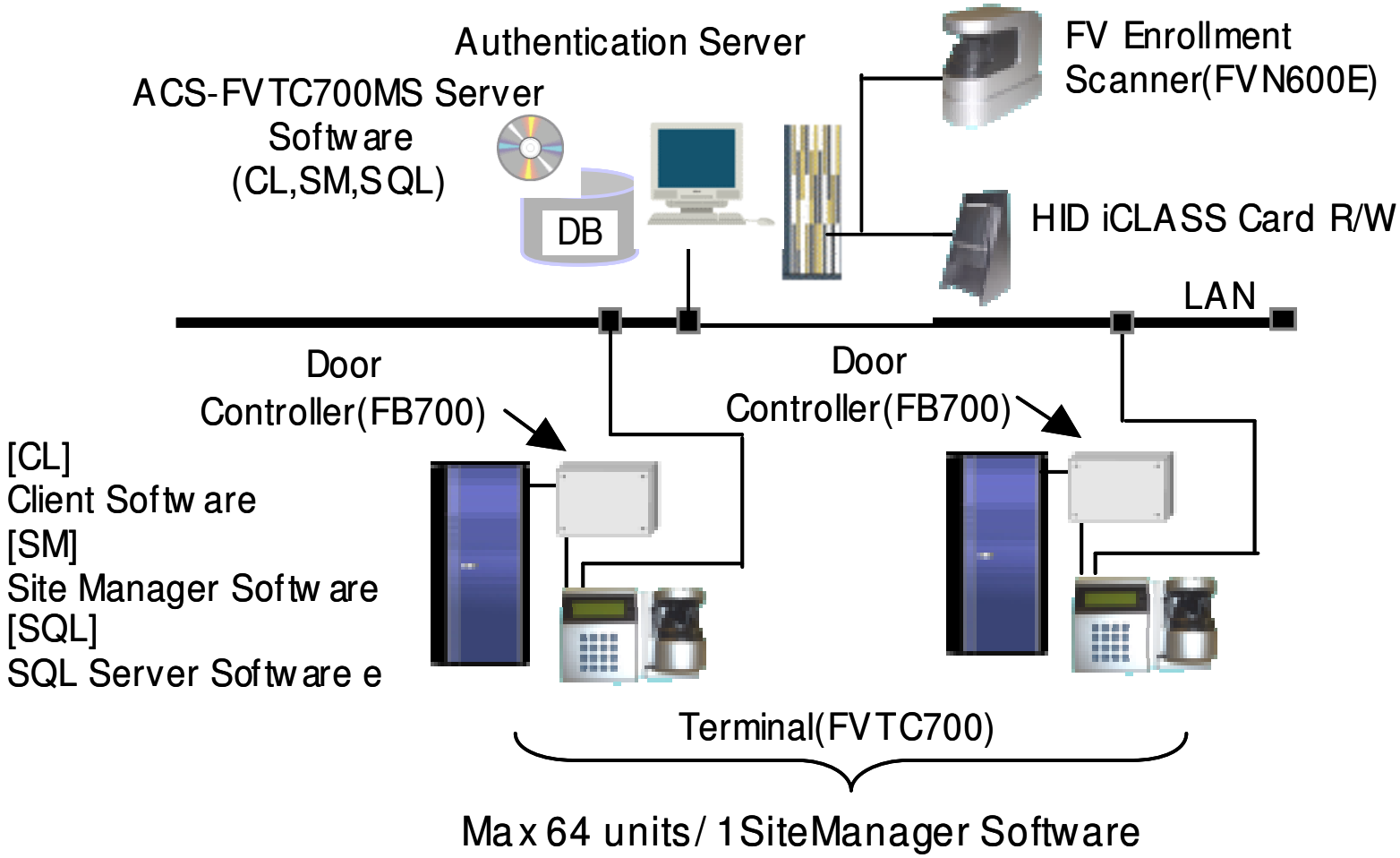
Maximum 256 terminals for a management server
HID iClass card or user ID with finger vein



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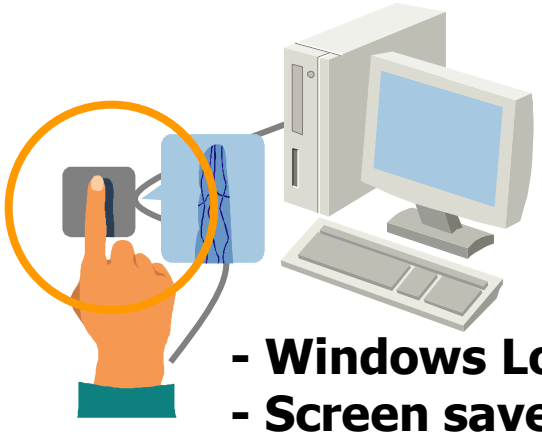
Features of finger vein authentication for PC

- **Supports Windows log-in, screen-saver cancellation, business application login**
- **Biometric information is stored in PC or a server**
- **Software development kit is available**

Logical security device

Stand alone use case



- **Windows Logon**
- **Screen saver unlock**
- **Password auto input**

Track Record

Ten thousands of the finger vein devices have been introduced at companies.

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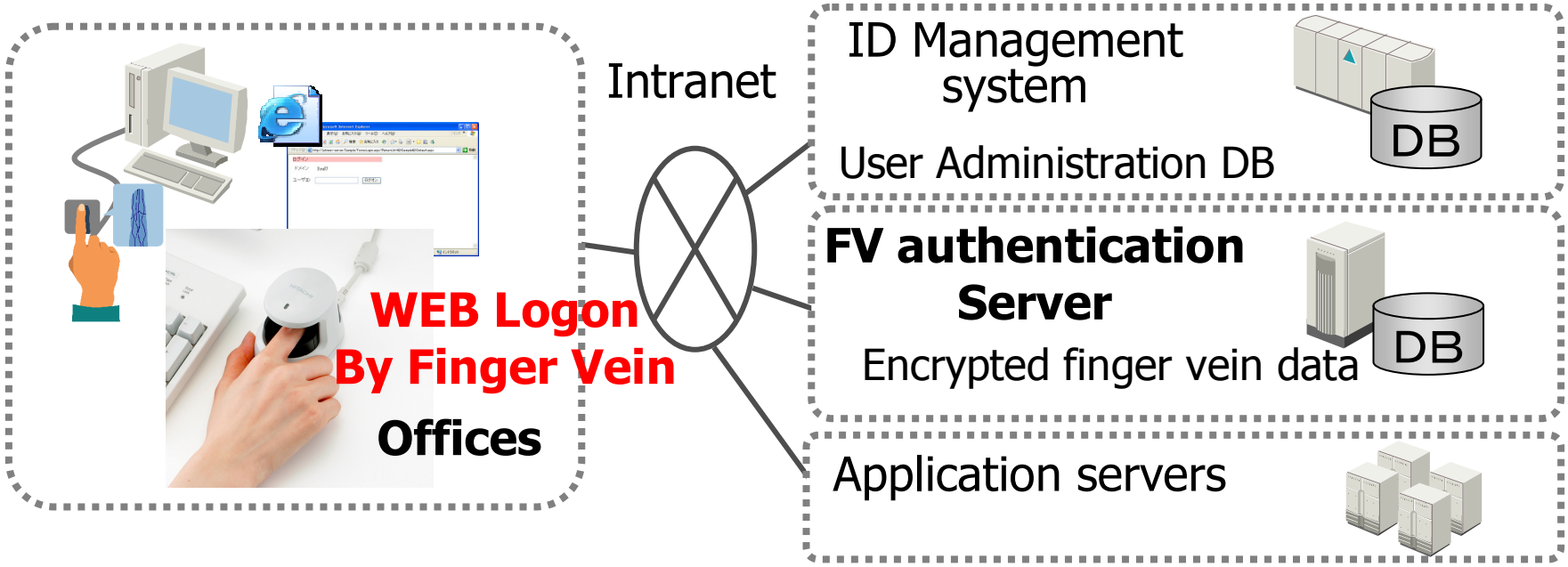
Server based finger vein authentication system

- Finger vein data is stored and verified in the server
- User can logon the system with ID and finger vein
- Enable user to logon from any client PC
- Easy to connect to WEB Single Sign On



4 Conclusion

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Important to chose biometric technology considering conditions of application

Finger vein authentication achieves higher security and convenience Suitable for application for general public

Major financial institutions (70%) in Japan are using finger vein authentication

Hitachi has capability to produce a variety of finger vein based authentication systems


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