

A Conceptual Framework for Testing Biometric Algorithms within Operating Systems' Authentication

***Arslan Brömme,
Marcel Kronberg, Oliver Ellenbeck, and Oliver Kasch***

***Biometric Authentication Research Group
Faculty of Informatics
University of Hamburg***

[broemme, biometrik]@informatik.uni-hamburg.de



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Plan of the Talk

1. Introduction

2. Process of Biometric Authentication

- Process of Biometric Authentication with Data Logging
- Resource Requirements of Biometric Techniques
- Data Logging Module

3. Biometric Authentication with Data Logging

- Unix: myPluggable Authentication Modules (PAM)
- Windows NT/2k: myGraphical Identification and Authentication Interface (GINA) & Overview of Surrounding Architecture

4. Testing Biometric Algorithms for Authentication

- Conceptual Framework
 - Example: Expected Benefits for Iris Biometrics
 - Improving Biometric Algorithms for Applications?
- } proceedings

• Summary, Conclusions and Future Work

• Demonstration (modified GINA within Windows 2k)



1. Introduction

Mission: Development of adequate biometric algorithms for authentication purposes

- **Laboratory tests are not sufficient**
 - **Not possible to accurately simulate realistic environmental conditions**
- **Tests under real-life conditions are necessary**
- **Test results are used for evaluation of biometric algorithms'**
 - **Degree of fitness (robustness, performance)**
 - **Usability of biometric technique**
- **Collection of quantitative data (data logging) and qualitative data (human observer)**
 - **Within standard OS (Windows NT/2k & Unix)**

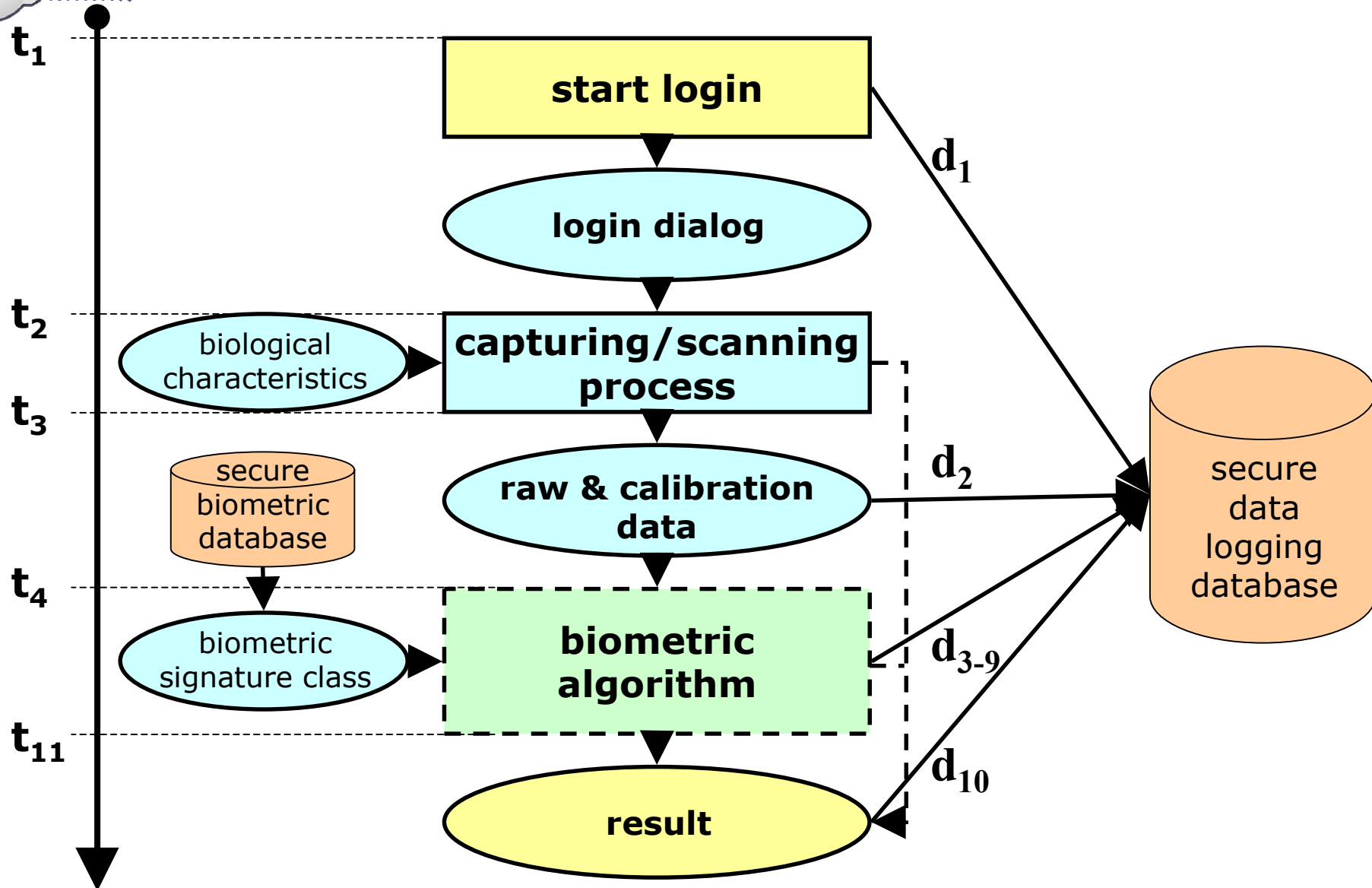


2. Process of Biometric Authentication

- ***Process of Biometric Authentication with Data Logging***
 - ***Definition of process for standard OS***
- ***Resource Requirements of Biometric Techniques***
 - ***Tabular overview of resource requirements for different biometric techniques***
- ***Data Logging Module***
 - ***Concept of data logging module for OS logon***



2.1 Process of Biometric Authentication w. Data Logging I





2.1 Process of Biometric Authentication w. Data Logging II

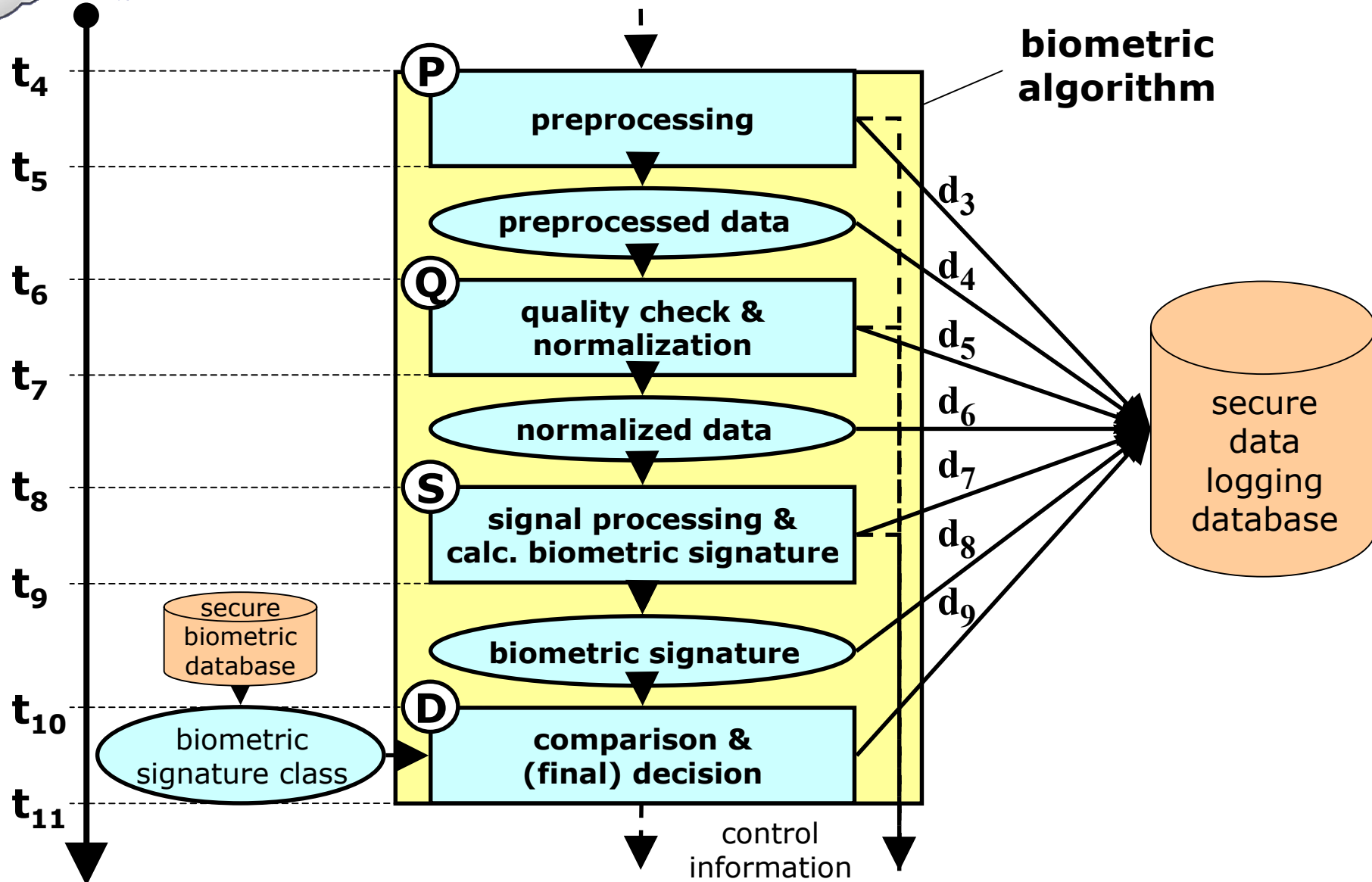
Biometric algorithm is subdivided into four modules

- **Ⓟ preprocessing**
- **Ⓠ quality check & normalization**
- **Ⓢ signal processing & calculation of biometric signature**
- **Ⓣ comparison & decision**

Timestamps t_{1-10} and data d_{1-9} from different modules can be collected



2.1 Process of Biometric Authentication w. Data Logging III





2.2 Resource Requirements of Biometric Techniques I

Five abstract resources for OS identified

- **Video [image]**
- **Video [stream]**
- **Audio [stream]**
- **Scan [single values]**
- **Scan [time series]**



2.2 Resource Requirements of Biometric Techniques II

body part	biological characteristic	Video [image]	Video [stream]	Audio [stream]	Scan [single]	Scan [timeseries]
<i>head</i>	face geometry	x	x	-	-	-
	iris	x	x	-	-	-
	retina (veins)	x	x	-	-	-
	voice	-	-	x	-	-
	lip movement	-	x	-	-	-
	dental	x	-	-	x	-
	ear	x	-	-	x	-
	tongue	x	-	-	x	-
<i>hand</i>	hand geometry	x	x	-	x	-
	finger/palm print	x	x	-	x	-
<i>cerebric</i>	brain waves	-	-	-	-	x
	intuitional acts	-	x	-	-	x
<i>body</i>	DNA	x	-	-	-	x
	gesture	-	x	-	-	x
	odor	-	-	-	x	x
<i>motoric</i>	movement patterns	-	x	-	-	x
	posture	x	x	-	-	-
	signing	x	x	-	x	-



2.3 Data Logging Module I

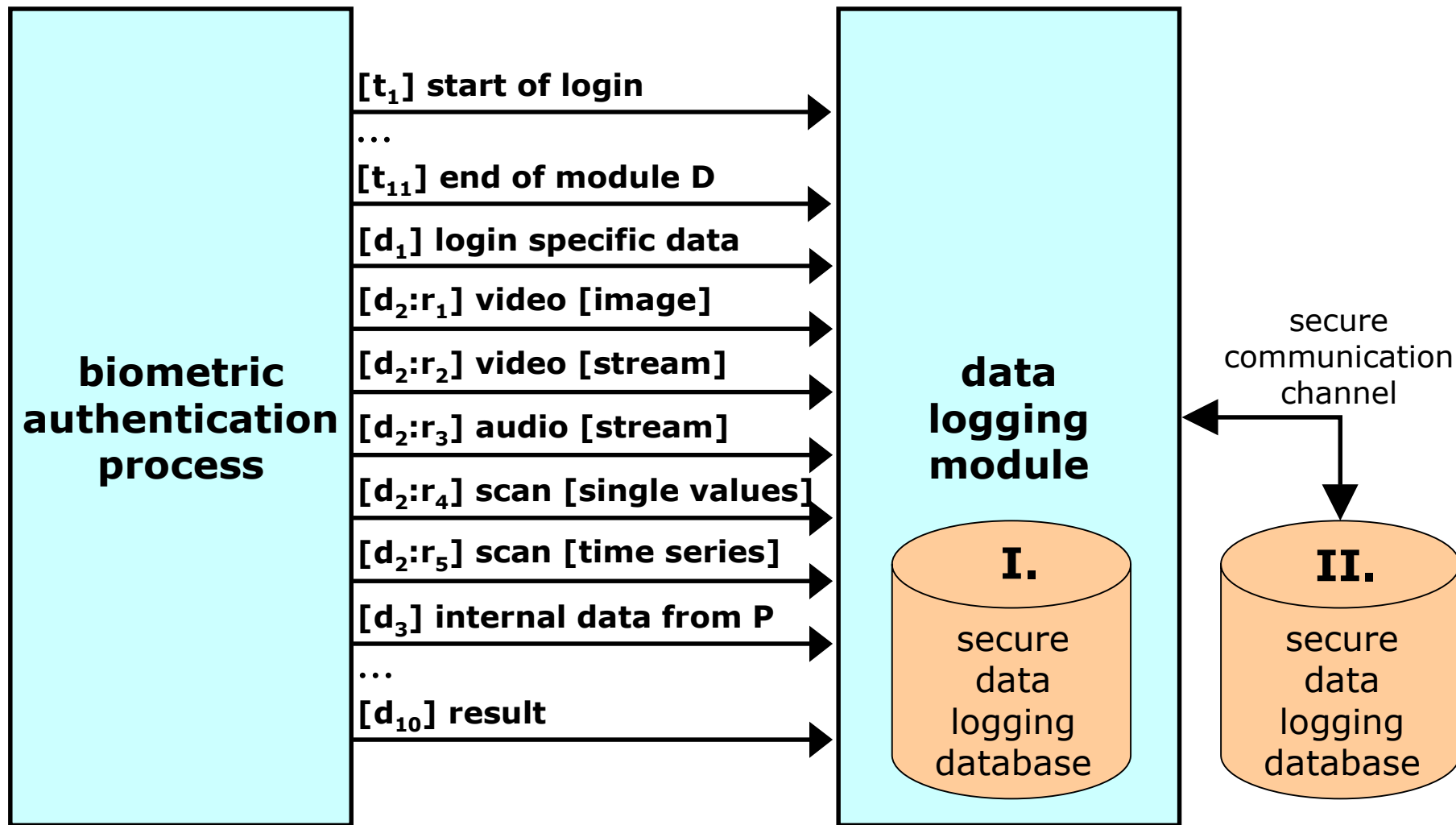
Storing collected data in authentication records by using a data logging module.

Functions of data logging module

- **Create an authentication record**
- **Update of an authentication record**
- **Insert single values into an authentication record**
- **Pass stream values to an authentication record**



2.3 Data Logging Module II



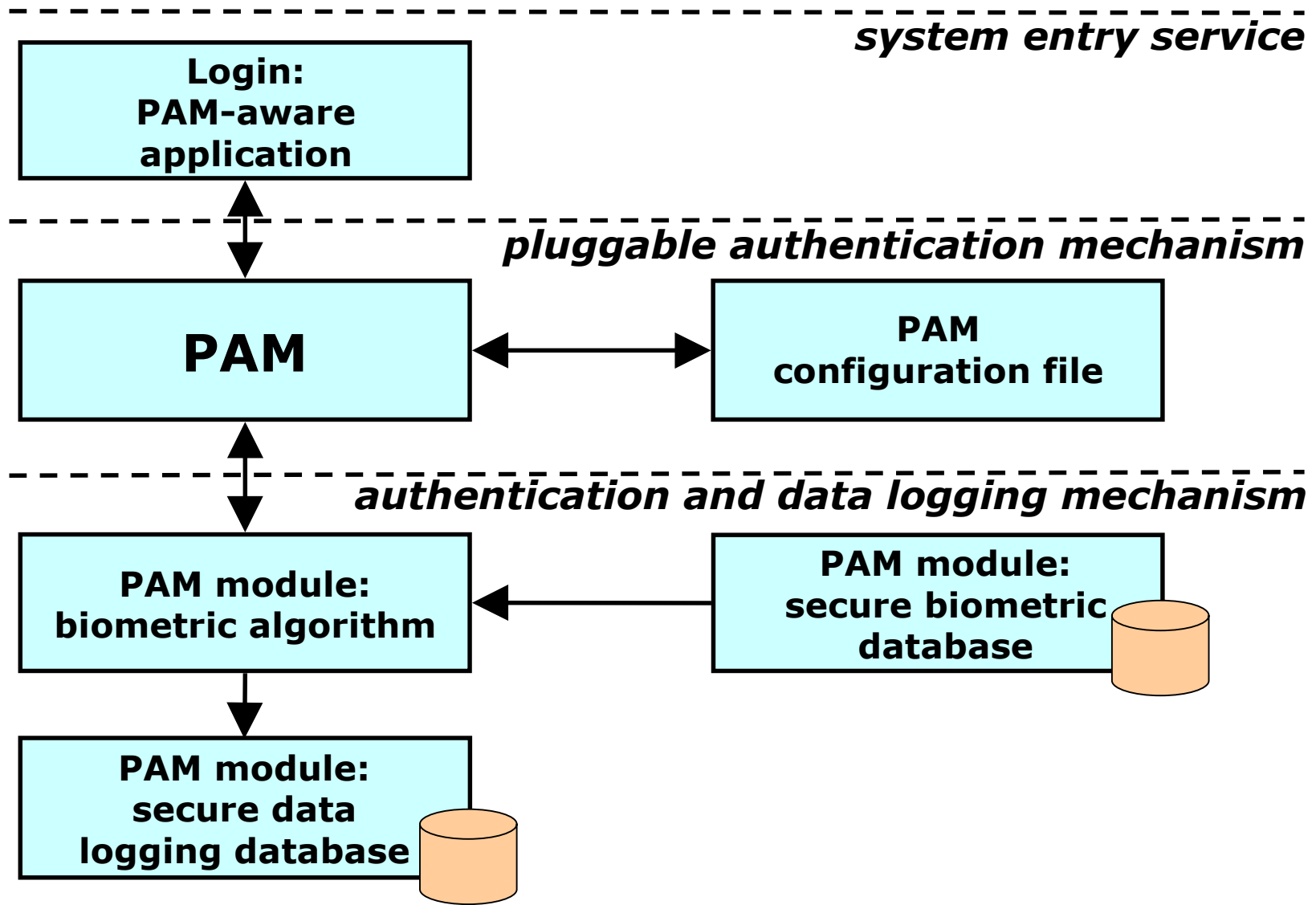


3. Biometric Authentication with Data Logging

- ***Unix***
 - ***myPluggable Authentication Modules (PAM)***
- ***Windows NT/2k***
 - ***myGraphical Identification and Authentication Interface (GINA)***

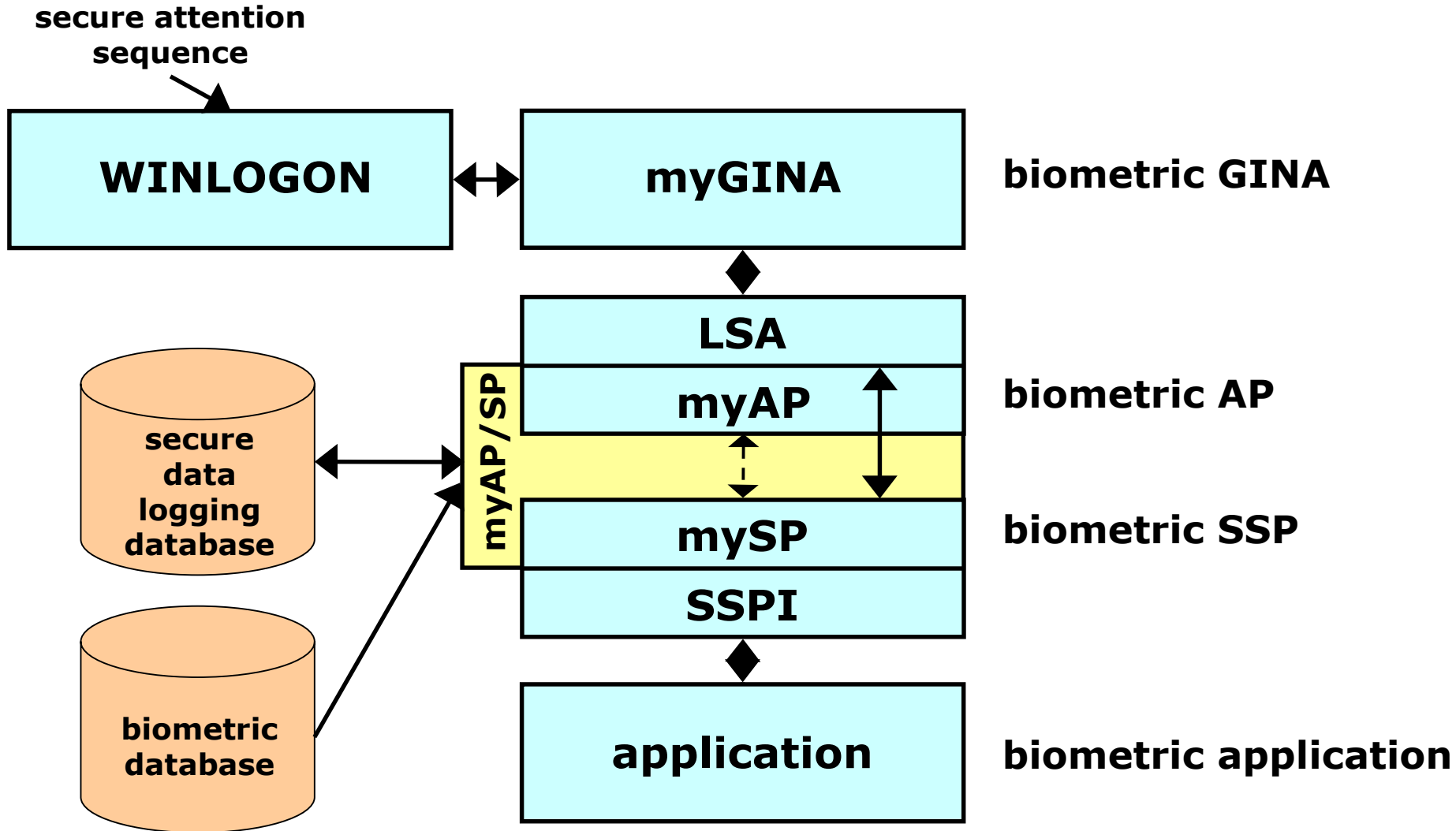


3.1 Unix: myPluggable Authentication Modules (PAM)

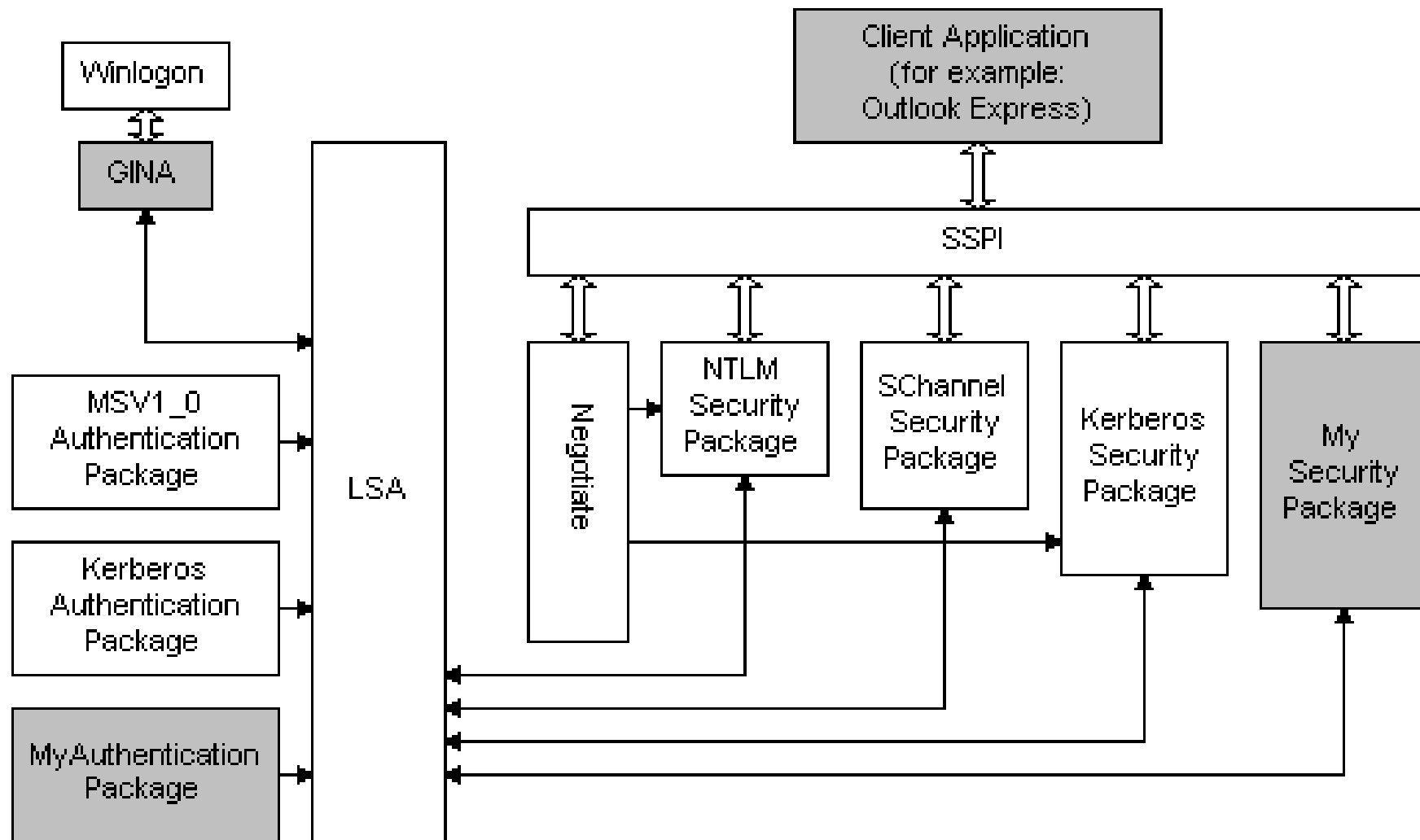




3.2 Windows NT/2k: Graphical Identification and Authentication Interface (GINA) & more



3.2 Windows NT/2k: Overview of Surrounding Architecture



[Figure by Microsoft]

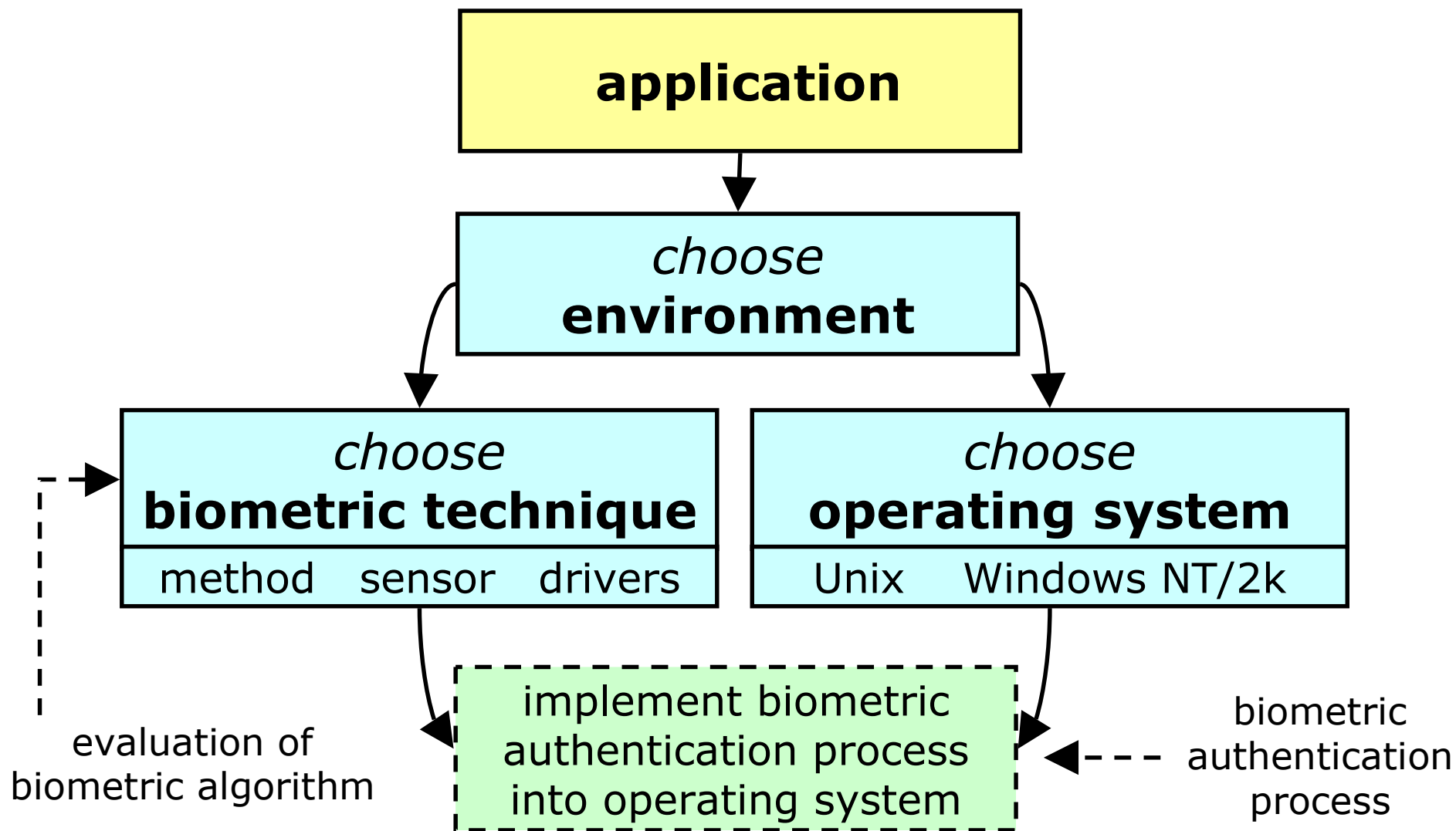


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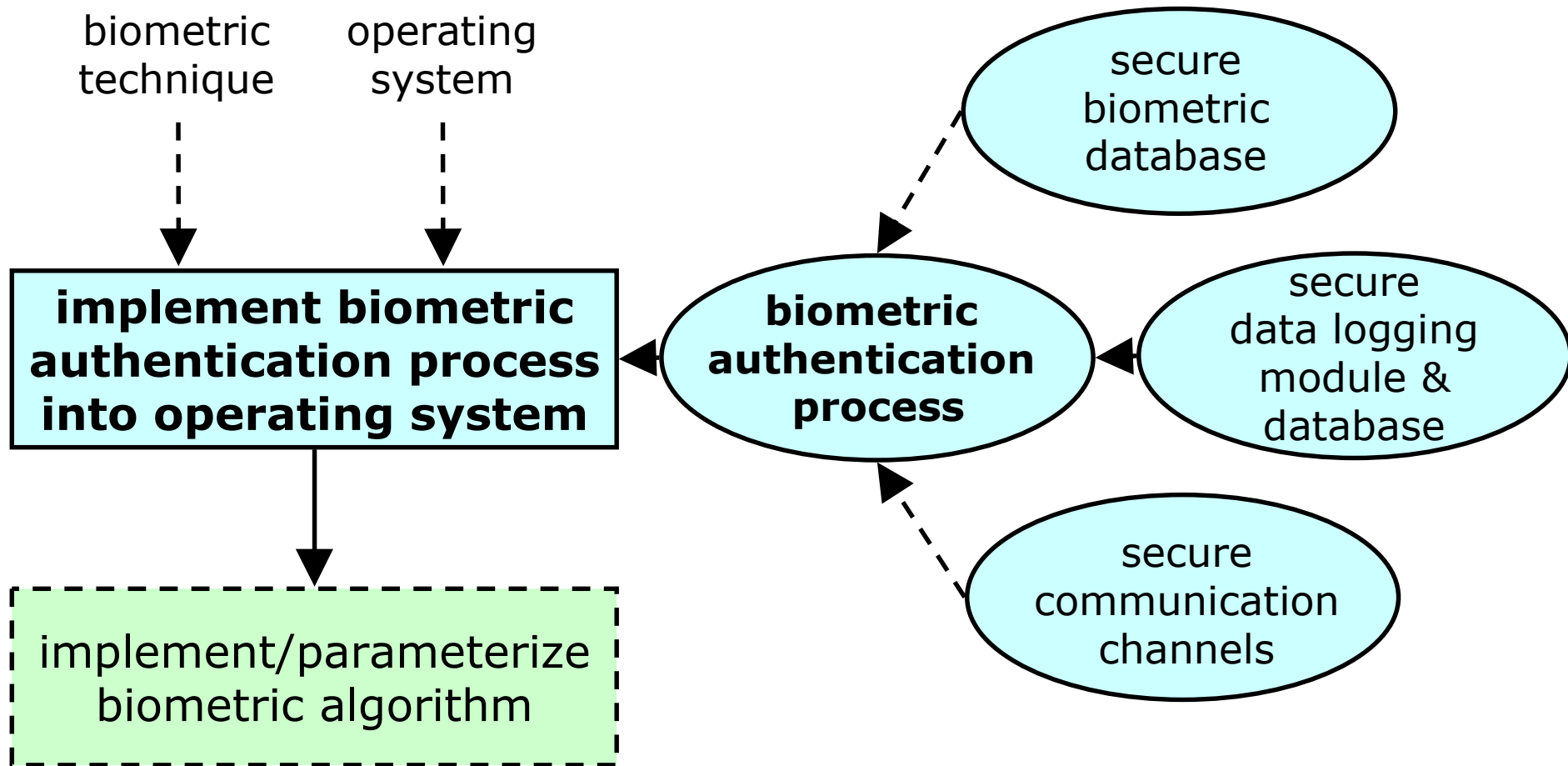


4.1 Conceptual Framework I



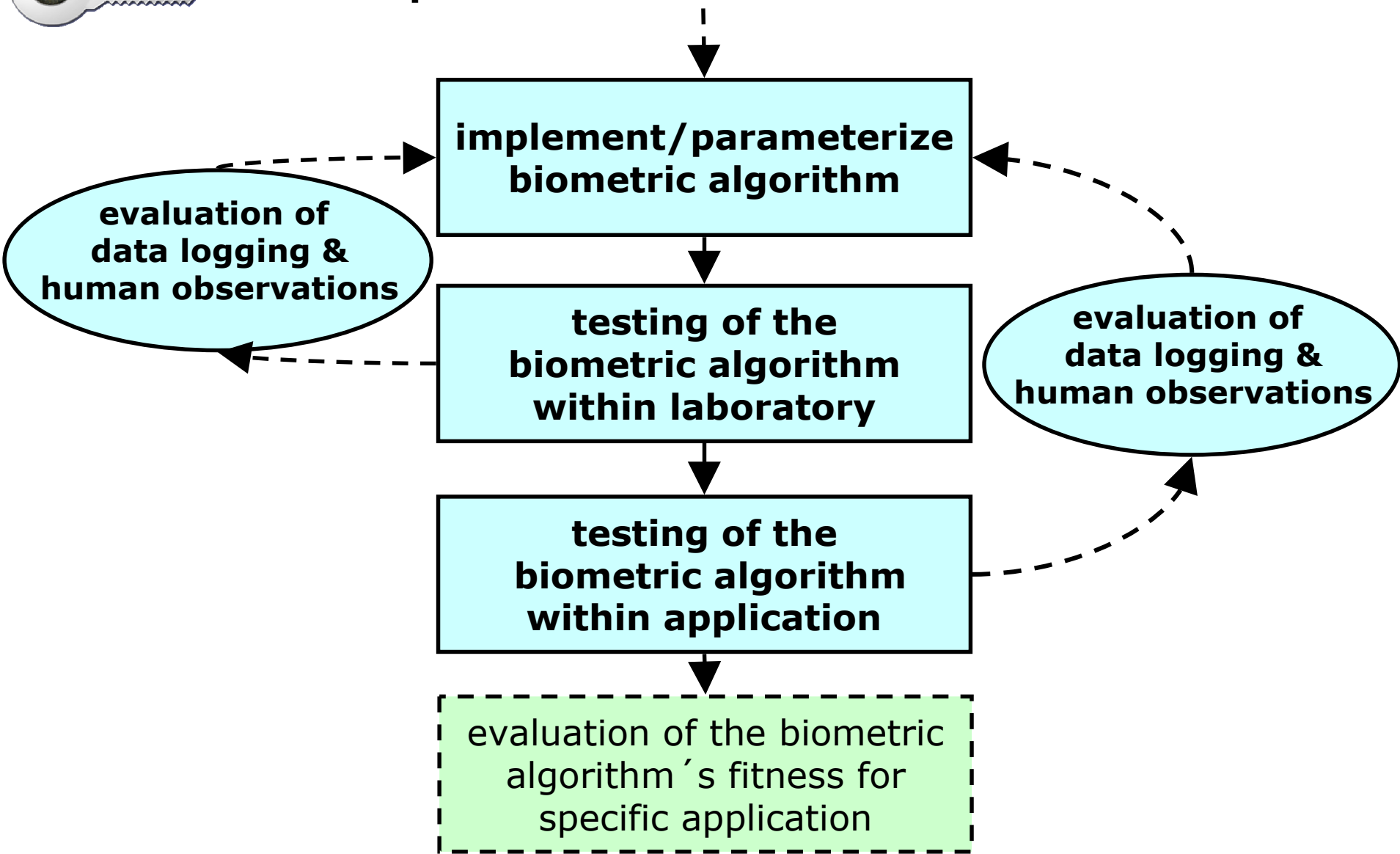


4.1 Conceptual Framework II



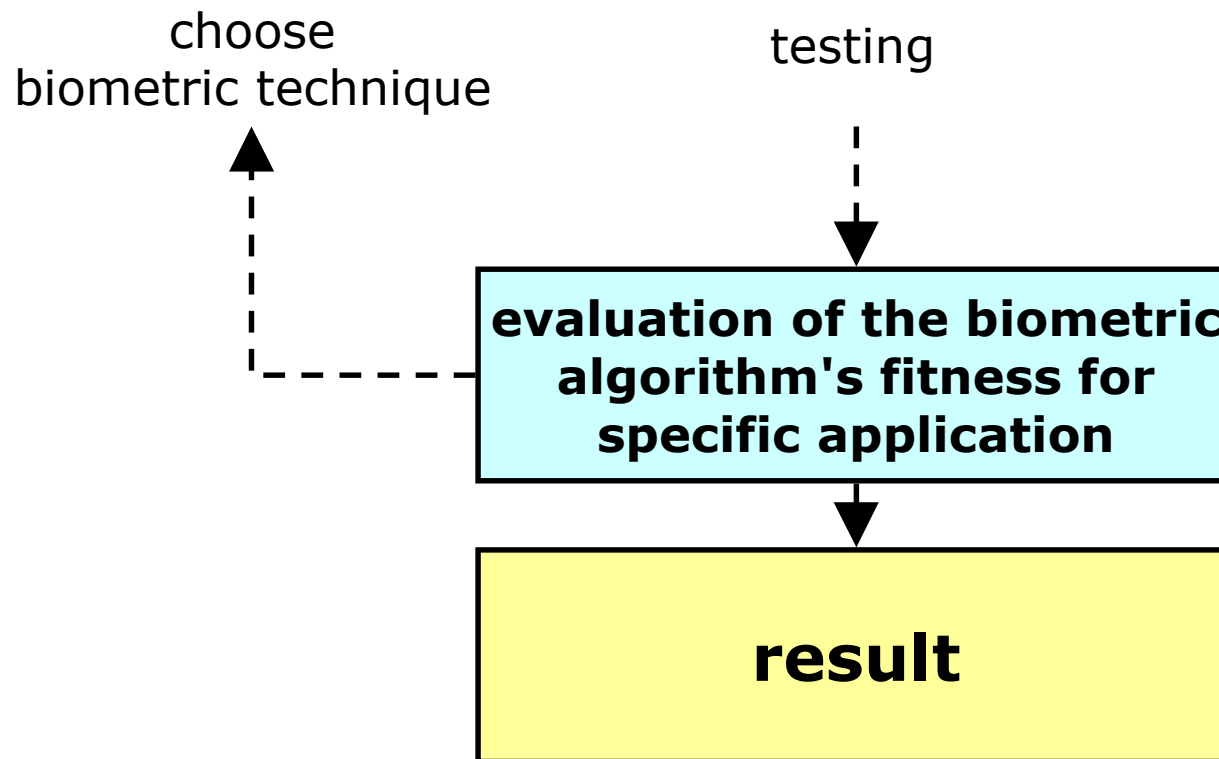


4.1 Conceptual Framework III





4.1 Conceptual Framework IV





5. Summary and Conclusions

In this paper we have introduced a

- **biometric authentication process with data logging**

embedded into a

- **conceptual framework for testing biometric algorithms.**

The presented conceptual framework enables the collection of

- **quantitative data (robustness, performance) and**
- **qualitative data (human observations)**

within operating systems' authentication.



5. Future Work

- ***Development of adequate biometric algorithms for real-life applications***
- ***Applicability of the conceptual framework for different biometric applications***
 - ***Mobile IT, vehicles, entrance control systems, surveillance systems***
- ***Biometric enrollment process with data logging***



6. Demonstration

Modified GINA.DLL within Windows 2k for Demonstration at ACM SAC 2002

Author:

Aleksander Koleski

**Biometric Authentication Research Group
biometrik@informatik.uni-hamburg.de**

Supervisor:

Arslan Brömme

**Biometric Authentication Research Group
Faculty of Informatics, University of Hamburg
broemme@informatik.uni-hamburg.de**