Hardware Security Concept for Spontaneous Network Integration of Mobile Devices

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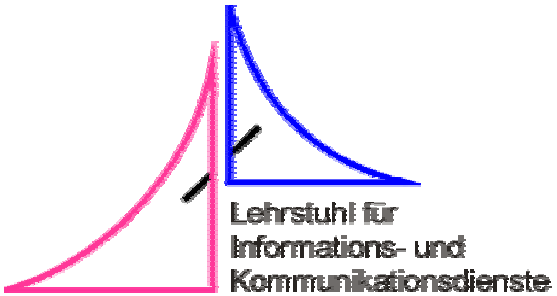
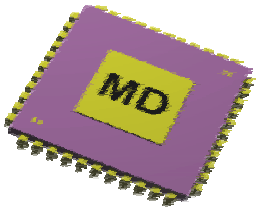


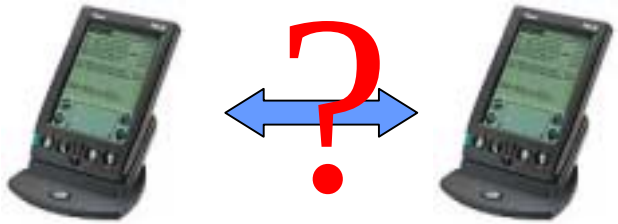


Outline

- Motivation
- Scenarios for mobile devices
- Requirements
- Architecture concept
- Realisation
- Conclusion

Motivation

- rapid growth of mobile devices
- **today's** applications:
  - personal information management



- **future** applications:
  - ad-hoc networking in ubiquitous environments over wireless networks

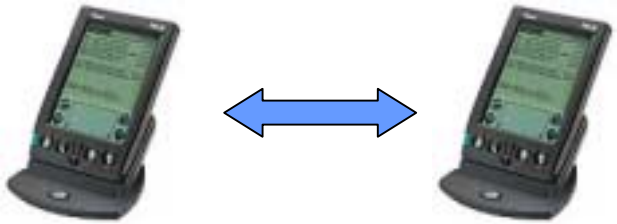
Scenarios for mobile devices

- receiving broadcast information's
  - news, cinema-program
- exchange personal cards
- storing personal information's
  - PIN, TAN, secret keys, credentials
- bank transactions
- signing contracts
- terminal for doctors in hospitals

Requirements

Wireless interface

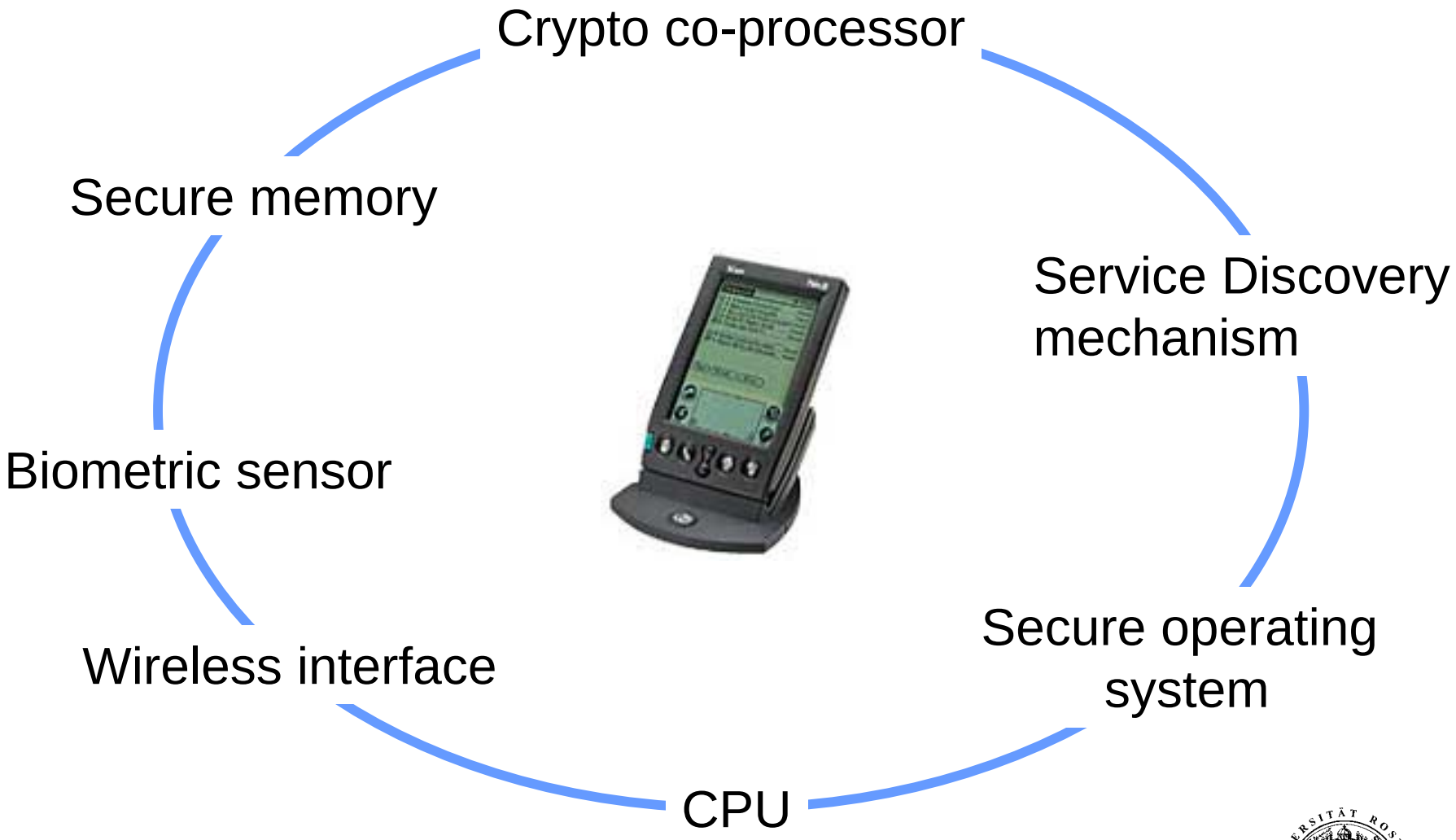
Service Discovery



Security

Power Management

Architecture Concept



Wireless Interface

technoloy	max. brutto datarate	range	connections	applications
IrDA	4 Mbit/s	1m	2	peer-to-peer between phones, notebooks, printer
DECT	128 kbit/s	50m	10	telephony support, data transmissions
Bluetooth	1 Mbit/s	10(100)m	8(+248 inactive)	universal ad-hoc-networking for mobile devices (data/voice)
HomeRF	2 Mbit/s	50m	>128	telephony support, data transmissions for home networking
IEEE 802.11b	11 Mbit/s	30-100m	ca. 10 pro Access Point	wireless LAN
HiperLAN2	54 Mbit/s	150m	ca. 10 pro Access Point	higher data transmissions

Security

Access Levels:

- Level 1:
  - non-secure
- Level 2:
  - only Authentication
- Level 3:
  - Authentication, Authorisation

Device Levels:

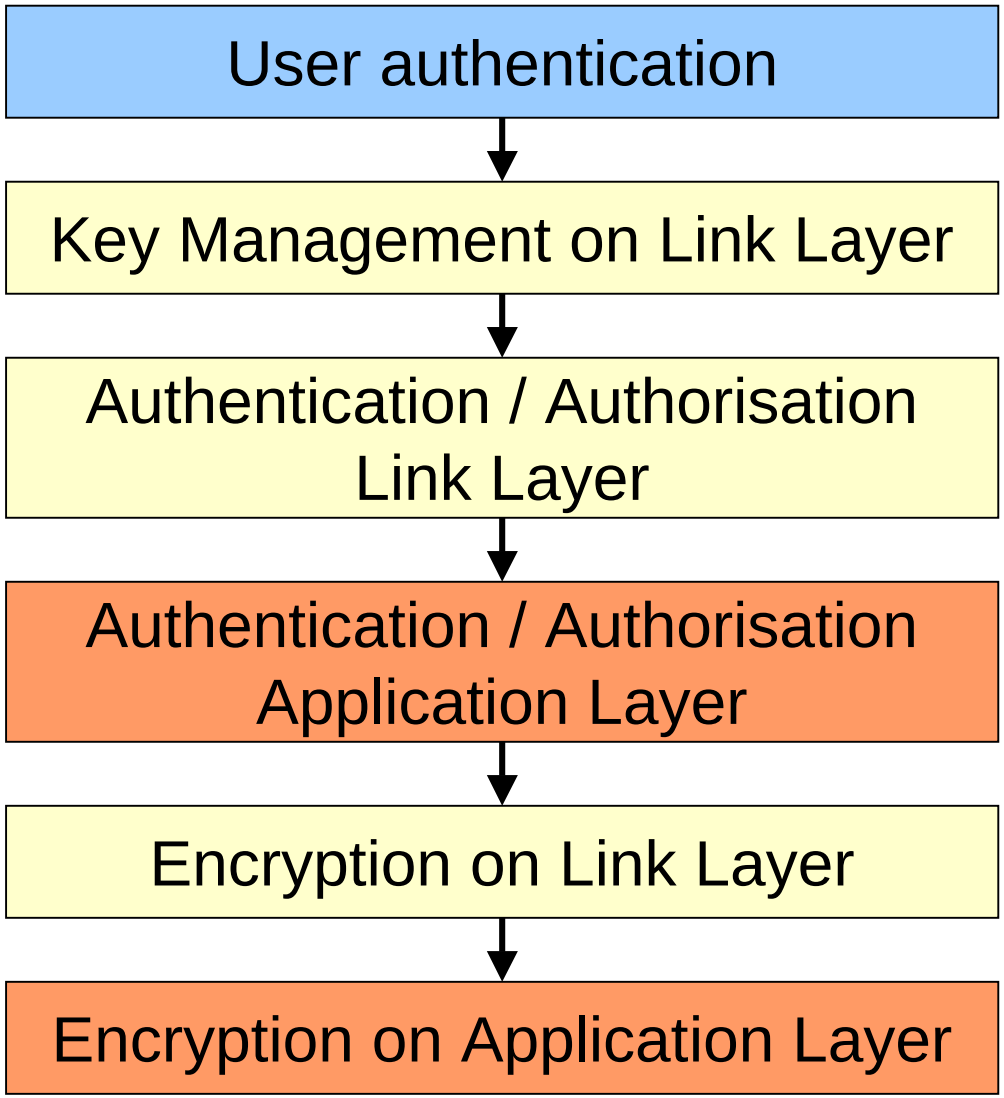
- Unknown Device
- Untrusted Device
- Trusted Device

Key Management

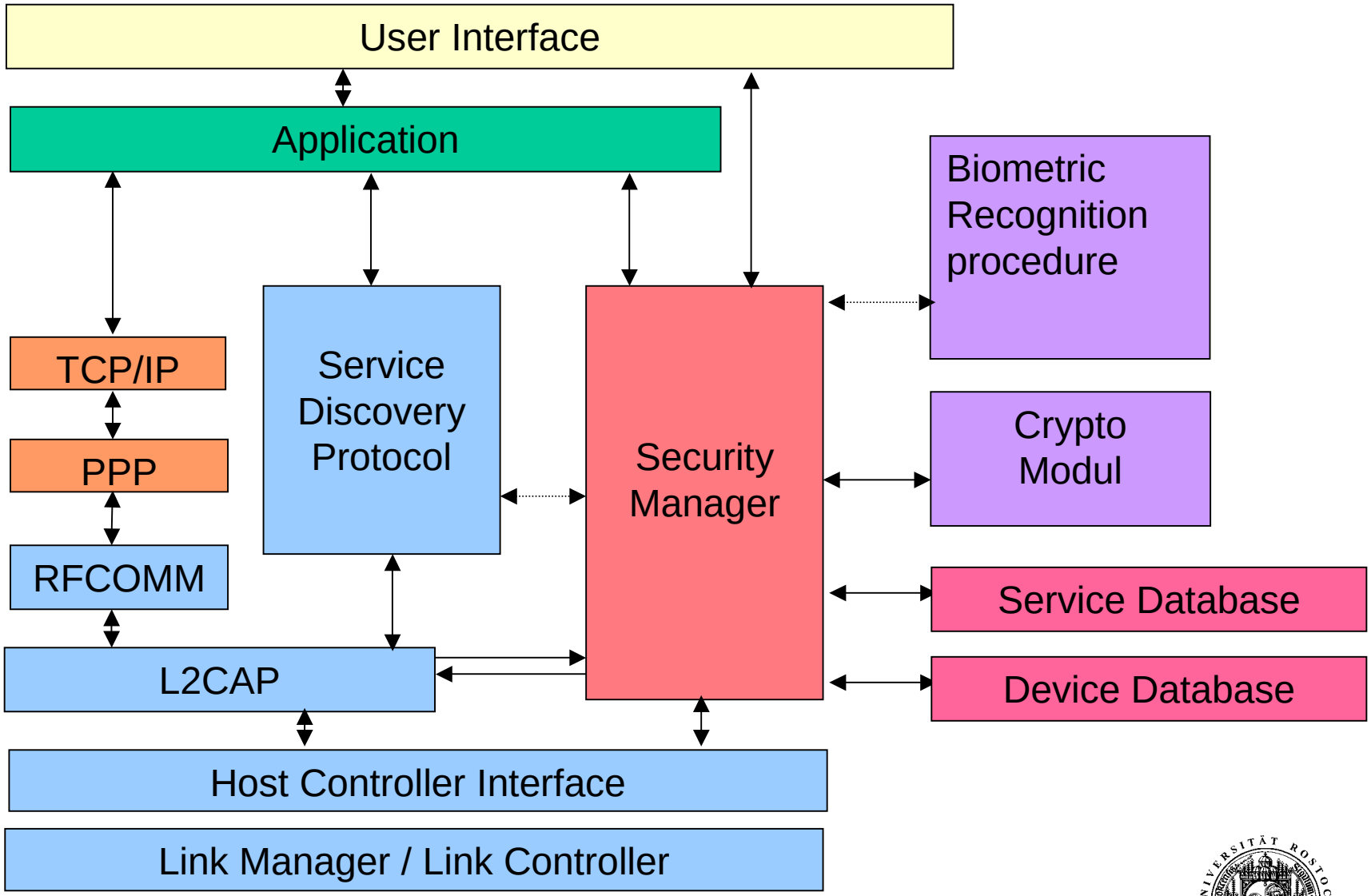
Encryption Management

Security Manager

Security Manager Architecture



Security Manager Architecture (2)



Biometric Recognition Methods

- Authorisation of transactions
- Authentication of users

- Fingerprint:
  - well usable
  - easy integration
  - matching on board
  - no abuse of biometric data

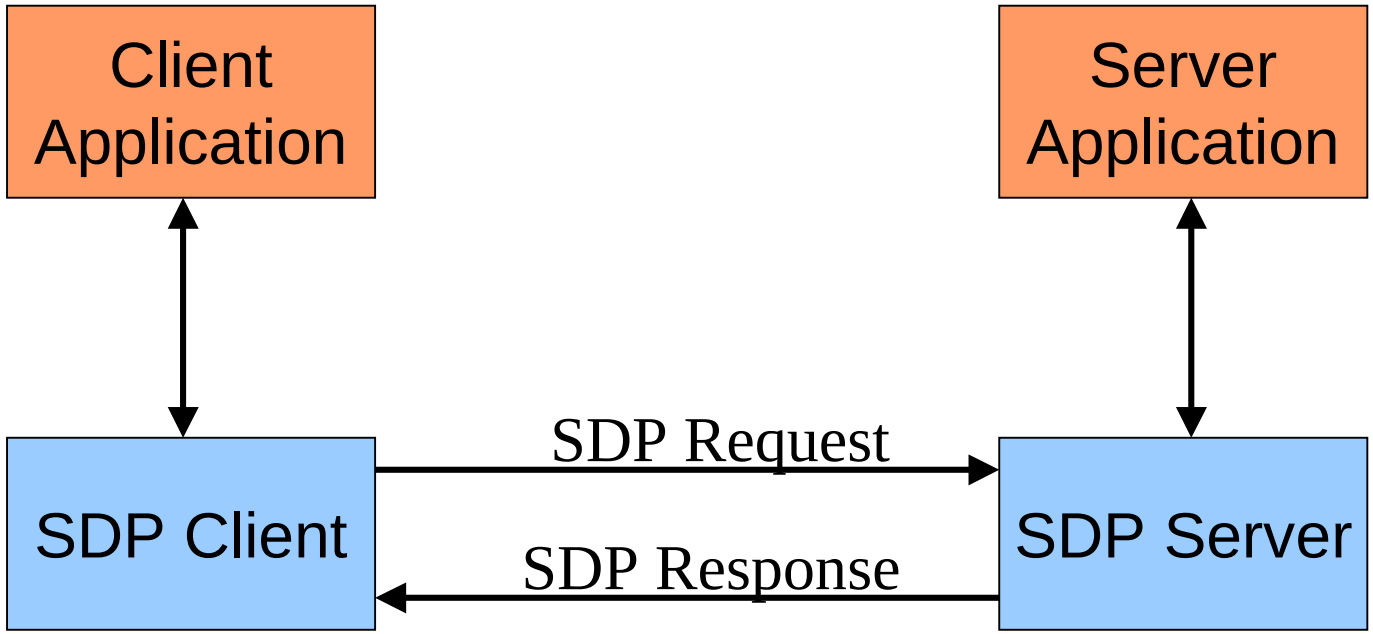
Crypto Co-processor

- **algorithms**: DES (Triple DES), RSA
- **example**: DES (RSA 100-1000 x slower)

type	clock	throughput	
typ. smartcard processor	4 MHz	3,7	KBit/s
AMD-K6	266 MHz	3,6	MByte/s
XILINX FPGA recurrent	4 MHz	1,9	MByte/s
XILINX FPGA pipelined	4 MHz	30,7	MByte/s

- **advantages** of crypto co-processors
  - performance enables appliance
  - scalable parallelism and pipeline (VHDL core)

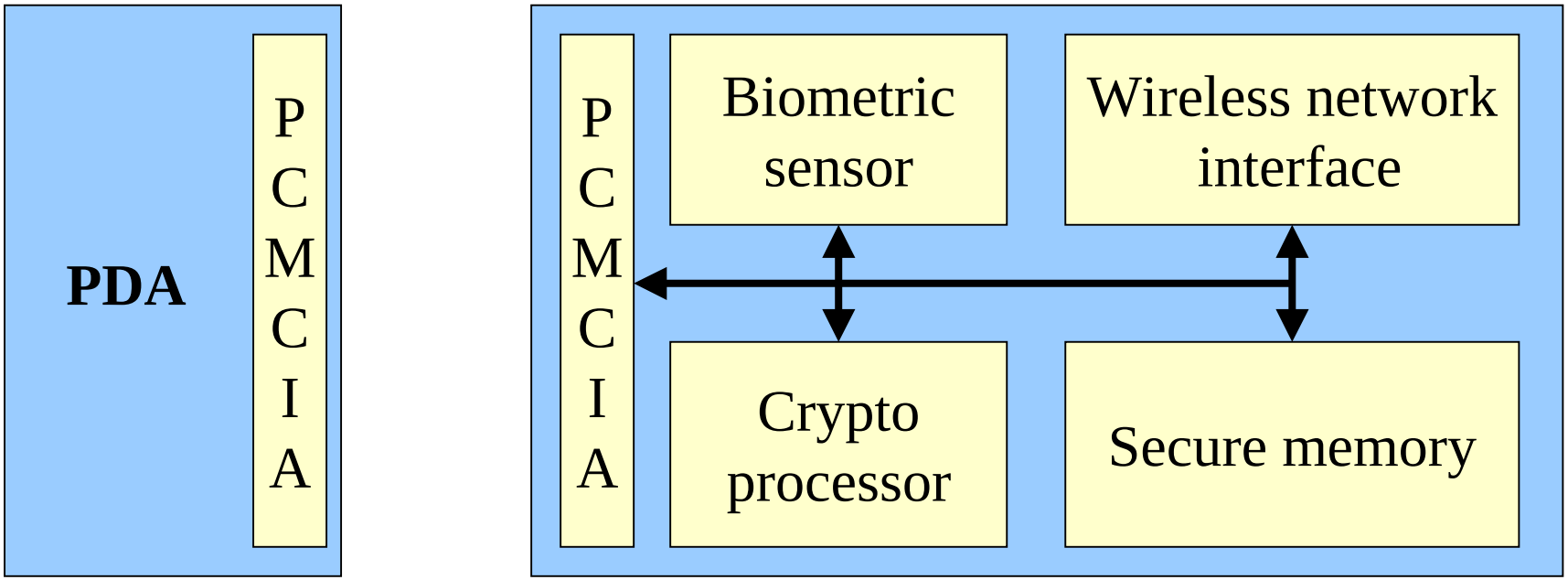
Service Discovery



Bluetooth - SDP

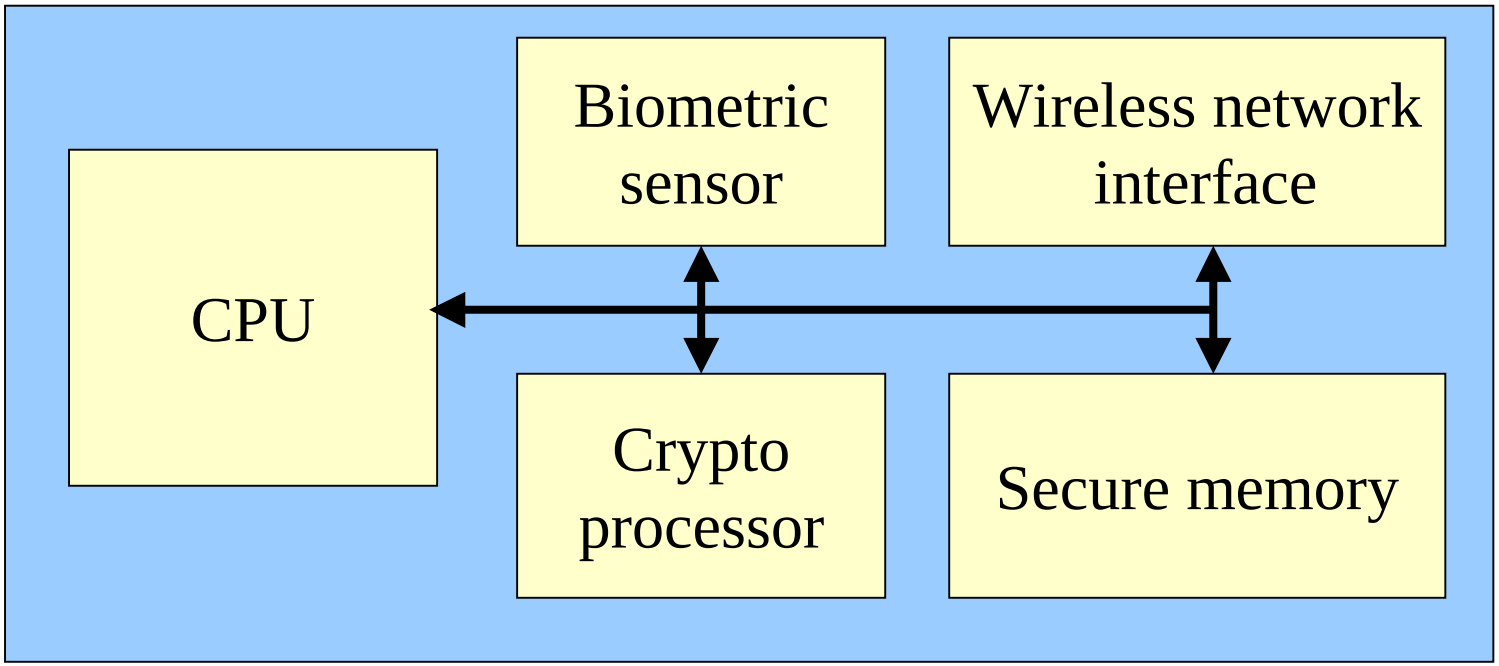
- only service information
- no access to services

Realisation – Add-on card



Expansion card for actual mobile devices

Realisation – Smart Badge



- active card
- optional: display & input device

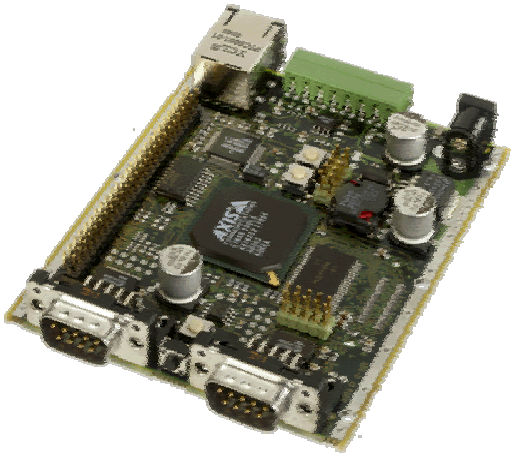
Development System

Hardware

- IPAQ H3650
  - 206 MHz S-ARM
  - 64MB RAM
  - 16MB Flash
- Axis Etrax 1000LX
  - 100MIPS 32bit RISC
  - 8MB RAM
  - 2MB Flash
- Sigma Bluetooth Controller
  - Spec. 1.0B
  - Ser/USB

Software

- Linux Kernel 2.4
- Bluetooth Stack **openBT**



Conclusion

spontaneous network integration of mobile devices

- enables:
  - variable communication possibilities
  - new service structures

- requires:
  - additional hardware components
  - security architecture to provide safe data transmissions
  - authorisation & authentication of services and devices