Architecture of SEMPER

Michael Steiner

IBM Zurich Research Laboratory
CH8803 Rüschlikon, Switzerland
Ph. +41 1 724 8286 / Fax +41 1 724 8955
<sti@zurich.ibm.com> / <http://www.zurich.ibm.com/~sti>

Second Public SEMPER Workshop,
November 4, 1998

SEMPER

IBM

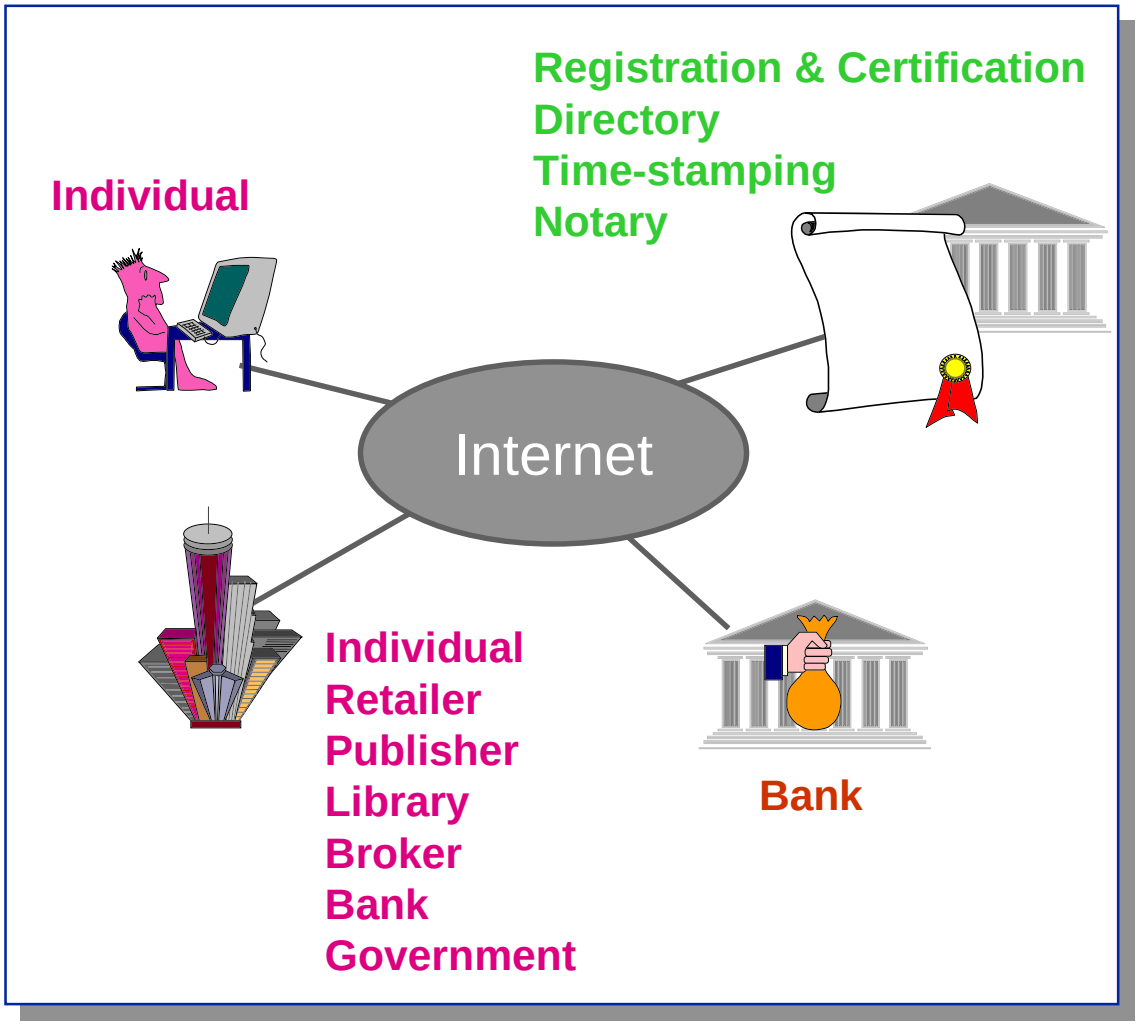
ACTS

Outline

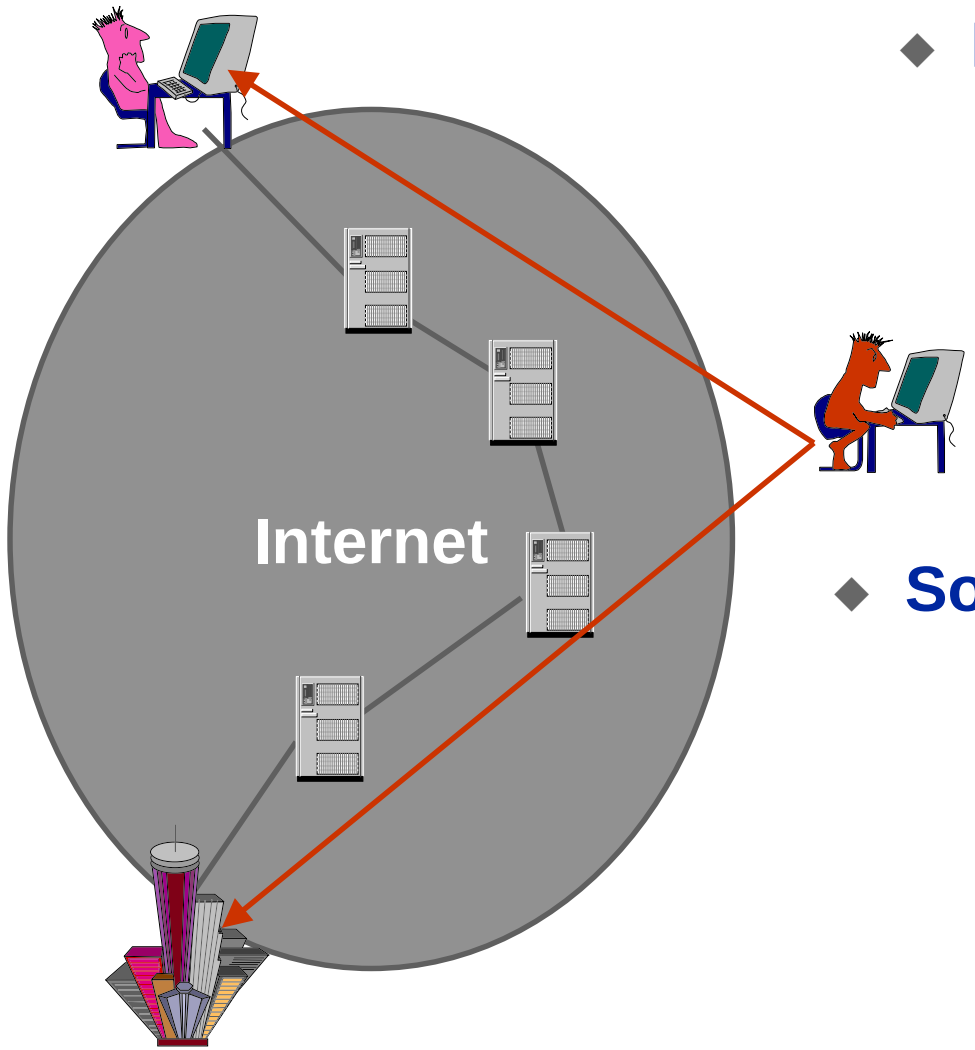
- Introduction
- Objectives
- Model
- Architecture
- Outlook
- Conclusions

Electronic Marketplace “Internet”

- Document Exchange
- Mail Order Retailing
- Electronic Publishing
- Ticketing
- Subscriptions
- Information Brokerage
- Auctioning
- ...



Current Situation



- **Requirements**
  - Integrity
  - Authentication
  - Confidentiality
- **Some issues**
  - Weak cryptography
  - Trust in CA
  - Trust in Peer

Secure Electronic Commerce

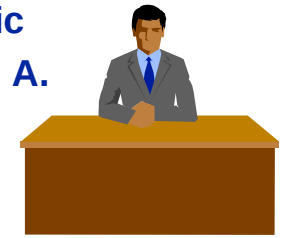
- **More than secure communication ...**
  - **Multi-party problems:** payments, notarized contract signing, auctioning, copy protection, ...
  - **Multi-party Security:** limit trust in others, make trust explicit, verifiability of trusted parties
- **More than payments ...**
  - **Processes:** Systems must be securely linked, e.g. contract with payment with delivery
- **More than technical security...**
  - **Legal and technical foundations:** Digital signatures; registration & certification; secure hardware; unified user interfaces; Dispute handling...

Objectives for Architecture

- **Coherent model as basis**
  - should be easy to understand ..
- **Security as driving factor**
  - security cannot be added later …
  - addresses multi-party security requirements
  - supports dispute handling
- **Openness**
  - Extensibility
  - Uniformity
  - Generality

Scenario: Buying Airline Tickets ...

- Notary Public
- Certification A.
- "Bank," etc.



Third Parties

Alice

Request

Offer

Reservation Order

Reservation Confirmation

Payment

Payment Receipt

Ticket

Ticket Receipt

BobAir

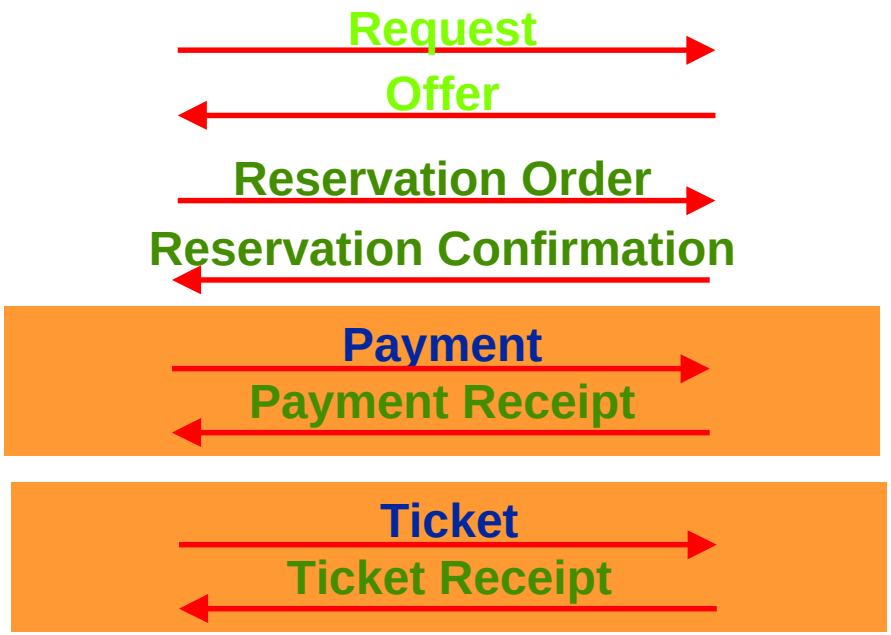
Dispute Handling

Secure Transfer & Exchanges

- Transfer & Exchanges
  - Data
  - Statements
  - Payments
  - Credentials
- Security Requirements
  - Authentication
  - Confidentiality
  - Non-repudiation
  - Fairness

Alice

BobAir



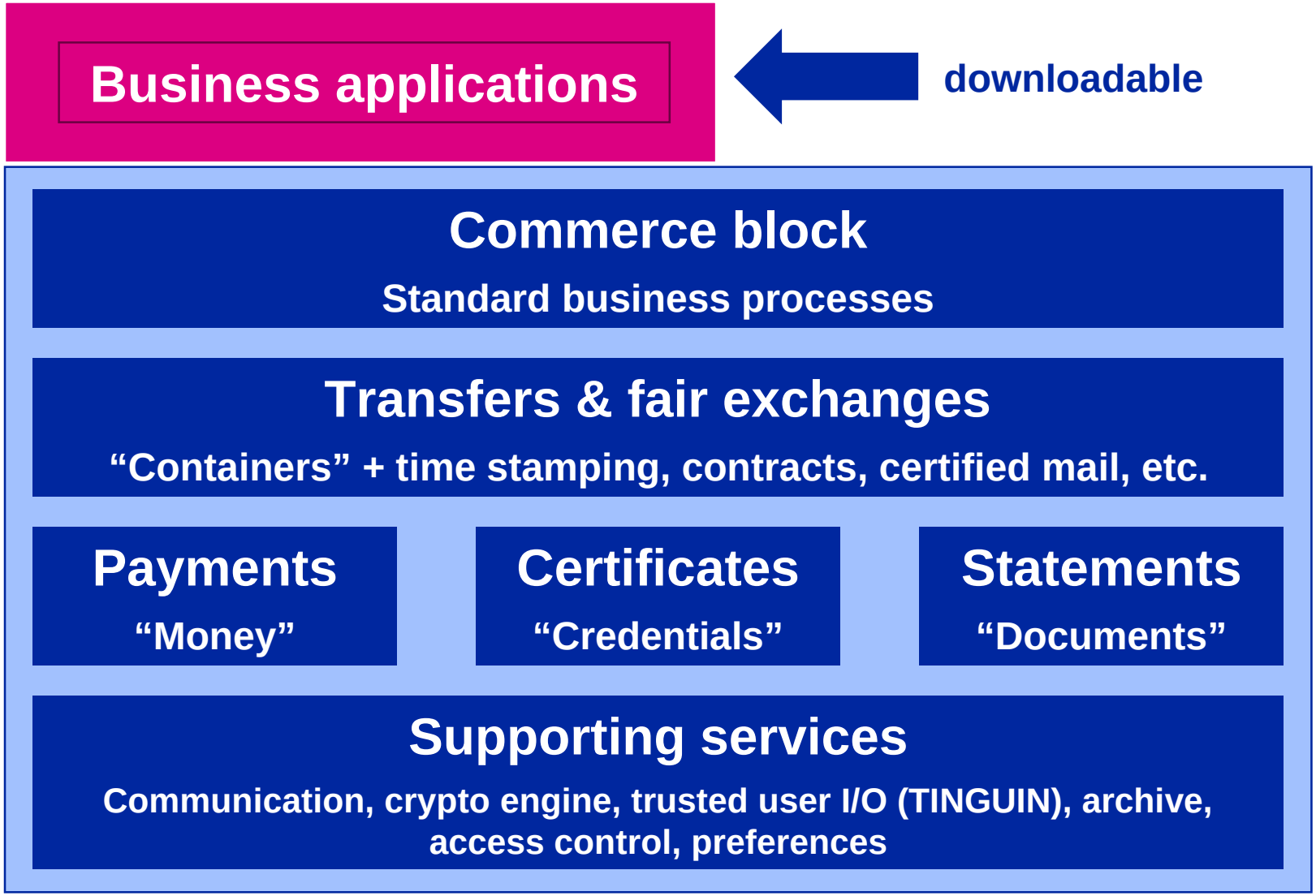
Bird's View

Alice

BobAir

Architecture

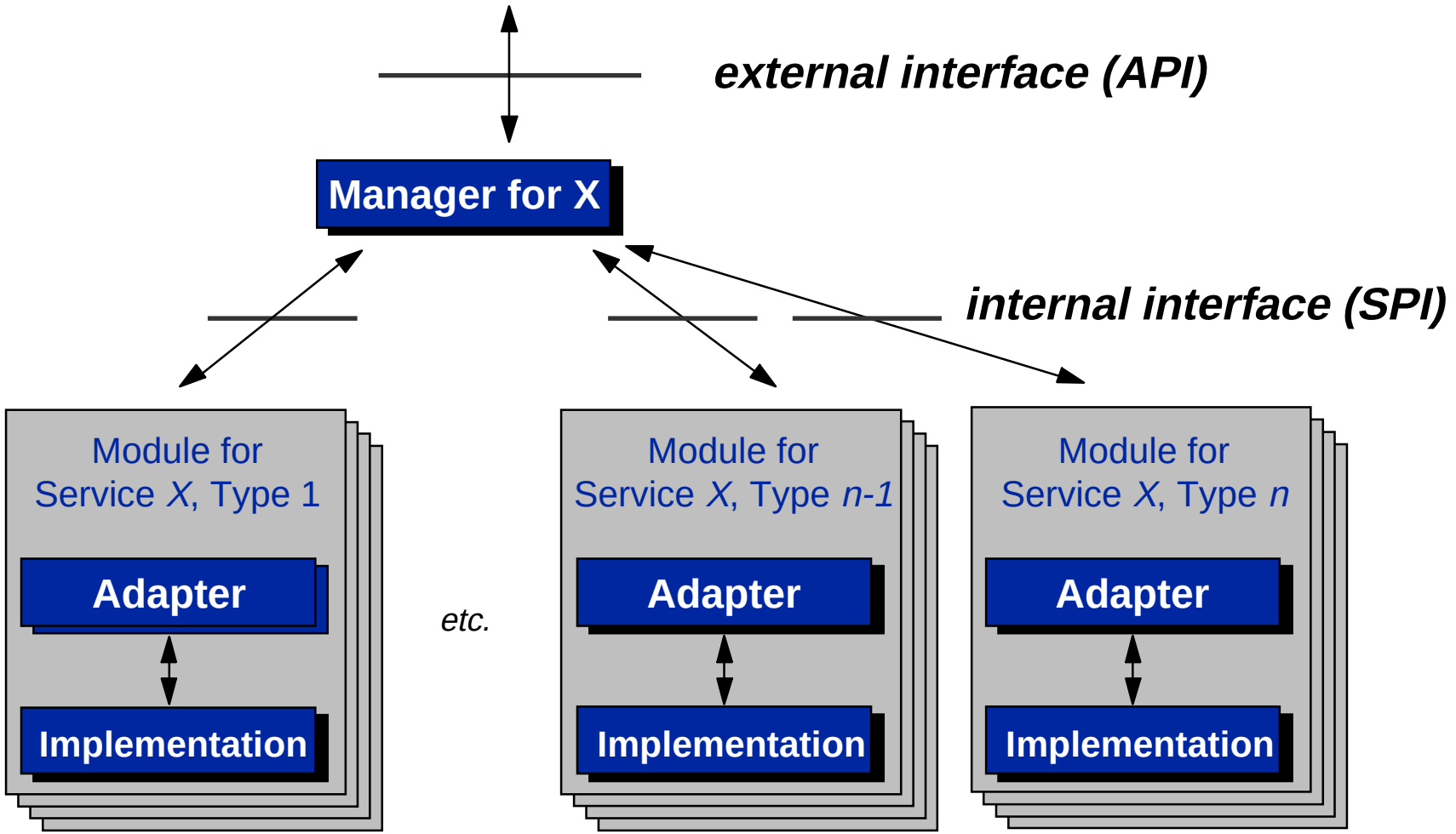
A closer look ...



SEMPER

IBM

Open Service Block Architecture



Accountability: Implications for Design

- Certificate cannot bind a user *per se*
- Ideal registration:
  - CA and user sign a contract
    - Certification policy
    - Accepted liabilities
    - Contents of certificate

Did supposed signer accept liability for such signatures?

  - User interface
    - Standard GUIs
    - Standard presentation SW
    - "Point of no return"

Was supposed signer aware of signed contents?

  - Secure key handling and signature generation
    - secrets generated by user
    - secrets never leave trusted user device (e.g., electronic wallet)
  - Notarization of signature

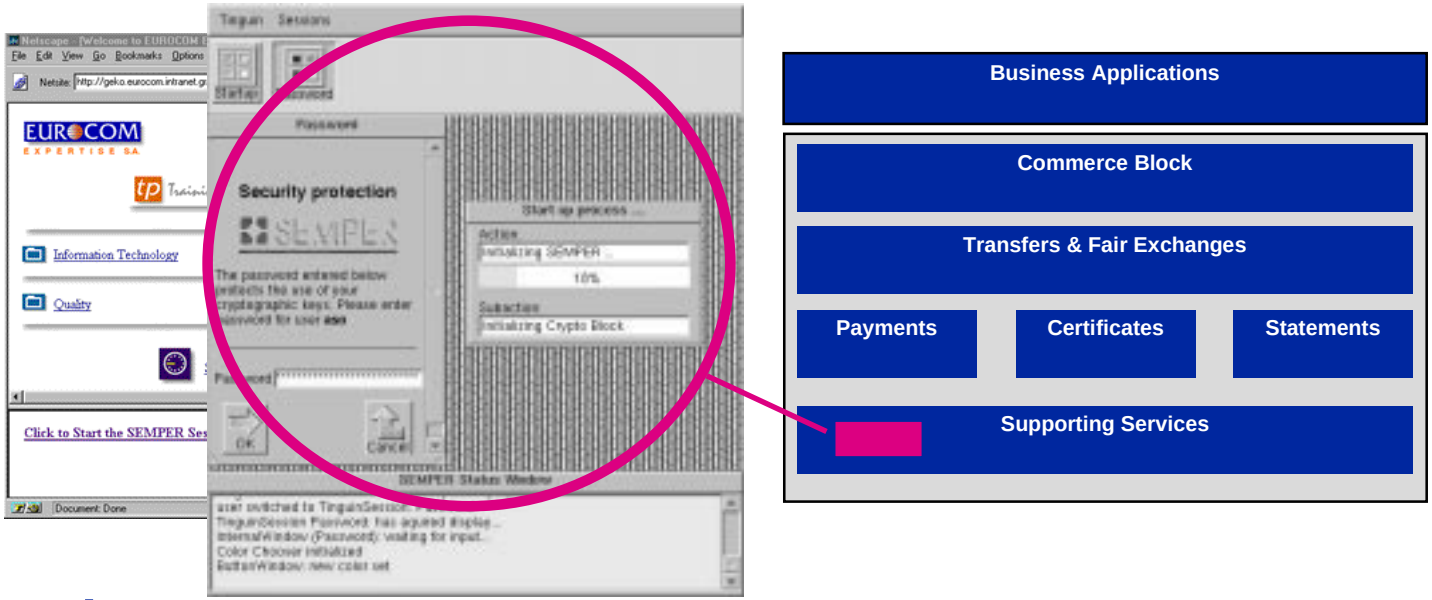
Was supposed signer the creator of a signature?

Commerce Layer

- **Deals**
  - business context with negotiated quality of service
  - secure linkage of commerce transactions
  - collection of evidence, deal browser & dispute handler.
- **Commerce transactions**
  - Extensible class hierarchy of primitive transactions (payments, offers, orders, ..)
  - Core classes enforce standardized presentation of information to the user and proper authorization
- **Downloadable extensions**
  - certification

Architecture

Trusted Interactive Graphical User Interface



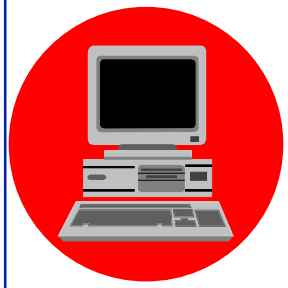
- **Why?**
  - Never trust a window on an untrusted PC or in a browser ...
- **How?**
  - Approximation in software: Dedicated window
  - Ideal solution: “Electronic wallets” with keypad & display
- **More general problem: Untrusted Hardware**

SEMPER

IBM

Need for Trusted User Devices

Software-only



Secret key + computation + protocols

User

Smartcard-only

Secret key + computation

Protocols

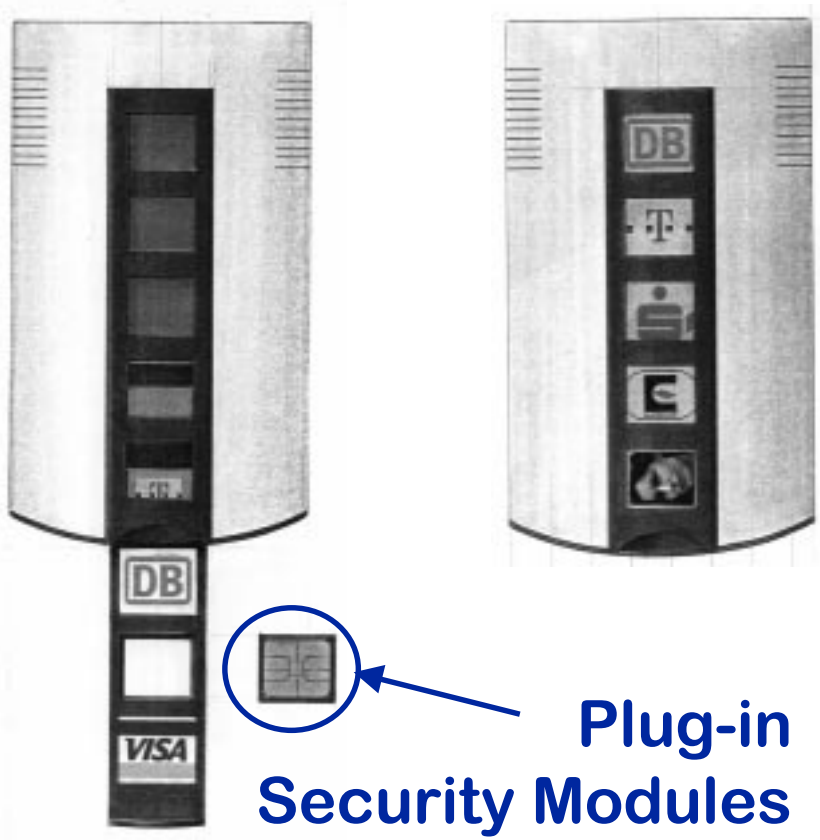
User

User device + security module

Secret key + computation + protocols

User

Electronic Wallet: *Design Example*



Plug-in
Security Modules

Infrared

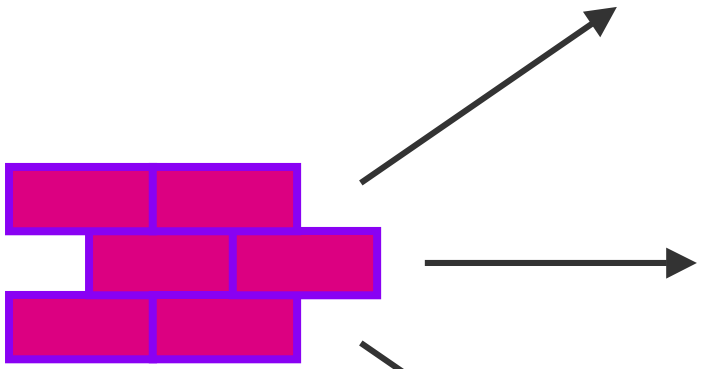
Display

Keypad

Back ***Front***

Conclusions

Sound architecture, solid bricks



- **SECA**
- **liability cover**
- **deal concept**
- **fair exchanges**
- **signed offers/orders**
- **trusted user interface**
- **pervasive anonymity**
- **dispute handling**

Supports multiple business models:

- business-to-business, business-to-consumer, private-to-private
- symmetric design

Comprehensive:

- multi-party security at its core
- processes, not just steps
- large set of supported services

Extensible:

- service framework
- generic interfaces
- downloading of modules, BAs