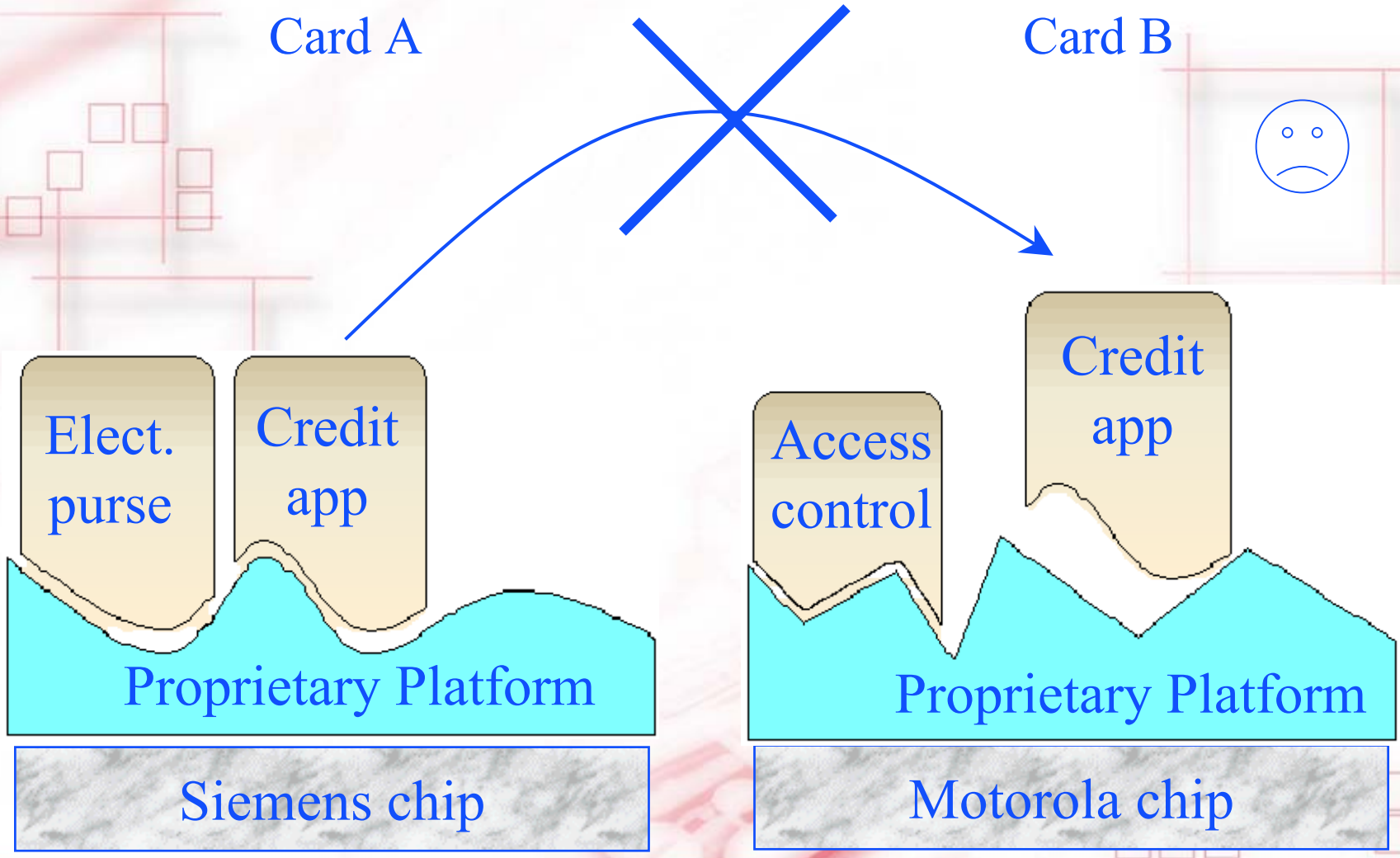
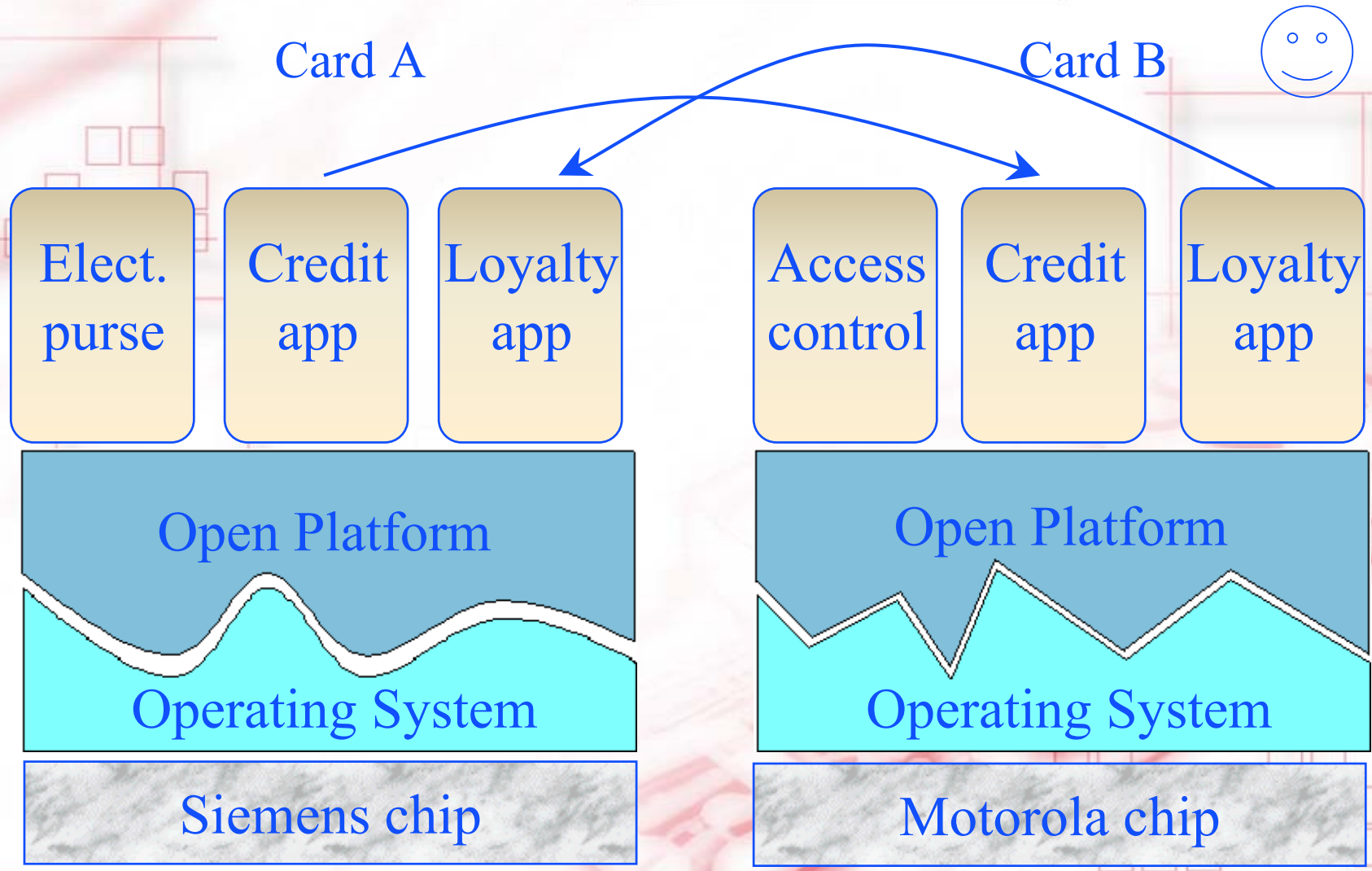
Smart Card Chip Operating System Platform

- Proprietary
  - Non portable across different vendors
  - Not open to outsiders
  - Single source
- Open
  - Multos card
  - Java card
  - Windows for Smart Card

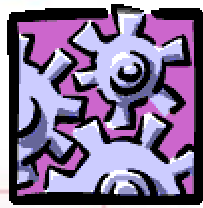
Non-Portable Application On Proprietary Platform



Portable Application On Open Platform

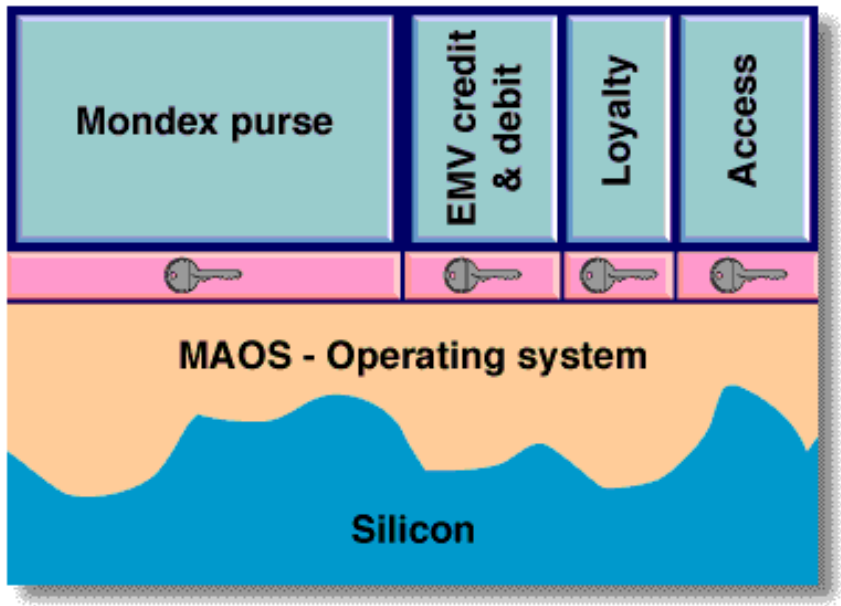


Multos Card



- MULTi-application OS developed by Mondex and MasterCard
- Rely on the Multos API
- ITSEC E6 certified firewalls for card application segregation
- Extremely secure smart card
- Internal structure is similar to Java card

Multos Card (cont.)



Applications

MULTOS

Firewalls

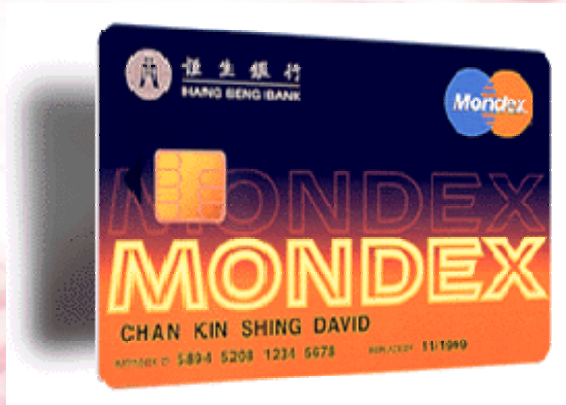
Silicon (hardware)

Interpreter and API

Application load certificate

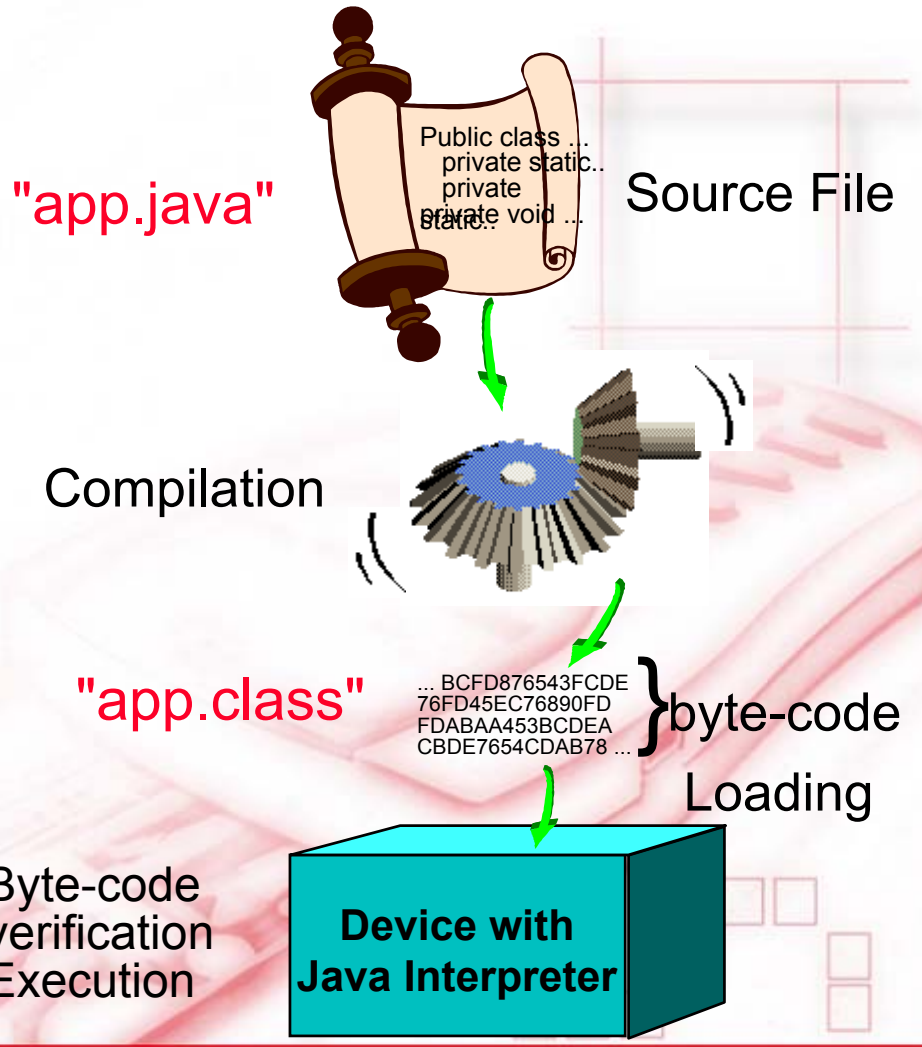
Multos Card (cont.)

- Uses dedicated programming language, Multos Executable Language (MEL)
- Can develop using C and then convert to MEL
- Java cardlet can also be run on Multos card

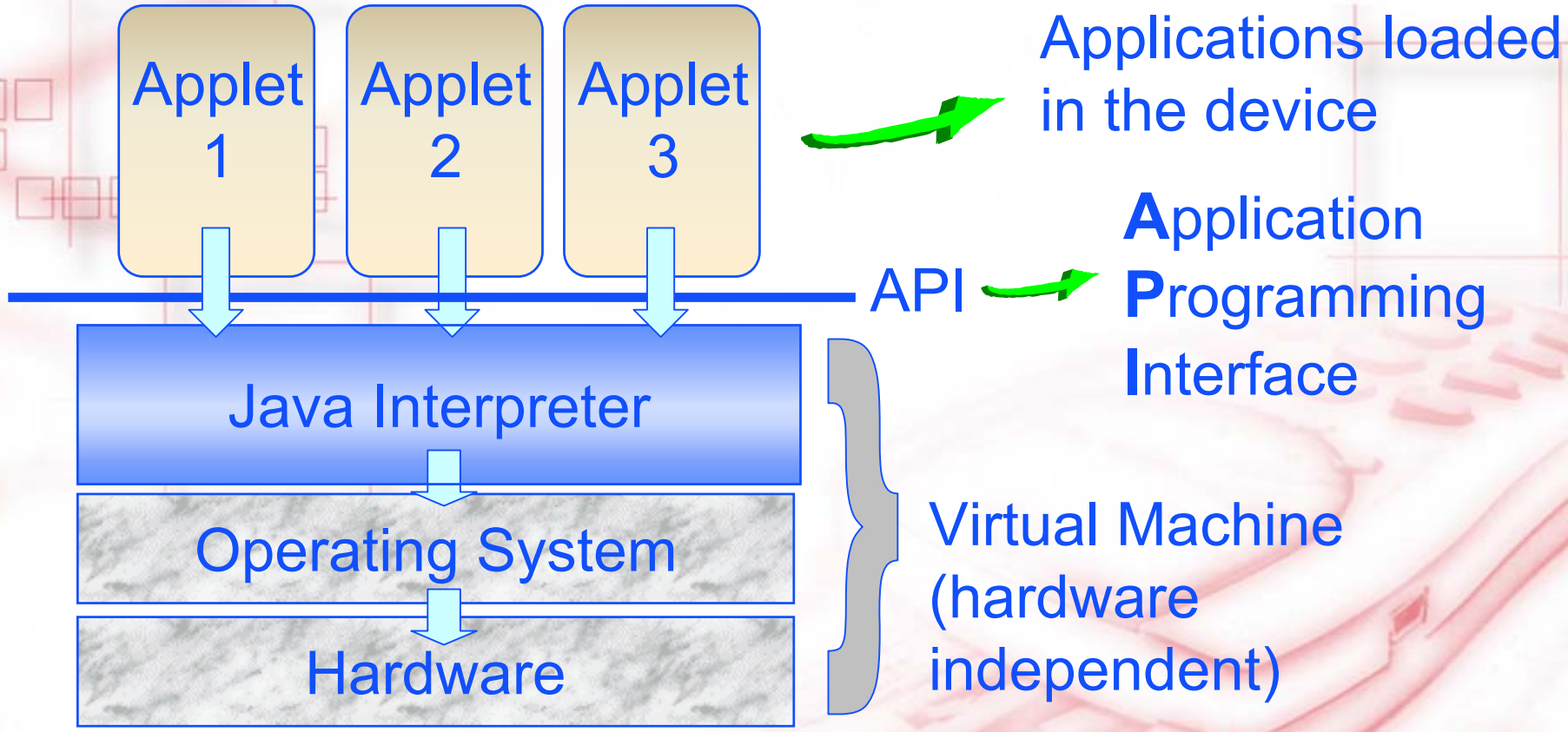


Java Card

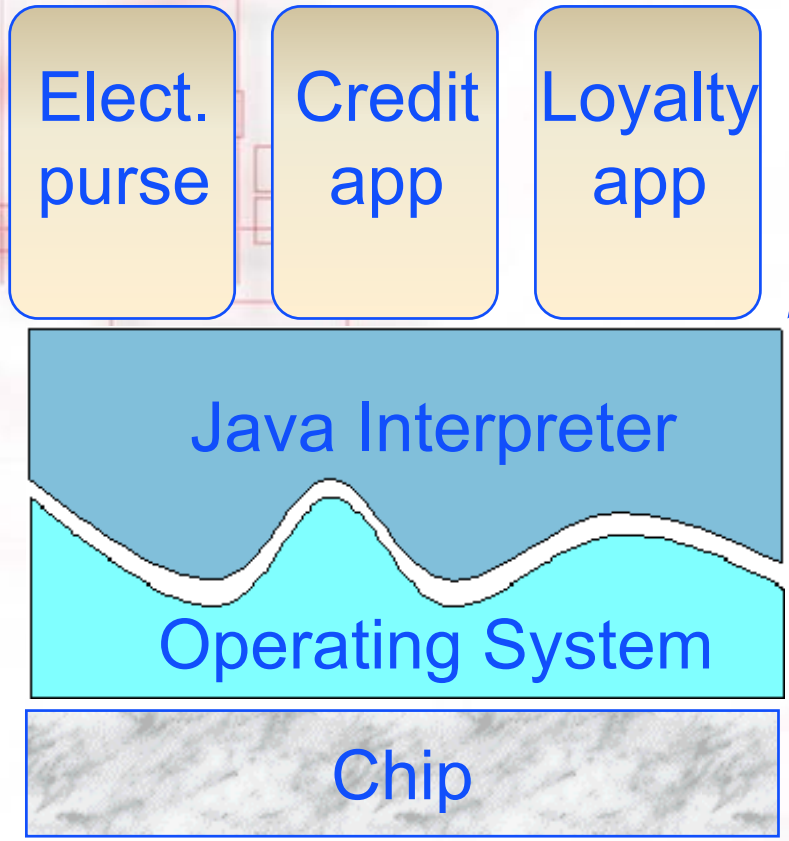
- Object Oriented Language
- Syntax similar to "C" and "C++"
- Interpreted language



Java Card (cont.)



What is Java Card API



Java Card API
(Application Programming Interface)

- The API defines a library of classes
- A class is an association of:
  - methods (functions)
  - fields (data)
- A Java card application is written by "calling" a set of Java card classes

Visa Open Platform Card

Visa Open Platform Card

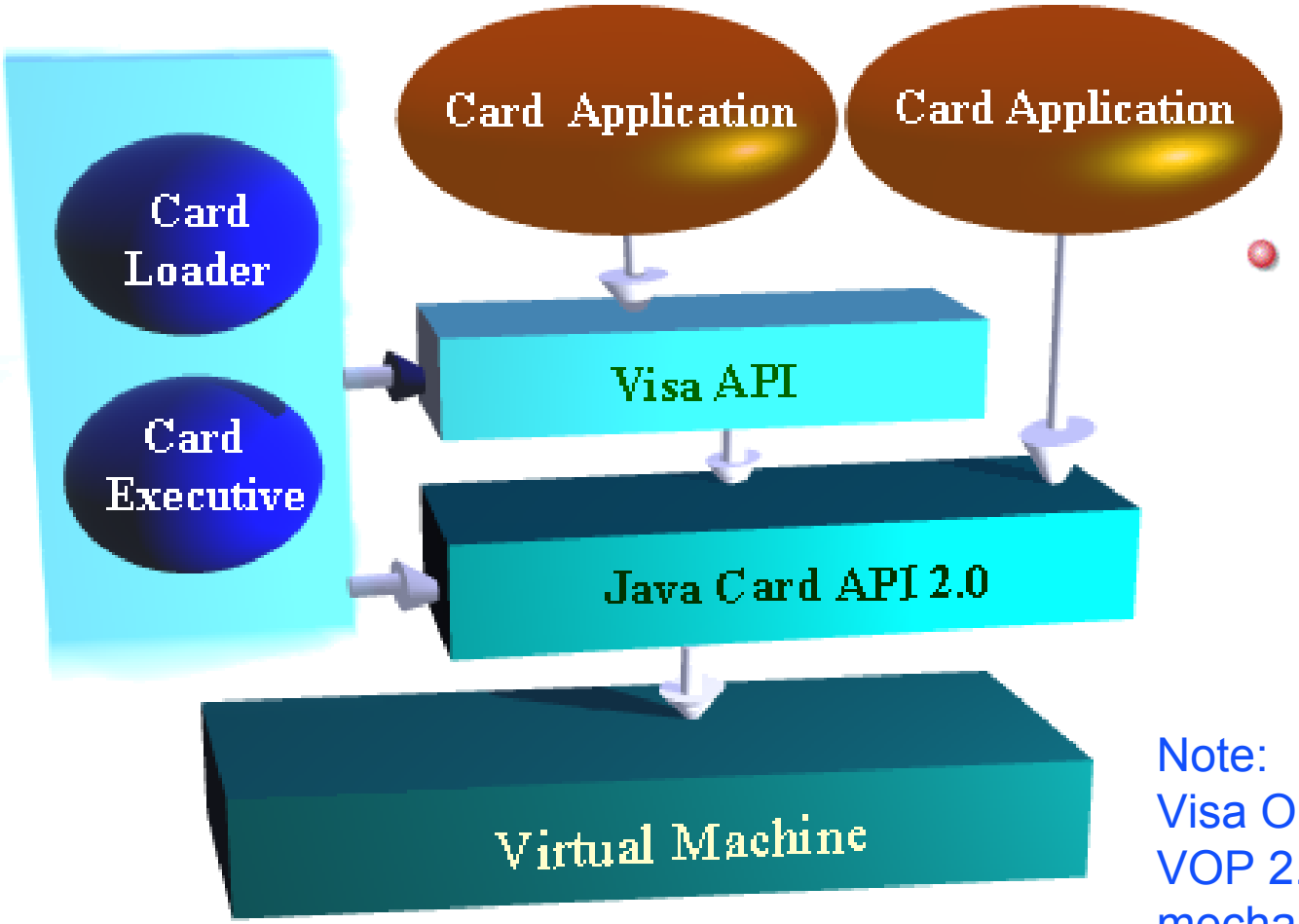
- Key features
  - Compliant card used by financial industry
  - With VisaCash, E-purse Cardlet defined and preloaded
  - Dynamic post-issuance loading of Applications

Visa Open Platform Card

Visa Open Platform Card

- Portability of Applications across chip-cards
- Standardization of Personalization
- Backward compatibility with existing terminals & systems

Visa Open Platform Card



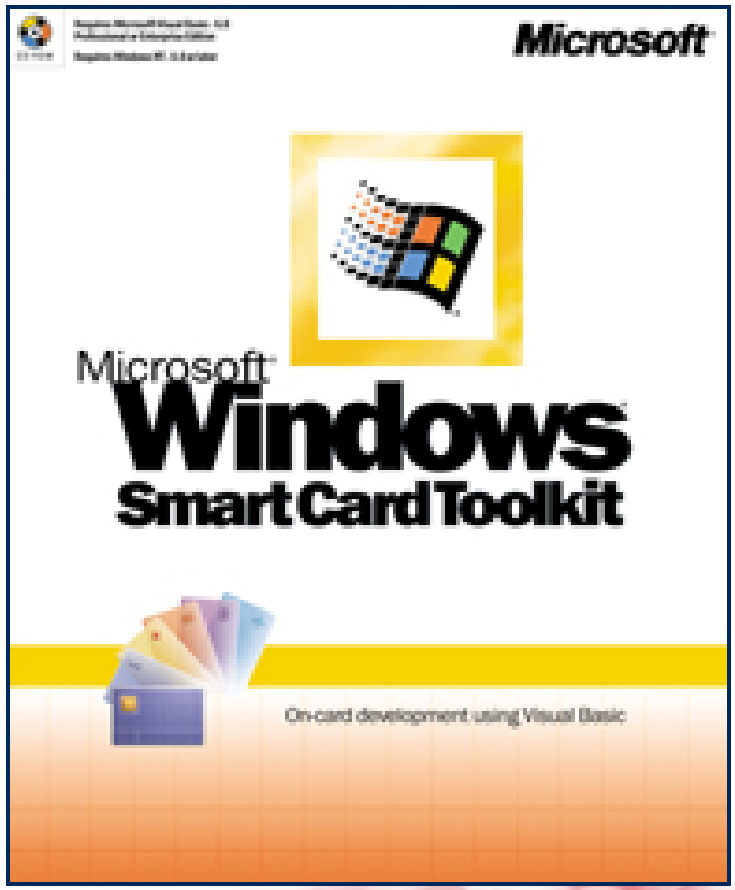
- **Java Card 2.1 :**
  specify the basic API

Note:
Visa Open Platform is **optional**.
VOP 2.0 standardize the loading mechanism for all vendors.

Windows Smart Card

- Proposed by Microsoft in Oct 27th 1998, released in Nov 15th 1999
- Multi-application OS using 8K ROM
- Low-cost
- Easy to program using VB on NT or Win 2K
- Cardlet can be downloaded to the card

Smart Card For Windows



Windows Smart Card

- **Secure operating system**
  - Control of a FAT file system with Access Controls Rule
  - On-card Win32 API,
  - Language-neutral virtual machine and popular cryptos
- **Rapid application development tools**
  - Support Visual Studio
  - With PC simulator

Windows Smart Card

- **Application used**
  - Secure network authentication
  - Secure corporate transactions
  - Health-care information
  - Electronic cash
  - Customer loyalty programs

PC/SC Standard

- Formed in May 1996 in partnership with major PC and smart card companies
  - Groupe Bull
  - Hewlett-Packard
  - Microsoft
  - Schlumberger
  - Siemens Nixdorf

PC/SC Standard

- Ensure compatible communications between all types of smart cards
- Standard model for interfacing smart card readers and cards with PCs
- Device-independent APIs for enabling smart card aware applications