



# What does Flash memory technology promise for the SIM Industry ?

Didier Save, PhD

Technology Marketing

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Gemplus

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Flash memory technology

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Promises for SIM industry

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Outlook



# Experienced leader in smart cards

**5.5 billion: total smart cards supplied**  
**€865 million: 2004 revenue**  
**6000 employees**

- Gemplus was founded in 1988.
- One of the original pioneers of smart card technology.
- World leader\* in shipments and revenue: 27% market share 2004
- Present around the world:
  - Over 50 sales & marketing offices
  - Research & development centers in Europe, USA and Asia
  - 20 personalization facilities and 11 manufacturing sites

*\* Gartner 2005, Frost 2004, Card Technology 2004*

# Expertise in secure platforms

Security is fundamental to our technology, helping to identify individuals, prevent fraud, and protect assets

- **Experience**
  - We have the largest, most experienced team of security and cryptography experts in the industry
- **Security**
  - We are constantly strengthening every angle of smart card security: cryptography, mobile code security, OS security, Internet and network security, and risk management
- **Certification**
  - We have more security certified products than any other player
- **Product development**
  - We analyze and respond to new threats, and develop products which meet our clients' evolving security requirements in every market sector
- **Service**
  - We offer complete security system solutions: cards, readers, software, middleware
  - We also offer consulting, audit, solution design, training and support

# Committed to innovation

Our commitment to our clients is reflected in our commitment to R&D. They demand an ever-wider range of innovative, high-quality solutions, so we invest to meet their evolving needs.

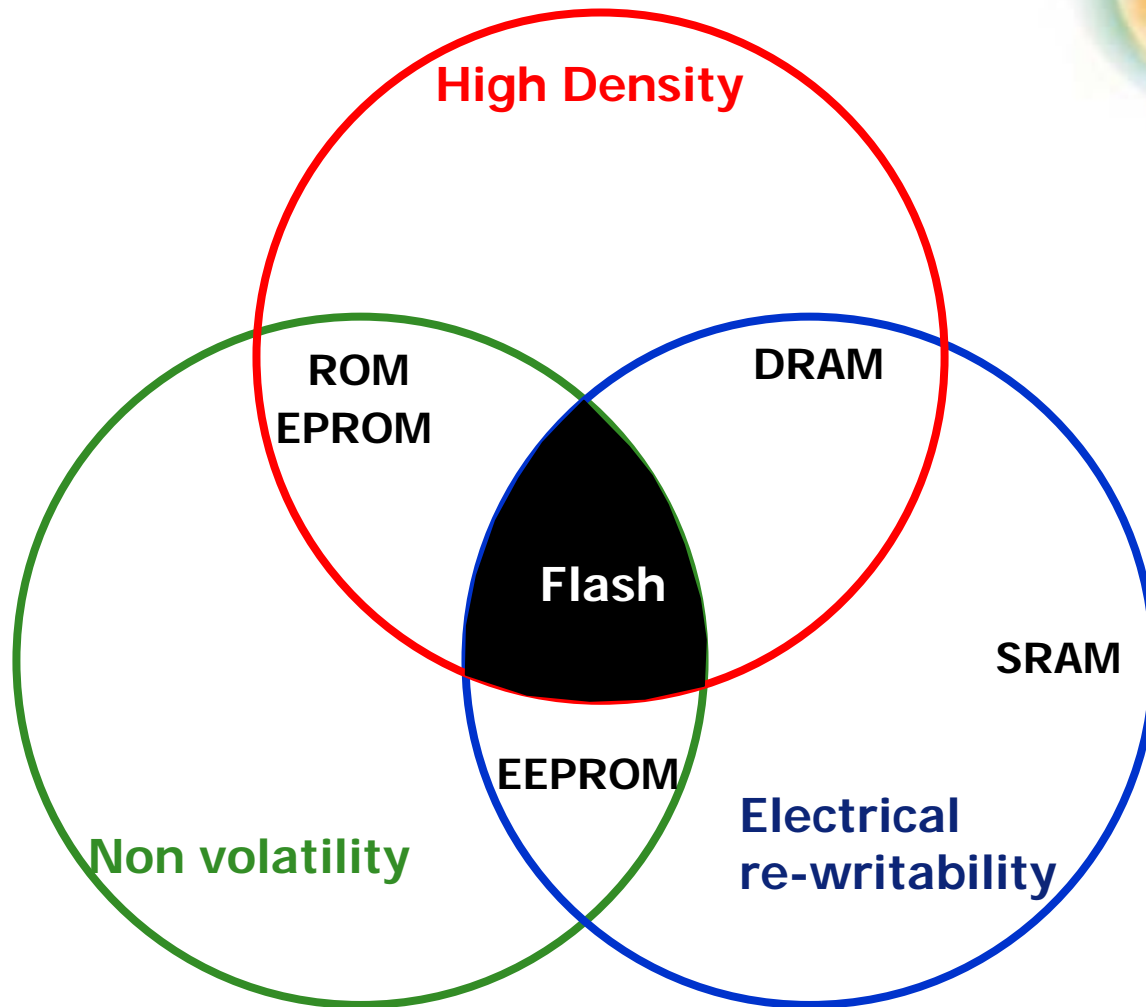
- **Investment:**
  - Highest R&D investment in the industry: 660 engineers worldwide
  - 5 R&D centers of expertise close to our clients around the world
- **Recognition:**
  - Leading and participating in many research & standardization projects
- **Expertise:**
  - Security solutions, OS development, and contactless technologies
  - Optimal product development
- **Quality:**
  - The first in the industry to be quality certified
  - Products conform to the strictest certification standards
- **Innovation:**
  - 2400 patents and patent applications, with more every year
  - Incubation group focusing on emerging markets e.g.: Trusted Computer Platforms & Digital Rights Management

# Flash memory technology

- SIM card chip is
  - Processing power
  - Security, and
  - Memories
- Memories account for more than 50% of chip area
  - ROM for Code
  - EEPROM for Data
- Flash memory is a first step to universal memory
  - Flash for Code
  - Flash for Data

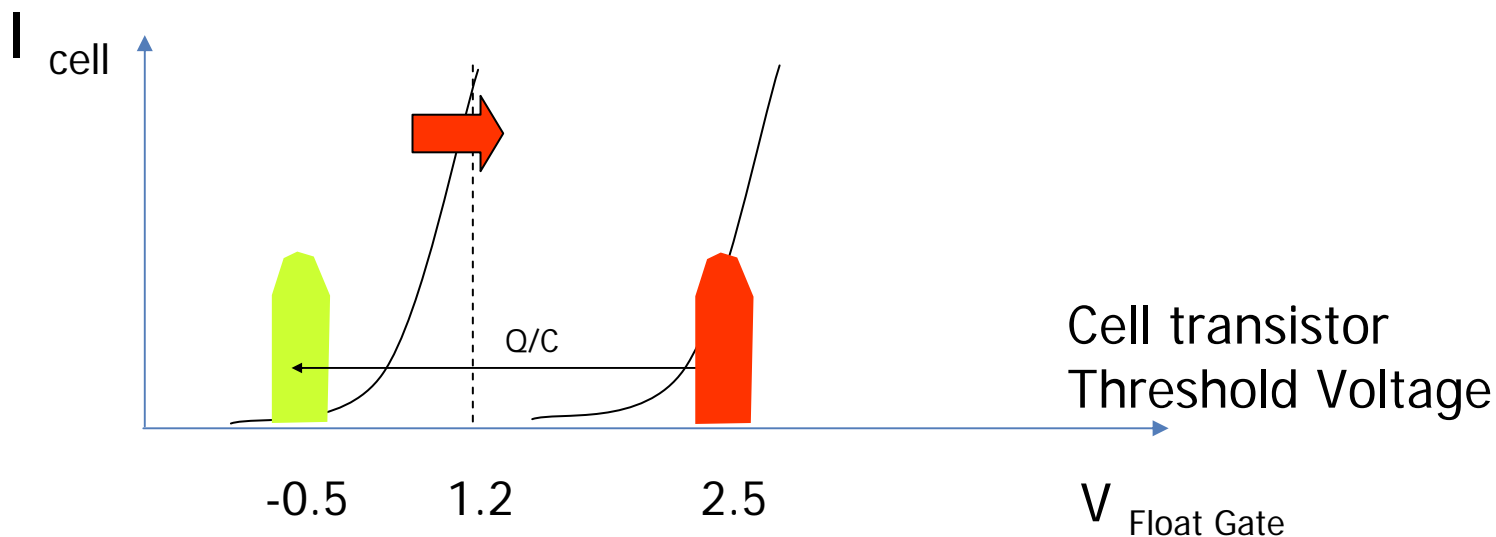


# Flash memory technology

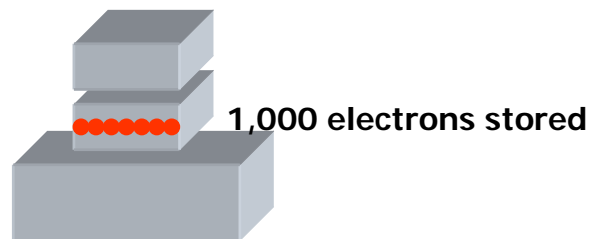
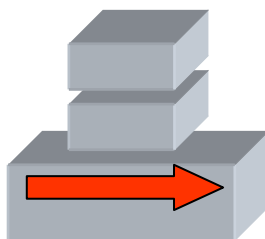


# Non Volatile Memory principle

Cell transistor current



Control Gate  
Floating Gate or Traps  
Substrate

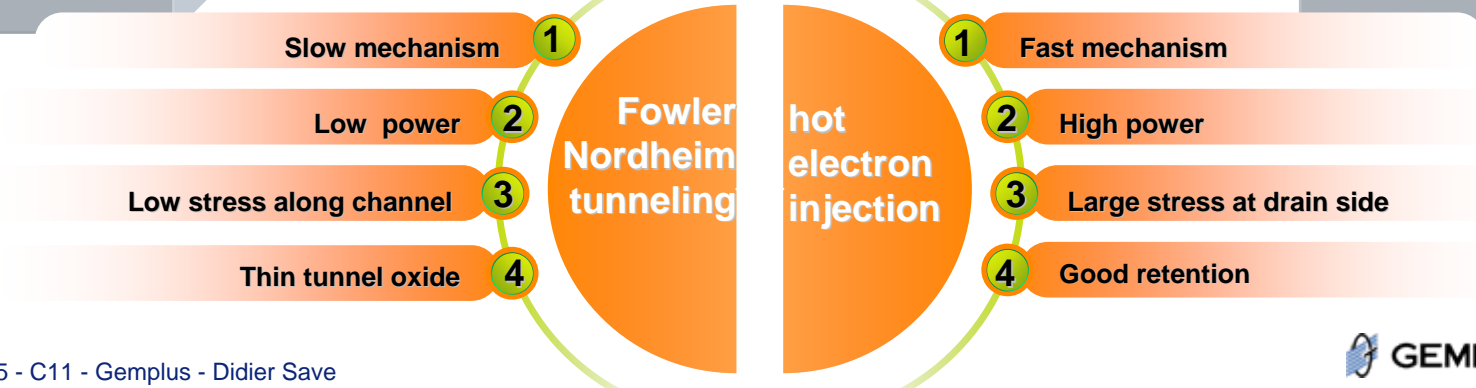
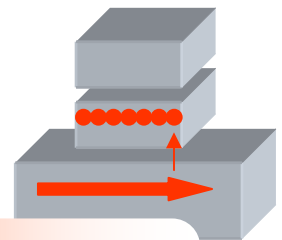
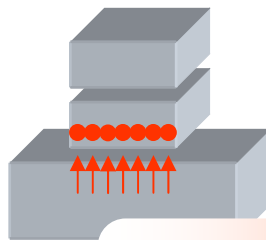
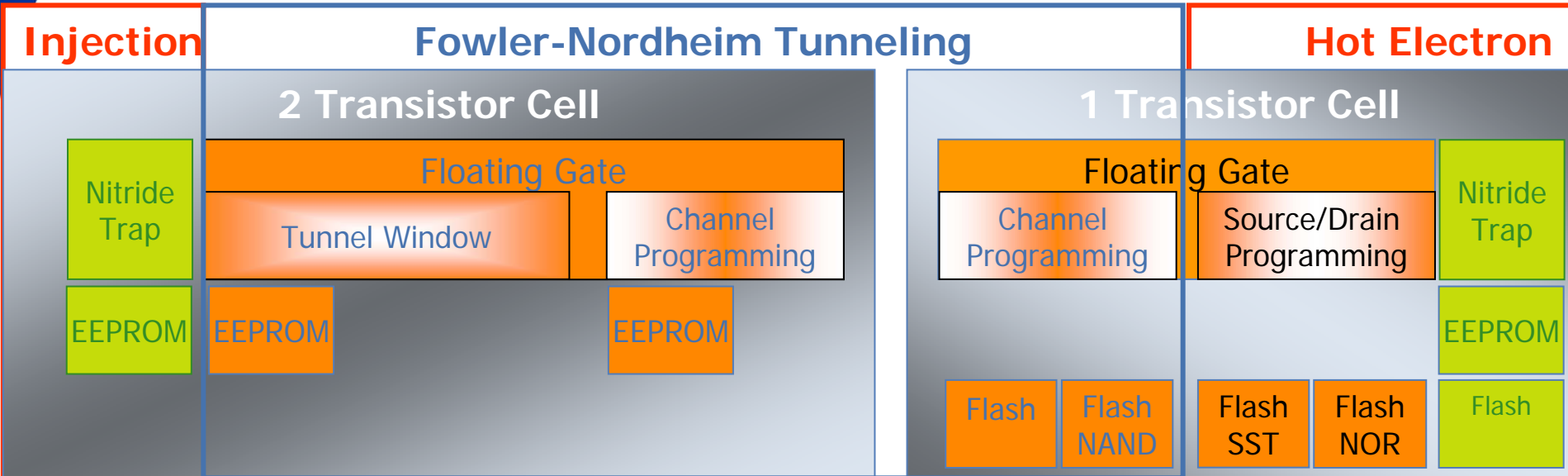


Cell transistor is  
Logic state is:

ON  
0 or 1

OFF  
1 or 0

# Electron injection mechanisms

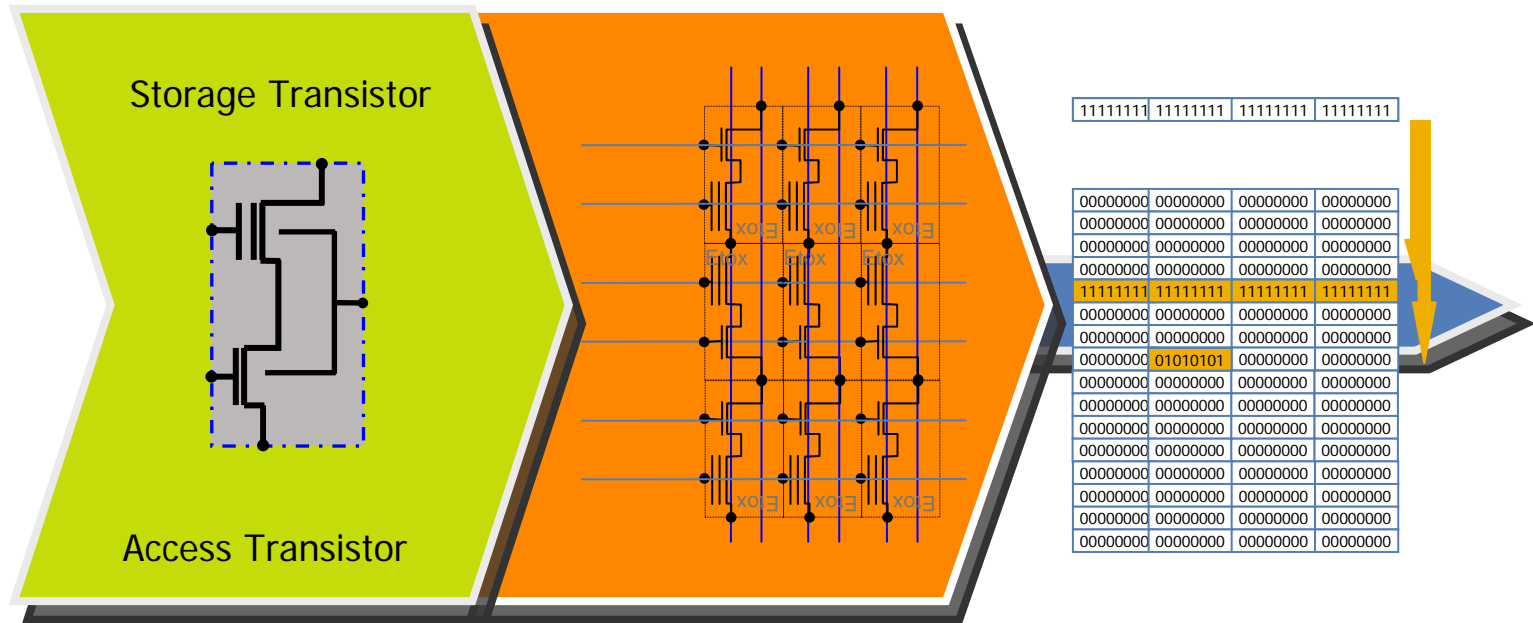


# EEPROM cell array architecture

2T cell

Array

Byte update



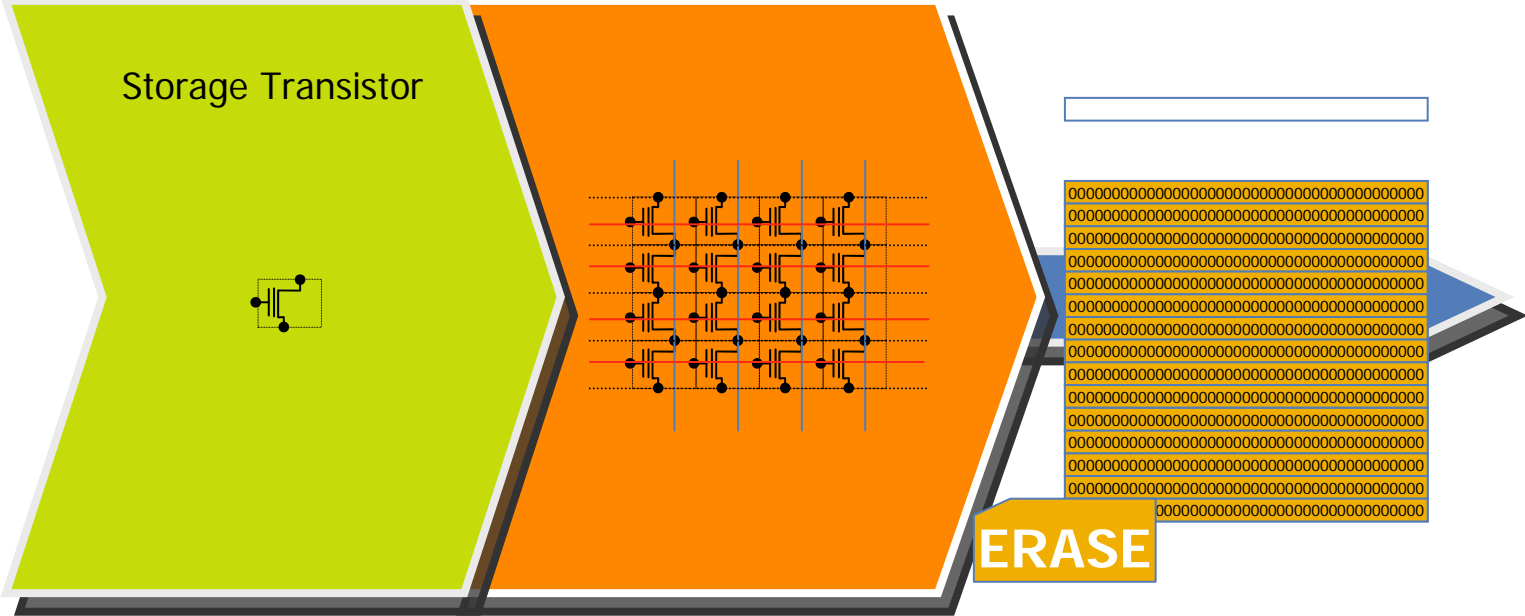
- EEPROM can be updated
- Byte per Byte or
  - Page per Page

# Flash cell array architecture

1T cell

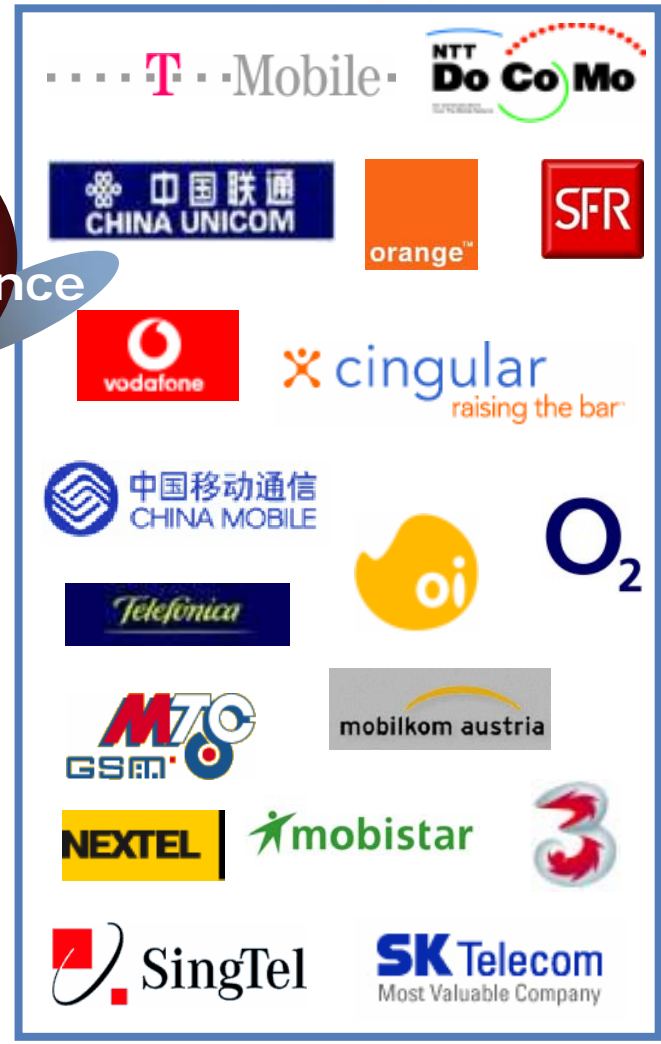
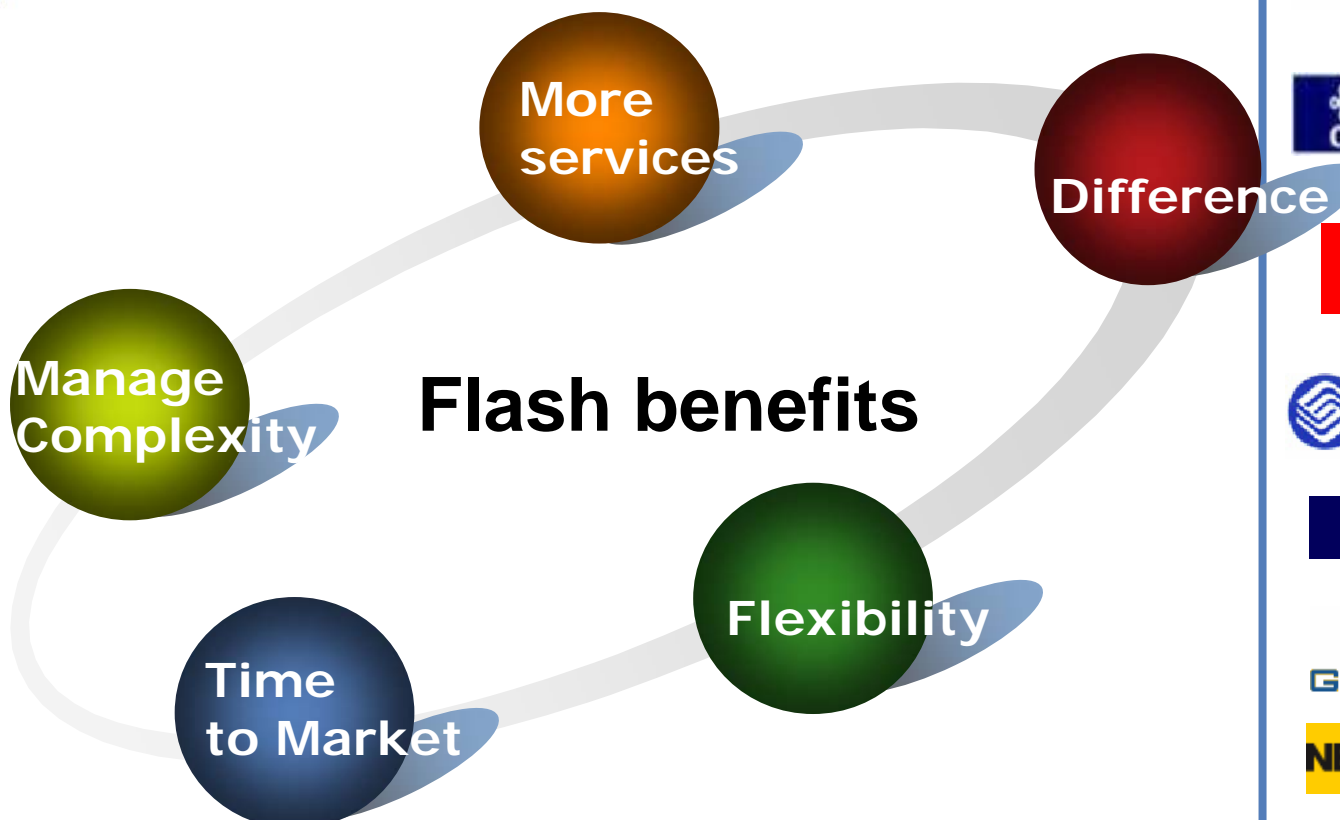
Array

Flash Erase



Flash can be flash erased and programmed per Page

# Promises for the SIM industry



# Outlook

- Technologies available in the field:
  - Conventional EEPROM
    - Reserved area for Code (Flash emulation)
  - Embedded NOR Flash
    - Code storage and execute in place
    - EEPROM emulation for Byte update granularity
- New technologies to come soon:
  - Multi-chip solution with stand alone NAND Flash
- Market fragmentation
- OTA services
- Time to Market
- Handset management
- Contact management
- Customization
- Content management
- ....

