# Emerging Threats: A Perspective from Mobius (EU project on Mobility, Ubiquity, and Security)

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http://mobius.inria.fr

Contract n$^{o}$ 015905

# Fact sheet

- Integrated Project within FET Global Computing II, started Sept 2005, 4 years duration.
- 16 members


| | |
|---|---|
| *INRIA* | *LMU Münich* |
| *RU Nijmegen* | *ETH Zürich* |
| *U. Edinburgh* | *Chalmers* |
| *Tallinn U.* | *Imperial College* |
| *UC. Dublin* | *U. Warsaw* |
| *UP. Madrid* | *TU Darmstadt* |
| *SAP Research* | *France Telecom* |
| *Trusted Logic* | *TLS* |

- Scientific Advisory Board:

  *Martin Abadi* *Amy Felty* *Rustan Leino*

- End User Panel

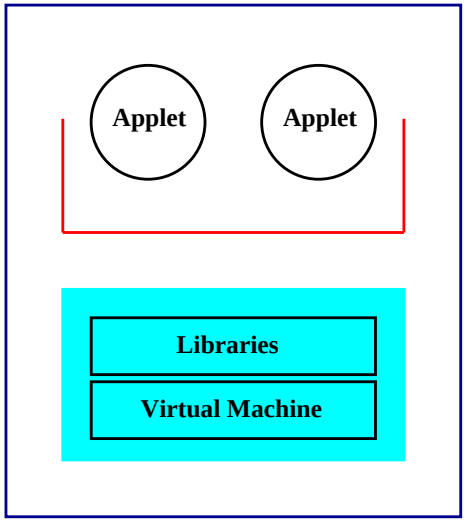
# Objectives

The goal of MOBIUS is

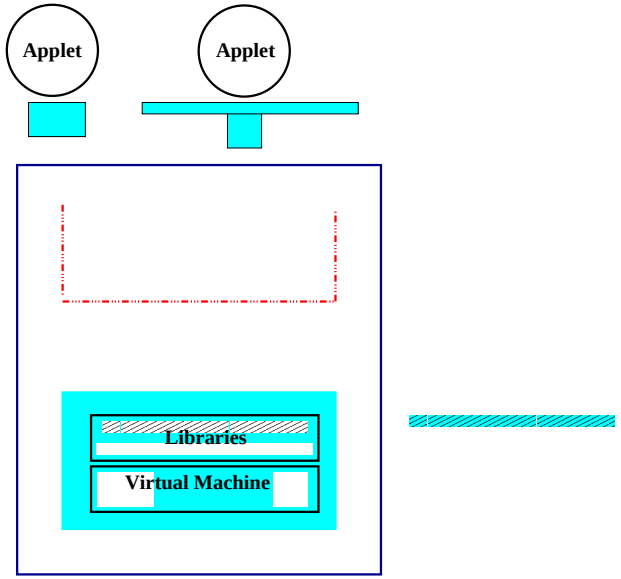
- to build a *security infrastructure*
- for *mobile code*
- in the context of *global computing*
- by means of *certificate-based verifiable evidence* (PCC)
- which captures *expressive security policies*

# Computational model

- Very large networks of (JVM-enabled) devices:
- No central trust authority: trust infrastructures must allow verifiable evidence (cryptography is not enough).
- Devices contain computational infrastructures that can be updated/extended remotely.
- Sandboxing is not enough. No sharp distinction between static Trusted Computing Base and mobile applications.



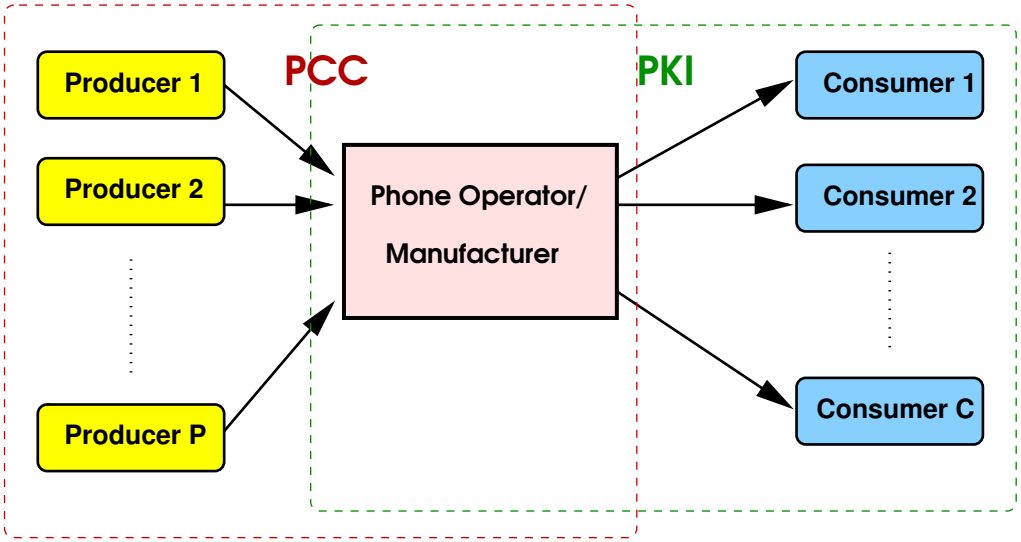

Current scenario




Mobius scenario

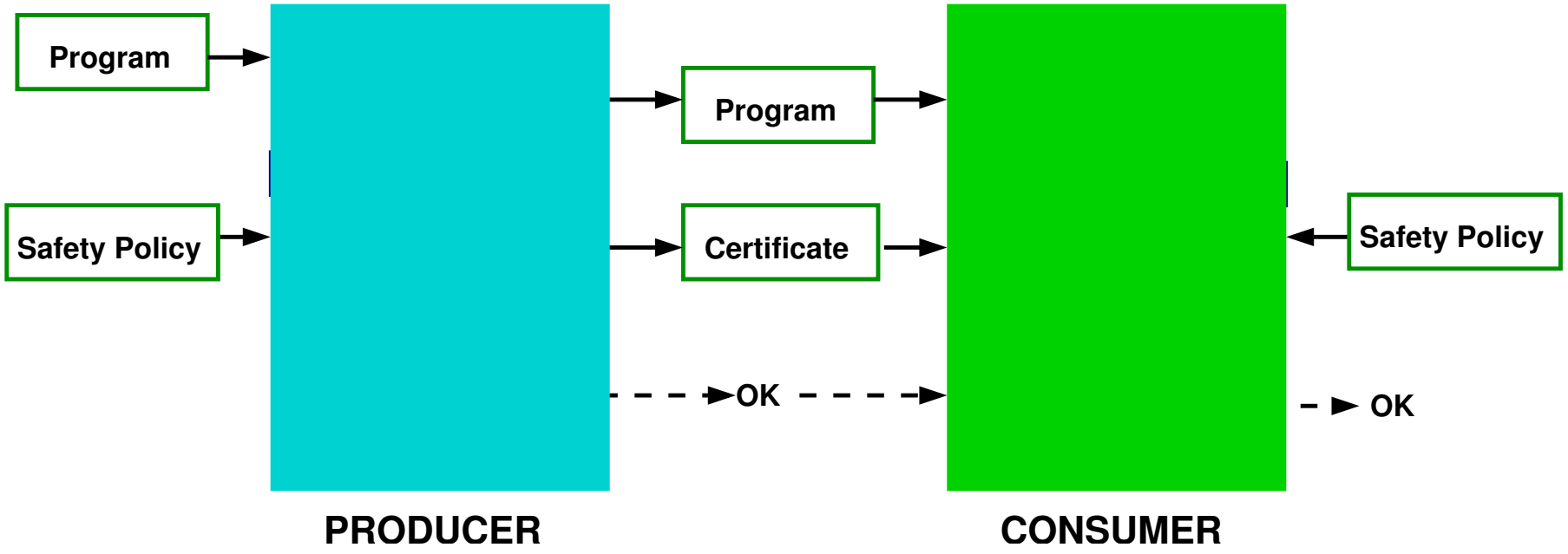
# An Application Scenario

- MOBIUS promotes *trust through verifiable evidence* (PCC). Can be combined with *trust by authority* or *trust by reputation*.
- Phone operators/manufacturers can act as trusted intermediaries:




- Provides an appropriate trade-off between feasibility and flexibility which will be exploited in the rest of the project.

# Certificate-based Mobile Code Safety



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- Key benefit: burden of ensuring compliance with desired security policy (mostly) shifted from consumer to producer.
- Fundamental challenges:
  1. defining *expressive security policies* covering a wide range of properties,
  2. obtaining *easy-to-use certificate generators* and,
  3. designing *simple, reliable, and efficient checkers* for the certificates.

# Enabling technologies

- The *Enabling technologies*: should address the three issues mentioned.
- Enabling technologies should provide enough precision and automation to guarantee applicability and scalability.
  - Type systems/static analyses:
    - efficient and automatic, but
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    - used for information flow, resource usage, aliasing

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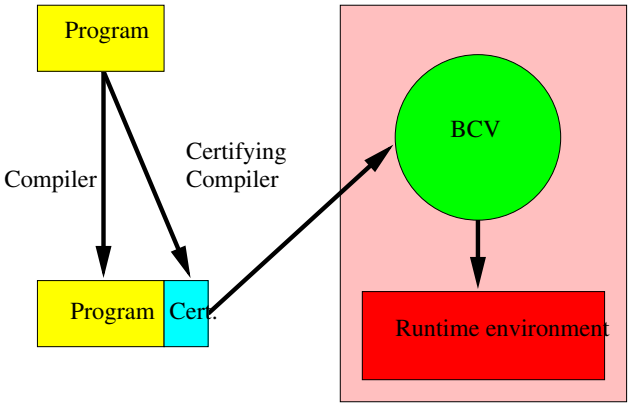
  - Program logics:
    - general, precise, but
    - often interactive
    - used for high-level security policies and functional correctness

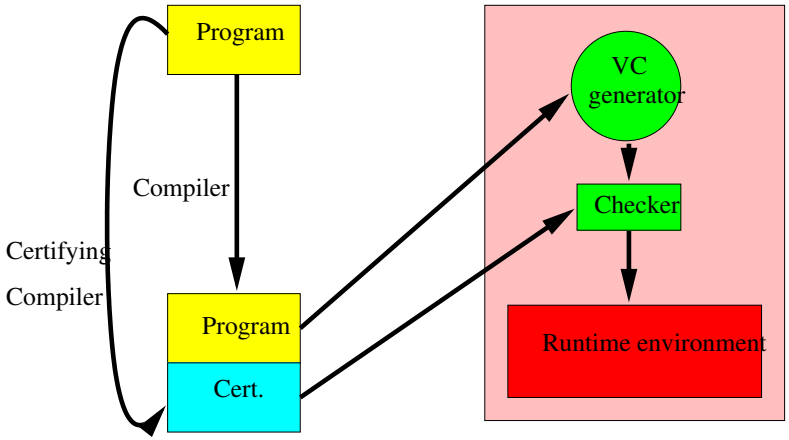
# Main flavors of PCC

## Type-based PCC



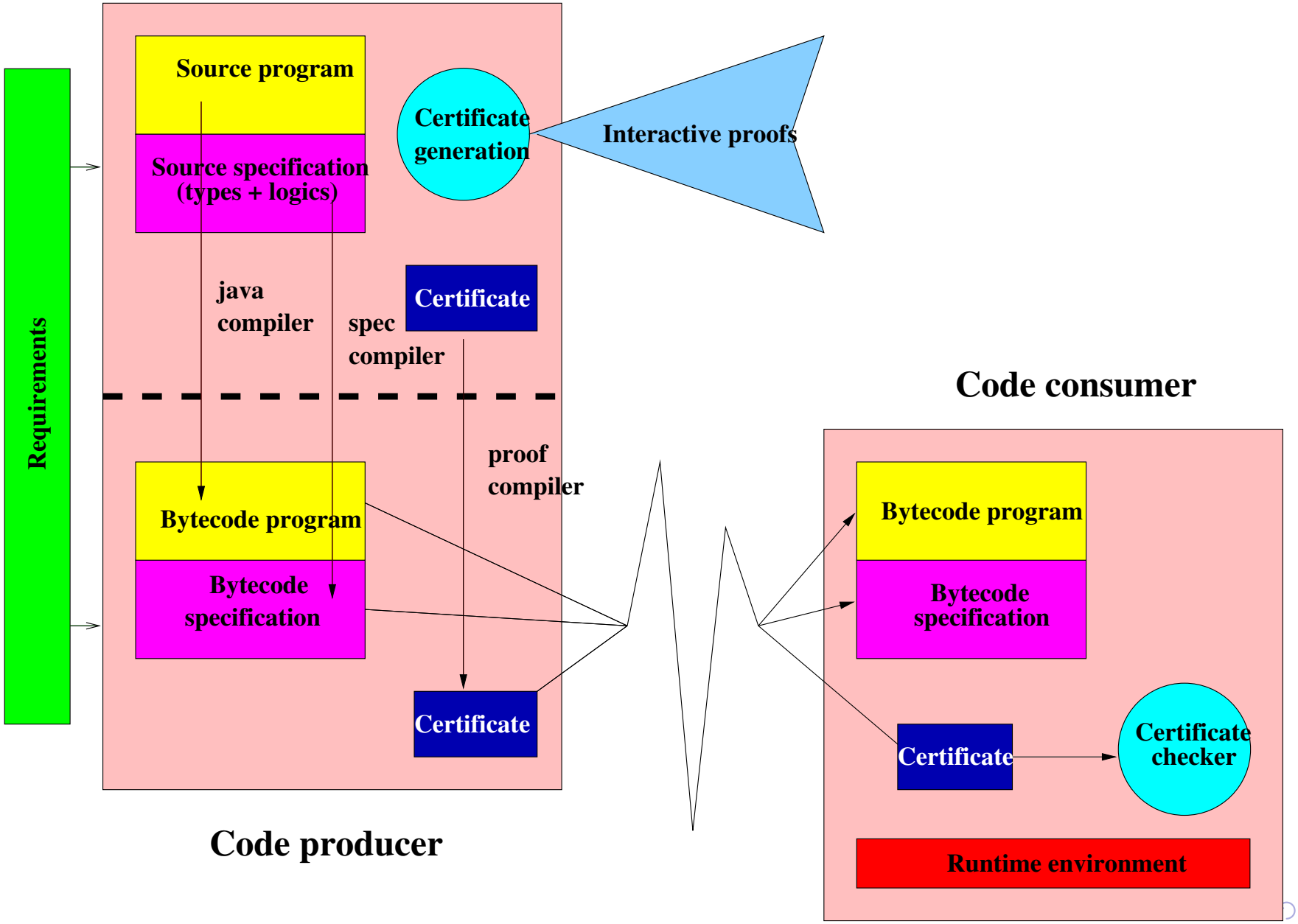

- Widely deployed in CLDC (and soon in J2SE)
- On-device checking is possible

## Logic-based PCC




- Original scenario
- Applications to type safety and memory safety

# Mobius vision



# MIDP: Assets

- MIDP: Mobile Information Device Profile (MIDP) of J2ME
  - 1/3 world's phones support MIDP
- Operator assets
  - Billable events
  - Support infrastructure
  - Reputation
  - Network infrastructure
- End-user assets
  - Billed events
  - Private information
    - Personal Information Manager (PIM)
    - passwords
    - geo-location
    - application-specific data (e.g., secure storage)
  - Mobile phone
  - Information with no back-up

# MIDP: Attacker's goals

- Make money
- Steal sensitive information
- Hurt operator/user
- Perform a hacker stunt
- Perform a terrorist act

# MIDP: Attacks

- Information flow
  - Disclosure of sensitive data
    - Sources: PIM, passwords, geo-location, application-specific
    - Sinks: persistent store, network access, covert channels
  - Modification of sensitive data
- Resource control
  - Abuse of billable events
    - Short messages
    - Phone calls
    - Network accesses
  - Memory/CPU usage
    - Synchronization
    - Exceptions
    - Network connections