Overview of CORBA Security

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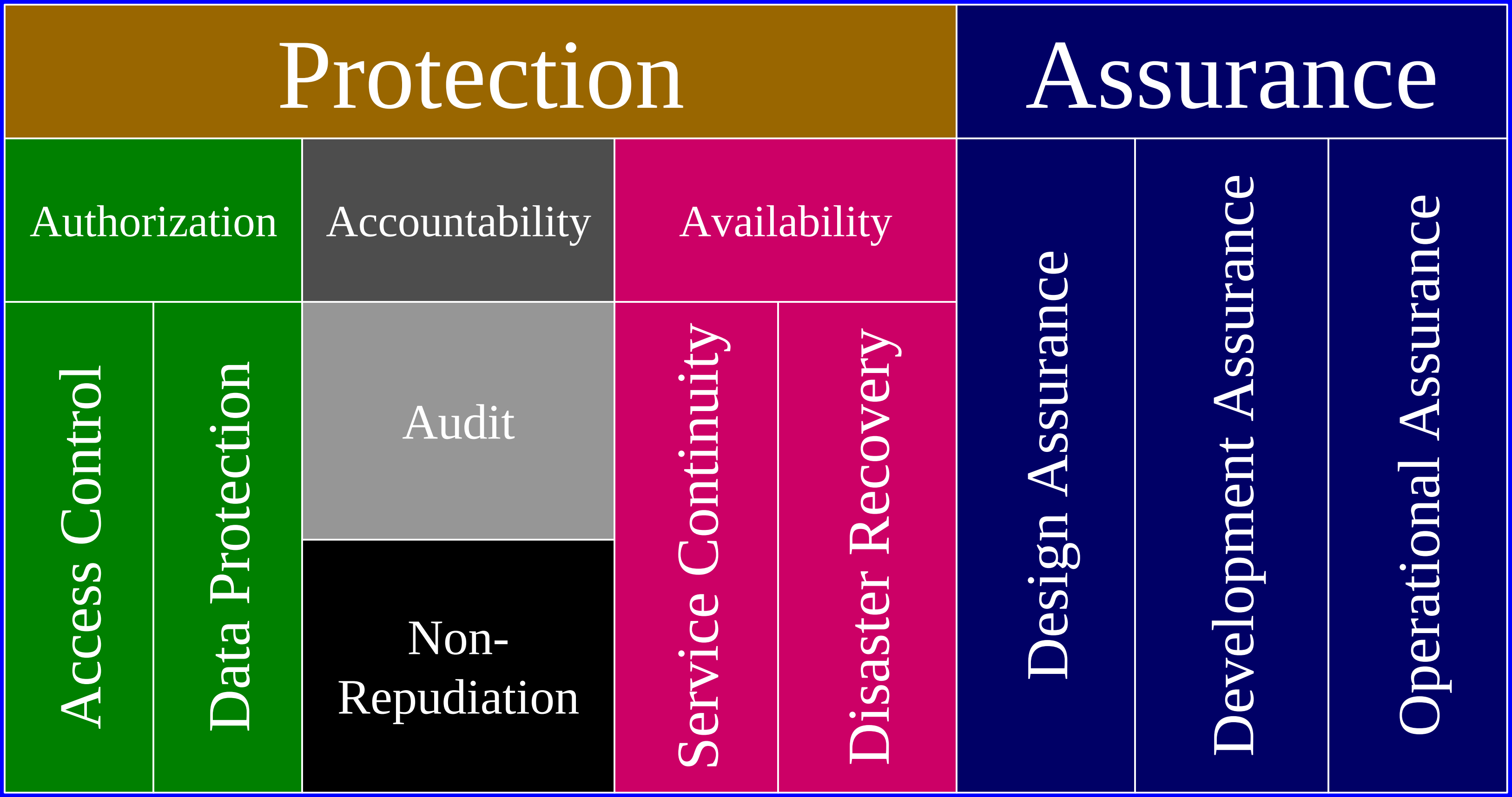
Outline

- Introduction into computer security
- Security in OO systems
- CORBA security model overview
- Application access control in CORBA
- Resource Access Decision Facility
- Further Information

What is Security?

- security -- “safety, or freedom from worry”
  - computers too heavy to steal
  - insurance
  - redundancy (disaster recovery services)

Conventional Approach to Security



Protection

Assurance

Authorization

Accountability

Availability

Access Control

Data Protection

Audit

Non-Repudiation

Service Continuity

Disaster Recovery

Design Assurance

Development Assurance

Operational Assurance

Protection

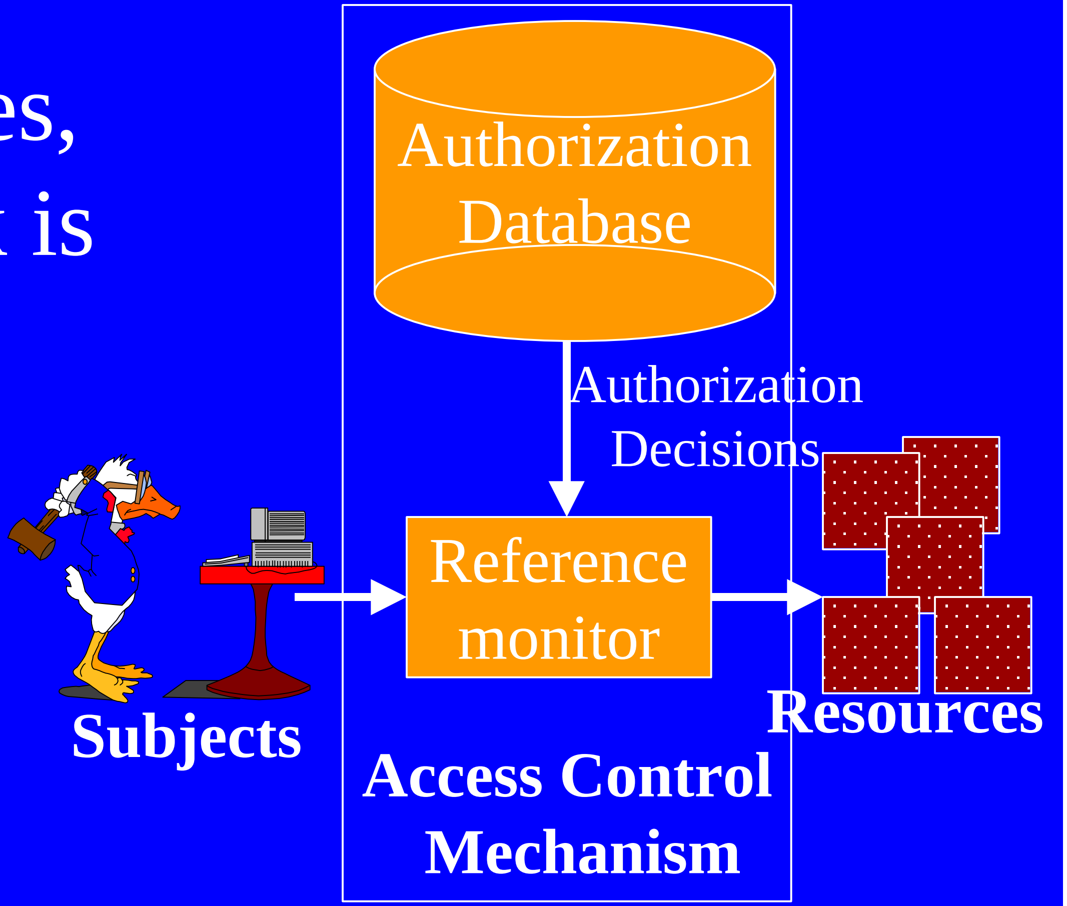
provided by a set of mechanisms (**countermeasures**) to prevent bad things (**threats**) from happening

Authorization -- protection against breaking rules

- Rule examples:
  - No one outside the company can read proprietary data
  - Tellers can initiate funds transfers of up to $500;
    Managers -- up to $5,000
    Transfers over $5,000 must be initiated by a VP
  - Attending physician can read patient HIV status

Authorization Mechanisms: Access Control

enforces the rules, when rule check is possible



Authorization Database

Authorization Decisions

Reference monitor

Subjects

Resources

Access Control Mechanism

Authorization Mechanisms: Data Protection

- No way to check the rules
  - e.g. telephone wire
- No trust to enforce the rules
  - e.g. MS-DOS

Accountability

- You can tell who did what when
- Audit -- actions are recorded in audit log
- Non-Repudiation -- evidence of actions is generated and stored

Availability

- Service continuity -- you can always get to your resources
- Disaster recovery -- you can always get back to your work after the interruption

Assurance

Set of things the system builder and the operator of the system do to convince you that it is really safe to use.

- The system can enforce the policy you are interested in, and
- the system works

Basic Object Interaction Model

- Objects do work by sending messages to one another
- ORBs handle the complexity of delivering messages to objects

Object Security Issues & Requirements: Naming

- Issues
  - no names,
  - no unique names,
  - aliases

  difficult to state security policies
- Requirement
  - ability to define object security policy without having to know its name.

Object Security Issues & Requirements: Scale

- Issues
  - – too many objects
  - – name-based grouping is not good for security grouping
- Requirements
  - – Policies -> policy groups, objects -> policy groups
  - – Operation-level control, operations -> policy groups, no knowledge of operation semantics

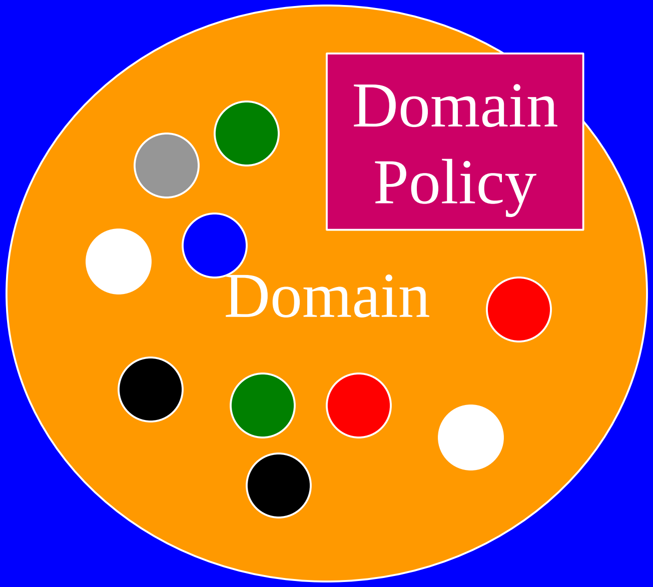
Object Security Issues: Encapsulation

- No knowledge of the internals, difficult to know what policy is needed to protect the system

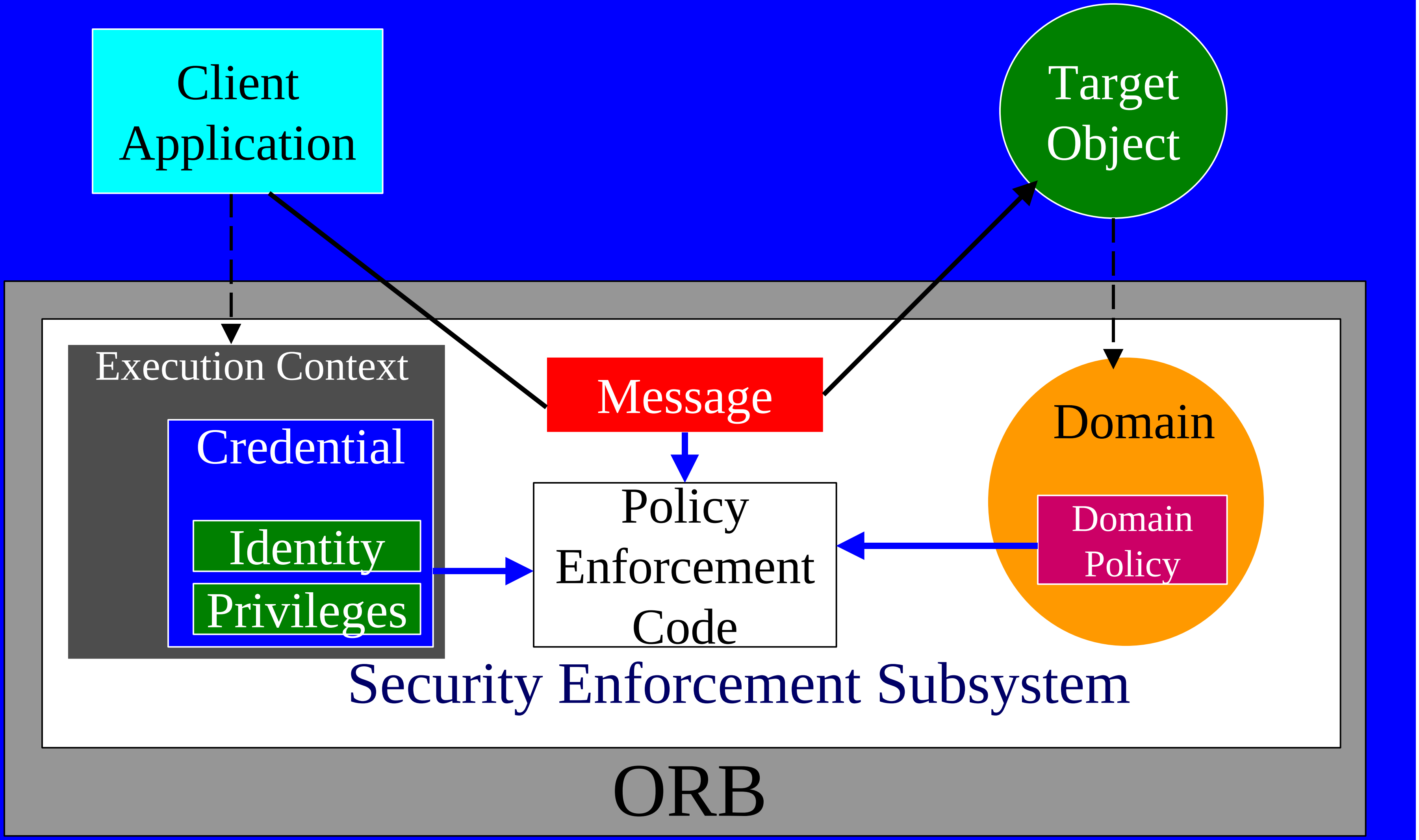
Overview of CORBA Security Model

Key Concepts

- Policy-based Protection
- Policy domains
- Execution context
- Credential
- Interfaces



Enforcement of Policies



Protection Policies

Subject action object

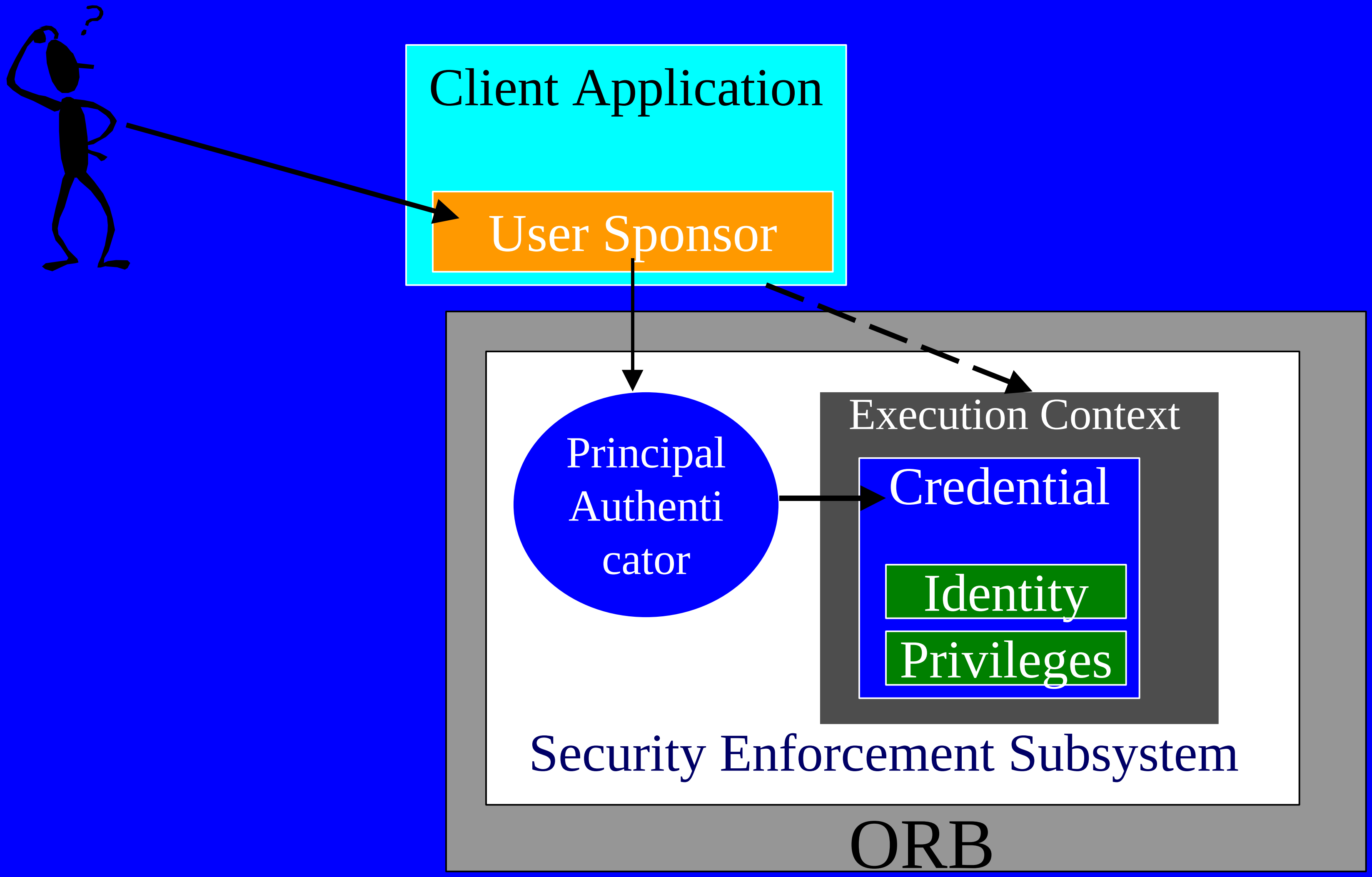
- Access control policy
  - **subject** may do **invoke method** to **object**
- Message protection policy
  - **ORB** must do **apply specified QoP** to **message**
  - QoP: authentication, integrity, confidentiality
- Audit Policy
  - if **action matches pattern** then **system** must do **generate** to **new audit event**

Protection Policies (2)

Subject action object

- Non-Repudiation Policy
  - if **action matches pattern** then **subject initiating action** must do **generate** to **new non-repudiation evidence**
  - if **action matches pattern** then **subject receiving request** must do **verify** to **non-repudiation evidence**

User Authentication



Client Application

User Sponsor

Principal Authenticator

Execution Context

Credential

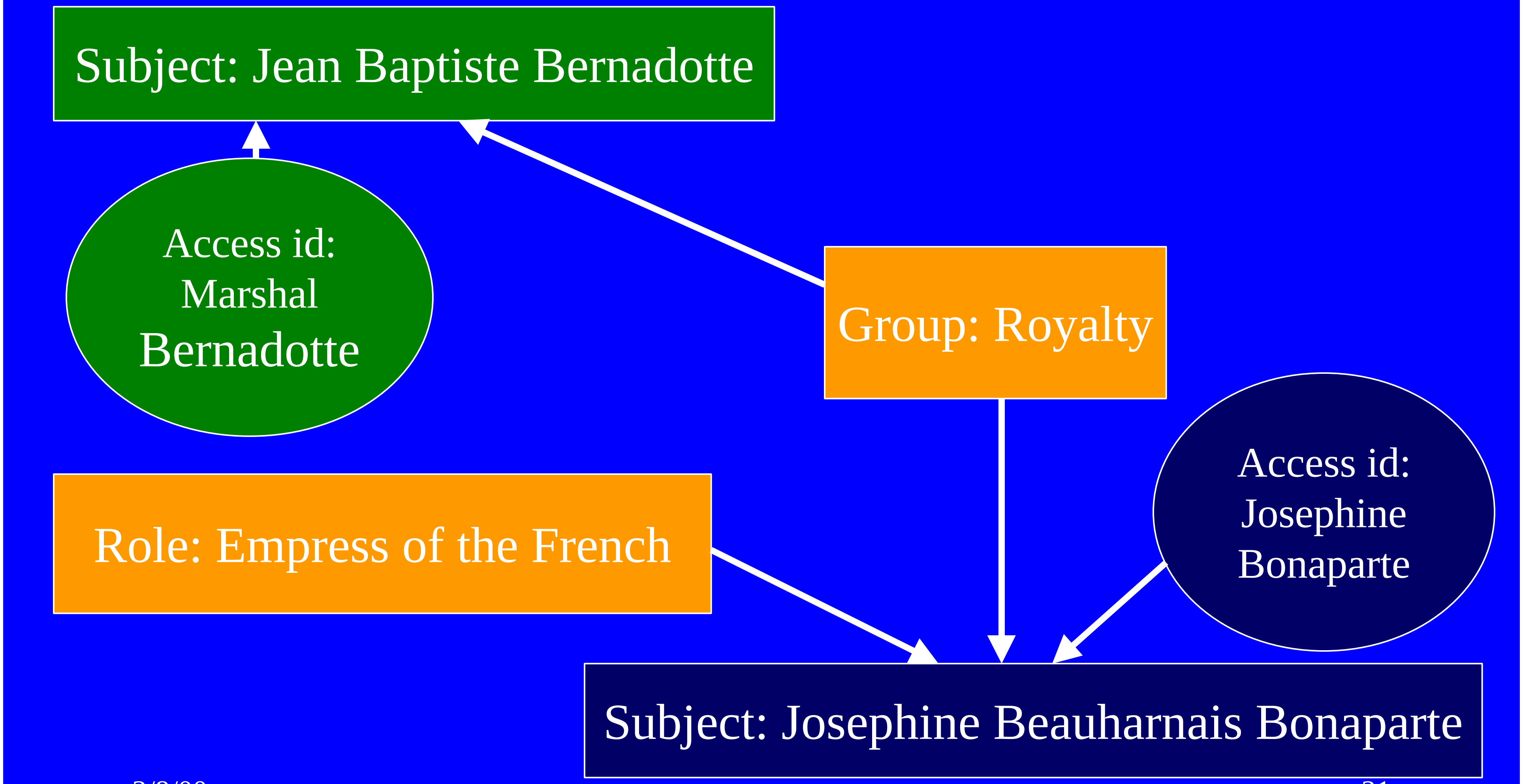
Identity

Privileges

Security Enforcement Subsystem

ORB

Security Attributes of Subjects



Subject: Jean Baptiste Bernadotte

Access id: Marshal Bernadotte

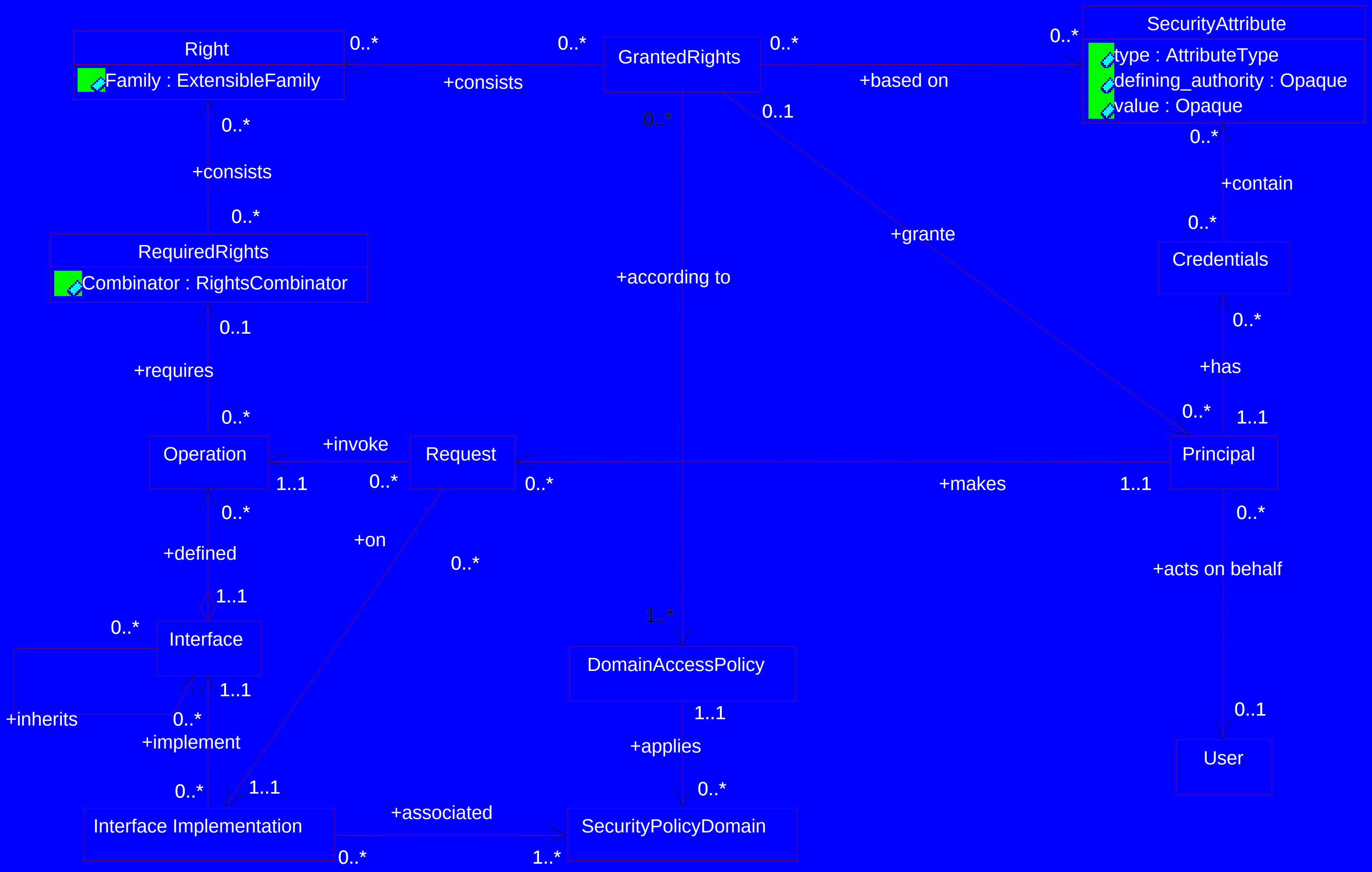
Group: Royalty

Role: Empress of the French

Access id: Josephine Bonaparte

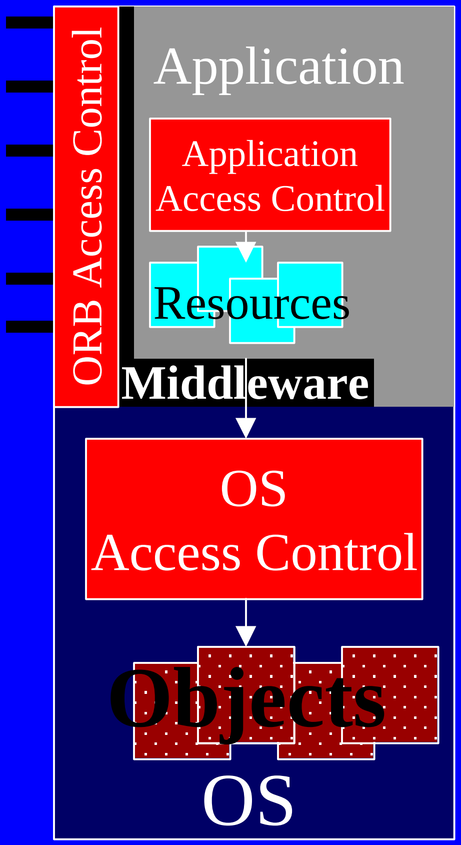
Subject: Josephine Beauharnais Bonaparte

Access Control



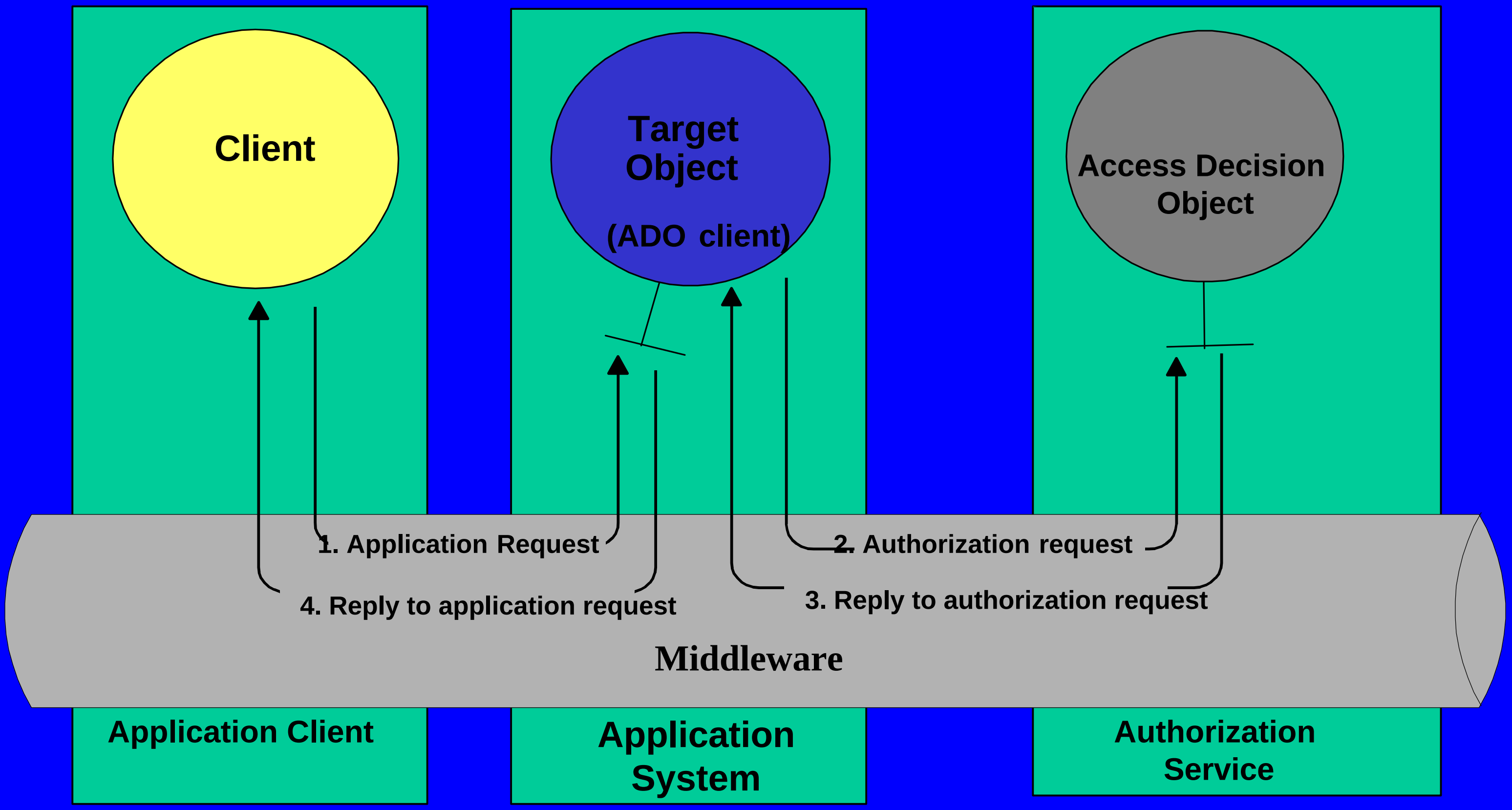
Application Access Control

- Granularity of control is coarse
- Many points of control (commonality, consistency, administration issues)

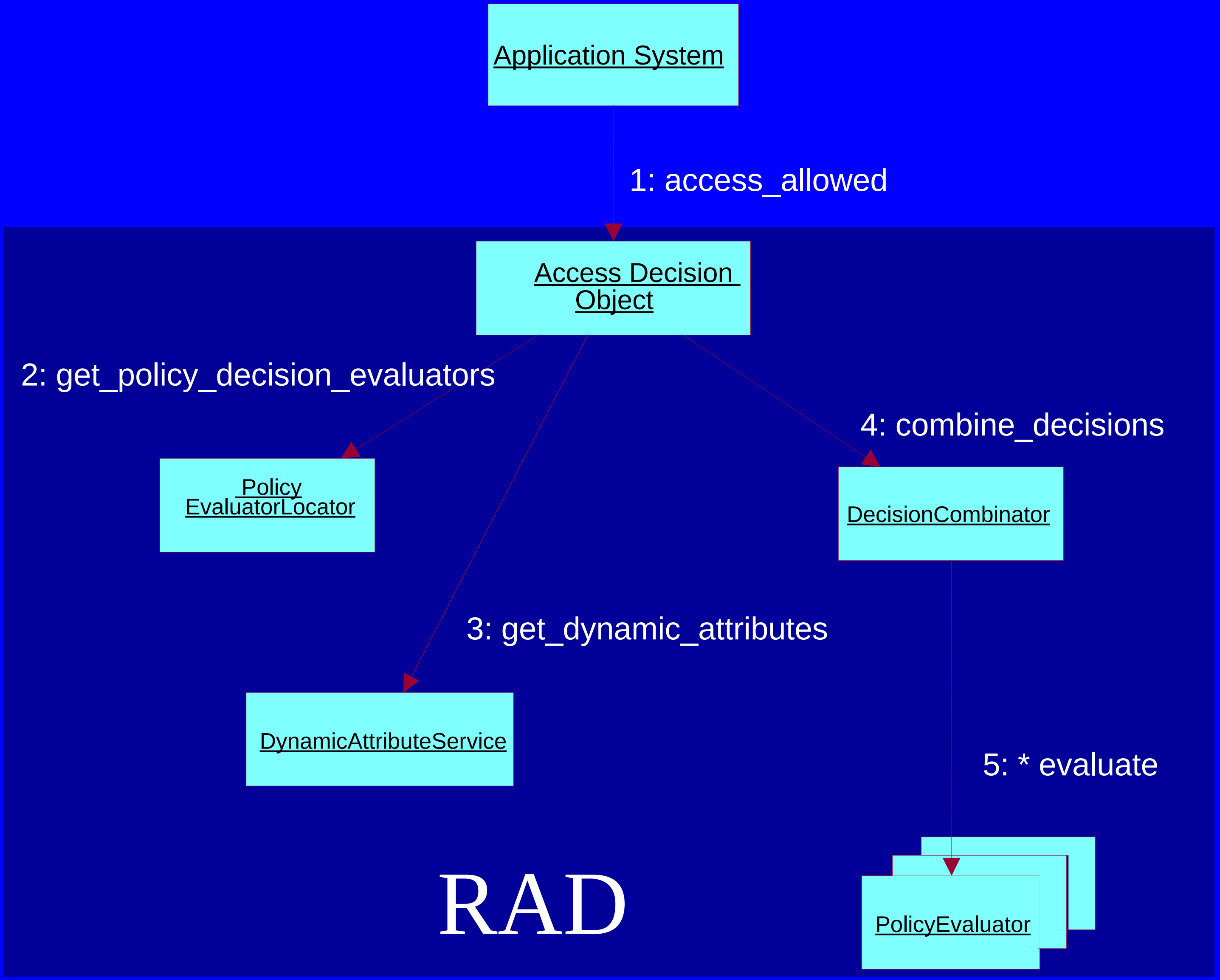


```
module SecurityLevel1 {
 interface Current : CORBA::Current {
     Security::AttributeList get_attributes (
               in Security::AttributeTypeList attributes
     );
 };
};
```

Framework of Resource Access Decision Facility



RAD Components



RAD Design Benefits

- Decoupling authorization logic from application systems
  - centralized administration of security policies
  - independent development and evolution of application and security services
- Generality of the solution
- Policy-neutral
- Support for request-specific factors

Further Information

- "CORBA Security: An Introduction to Safe Computing with Objects" by Bob Blakley
- "Instant CORBA" by R. Orfali, D. Harkley, and J. Edwards
- CORBASEC FAQ http://cadse.cs.fiu.edu/corba/corbasec/faq/
- corba-security@cs.fiu.edu
- CORBA security specification
  - ftp://ftp.omg.org/pub/docs/formal/98-12-17.pdf
- RAD project http://cadse.cs.fiu.edu/research_projects/research3/