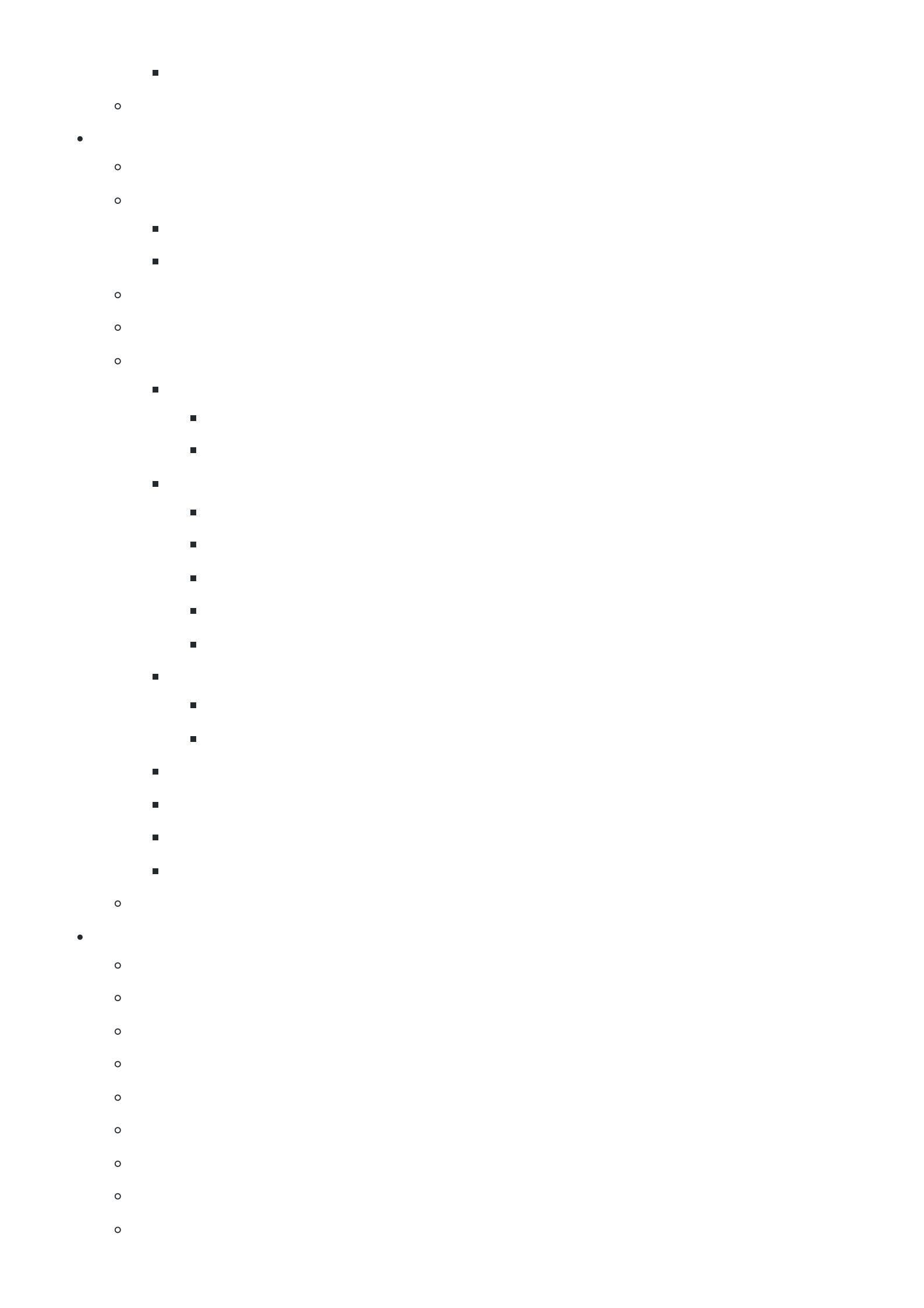

[License](#) CC0 1.0



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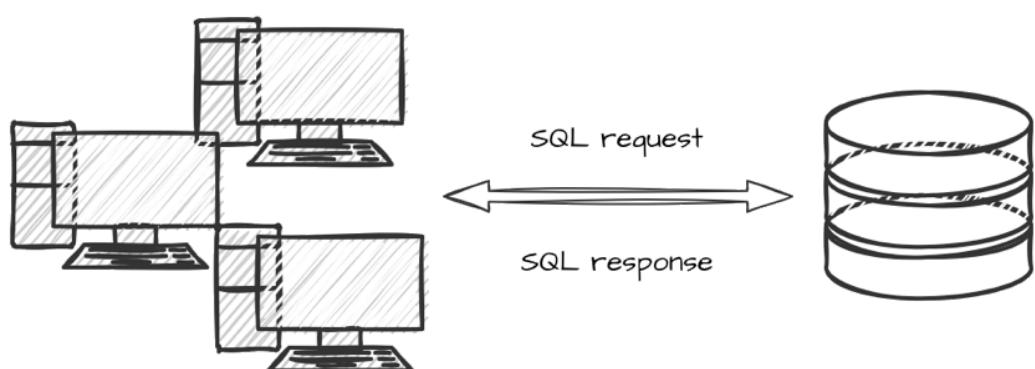
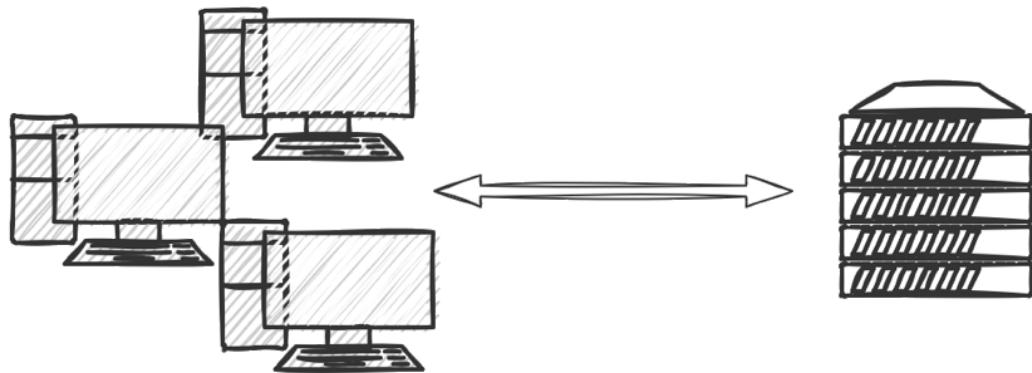
A

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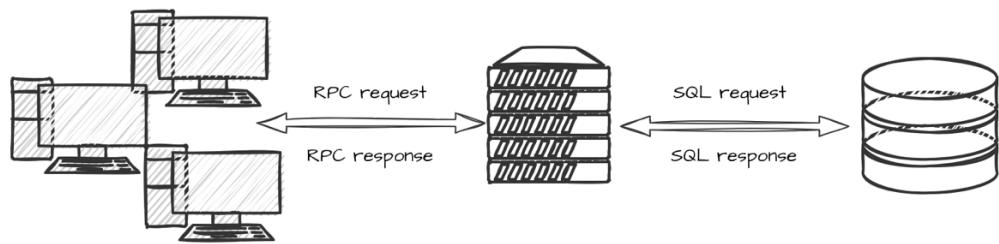
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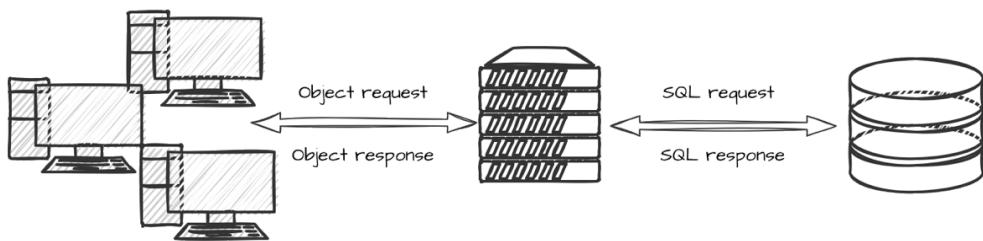




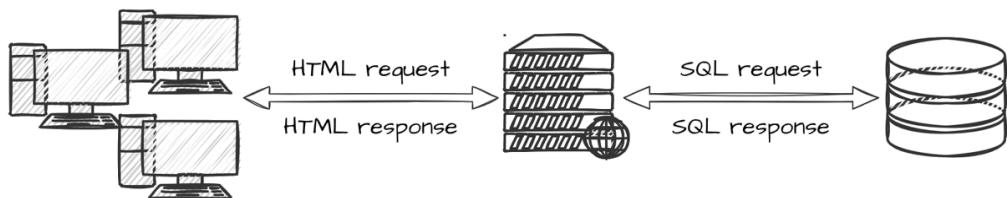
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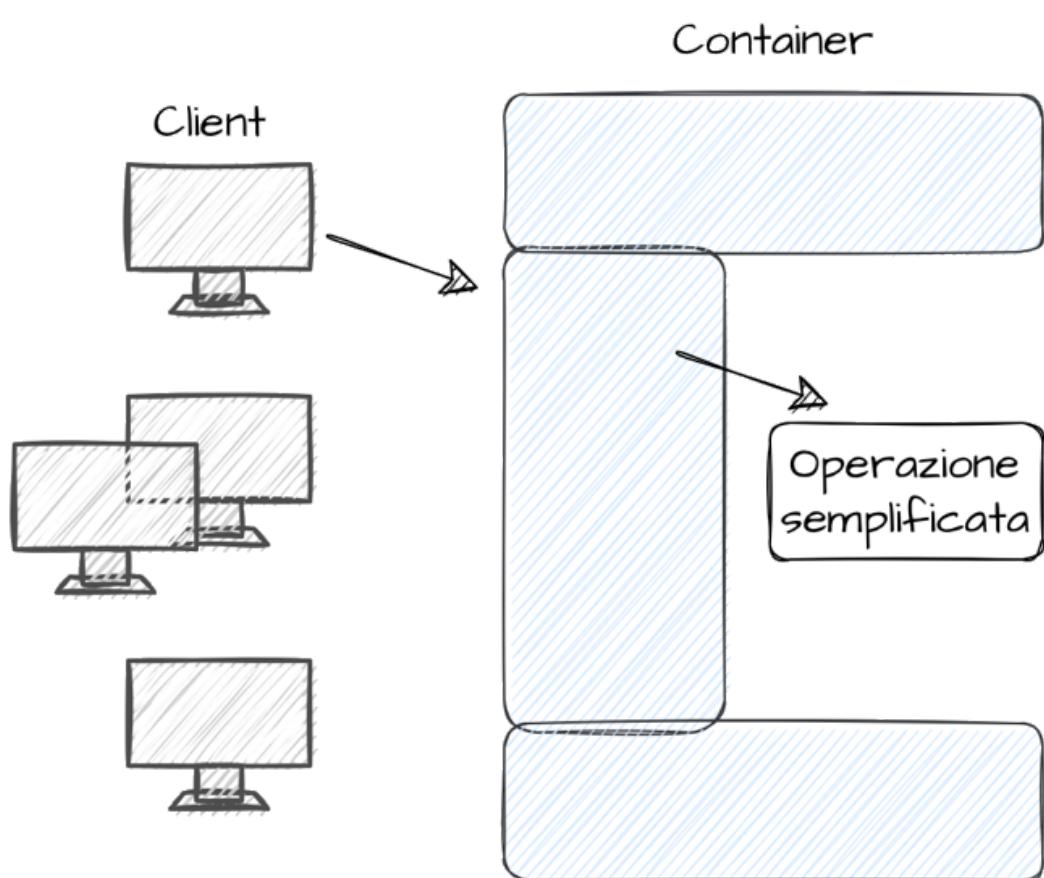


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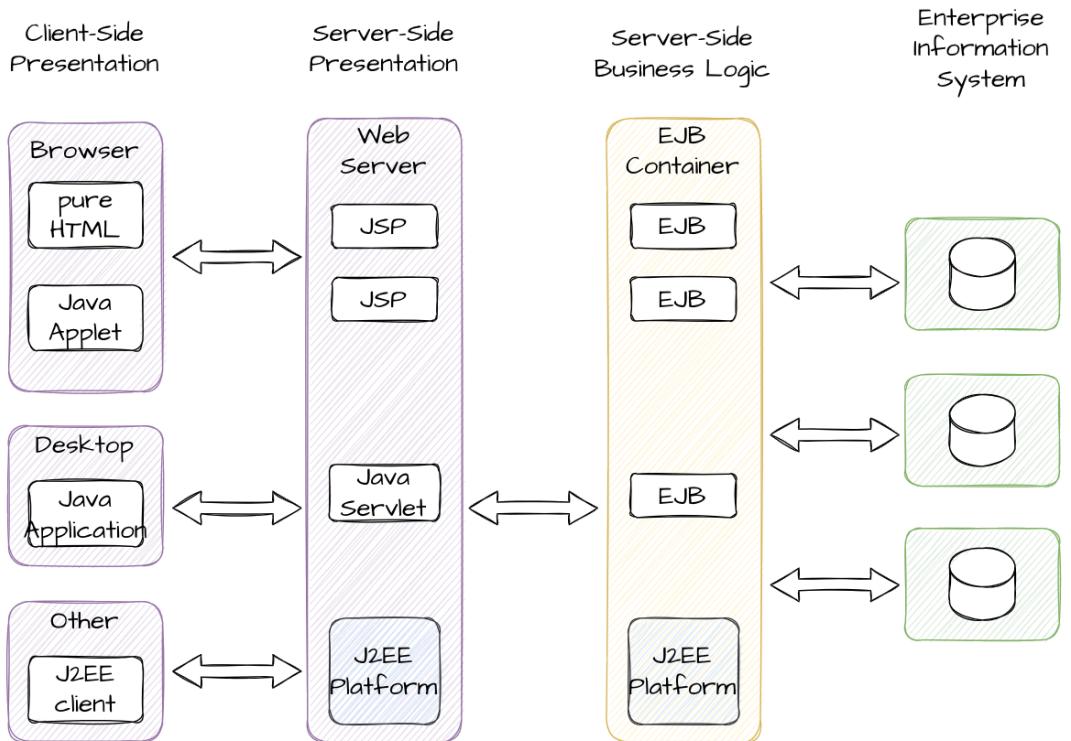
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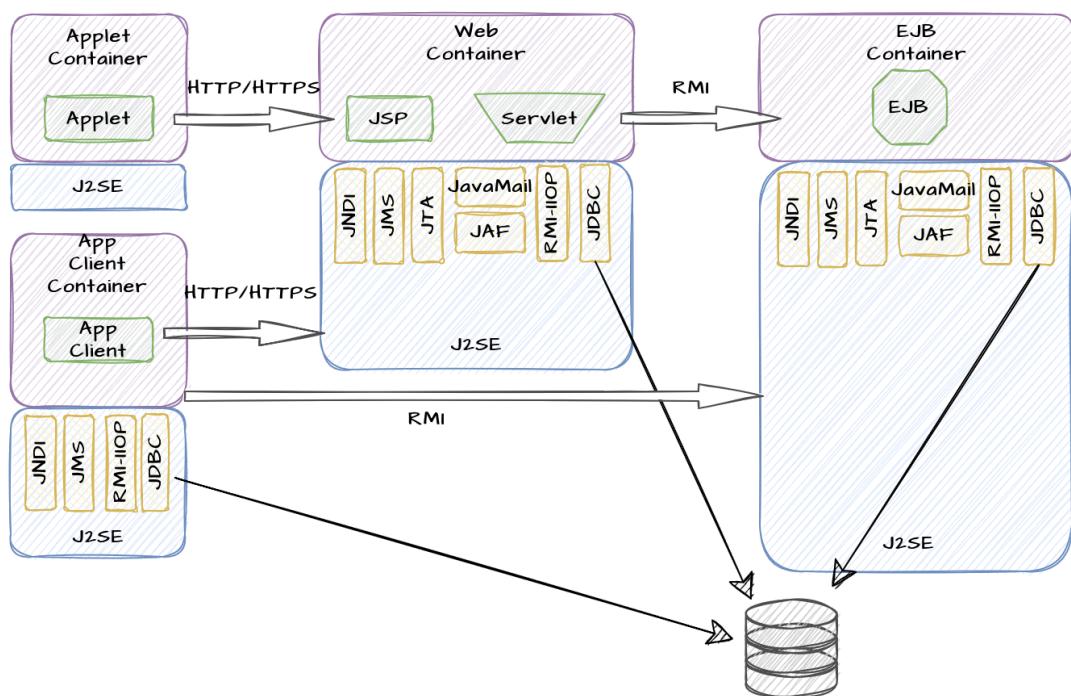
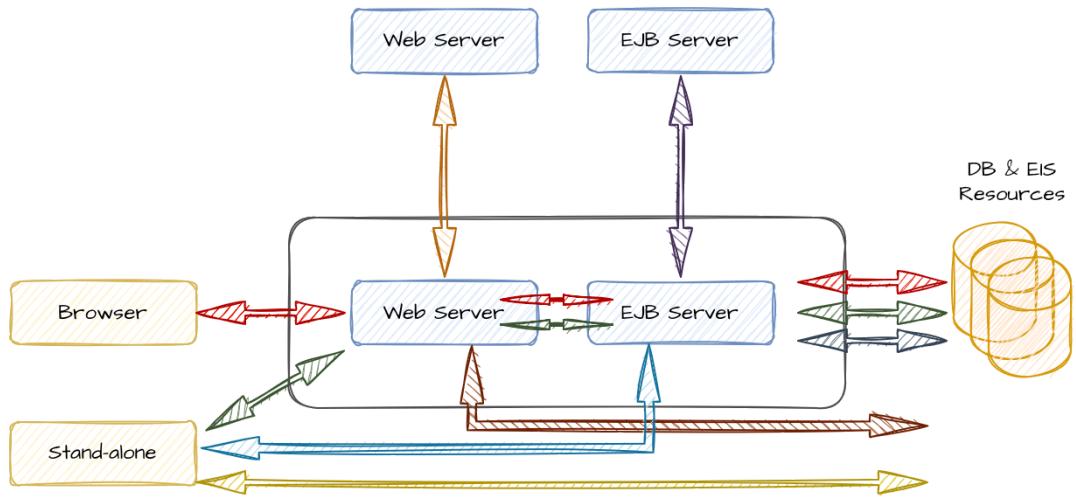
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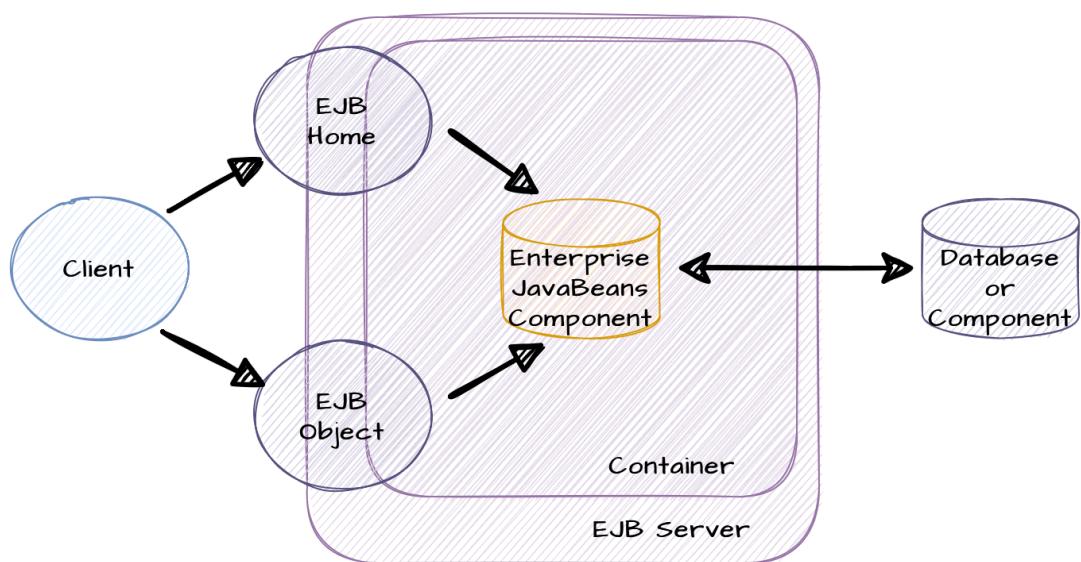
Capitoli 2

Capitolo 5

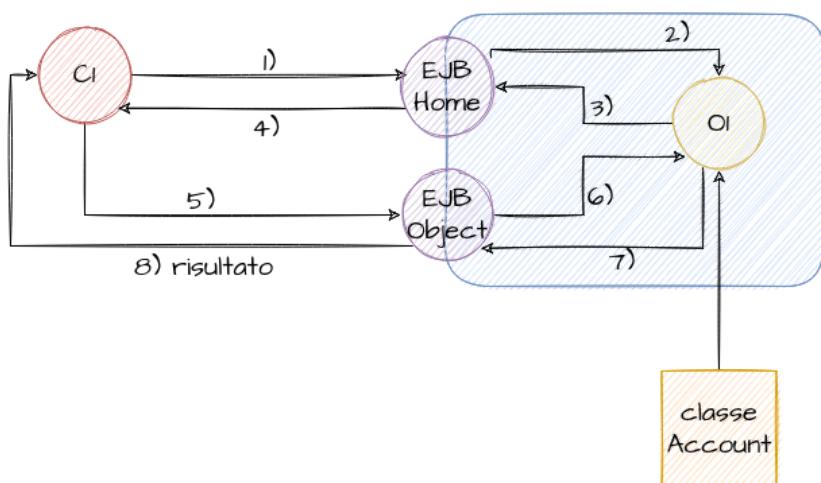


B

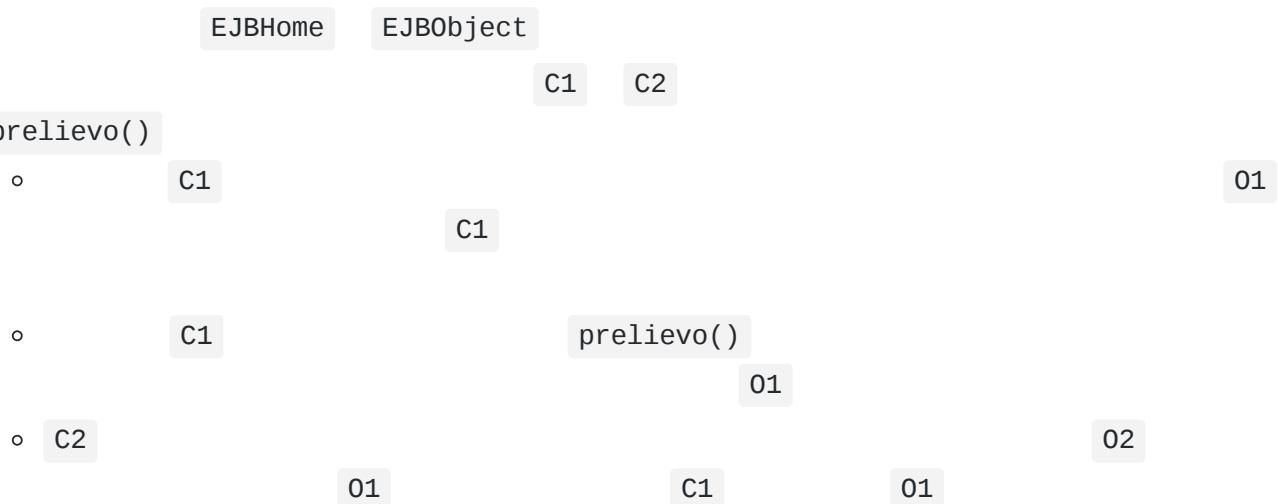
A B A



- EJBHome
- EJBObject



- Account
- prelievo() deposito()



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- **EJBHome**

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- **EJBObject**

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- **EJBHome** **EJBObject**

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- **EJBHome** **EJBObject**

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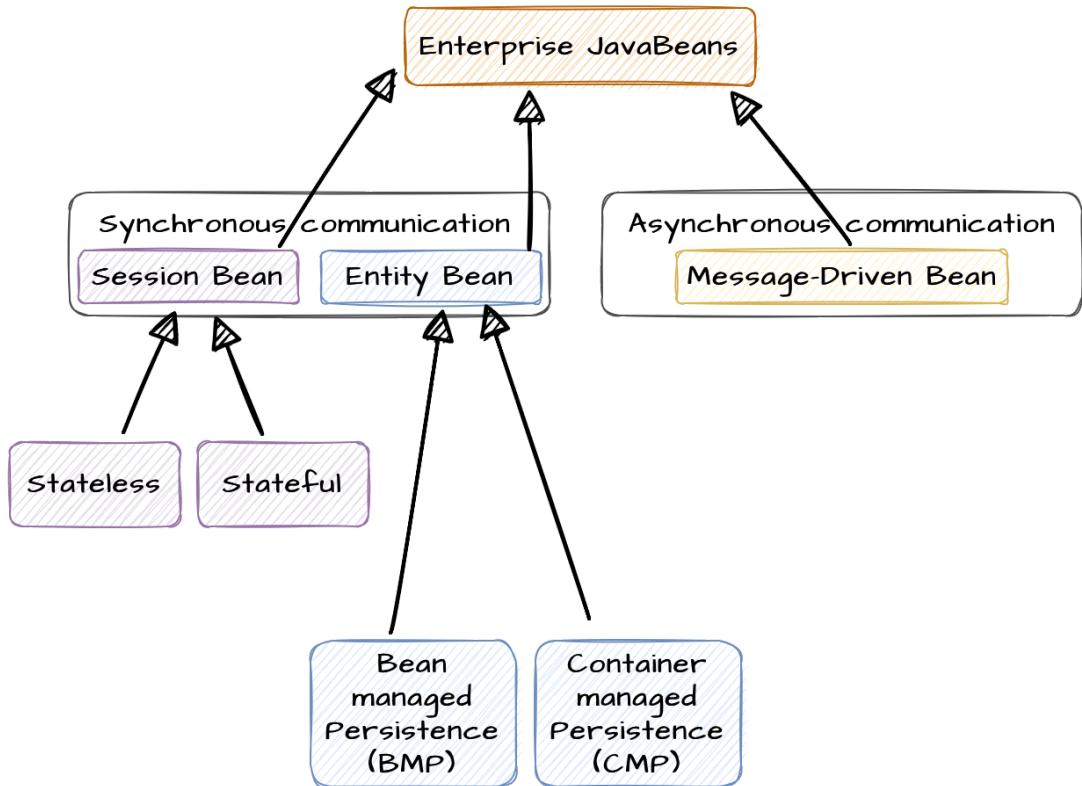
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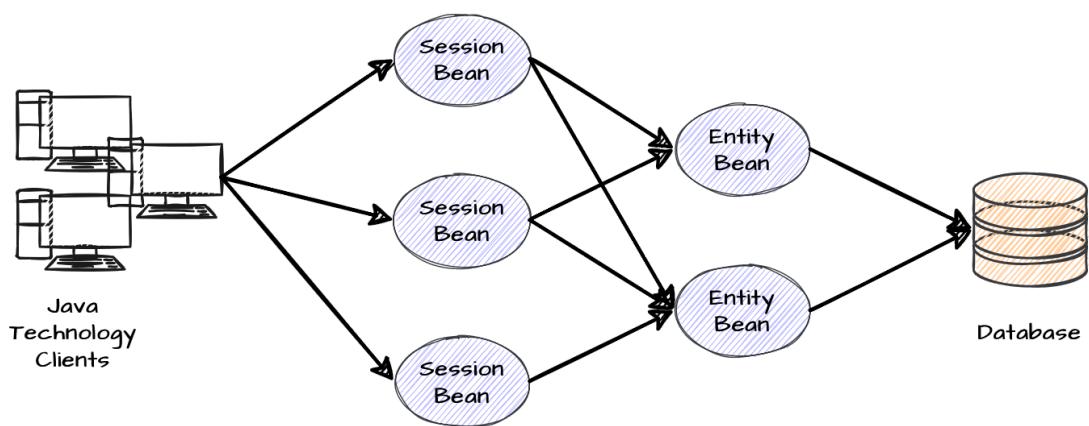
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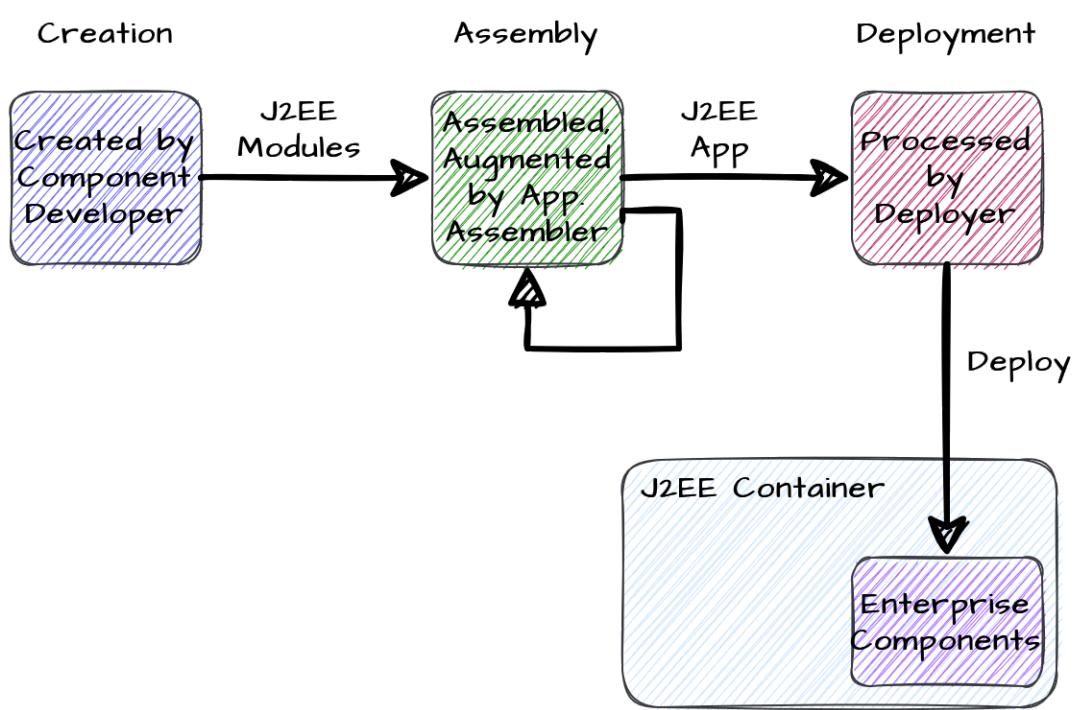


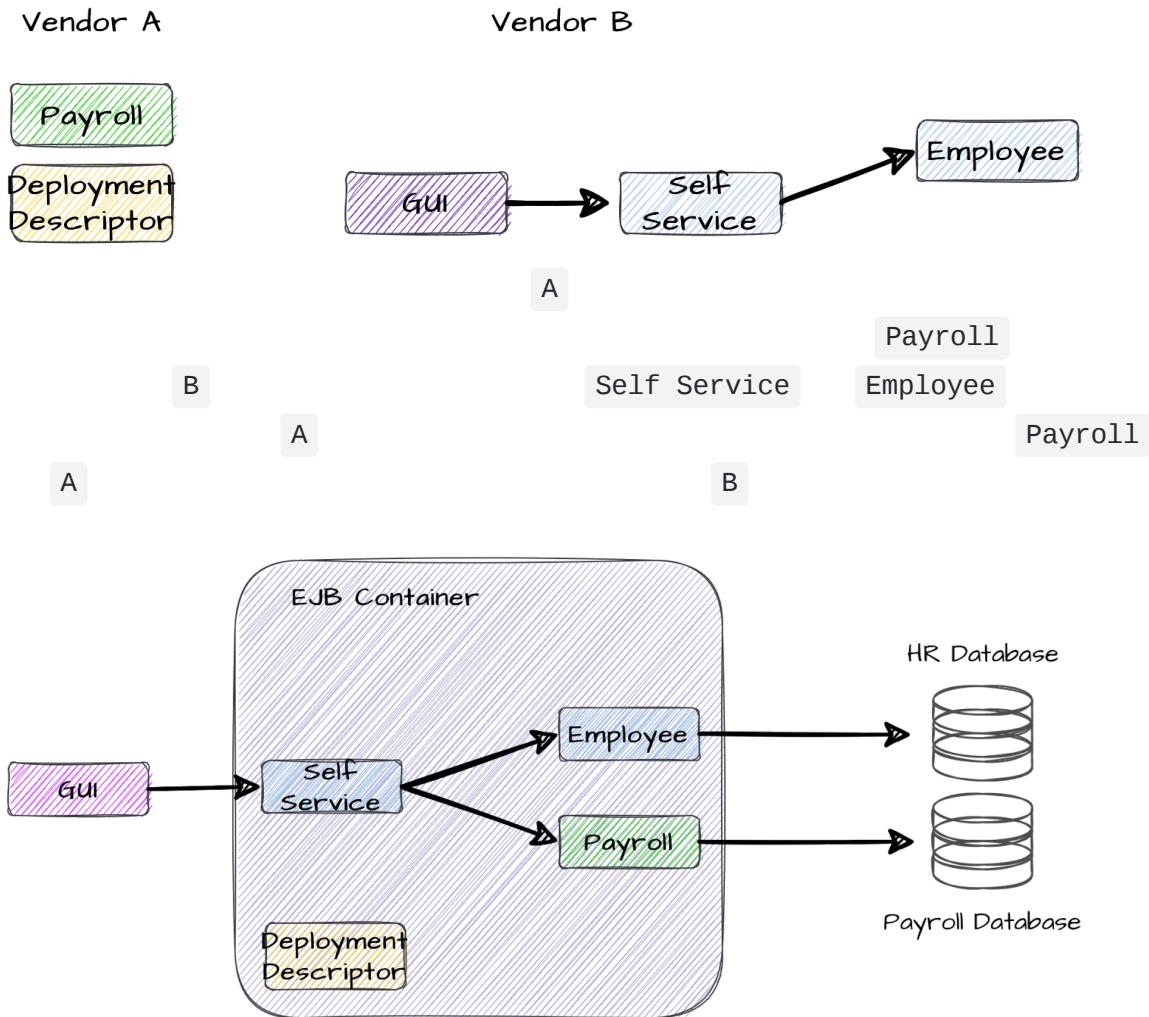
- javax.ejb.SessionBean

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- javax.ejb.EntityBean

Capitolo 7







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EJBHome

-

create() find() remove()

-

EJBObject

-

create() find()

EJBHome

EJBObject

```
// EJBHome
package com.ejb_book.interest;

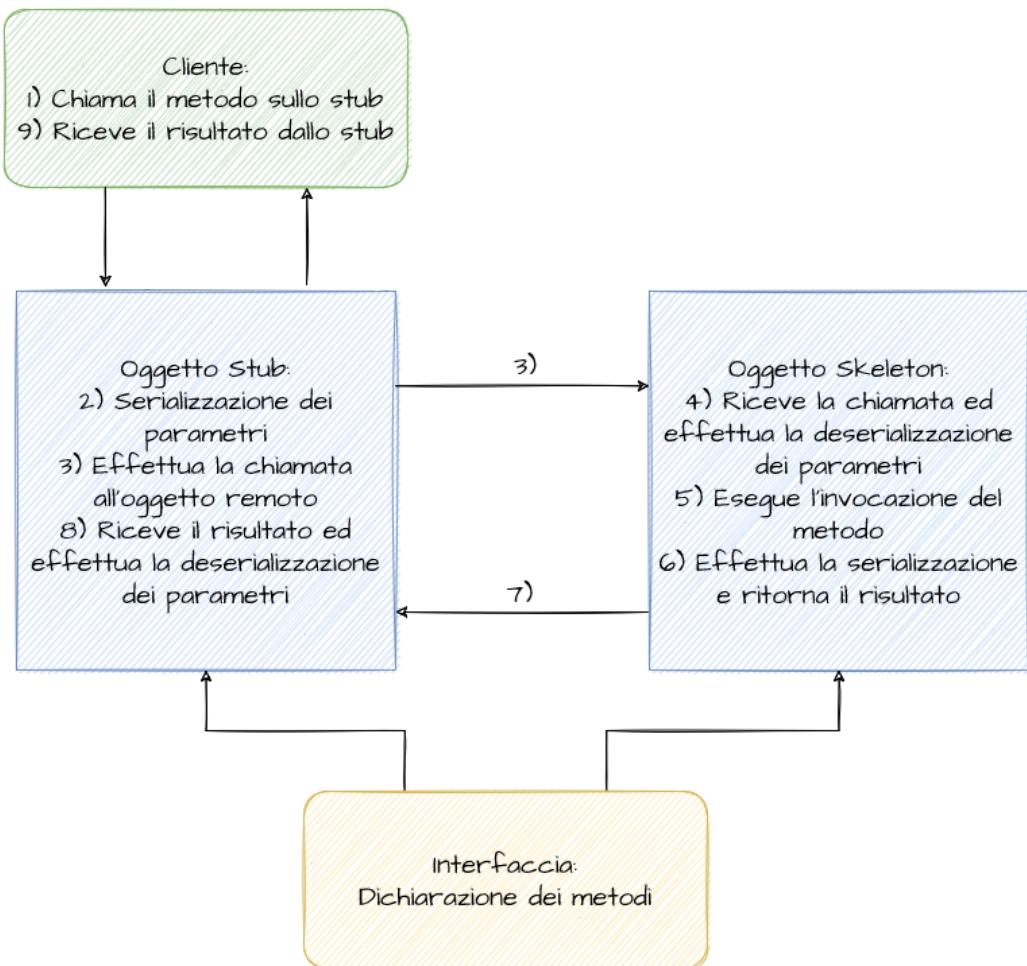
import javax.ejb.*;
import java.rmi.*;

public interface InterestHome extends EJBHome{
    public Interest create() throws CreateException, RemoteException;
}
```

```
// EJBObject
package com.ejb_book.interest;

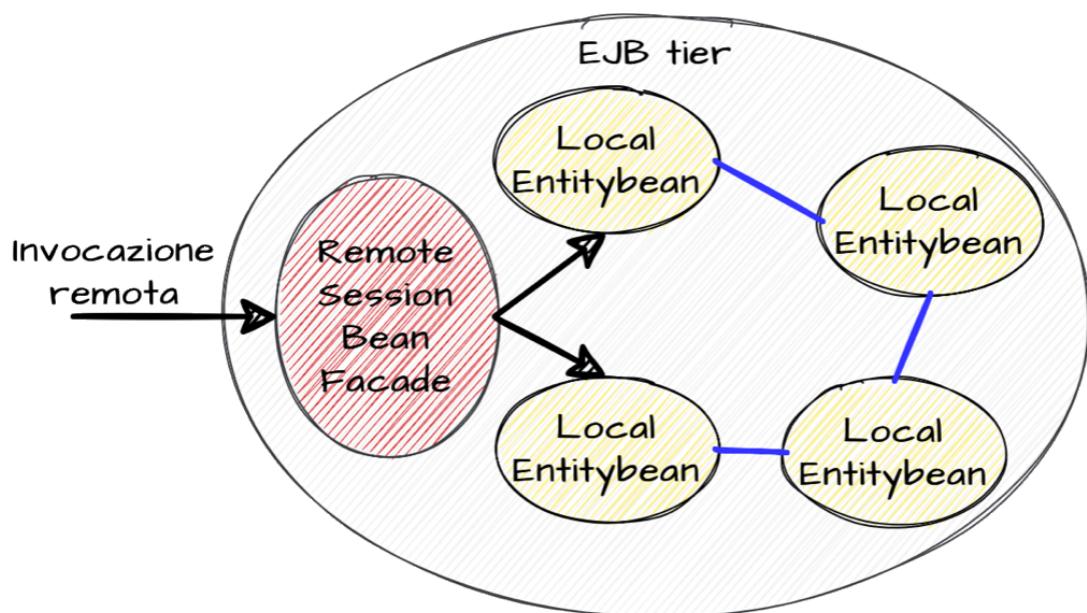
import javax.ejb.*;
import java.rmi.*;

public interface Interest extends EJBObject {
    // Calcola l'interesse da pagarsi ad un dato proprietario, ad uno specifico
    // tasso di interesse (percentuale per term)
    public double getInterestOnPrincipal(double principal, double interestPerTerm, int terms)
        throws RemoteException;
}
```



EJBLocalObject

EJBLocalHome



```
// EJBHome
package com.ejb_book.interest;

import javax.ejb.*;
import java.rmi.*;

public interface InterestLocalHome extends EJBLocalHome {
```

```
    public InterestLocal create() throws CreateException;  
}
```

```
// EJBObject  
package com.ejb_book.interest;  
  
import javax.ejb.*;  
import java.rmi.*;  
  
public interface InterestLocal extends EJBLocalObject {  
  
    // Calcola l'interesse da pagarsi ad un dato proprietario, ad uno specifico  
    // tasso di interesse (percentuale per term)  
    public double getInterestOnPrincipal(double principal, double interestPerTerm, int terms);  
  
}
```

EJBHome

EJBLocalHome

RemoteException

•

- InitialContext

- lookup

-

- create()

```
public class InterestClient {
```

```
    public static void main (String[] args) throws CreateException, RemoteException, NamingException {
```

```
// passo 1: ottenere un'istanza di EJBHome (in realtà un oggetto
// stub per l'oggetto EJBHome) via JNDI
InitialContext initialContext = new InitialContext();
Object o = initialContext.lookup("Interest");
InterestHome interestHome = (InterestHome) PortableRemoteObject.narrow(o, InterestHome.class);

// passo 2: creare un oggetto EJBObject remoto (in realtà
// uno stub all'oggetto EJBObject remoto
Interest interest = interestHome.create();

double principal = 10000.0;
double rate = 10.0;
int terms = 10;

System.out.println("Principal = $" + principal);
System.out.println ("Rate(%) = " + rate);
System.out.println ("Terms = " + terms);

// passo 3: invocazione metodi di business
System.out.println("Interest = $" + interest.getInterestOnPrincipal(principal, rate, terms));

System.out.println("Total = $" + interest.getTotalRepayment(principal, rate, terms));

// passo 4: clean up
interest.remove();
}

}
```

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Capitolo 3

Capitolo 4

- `@Overrided`

```
    @Override  
    public String toString() {  
        ...  
    }
```

- `@Deprecated`

```
    @Deprecated  
    public class ExampleClass { ... }
```

- `@SuppressWarnings`

```
    @SuppressWarnings("unchecked")  
    public void aMethod() {  
        ...  
    }
```

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- `@Overrided`

- `@Deprecated`

- `@SuppressWarnings`

```
@Override
public String toString() {
    ...
}
```

- `@Override`
- `@SuppressWarnings("unchecked")`
- `@SuppressWarnings`
- `@CheckForNull`

```
public @interface GroupTODO {
    public enum Severity {CRITICAL, IMPORTANT, TRIVIAL} ;
    Severity severity() default Severity.IMPORTANT;
    String item();
    String assignedTo();
}
```

```
@interface
```

```
@GroupTODO (  
    severity = GroupTODO.Severity.CRITICAL;  
    item = "Figure out the amount of interest per month"  
    assignedTo = "Luca Foschini";  
)  
public void calculateInterest(float amount, float rate) { ... }
```

severity

IMPORTANT

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AnnotationA

AnnotationA

AnnotationA

AnnotationB

AnnotationA

- @Target

```
@Target ( { ElementType.METHOD, ElementType.PACKAGE } )  
public @interface ExampleAnnotation { ... }
```

- @Documented

```
@Documented  
public @interface ExampleAnnotation { ... }
```

- `@Inherited`

```
@Target ( { ElementType.METHOD, ElementType.PACKAGE } )  
public @interface ExampleAnnotation { ... }
```

- `@Retention`

```
@Inherited  
public @interface ExampleAnnotation { ... }
```

`@Retention`

- `@Retention(RetentionPolicy.SOURCE)`

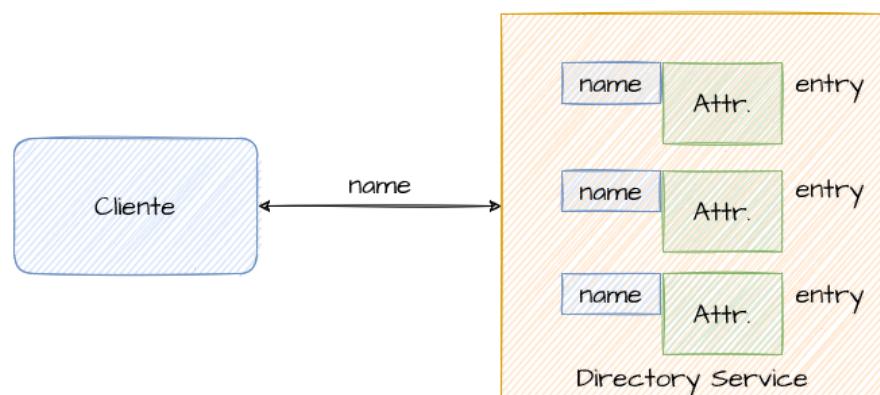
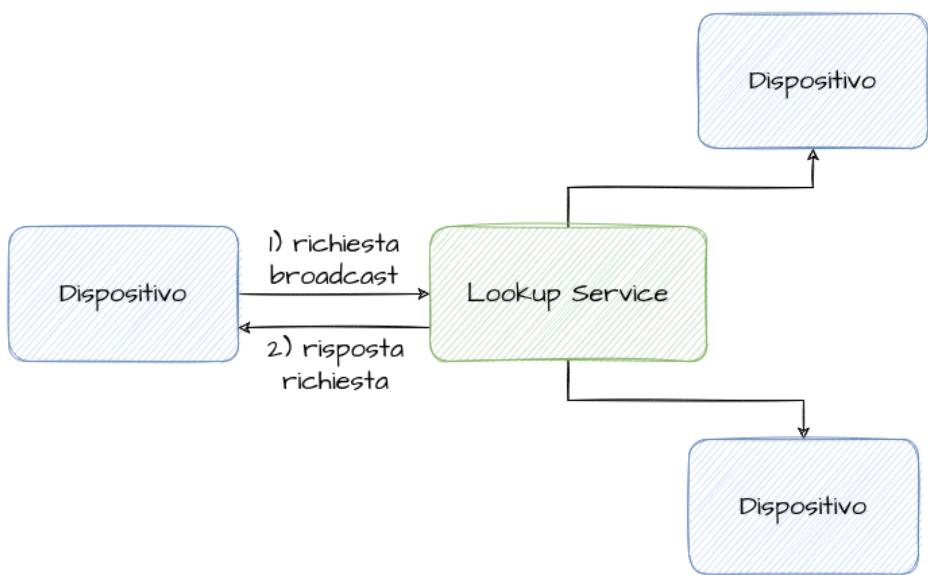
`@Override`

- `@Retention(RetentionPolicy.CLASS)`

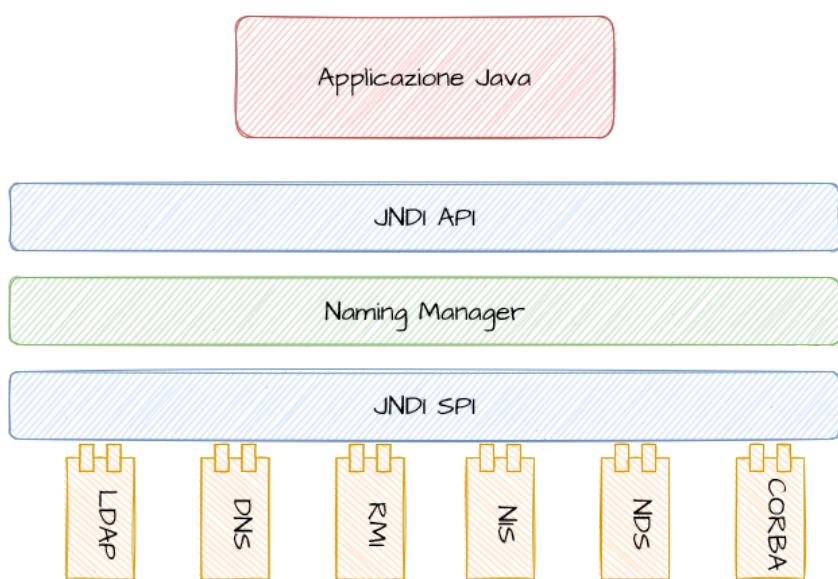
- `@Retention(RetentionPolicy.RUNTIME)`

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- www.google.com
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Rete Locale



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Context

Context

InitialContext

- bind

```
void bind(String stringName, Object object)
```

- rebind

```
void rebind(String stringName, Object object)
```

- lookup

```
Object lookup(String stringName)
```

- unbind

```
void unbind(String stringName)
```

- rename

```
void rename(String stringOldName, String stringNewName)
```

- listBindings

```
NamingEnumeration listBindings(String stringName)
```

InitialContext

DirContext

Context

Context

- bind

```
void bind(String stringName, Object object, Attributes attributes)
```

- rebind

```
void rebind(String stringName, Object object, Attributes attributes)
```

- createSubcontext

```
DirContext createSubcontext(String stringName, Attributes attributes)
```

- getAttributes

```
Attributes getAttributes(String stringName)
```

- getAttributes

```
Attributes getAttributes(String stringName, String [] rgstringAttributeNames)
```

- modifyAttributes

ADD_ATTRIBUTE

REPLACE_ATTRIBUTE REMOVE_ATTRIBUTE

```
void modifyAttributes(String stringName, int nOperation, Attributes attributes)
```

- modifyAttributes

ADD_ATTRIBUTE

REPLACE_ATTRIBUTE REMOVE_ATTRIBUTE

```
void modifyAttributes(String stringName, ModificationItem [] rgmodificationitem)
```

-

Hashtable

```
Hashtable hashtableEnvironment = new Hashtable();
hashtableEnvironment.put(Context.INITIAL_CONTEXT_FACTORY, "com.sun.jndi.ldap.LdapCtxFactory");
```

- ```
hashtableEnvironment.put(Context.PROVIDER_URL, "ldap://localhost:389/dc=etcee,dc=com");
hashtableEnvironment.put(Context.SECURITY_PRINCIPAL, "name");
hashtableEnvironment.put(Context.SECURITY_CREDENTIALS, "password");
```

#### InitialContext

```
Context context = new InitialContext(hashtableEnvironment);
```

#### InitialDirContext

```
DirContext context = new InitialDirContext(hashtableEnvironment);
```

- 
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#### lookup

lookup

- - java.naming.provider.url    java.naming.factory.initial    java.naming
  - java.naming.ldap    java.naming.service
  - java.naming.security.sasl    java.naming.feature
  - com.sun.jndi.ldap.trace.ber
- - InitialContext    HashTable
  - jndi.properties
-

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Capitolo 2

Capitolo 6

@Stateless    @Stateful    @MessageDriven

```
@Remote
public interface Payroll {
 public void setTaxDeductions(int empId, int deductions);
}
```

@Remote    @Local    @WebService

@Remote

@Local

Capitolo 7

```
public interface Payroll {
 public void setTaxDeductions(int empId, int deductions);
}
```

```
// interfaccia locale di EJBHome
public interface PayrollHome extends javax.ejb.EJBLocalHome {
 public Payroll create() throws CreateException;
}
```

```
// interfaccia locale di EJBObject
public interface Payroll extends javax.ejb.EJBLocalObject {
 public void setTaxDeductions(int empId, int deductions);
}
```

```
@Stateless
public class PayrollBean implements Payroll {

 public void setTaxDeductions(int empId, int deductions) {
 ...
 }
}
```

```
public class PayrollBean implements javax.ejb.SessionBean {

 SessionContext ctxt;

 public void setSessionContext(SessionContext ctxt) {
 this.ctxt = ctxt;
 }

 public void ejbCreate() {...}
 public void ejbActivate() {...}
 public void ejbPassivate() {...}
 public void ejbRemove() {...}

 public void setTaxDeductions(int empId, int deductions) {
 ...
 }
}
```

jms.MessageListener

@MessageDriven

```
@MessageDriven
public class PayrollMDB implements javax.jms.MessageListener {

 public void onMessage(Message msg) {
 ...
 }
}
```

```
@EJB
ShoppingCart myCart;
```

...

```
Collection widgets = myCart.startToShop("widgets");
```

...

```
Context initialContext = new InitialContext();
ShoppingCartHome myCartHome = (ShoppingCartHome) initialContext.lookup("java:comp/env/ejb/cart");
ShoppingCart myCart = myCartHome.create();
// utilizzo del bean
Collection widgets = myCart.startToShop("widgets")
```

...

```
// necessario anche il codice per gestire esplicitamente
// l'eccezione javax.ejb.CreateException
```

- @EJB

- @PersistenceContext @PersistenceUnit  
Capitolo 6
- @Resource

@Resource

@Resource

- name name

○

○

- type

○

@Resource

@Resource

- authenticationType  
CONTAINER APPLICATION
- shareable
- mappedName

```
public class SomeClass {
 @Resource
 private javax.sql.DataSource myDB;
}
```

```
public class SomeClass {
 private javax.sql.DataSource myDB;

 ...

 @Resource
 private void setmyDB(javax.sql.DataSource ds) {
 myDB = ds;
 }

 ...
}
```

```
@Resource(name="myMessageQueue", type="javax.jms.ConnectionFactory")
public class SomeMessageBean { ... }
```

name type  
@Resource

- 
- 

@Resources

```
@Resources({
 @Resource(name="myMessageQueue", type="javax.jms.ConnectionFactory"),
 @Resource(name="myMailSession", type="javax.mail.Session")
})
public class SomeMessageBean { ... }
```

// Vista cliente da EJB 3.X di un bean EJB 2.X

```
@EJB
ShoppingCartHome cartHome;

Cart cart = cartHome.create();
cart.addItem(...);
cart.remove();
```

EJBHome

// Vista cliente da EJB 2.X di un bean conforme a EJB 3.X

```
Context initialContext = new InitialContext();
ShoppingCartHome myCartHome = (ShoppingCartHome) initialContext.lookup("java:comp/env/ejb/cart");
```

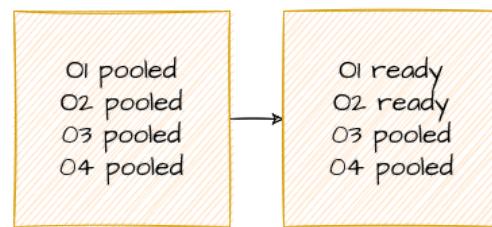
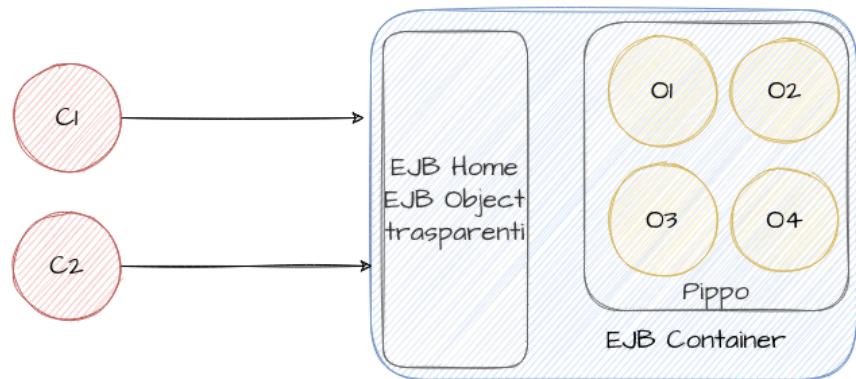
```
ShoppingCart cart = myCartHome.create();
cart.addItem(...);
cart.remove();
```

EJBHome

EJBObject

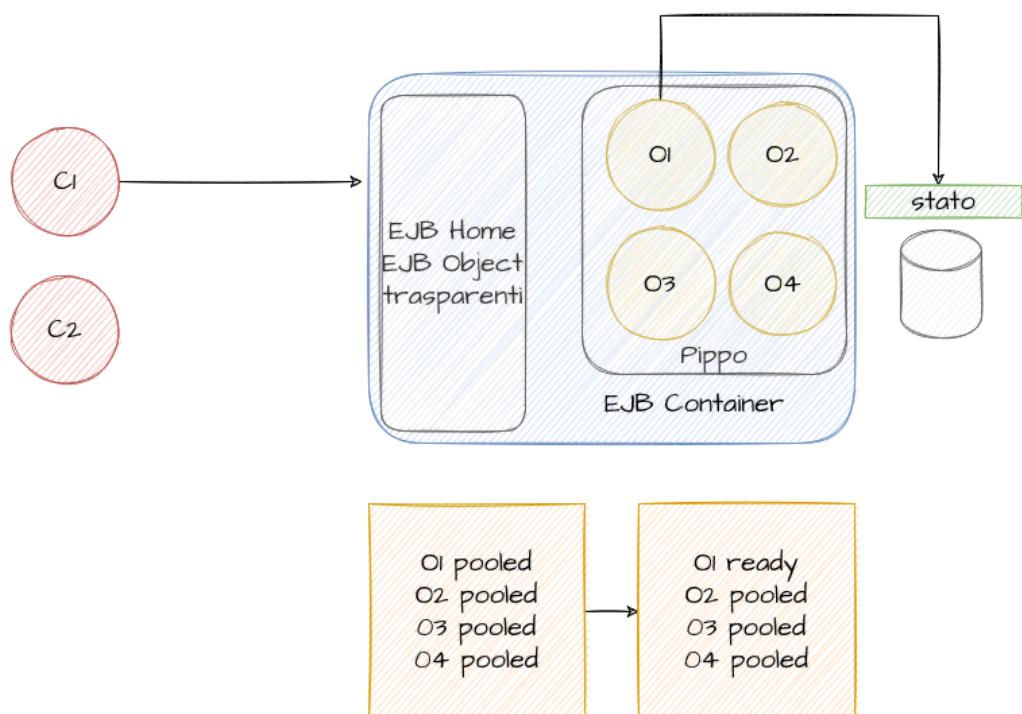
Capitolo 2

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C1



@javax.ejb.PostActivate

`@javax.ejb.PrePassivate`

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`commit`

`rollback`

| time | T1      | T2     |
|------|---------|--------|
| 1    | R(x)    |        |
| 2    | W(x)    |        |
| ...  |         |        |
| 1000 | R(x500) |        |
| 1001 | commit  |        |
| 1002 |         | R(y)   |
| 1003 |         | W(y)   |
| 1004 |         | commit |

$$\begin{aligned}
 \text{Tempo medio di risposta} &= \\
 (1001 + (1004-1)) / 2 &= \\
 &= 1002
 \end{aligned}$$

| time | T1      | T2     |
|------|---------|--------|
| 1    | R(x)    |        |
| 2    |         | R(y)   |
| 3    |         | W(y)   |
| 4    |         | commit |
| 5    | W(x)    |        |
| ...  |         |        |
| 1003 | R(x500) |        |
| 1004 | commit  |        |

$$\begin{aligned}
 \text{Tempo medio di risposta} &= \\
 (1004 + 3) / 2 &= \\
 &= 503.5
 \end{aligned}$$

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X X X  
T2 T1

| T1     | X | T2     |
|--------|---|--------|
| R(x)   | I |        |
| X=X-I  | I |        |
|        | I | R(x)   |
|        | I | X=X-I  |
| w(x)   | O |        |
| commit | O |        |
|        | O | w(x)   |
|        | O | commit |

T2

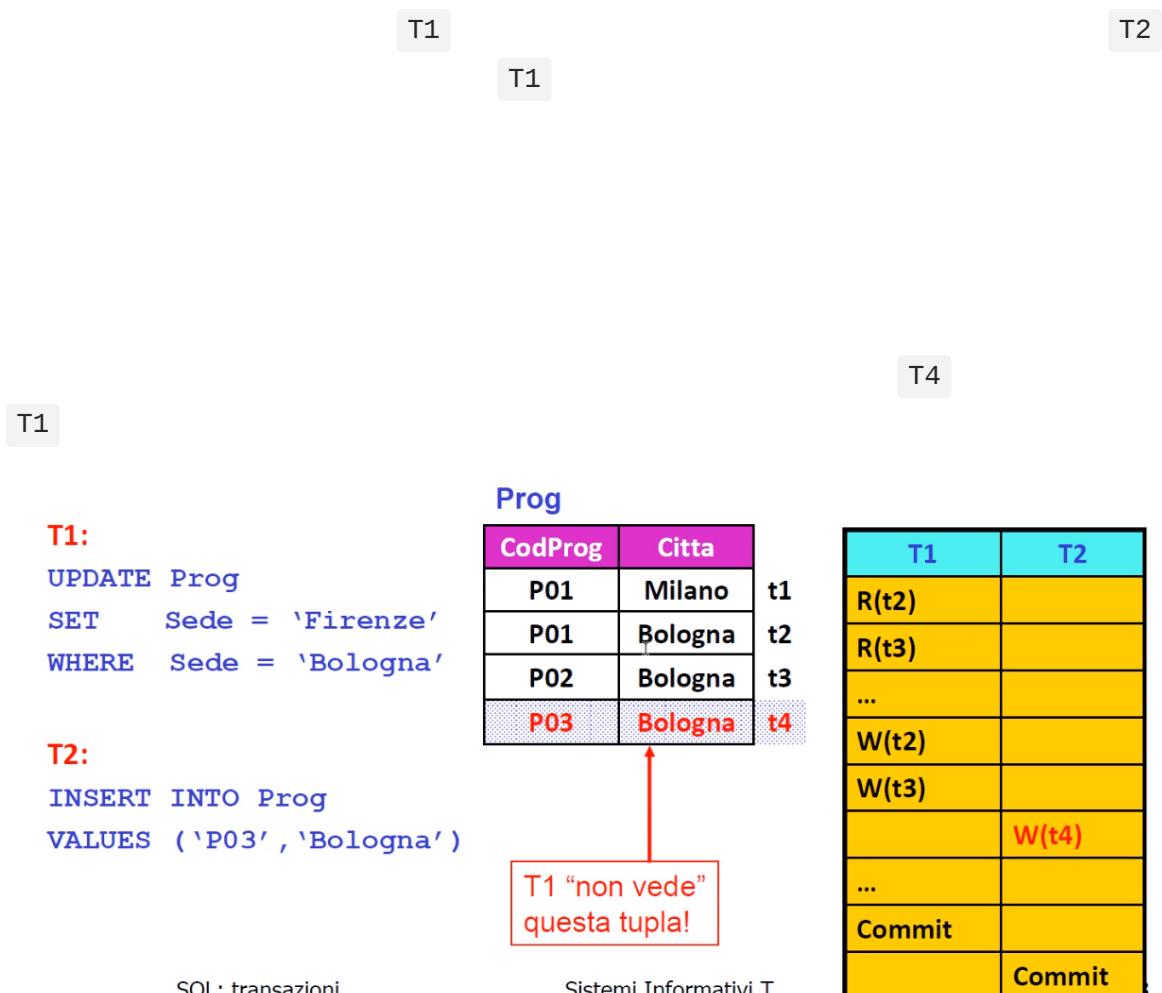
X

T2

T1

| T1       | X | T2     |
|----------|---|--------|
| R(x)     | O |        |
| X=X+1    | O |        |
| W(x)     | I |        |
|          | I | R(x)   |
| rollback | O |        |
|          | O | ...    |
|          | O | ...    |
|          | O | commit |

| T1     | X | T2     |
|--------|---|--------|
| R(x)   | O |        |
|        | O | R(x)   |
|        | I | X=X+1  |
|        | I | W(x)   |
|        | I | commit |
| R(x)   | I |        |
| ...    | I |        |
| commit | I |        |



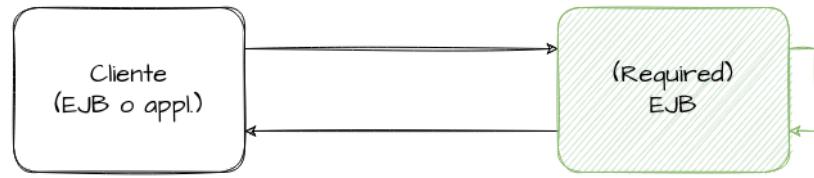
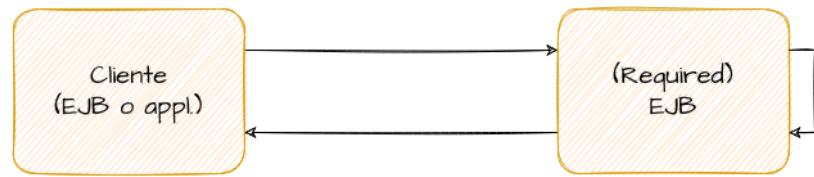
- `ISOLATION_READ_UNCOMMITTED`
- `ISOLATION_READ_COMMITTED`
- `ISOLATION_REPEATABLE_READ`
- `ISOLATION_SERIALIZABLE`
- `@TransactionManagement`
  - `CONTAINER`
  - `BEAN`
- `commit`
- `commit`    `rollback`
  - `java.sql.Connection`
  - `javax.transaction.UserTransaction`
  - `javax.jms.Session`
- `@TransactionAttribute`
  - `BeanA`
  - `BeanB`
- `BeanA`
  - `BeanB`
- `BeanB`
  - `BeanA`

REQUIRED

REQUIRES\_NEW MANDATORY NOT\_SUPPORTED SUPPORTS NEVER

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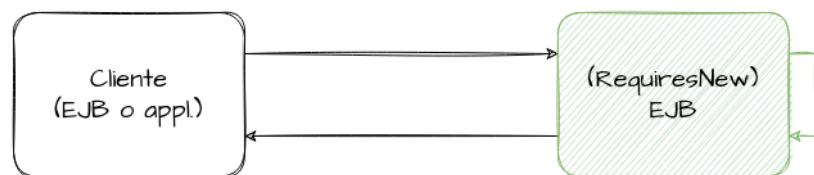
- REQUIRED



Leggenda

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| transazionale<br>T2 |
| no<br>transazionale |

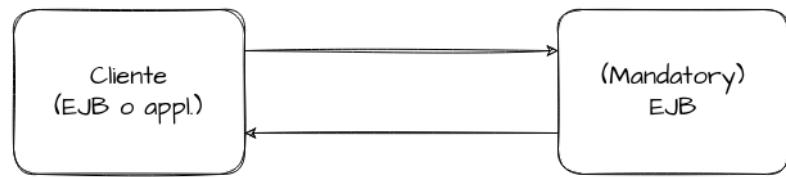
- REQUIRES\_NEW



Leggenda

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|---------------------|
| transazionale<br>T1 |
| transazionale<br>T2 |
| no<br>transazionale |

- MANDATORY



Leggenda

transazionale  
T1

transazionale  
T2

no  
transazionale

- NOT\_SUPPORTED



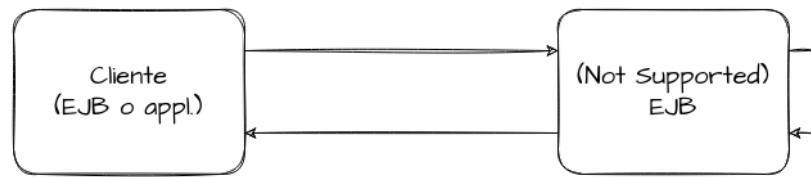
Leggenda

transazionale  
T1

transazionale  
T2

no  
transazionale

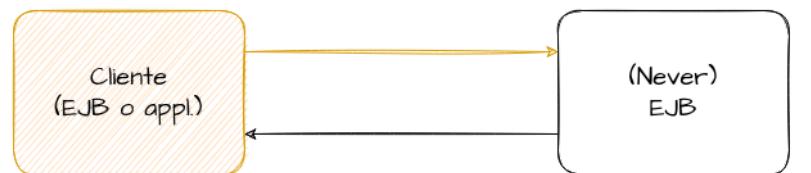
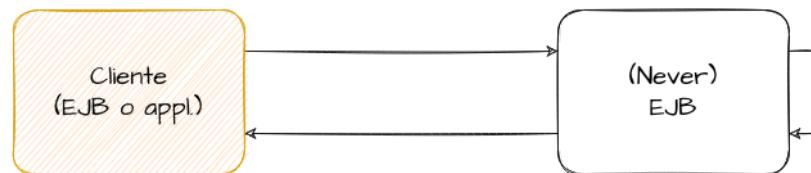
- SUPPORTS



Leggenda



- NEVER



Leggenda



rollback

- **rollback**
- **setRollBackOnly**    EJBContext    EJBContext



- **callback**  
SessionSynchronization
- **afterBegin**
- **beforeCompletion**
- **afterCompletion**
  - commit**
  - rollback**

```

import static TransactionAttributeType.*;

@Stateless
@TransactionAttribute(NOT_SUPPORTED)
public class TravelAgentBean implements TravelAgentRemote {

 public void setCustomer(Customer cust) { ... }

 @TransactionAttribute(REQUIRED)
 public TicketDO bookPassage(CreditCard card, double price) { ... }
}

```

```

// EJB 3.0: Bean-managed transaction
@TransactionManagement(BEAN)
@Stateless
public class PayrollBean implements Payroll {

 @Resource UserTransaction utx;
}

```

```
@PersistenceContext EntityManager payrollMgr;
public void setTaxDeductions(int empId, int deductions) {

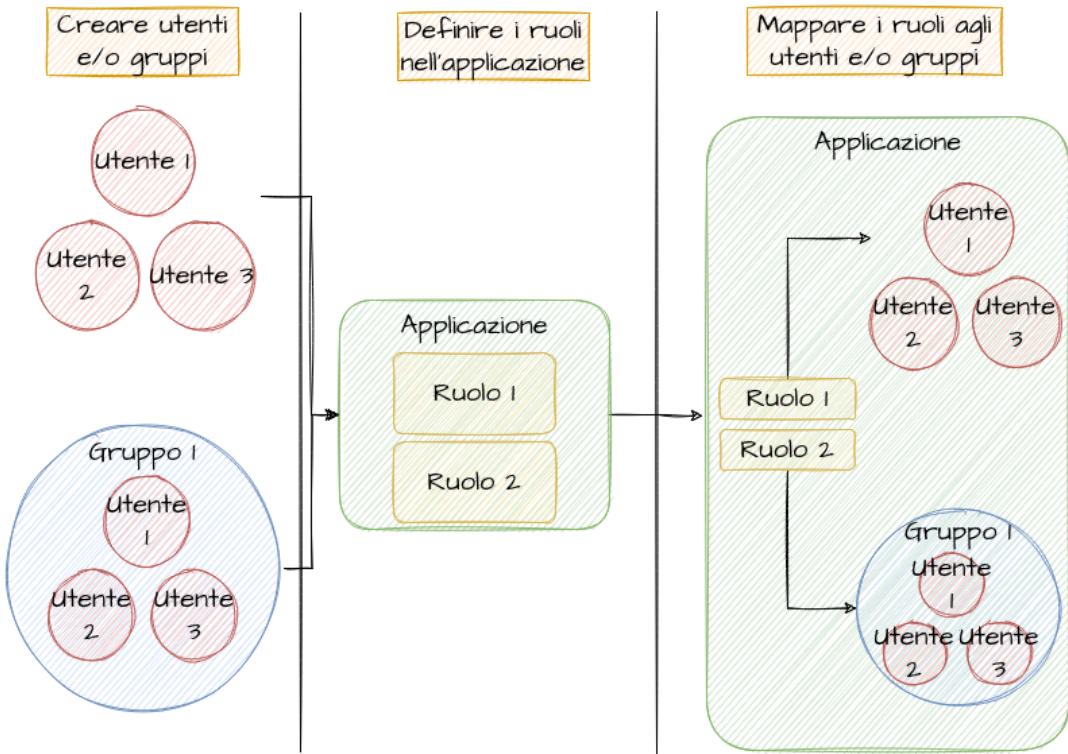
 utx.begin();
 payrollMgr.find(Employee.class, empId).setDeductions(deductions);
 utx.commit();
}

...
}
```

@Resource

Capitolo 6

Capitolo 7



- `@RolesAllowed`
- `@PermitAll`
- `@DenyAll`
- `@RunAs`

```

@Stateless
public PayrollBean implements Payroll {

 public void setBenefitsDeduction(int empId, double deduction) { ... }
 public double getBenefitsDeduction(int empId) { ... }
 public double getSalary(int empid) { ... }

 // setting del salario ha un accesso più restrittivo
 @RolesAllowed("HR_PayrollAdministrator")
 public void setSalary(int empId, double salary) { ... }
}

```

- `@Interceptors`
- `@AroundInvoke`

```

//classe Profiler
public class Profiler {

 @AroundInvoke
 public Object profile() throws Exception {
 ...
 }
}

...
//classe intercettata

```

```
@Interceptors(Profiler.class)
public Object m1(...) throws ... { ... }
```

- - 
  -
-

```
public SampleDAO samplelookup(String id) {

 Connection c = null;
 PreparedStatement ps = null;
 ResultSet rs = null;
 SampleDAO dao = null;
 try {
 c = getDataSource().getConnection();
 ps = c.prepareStatement("SELECT ...");
 ps.setString(1, id);
 rs = ps.executeQuery();
 if (rs.first()) {
 dao = new SampleDAO(id, rs.getString(2), rs.getString(2));
 }
 }
 catch (SQLException se) {
 throw new SampleDAORuntimeException(se);
 }
 finally {
 if (rs != null) try {rs.close();} catch (SQLException se) {}
 if (ps != null) try {ps.close();} catch (SQLException se) {}
 if (c != null) try {c.close();} catch (SQLException se) {}
 }

 return dao;
}
```

- 
- 
-

- `javafx.persistence.Entity`
- `public protected`
- `final`
- `getter`
- `Serializable`
- `private`
- `protected package-private`
- `javax.persistence.Transient`
- `protected Set<Purchase> purchases;`
- `getter setter getProperty() setProperty() isProperty()`
- `Customer`
- `firstName String`
- ```
public String getFirstName() {
    return name;
}

public void setFirstName(String firstName) {
    this.firstName = firstName;
}
```
- `public Set<Purchase> getPurchases() {
 return purchases;
}`

```
}
```

```
javax.persistence.Id
```

```
@Entity  
public class Project {  
    @Id  
    private long id;  
  
    ...  
}
```

```
javax.persistence.EmbeddedId
```

```
javax.persistence.IdClass
```

```
@Entity @IdClass(ProjectId.class)  
public class Project {  
    @Id  
    private int departmentId;  
    @Id  
    private long projectId;  
  
    ...  
}  
  
public class ProjectId {  
    private int departmentId;  
    private long projectId;  
}
```

```
@IdClass
```

```
@Entity
public class Project {
    @EmbeddedId
    private ProjectId id;

    ...

}

@Embeddable
public class ProjectId {
    private int departmentId;
    private long projectId;
}
```

Project
ProjectId

- public
- hashCode() equals(Object other)
-
-

```
@Entity
public final class LineItemKey implements Serializable {

    public Integer orderId;
    public int itemId;

    public LineItemKey() {
    }

    public LineItemKey(Integer orderId, int itemId) {
        this.orderId = orderId;
        this.itemId = itemId;
    }

    public boolean equals(Object other0b) {

        if (this == other0b) {
            return true;
        }

        if (!(other0b instanceof LineItemKey)) {
            return false;
        }

        LineItemKey other0b2 = (LineItemKey) other0b;
        if (this.orderId != other0b2.orderId) {
            return false;
        }
        if (this.itemId != other0b2.itemId) {
            return false;
        }
        return true;
    }

    public int hashCode() {
        int result = 17;
        result = 31 * result + orderId;
        result = 31 * result + itemId;
        return result;
    }
}
```

```

    }

    LineItemKey other = (LineItemKey) other0b;
    return ((orderId==null ? other.orderId==null : orderId.equals(other.orderId))
        && (itemId == other.itemId));
}

public int hashCode() {
    return ((orderId==null? 0 : orderId.hashCode())^((int) itemId));
}

public String toString() {
    return "" + orderId + "-" + itemId;
}

}

```

```

@Entity
public abstract class Employee {

    @Id
    protected Integer employeeId;

    ...

}

@Entity
public class FullTimeEmployee extends Employee {

    protected Integer salary;

    ...

}

@Entity
public class PartTimeEmployee extends Employee {

```

```
    protected Float hourlyWage;  
}
```

```
    @MappedSuperclass
```

```
        @MappedSuperclass
```

```
@MappedSuperclass  
public class Employee {  
  
    @Id  
    protected Integer employeeId;  
  
    ...  
}  
  
@Entity  
public class FullTimeEmployee extends Employee {  
  
    protected Integer salary;  
  
    ...  
}  
  
@Entity  
public class PartTimeEmployee extends Employee {  
  
    protected Float hourlyWage;  
  
    ...  
}
```

```
javax.persistence.Inheritance
```

- `InheritanceType.SINGLE_TABLE`

NULL

- InheritanceType.TABLE_PER_CLASS

- InheritanceType.JOINED

InheritanceType.SINGLE_TABLE

@Inheritance

TABLE_PER_CLASS

JOINED

- javax.persistence.OneToOne

- javax.persistence.OneToMany

- javax.persistence.ManyToOne

- javax.persistence.ManyToMany

```
@OneToMany  
public Set<Purchase> getPurchases() {  
    return purchases;  
}
```

Ordine

Oggetto

@mappedBy

```
@OneToMany(cascade=REMOVE, mappedBy="customer")  
public Set<Order> getOrders() {  
    return orders;  
}
```

```
@PersistenceContext
```

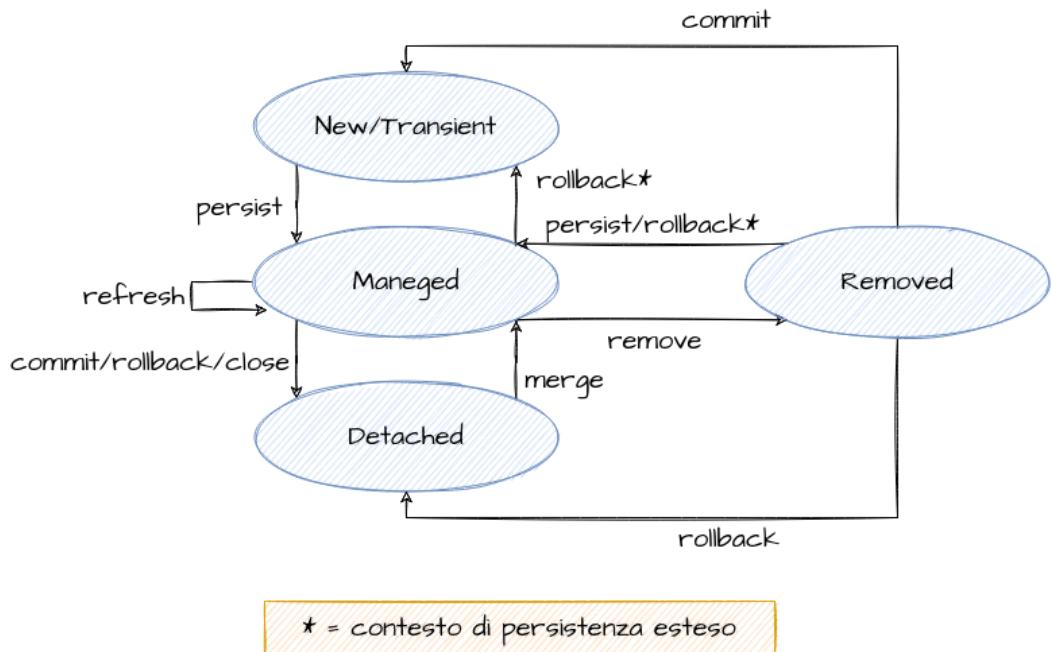
```
@PersistenceContext  
EntityManager em;
```

```
createEntityManager()
```

```
javax.persistence.EntityManagerFactory
```

```
@PersistenceUnit
```

```
EntityManagerFactory emf;  
EntityManager em = emf.createEntityManager();
```



-
-
-
-

```
persist()
cascade=PERSIST
```

```
persist()
cascade=ALL
```

- `persist()`
- `IllegalArgumentException`

```
persist()
```

```
@PersistenceContext
EntityManager em;

...
public LineItem createLineItem(Order order, Product product) {
    LineItem li = new LineItem(order, product, quantity);
```

```
order.getLineItems().add(li);
em.persist(li);

return li;
}

// persist propagata a tutte le Entity in relazione con
// cascade element = ALL o PERSIST

@OneToMany(cascade=ALL, mappedBy="order")
public Collection<LineItem> getLineItems() {
    return lineItems;
}
```

- **remove()**
 - **remove()**
IllegalArgumentException
 - **remove()**
- remove()**
cascade=REMOVE cascade=ALL

```
public void removeOrder(Integer orderId) {
    try {
        Order order = em.find(Order.class, orderId);
        em.remove(order);
    }
}
```

refresh()

commit

flush()

commit

```
persistence.xml
```

```
<persistence>
    <persistence-unit name="OrderManagement">
        <description> Questa unità gestisce ordini e clienti</description>
        <jta-data-source>jdbc/MyOrderDB</jta-data-source>
        <jar-file>MyOrderApp.jar</jar-file>
        <class>com.widgets.Order</class>
        <class>com.widgets.Customer</class>
    </persistence-unit>
</persistence>
```

OrderManagement

jdbc/MyOrderDB

Order Customer

jar-file class

jta-data-source

createQuery() createNamedQuery()

createQuery()

```
public List findWithName(String name) {
    return em.createQuery(
        "SELECT c FROM Customer c WHERE c.name LIKE :custName")
```

```
.setParameter("custName", name)
.setParameter(10)
.getResultList();
}
```

```
createNamedQuery()
```

```
@NamedQuery
```

```
@NamedQuery(
    name="findAllCustomersWithName",
    query="SELECT c FROM Customer c WHERE c.name LIKE :custName")
```

```
@PersistenceContext
```

```
public EntityManager em;
```

```
...
```

```
customers = em.createNamedQuery("findAllCustomersWithName")
    .setParameter("custName", "Smith")
    .getResultList();
```

```
setParameter()
```

```
:
```

```
:custName
```

```
@OneToMany(cascade=ALL, mappedBy="owner", fetch=EAGER)
```

```
@OneToMany(cascade=ALL, mappedBy="owner", fetch=LAZY)
```

persist

```
@Entity
@EntityListener(com.acme.AlertMonitor.class)
public class AccountBean implements Account {

    Long accountId;
    Integer balance;
    boolean preferred;
    @Transient ClassA obj1;

    public Long getAccountId() { ... }
    public Integer getBalance() { ... }
    public boolean isPreferred() { ... }
    public void deposit(Integer amount) { ... }
    public Integer withdraw(Integer amount) throws NSFException {... }

    @PrePersist
    public void validateCreate() {

        if (getBalance() < MIN_REQUIRED_BALANCE)
            throw new AccountException("Insufficient balance to open an account");
    }

    @PostLoad
    public void adjustPreferredStatus() {
        preferred = (getBalance() >= AccountManager.getPreferredStatusLevel());
    }
}
```

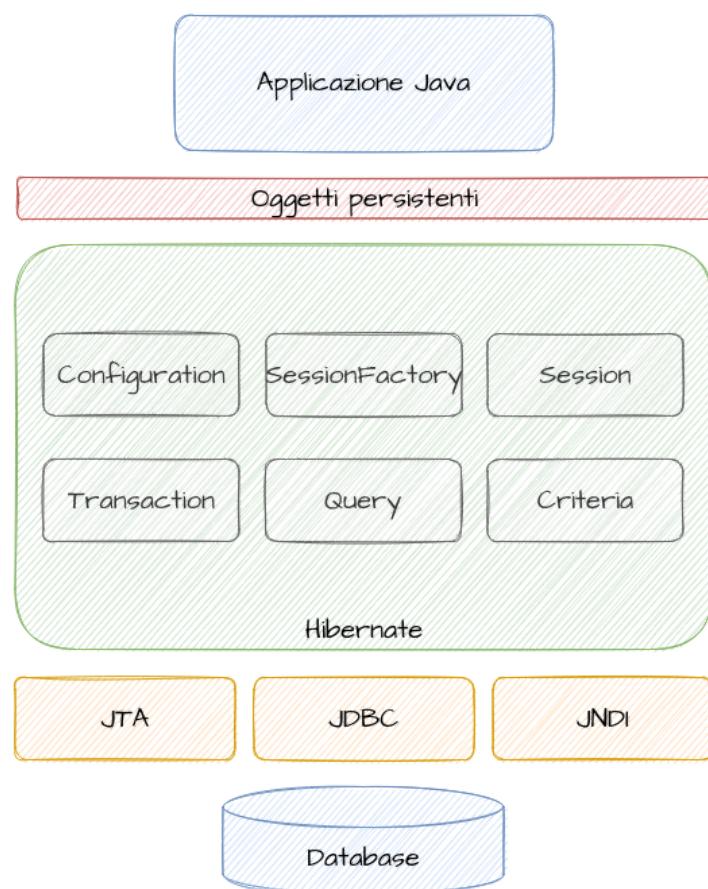
```
public class AlertMonitor {
    @PostPersist
    public void newAccountAlert(Account acct) {
        Alerts.sendMarketingInfo(acct.getAccountId(), acct.getBalance());
```

```
    }  
}
```

AccountBean

@EntityListener(com.acme.AlertMonitor.class)

AlertMonitor



SessionFactory
Session

EntityManagerFactory

SessionFactory

SessionFactory

Session

EntityManager

Transaction

Transaction

Transaction

•

•

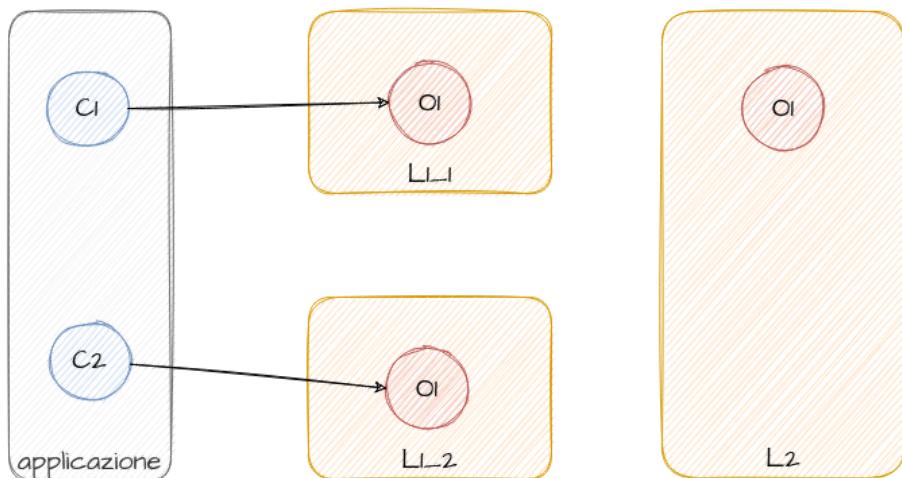
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Session

Session

SessionFactory

SessionFactory



SessionFactory

Session

Session

C_1

01

C_2

SessionFactory

Session

01

L_{1_2}

C_1

01

C_2

01

C_1

@Version

```
@Entity  
@Table(name = "orders")  
public class Order {  
    @Id private long id;  
    @Version private int version;  
    private String description;  
    private String status;  
  
    ...  
}
```

```
update orders set description=?, status=?, version=? where id=? and  
version=?
```

```
update orders set description=?, status=?, version=2 where id=? and  
version=1
```

```
update orders set description=?, status=?, version=2 where id=? and  
version=1
```

org.hibernate.StaleObjectStateException

FetchMode

- `FetchMode.DEFAULT` `FetchMode`
- `FetchMode.JOIN`
- `FetchMode.SELECT`
-
-

```
// cerca gli oggetti persona tramite un oggetto di esempio
Criteria crit = sess.createCriteria(Person.class);
Person person = new Person();
person.setName("Shin");
Example exampleRestriction = Example.create(person);
crit.add(exampleRestriction);
List results = crit.list();
```

•

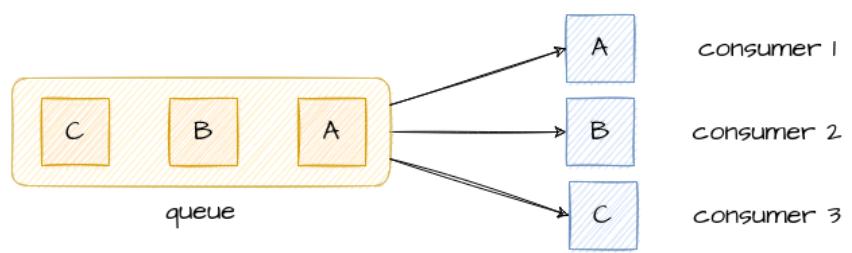
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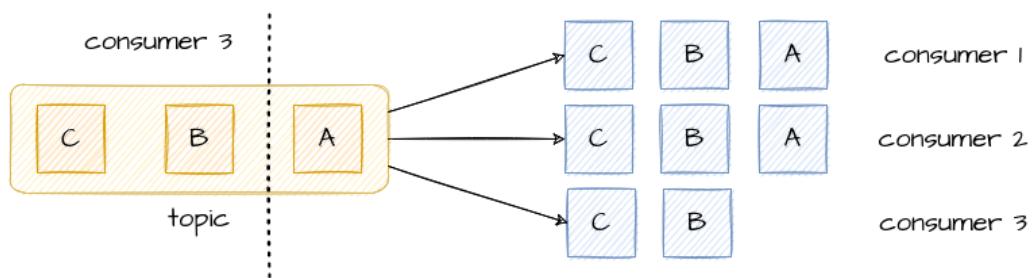
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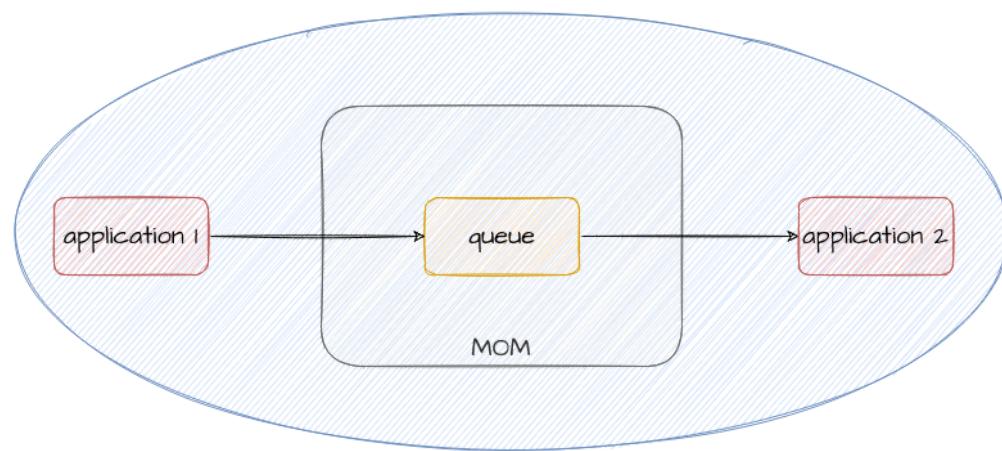
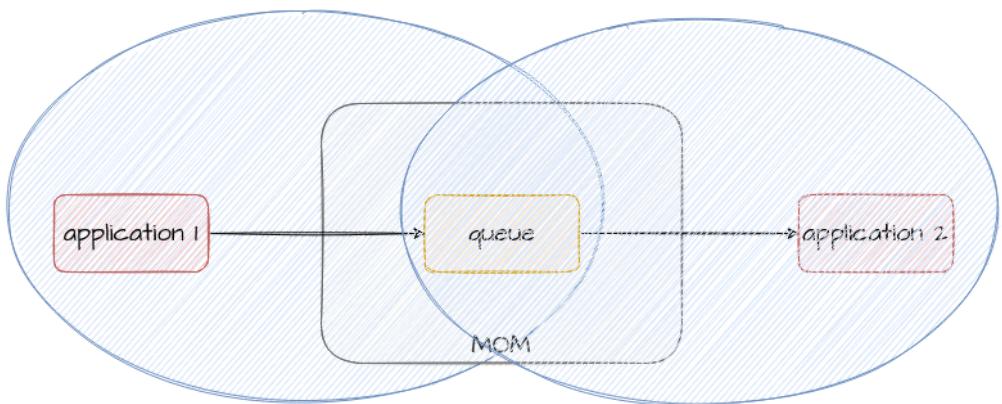
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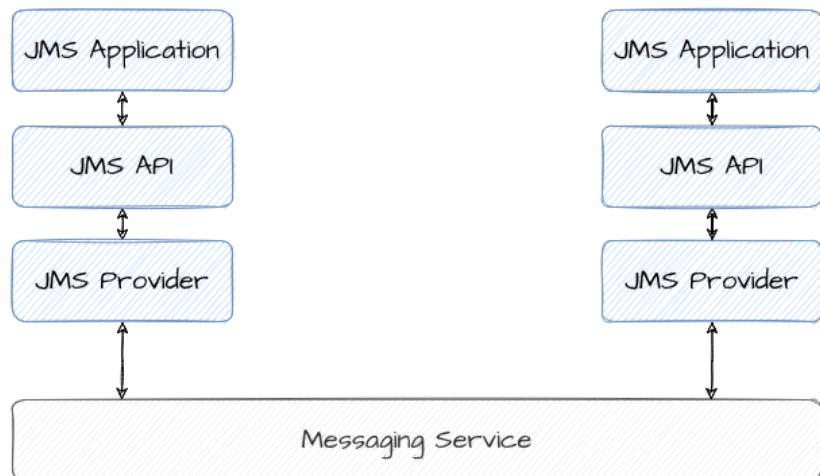
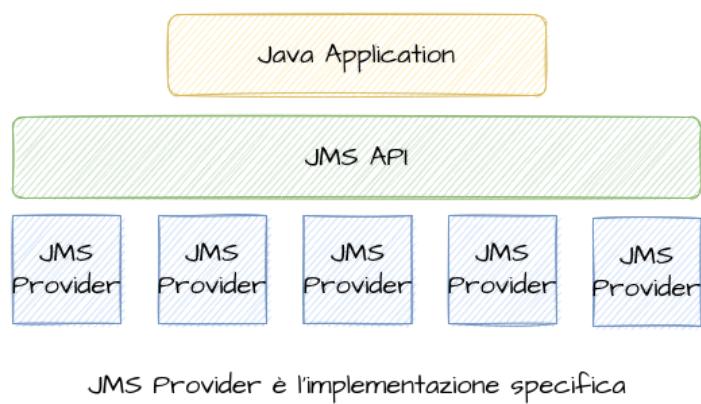
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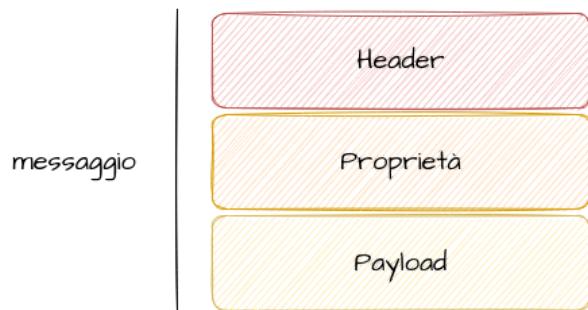
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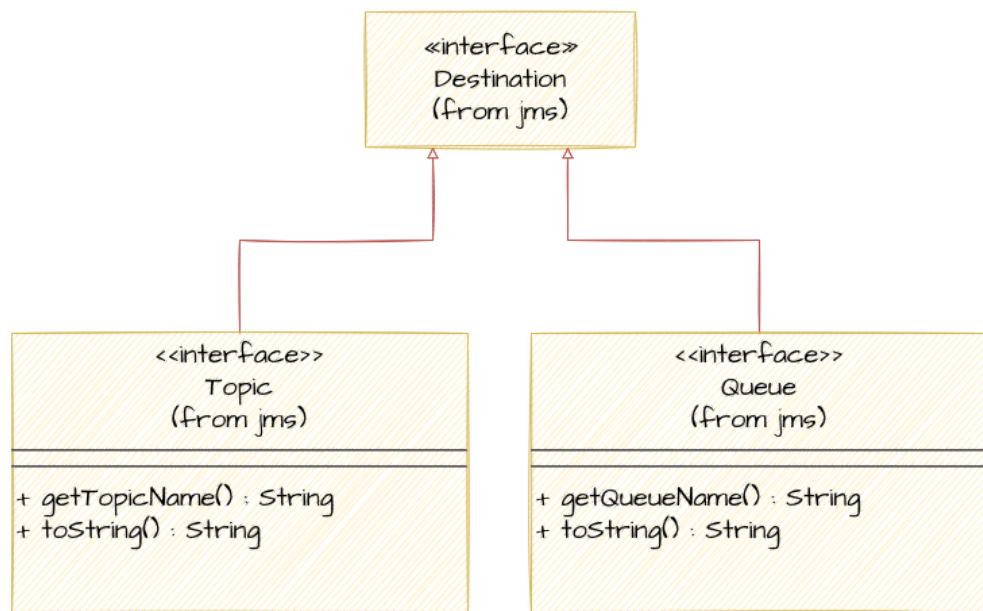


JMSDestination JMSDeliveryMode
 JMSMessageID JMSTimeStamp JMSRedelivered JMSExpiration JMSPriority
 JMSCorrelationID JMSReplyTo
 JMSType

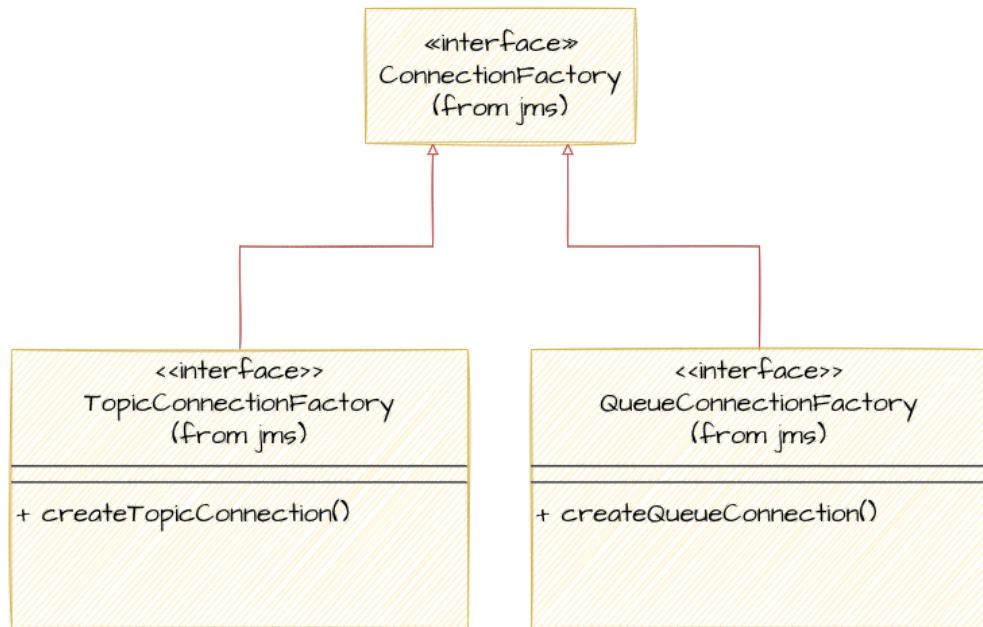
StreamMessage MapMessage TextMessage ObjectMessage
 BytesMessage

- StreamMessage
- MapMessage
- BytesMessage

Destination
 Queue Topic

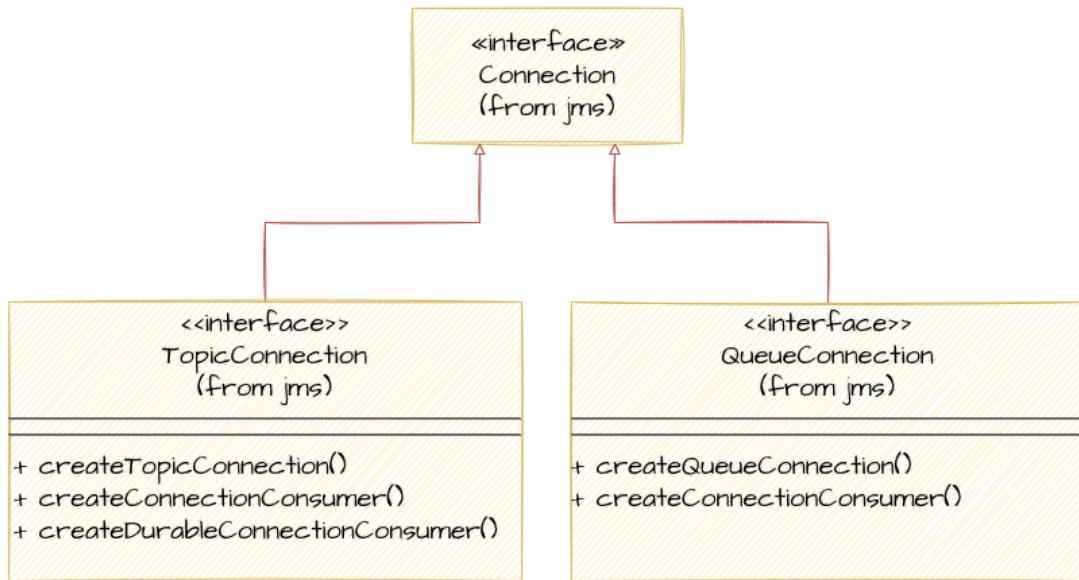


ConnectionFactory
java.sql.DriverManager
QueueConnectionFactory TopicConnectionFactory



Connection

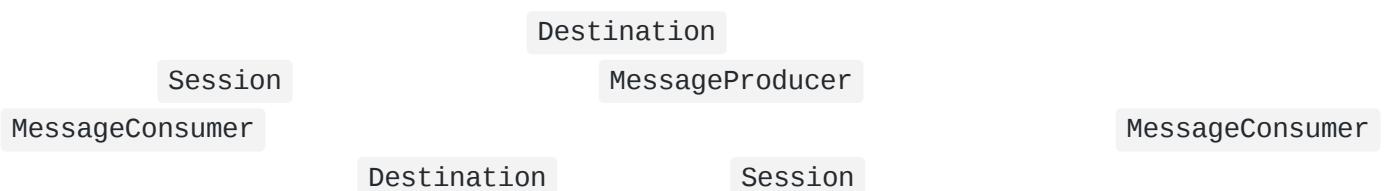
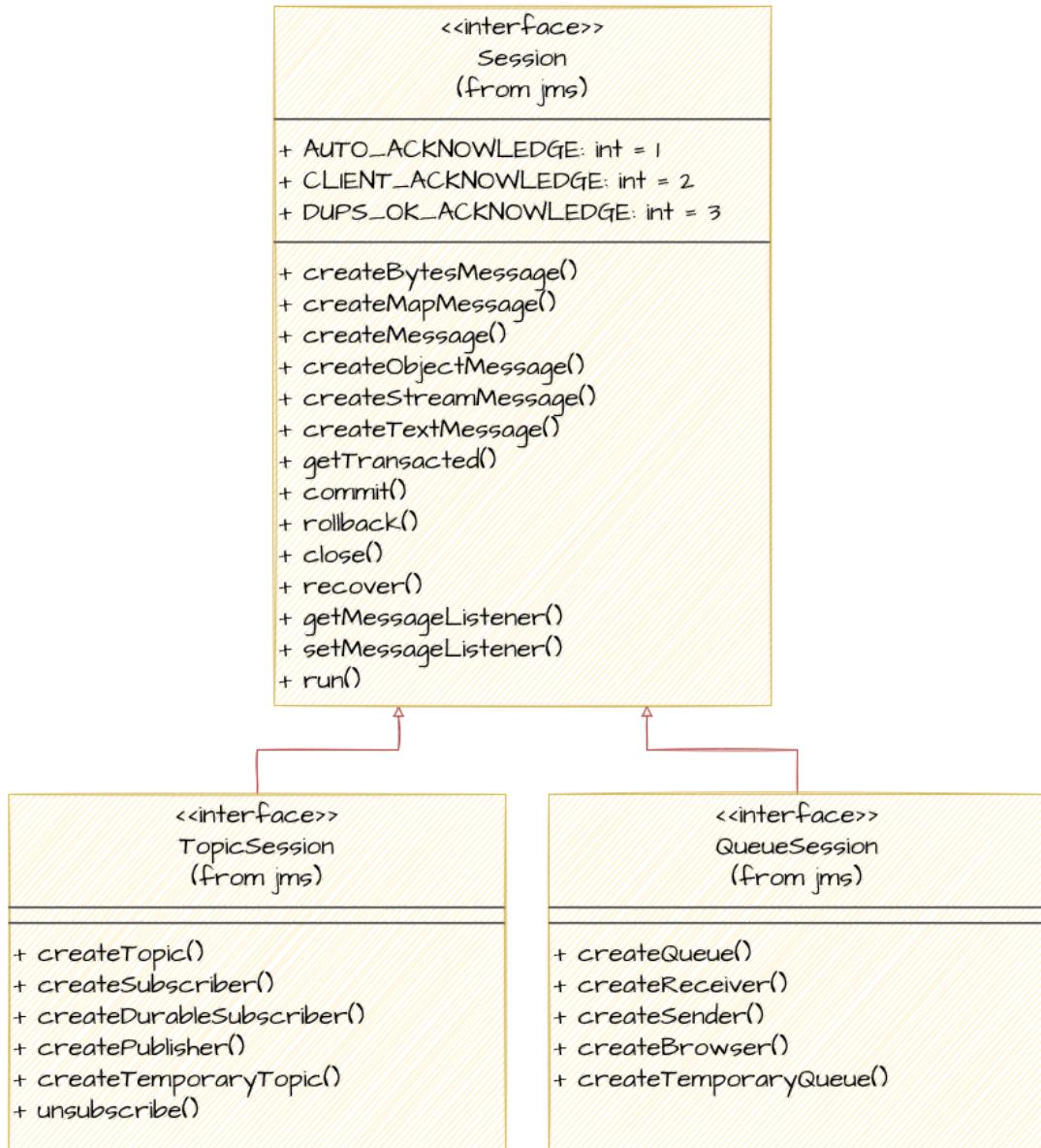
ConnectionFactory

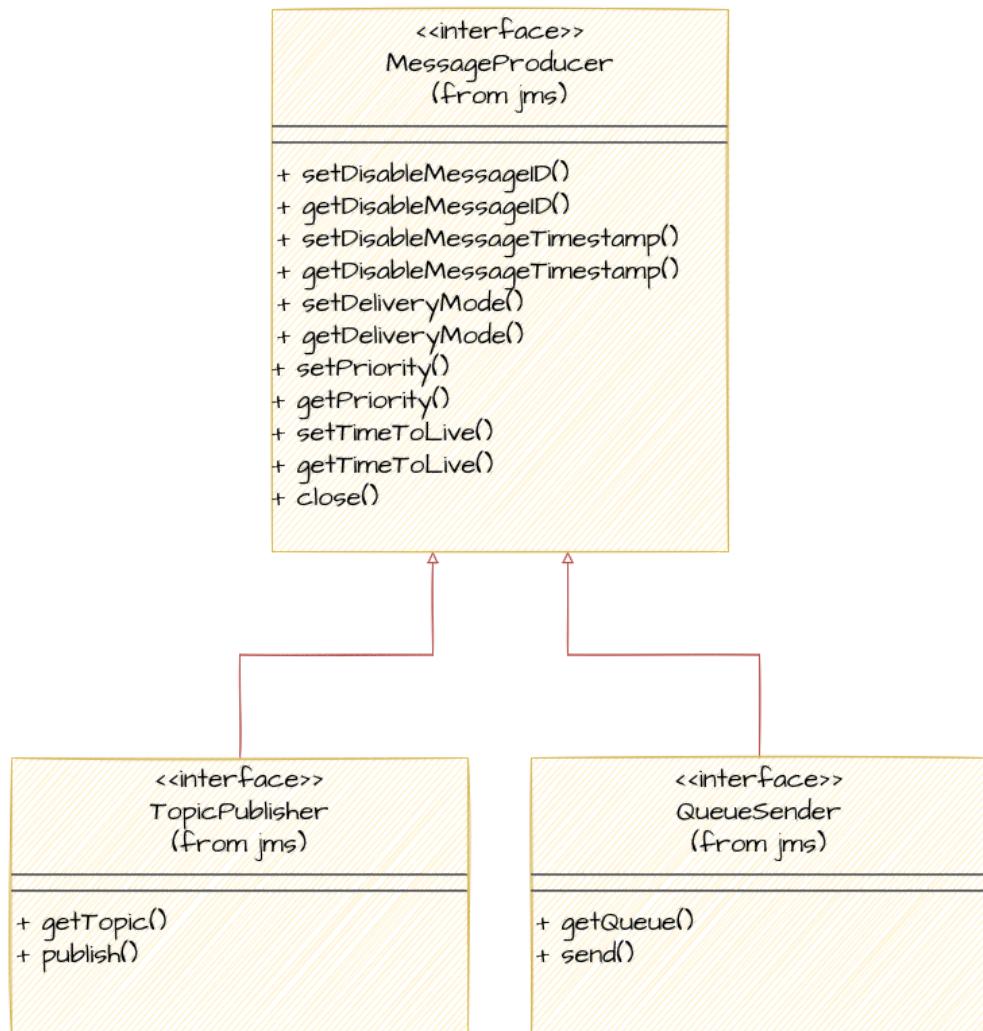


Session

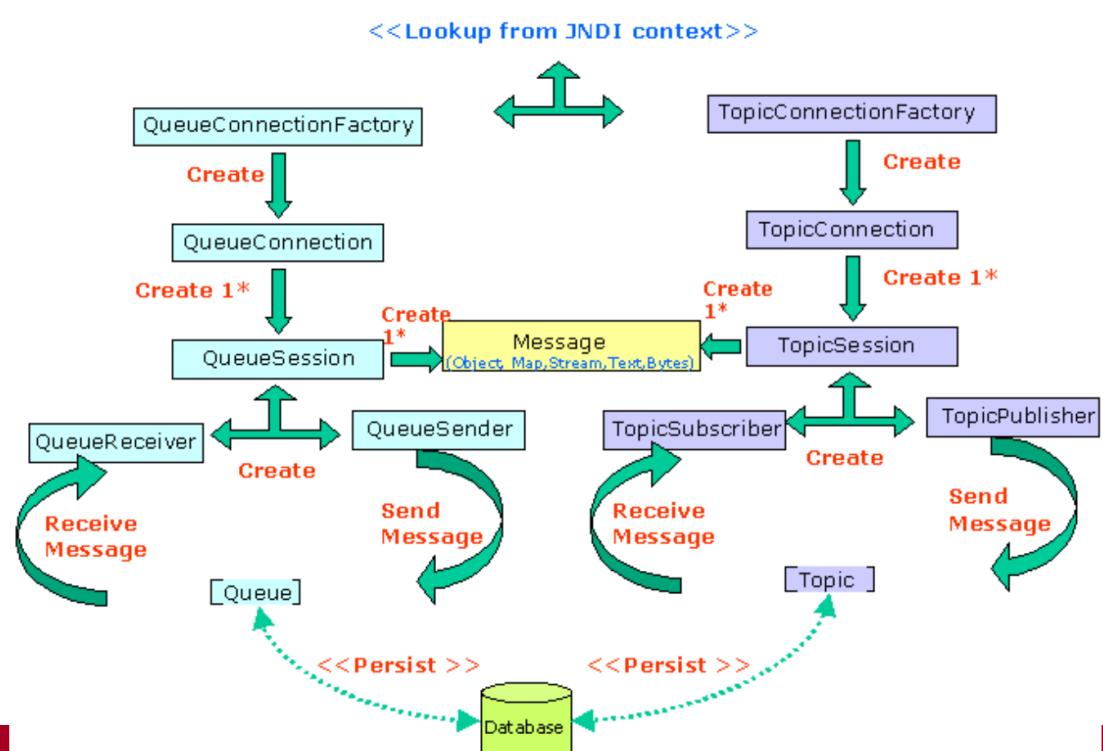
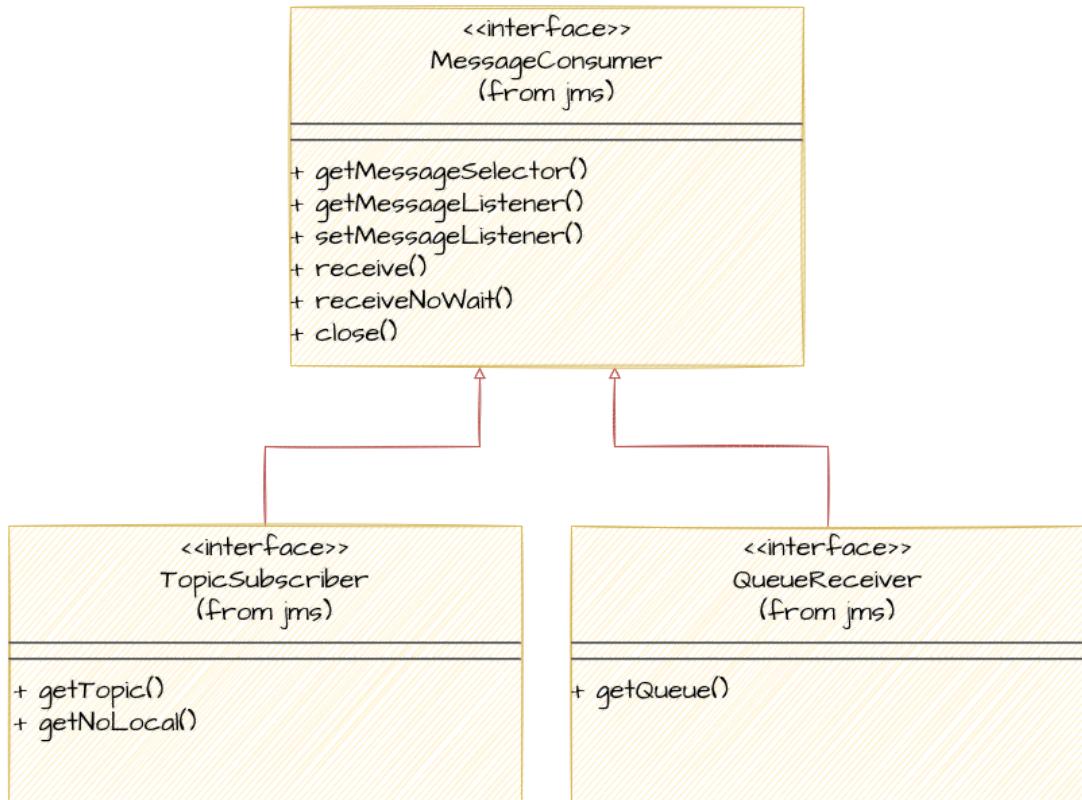
Connection

Connection





- `receive()`
 - `MessageListener`
 - `onMessage()`
- `MessageListener`



-
-

-

ConnectionFactory

Destination

Topic

Queue

```
// Ottiene oggetto InitialContext
Context jndiContext = new InitialContext();

// Trova l'oggetto ConnectionFactory via JNDI
TopicConnectionFactory factory = (TopicConnectionFactory) jndiContext.lookup("MyTopicConnectionFactory");

// Trova l'oggetto Destination via JNDI
// (Topic o Queue)
Topic weatherTopic = (Topic) jndiContext.lookup("WeatherData");
```

-

Connection

```
// Richiede la creazione di un oggetto Connection
// all'oggetto ConnectionFactory
TopicConnection topicConnection = factory.createTopicConnection();
```

-

Session

```
// Crea un oggetto Session da Connection:
// primo parametro controlla transazionalità
// secondo specifica il tipo di ack
TopicSession session = topicConnection.createTopicSession(false, session.CLIENT_ACKNOWLEDGE);
```

-

MessageProducer

TopicPublisher

QueueSender

```
// Richiede la creazione di un oggetto MessageProducer
// all'oggetto Session
// TopicPublisher per Pub/Sub
// QueueSender per Point-to-Point
TopicPublisher publisher = session.createPublisher(weatherTopic);
```

- **Connection**

```
// Avvia la Connection  
// Fino a che la connessione non è avviata, il  
// flusso dei messaggi non comincia: di solito  
// Connection viene avviata prima dell'invocazione  
// dei metodi per la trasmissione messaggi  
topicConnection.start();
```

-

```
// Creazione del messaggio  
TextMessage message = session.createMessage();  
message.setText("text:35 degrees");  
  
// Invio del messaggio  
publisher.publish(message);
```

- **Session** **Connection**

```
session.close();  
topicConnection.close();
```

- **ConnectionFactory** **Destination** **Topic**

- Queue**

- **Connection**
 - **Session**
 - **MessageConsumer** **TopicSubscriber** **QueueReceiver**

```
// Crea oggetto Subscriber da Session  
TopicSubscriber subscriber = session.createSubscriber(weatherTopic);
```

- **MessageListener**

```
// Crea oggetto MessageListener  
WeatherListener myListener = new WeatherListener();  
  
// Registra MessageListener per l'oggetto  
// TopicSubscriber desiderato  
subscriber.setMessageListener(myListener);
```

- **Connection**

- Session Connection

```
createSession()
```

- MessageConsumer.receive() MessageListener.onMessage()
return
- acknowledge()
-

AUTO_ACKNOWLEDGE

CLIENT_ACKNOWLEDGE

DUPS_OK_ACKNOWLEDGE

send()

send()

setDeliveryMode()

MessageProducer

```
// metodo dell'interfaccia MessageProducer  
producer.setDeliveryMode(DeliveryMode.NON_PERSISTENT);
```

JMSPriority

TimeToLive

setPriority()

setTimeToLive()

MessageProducer

```
// metodi nell'interfaccia MessageProducer  
producer.setTimeToLive(60000);  
producer.setPriority(7);
```

Destination

MessageProducer

Session

MessageProducer

MessageProducer

- Session
- Session

Session

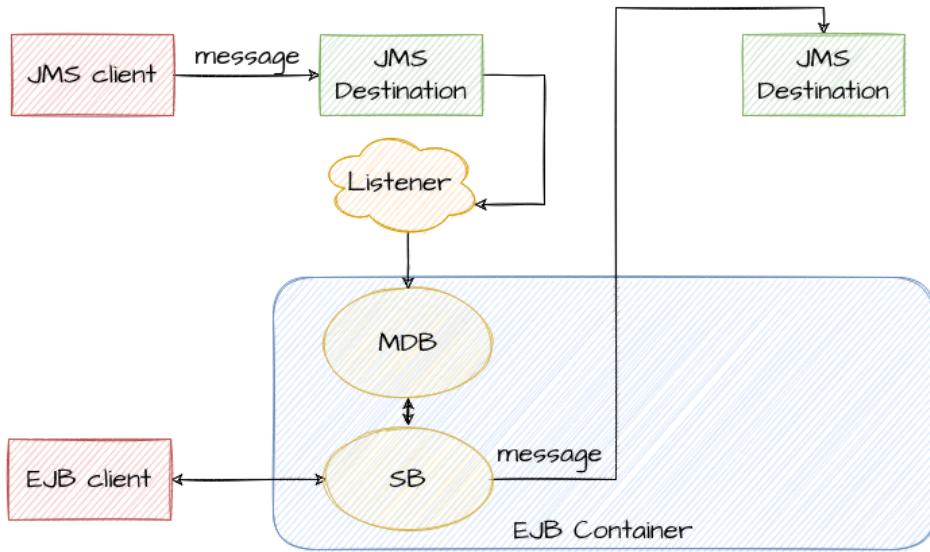
Session.commit()

Session.abort()

QueueConnection.createQueueSession(true, ...)

Session.commit()

Session.rollback()

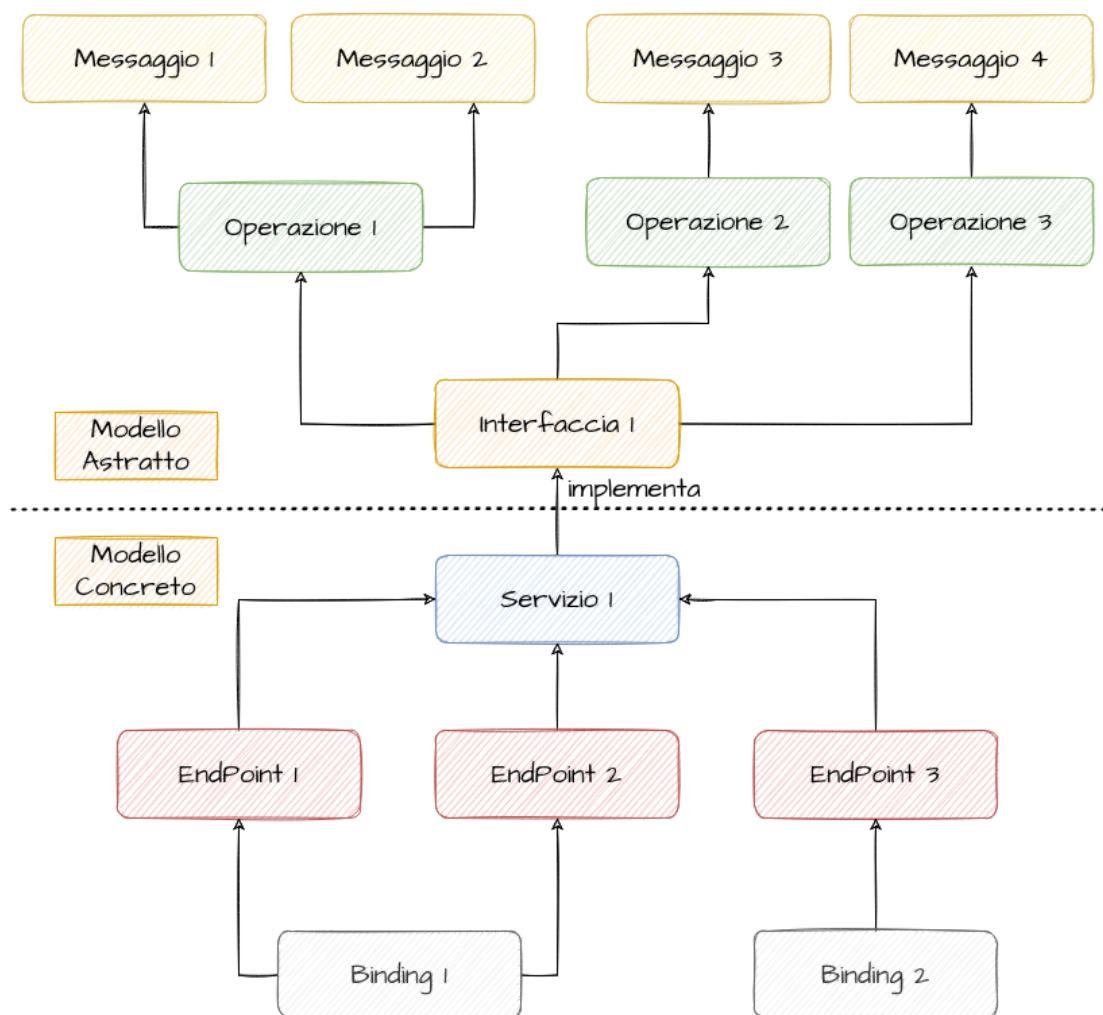


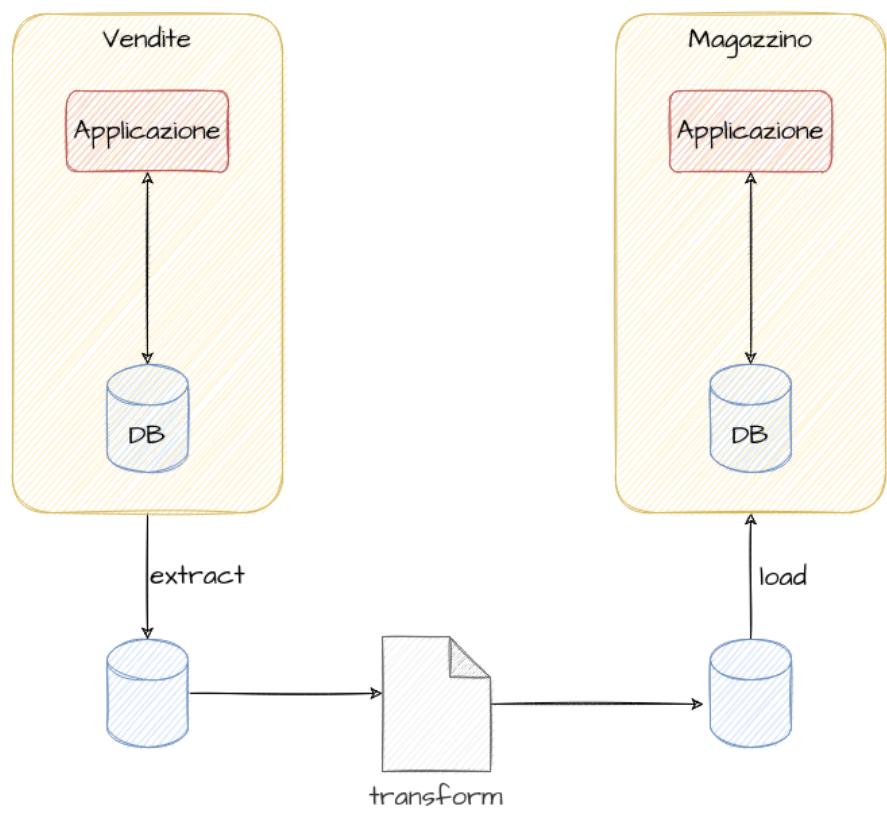
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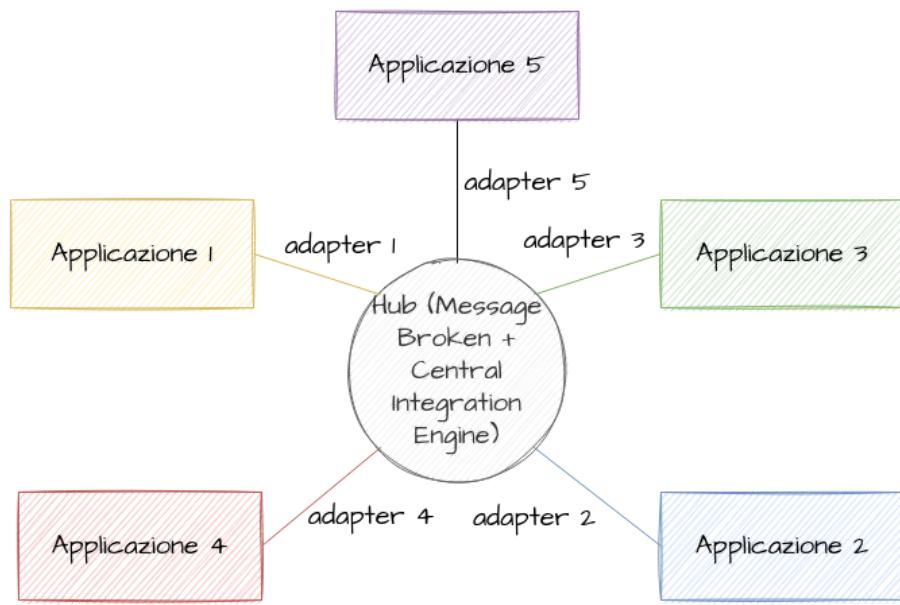
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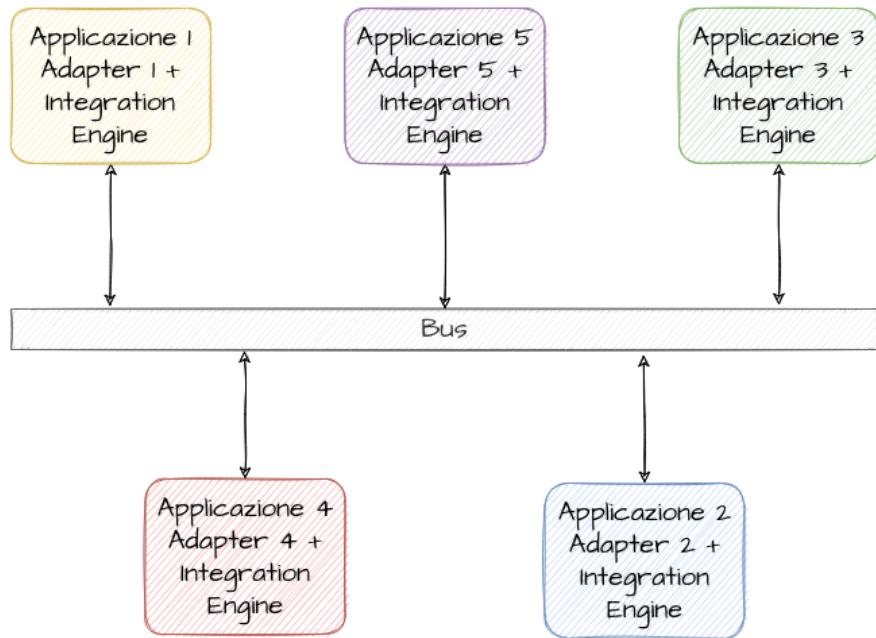
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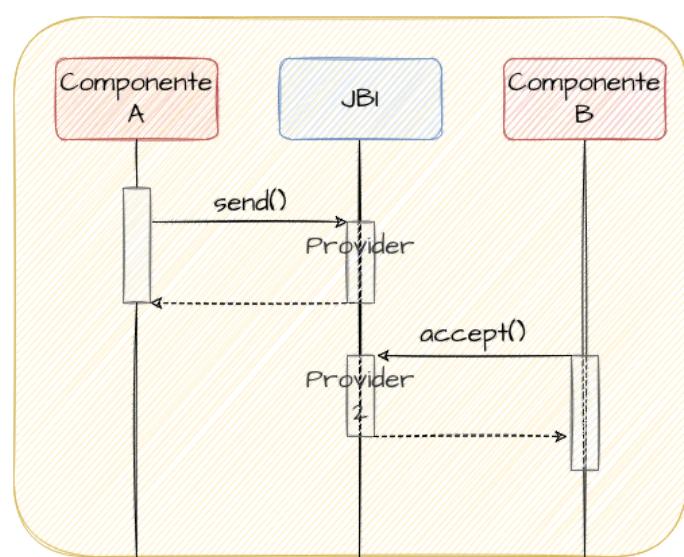




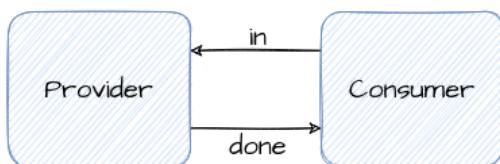


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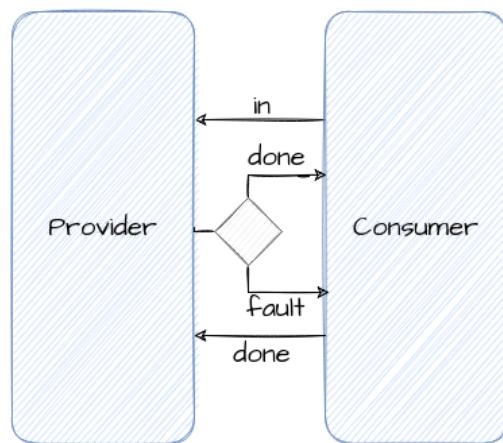
A B



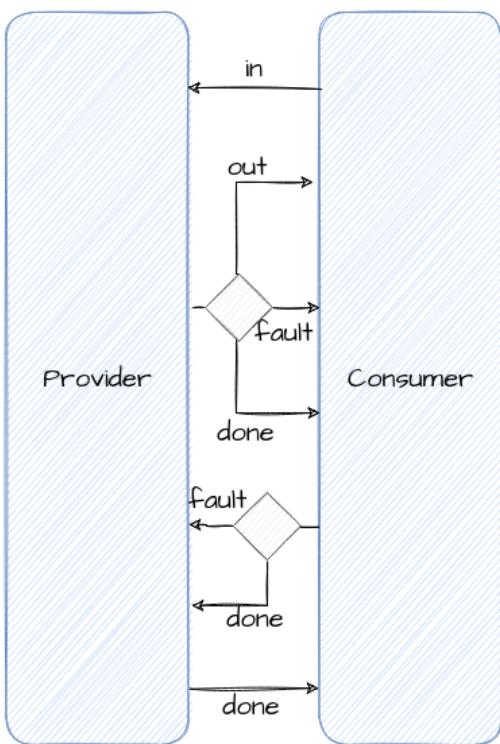
A B B



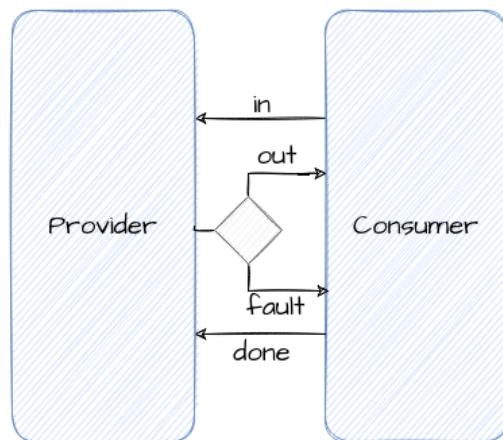
In-Only



Robust in-Only



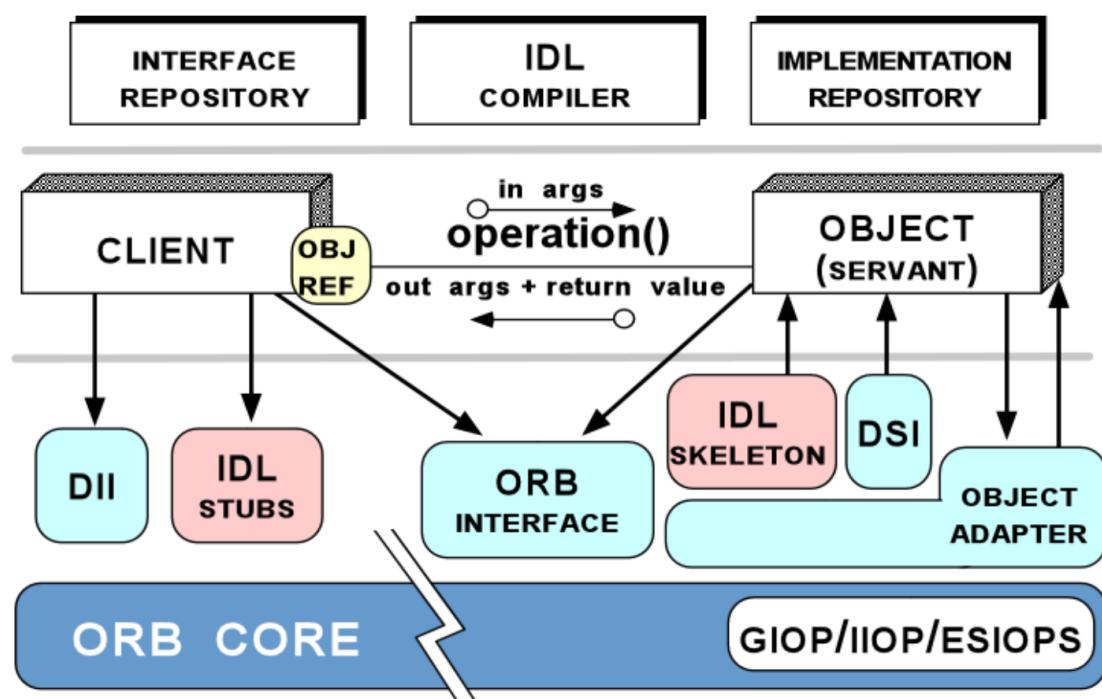
In Optional-Out



In-Out

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Releases



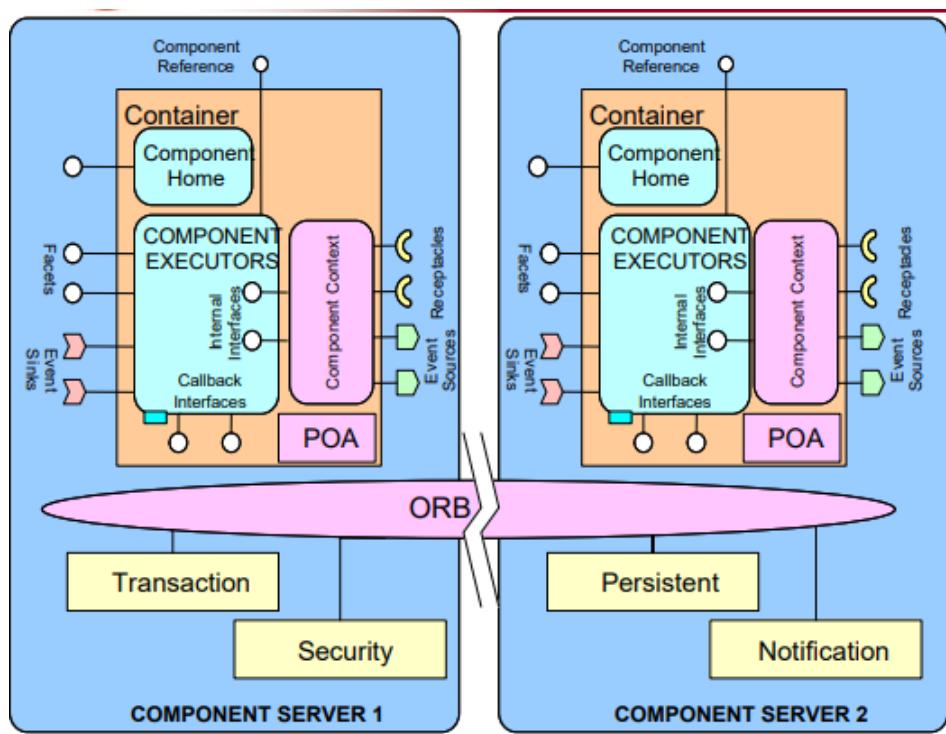
```
interface Foo
{
    parametro in ingresso
    void bar (in long arg);
};
```

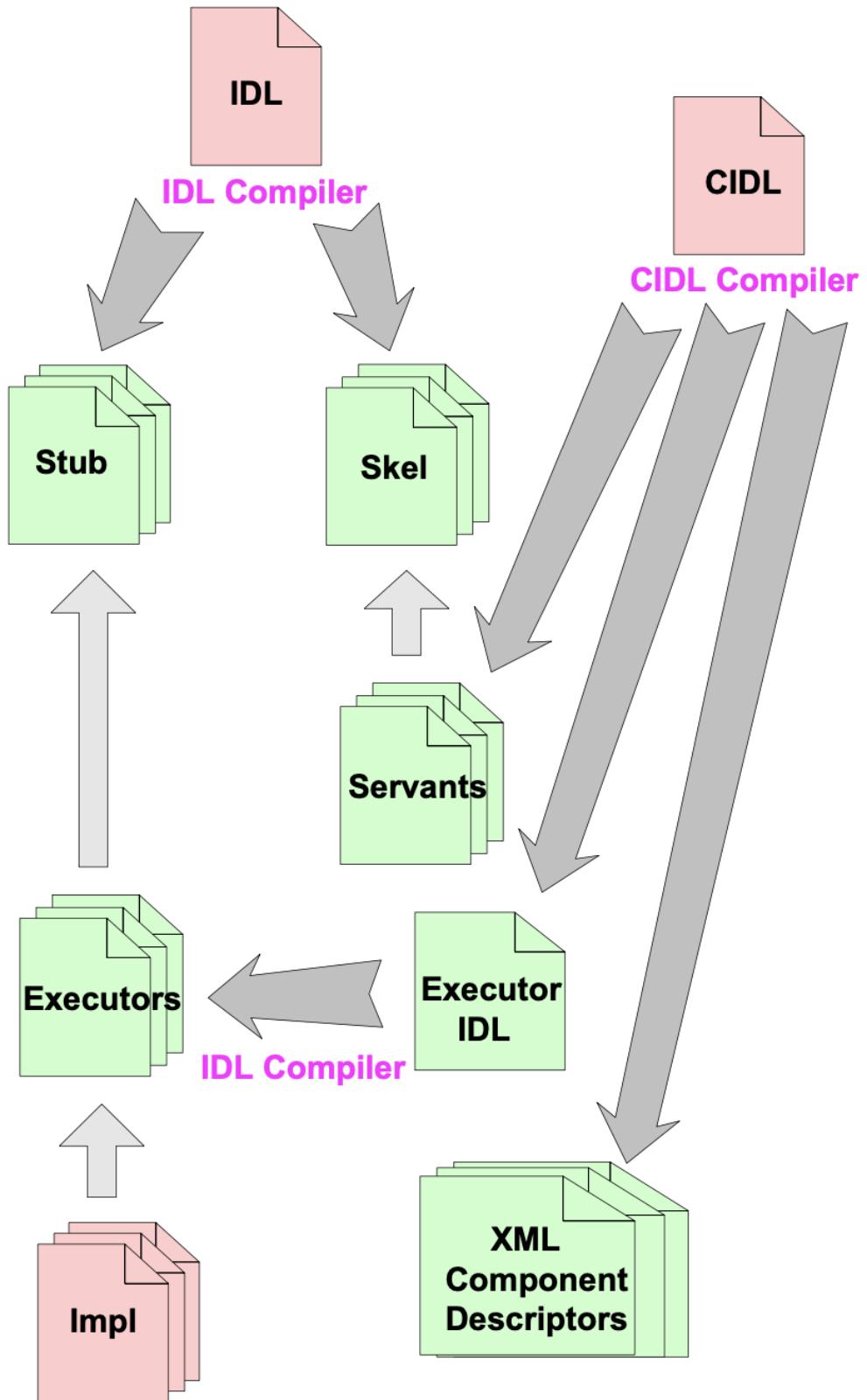
IDL

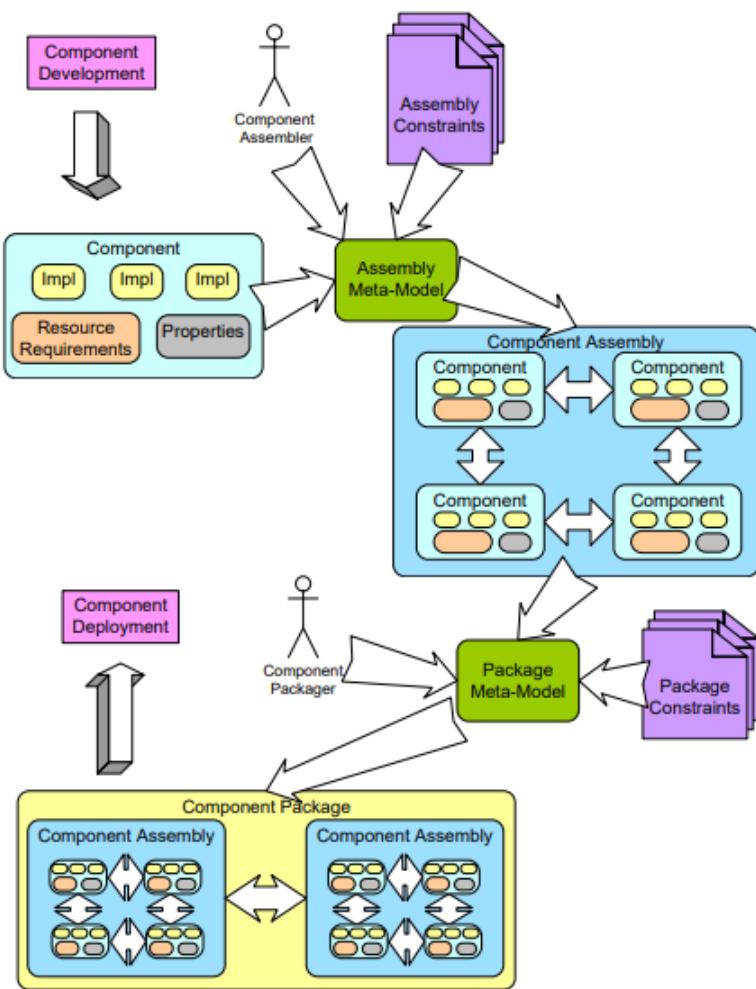


C++

```
class Foo : public virtual CORBA::Object
{
    virtual void bar (CORBA::Long arg);
};
```

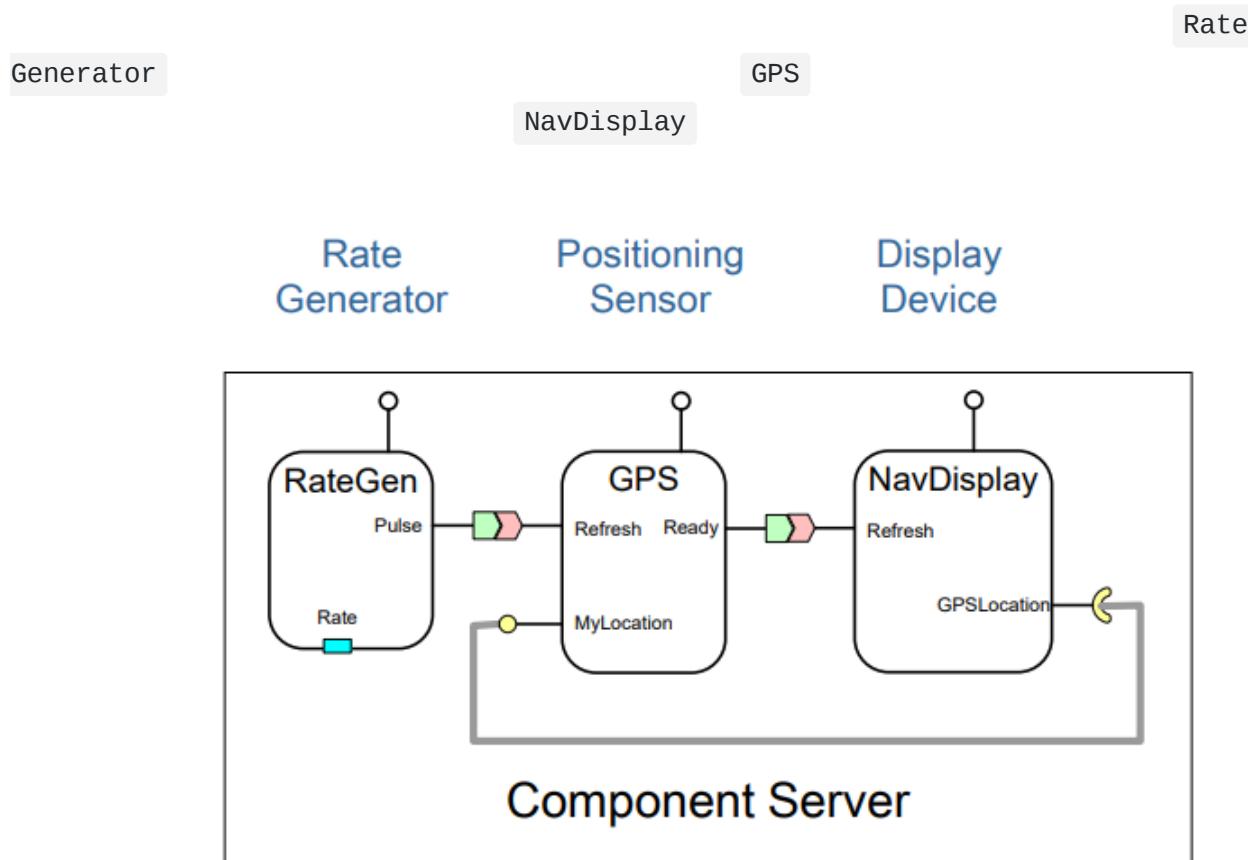




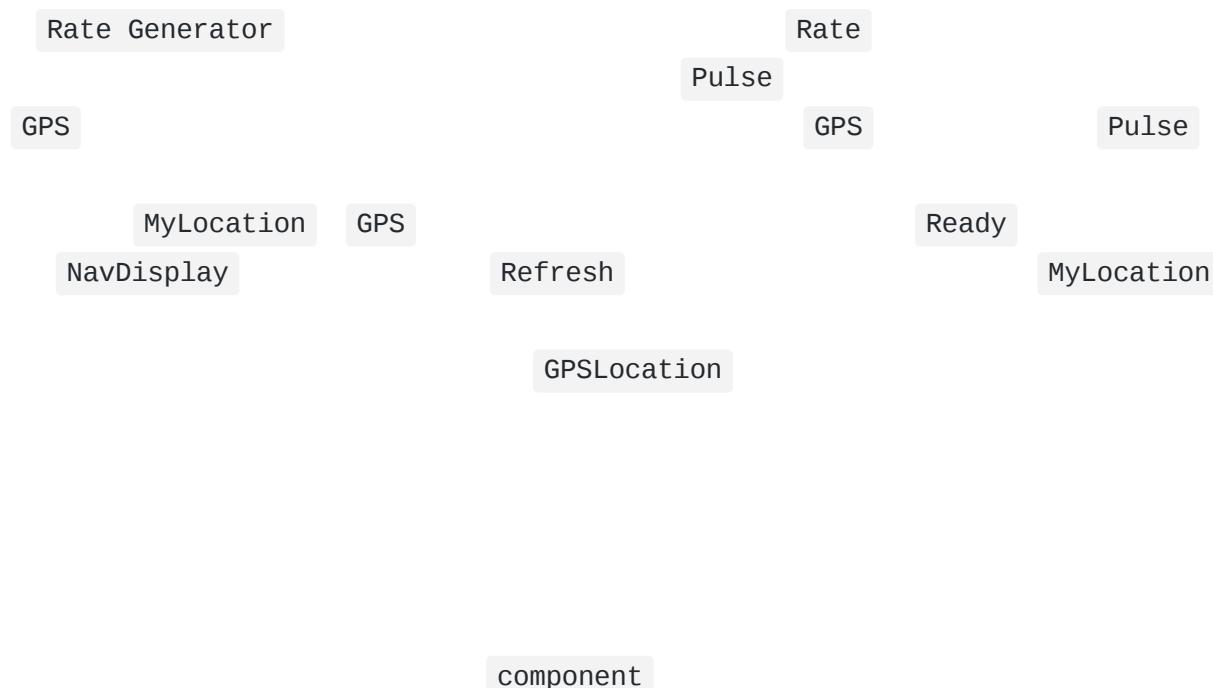


Name	Provider	Open Source	Language	URL
Component Integrated ACE ORB (CIAO)	Vanderbilt University & Washington University	Yes	C++	www.dre.vanderbilt.edu/CIAO/
Enterprise Java CORBA Component Model (EJCCM)	Computational Physics, Inc.	Yes	Java	www.cpi.com/ejccm/
K2 	iCMG	No	C++	www.icmgworld.com/products.asp
MicoCCM	FPX	Yes	C++	www.fpx.de/MicoCCM/
OpenCCM	ObjectWeb	Yes	Java	openccm.objectweb.org/
QoS Enabled Distributed Object (Qedo)	Fokus	Yes	C++	www.qedo.org
StarCCM	Source Forge	Yes	C++	sourceforge.net/projects/starccm/

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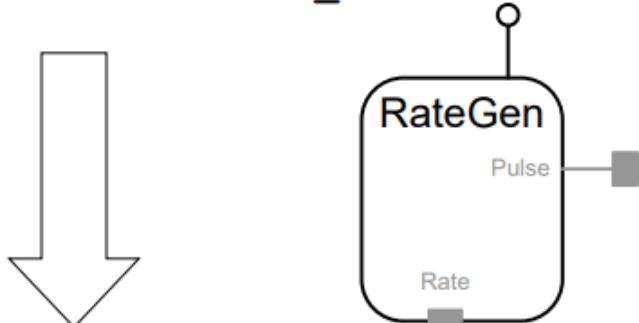
\$CIAO_ROOT/examples/OEP/Display/



```
interface rate_control
{
    void start ();
    void stop ();
};

component RateGen
    supports rate_control {};

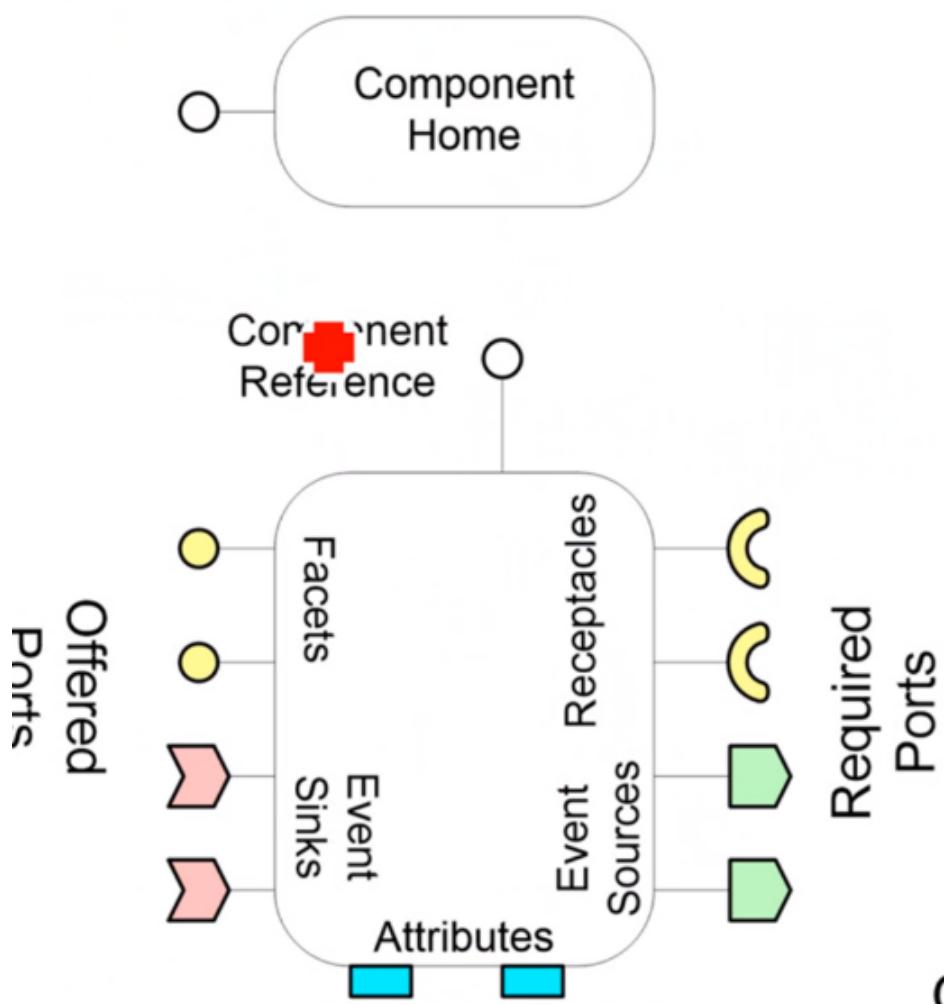
```



RateGen

rate_control

component



provides

uses

-
-
-
- publishes
- emits
- consumes
- attribute

home

```
// IDL 3

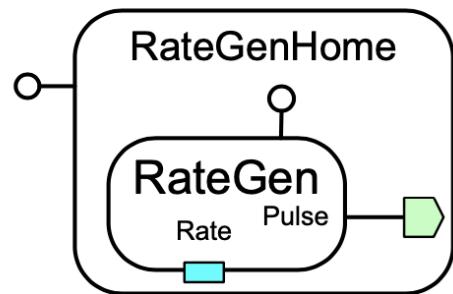
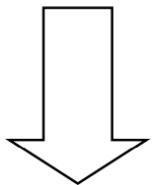
home RateGenHome manages RateGen
{
    factory create_pulser
        (in rateHz r);
};

// Equivalent IDL 2

interface RateGenHomeExplicit
: Components::CCMHome {
    RateGen create_pulser
        (in rateHz r);
}

interface RateGenHomeImplicit
: Components::KeylessCCMHome {
    RateGen create ();
}

interface RateGenHome :
    RateGenHomeExplicit,
    RateGenHomeImplicit {};
```



RateGen

getAllFacets()

getComponent()

```
int
main (int argc, char *argv[])
{
    CORBA::ORB_var orb = CORBA::ORB_init (argc, argv);

    // Get the NameService reference
    CORBA::Object_var o = ns->resolve_str("myHelloHome");
    HelloHome_var hh = HelloHome::_narrow(o.in ());
    HelloWorld_var hw = hh->create();

    // Get all facets & receptacles
    Components::FacetDescriptions_var fd = hw->get_all_facets();
```

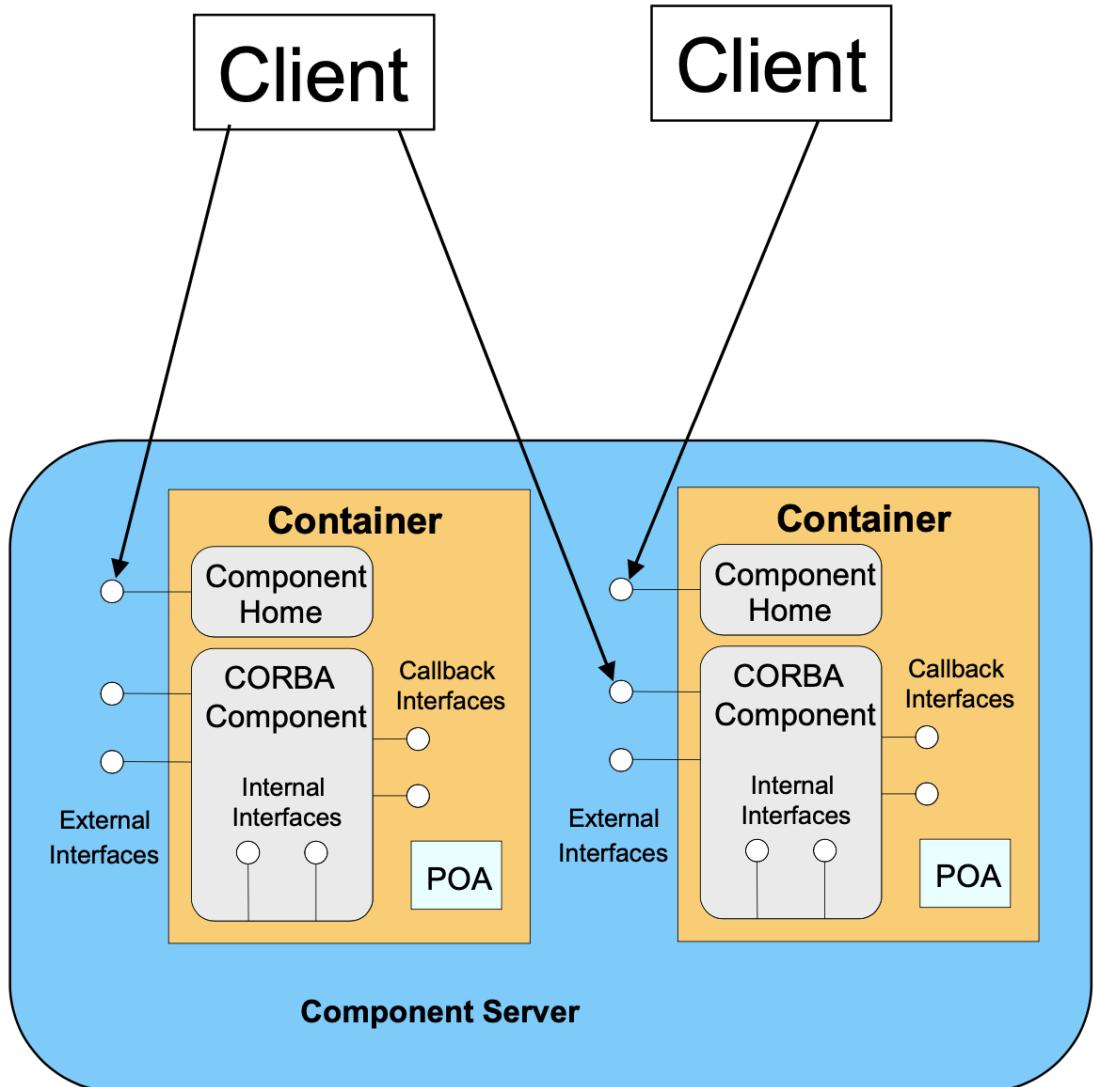
```
Components::ReceptacleDescriptions_var rd = hw->get_all_receptacles();

// Get a named facet with a name "Farewell"
// CORBA::Object_var fobj = hw->provide("Farewell");

// Can invoke sayGoodbye() operation on Farewell after
// narrowing to the Goodbye interface.

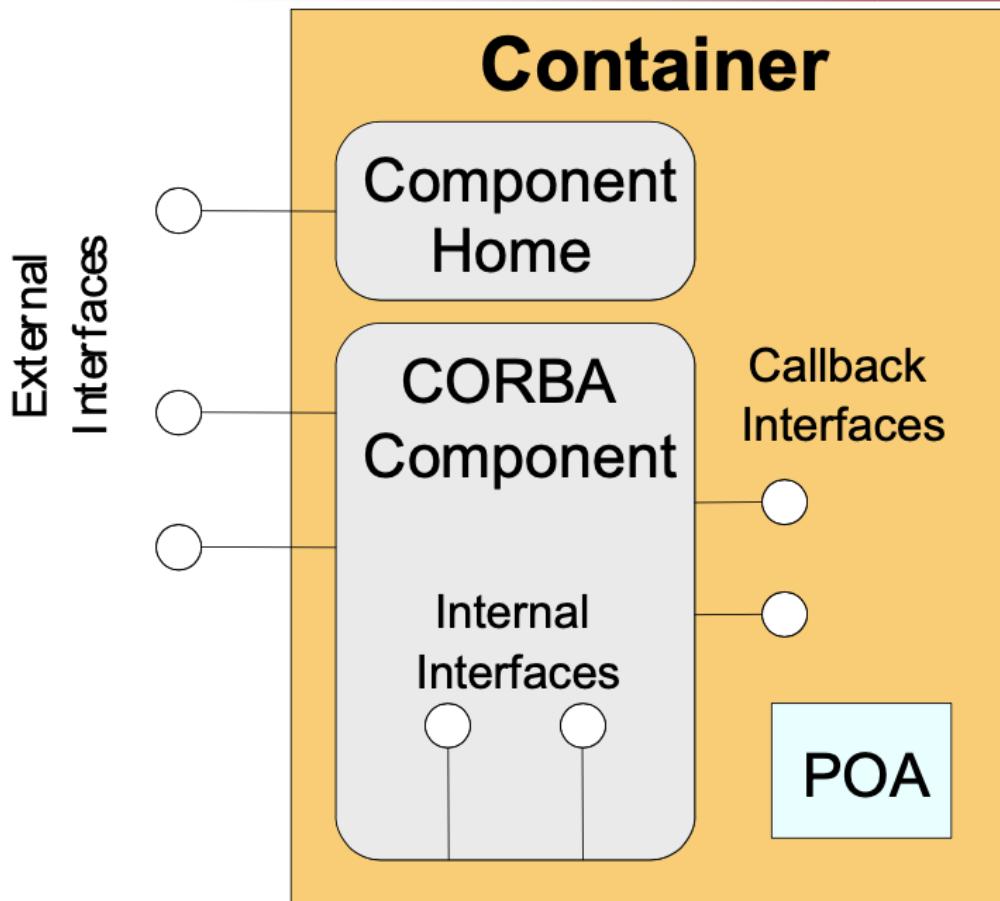
...

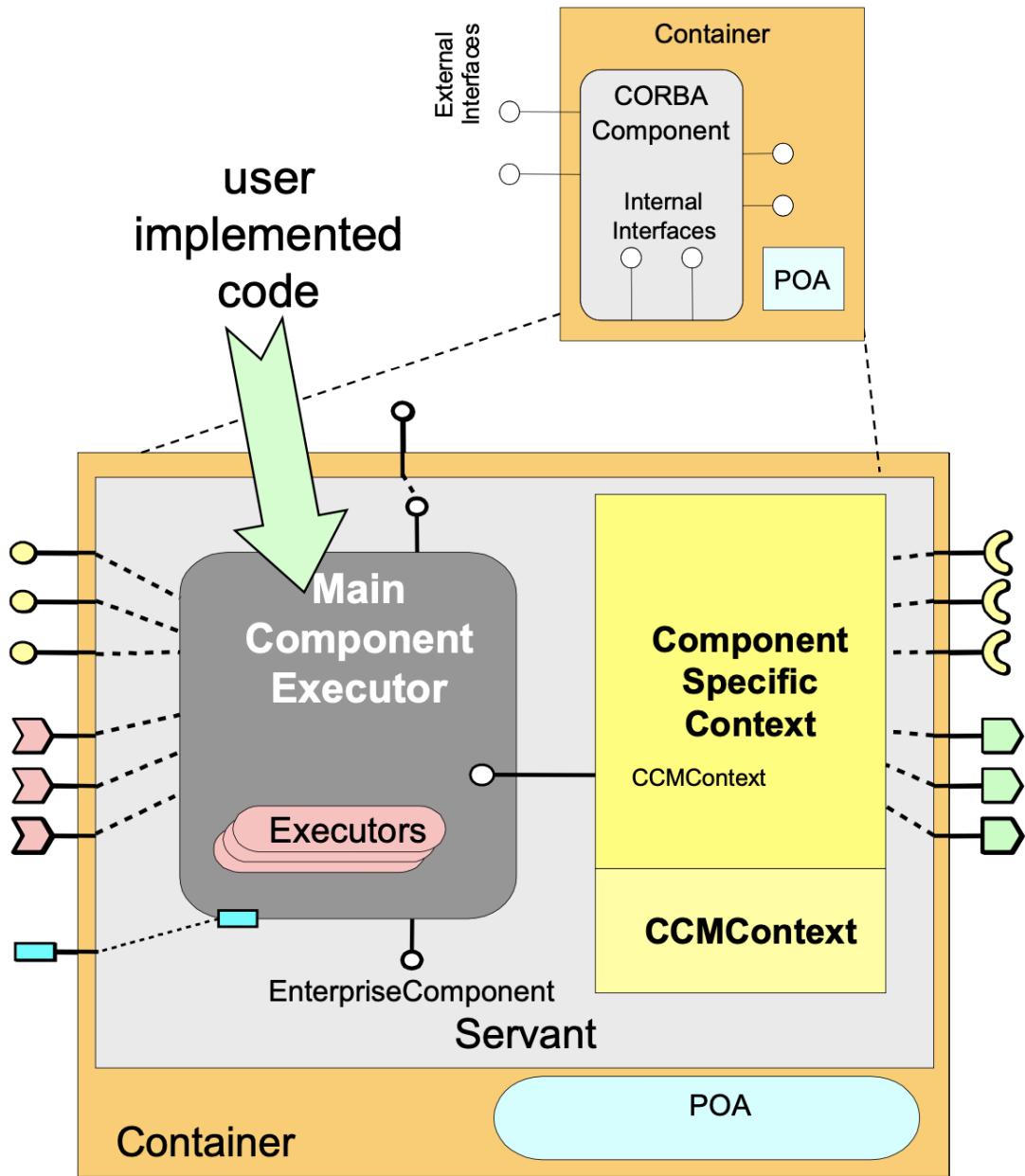
return 0;
}
```

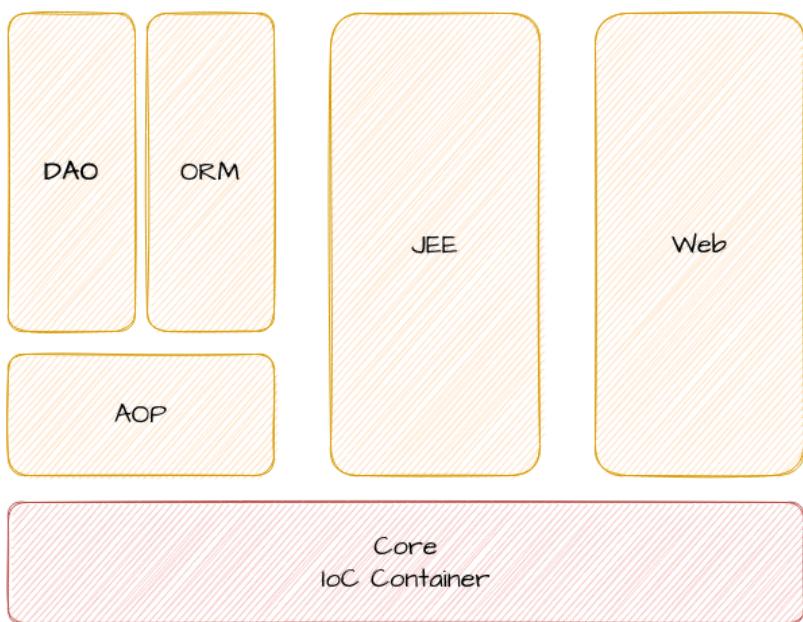


Component category	Container Implementation type	Container type	External Type
Service	Stateless	Session	Keyless
Session	Conversational	Session	Keyless
Process	Durable	Entity	Keyless
Entity	Durable	Entity	Keyful

-
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-







• BeanFactory

•

•

•

•


```
public class ConstructorInjection {  
  
    private Dependency dep;  
  
    public ConstructorInjection(Dependency dep) {  
        this.dep = dep;  
    }  
}
```

```
public class SetterInjection {  
  
    private Dependency dep;  
  
    public void setMyDependency(Dependency dep) {  
        this.dep = dep;  
    }  
}
```

setter

setter

BeanFactory

BeanFactory

BeanFactory

XmlBeanFactory

BeanFactory

XmlBeanFactory

DefaultListableBeanFactory

BeanFactory

getBean()

```
public class XmlConfigWithBeanFactory {  
    public static void main(String[] args) {  
        XmlBeanFactory factory = new XmlBeanFactory(new FileSystemResource("beans.xml"));  
        SomeBeanInterface b = (SomeBeanInterface) factory.getBean("nameOftheBean");  
    }  
}
```

```
public class ConfigurableMessageProvider implements MessageProvider {  
  
    private String message;  
  
    // usa dependency injection per config. del messaggio  
    public ConfigurableMessageProvider(String message) {  
        this.message = message;  
    }
```

```
}
```



```
public String getMessage() {
```

```
    return message;
```

```
}
```

```
}
```

```
<beans>
```

```
    <bean id="provider" class="ConfigurableMessageProvider">
```

```
        <constructor-arg>
```

```
            <value> Questo è il messaggio configurabile</value>
```

```
        </constructor-arg>
```

```
    </bean>
```

```
</beans>
```

provider

ConfigurableMessageProvider

constructor-arg

-
-
-
-
-

```
<beans>
```

```
    <bean id="injectSimple" class="InjectSimple">
```

```
        <property name="name">
```

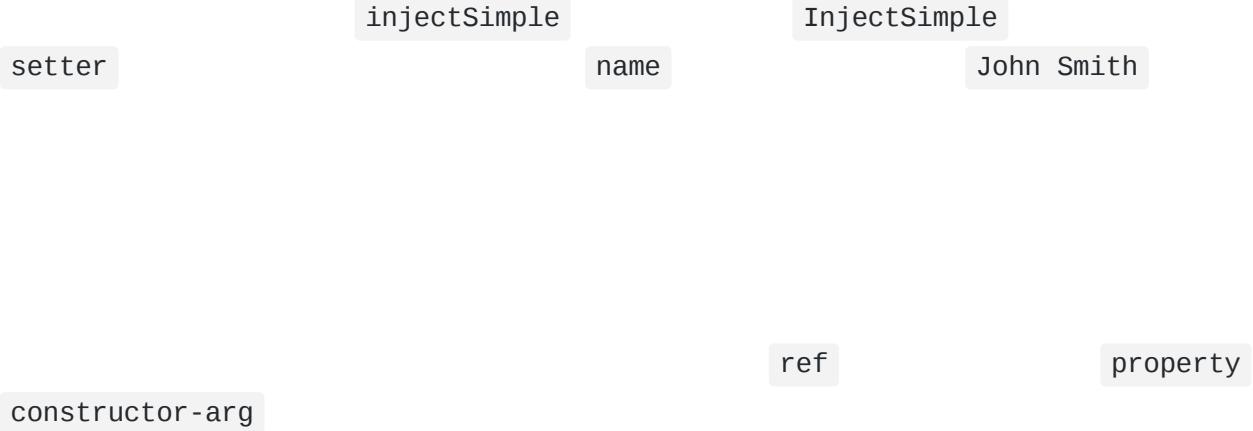
```
            <value>John Smith</value>
```

```
        </property>
```

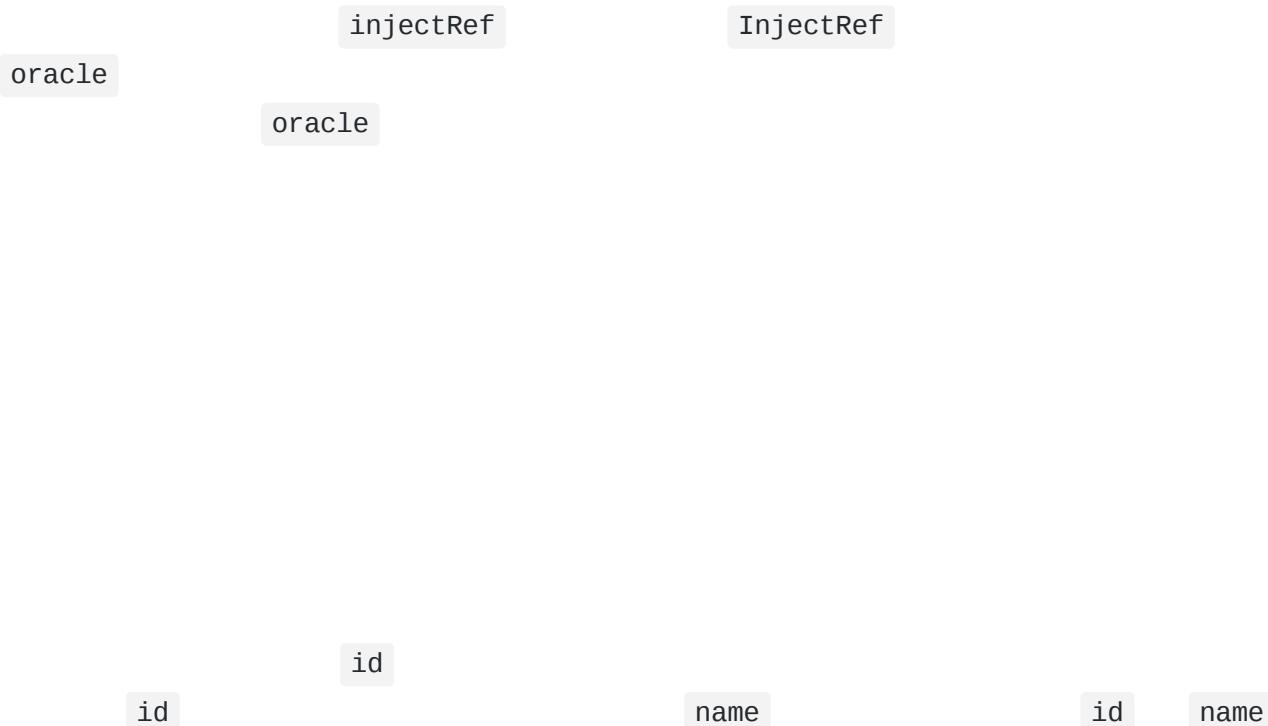
```
        <property name="age">
```

```
            <value>35</value>
```

```
</property>
<property name="height">
    <value>1.78</value>
</property>
</bean>
</beans>
```



```
<beans>
    <bean id="injectRef" class="InjectRef">
        <property name="oracle">
            <ref local="oracle"/>
        </property>
    </bean>
</beans>
```



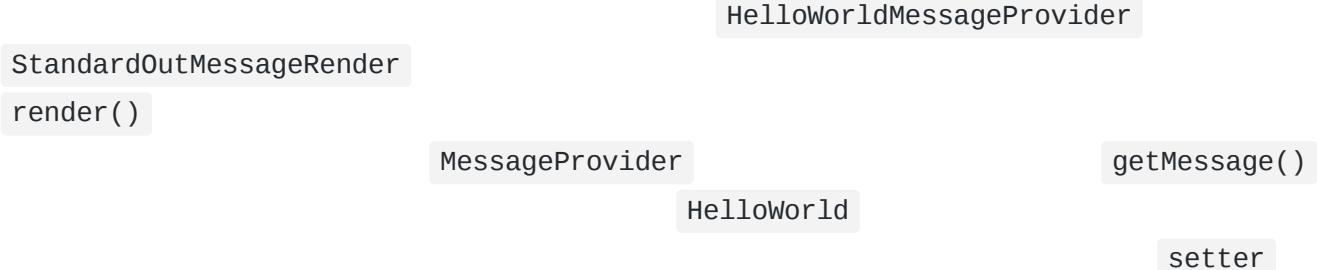
BeanFactory

```
public class HelloWorld {  
  
    public static void main(String[] args) {  
        System.out.println("Hello World!");  
    }  
  
}
```

```
public class HelloWorldMessageProvider {  
  
    public String getMessage() {  
        return "Hello World!";  
    }  
  
}
```

```
public class StandardOutMessageRenderer {  
  
    private HelloWorldMessageProvider messageProvider = null;  
  
    public void render() {  
        if (messageProvider == null) {  
            throw new RuntimeException("You must set the property messageProvider of class:" +  
                StandardOutMessageRenderer.class.getName());  
        }  
  
        System.out.println(messageProvider.getMessage());  
    }  
  
    // dependency injection tramite metodo setter  
    public void setMessageProvider(HelloWorldMessageProvider provider) {
```

```
this.messageProvider = provider;  
}  
  
public HelloWorldMessageProvider getMessageProvider() {  
    return this.messageProvider;  
}  
}
```



```
public class HelloWorldDecoupled {  
  
    public static void main(String[] args) {  
        StandardOutMessageRenderer mr = new StandardOutMessageRenderer();  
        HelloWorldMessageProvider mp = new HelloWorldMessageProvider();  
        mr.setMessageProvider(mp);  
        mr.render();  
    }  
}
```

MessageRenderer MessageProvider

```
public interface MessageProvider {  
  
    public String getMessage();  
}
```

```
public class HelloWorldMessageProvider implements MessageProvider {  
  
    public String getMessage() {  
        return "Hello World!";  
    }  
}
```

```
public interface MessageRenderer {
```

```
public void render();
public void setMessageProvider(MessageProvider provider);
public MessageProvider getMessageProvider();
}
```

```
public class StandardOutMessageRenderer implements MessageRenderer {
    // MessageProvider è una interfaccia Java ora
    private MessageProvider messageProvider = null;

    public void render() {
        if (messageProvider == null) {
            throw new RuntimeException("You must set the property messageProvider of class:" +
                StandardOutMessageRenderer.class.getName());
        }

        System.out.println(messageProvider.getMessage());
    }

    public void setMessageProvider(MessageProvider provider) {
        this.messageProvider = provider;
    }

    public MessageProvider getMessageProvider() {
        return this.messageProvider;
    }
}
```

main

```
public class HelloWorldDecoupled {

    public static void main(String[] args) {
        MessageRenderer mr = new StandardOutMessageRenderer();
        MessageProvider mp = new HelloWorldMessageProvider();
        mr.setMessageProvider(mp);
        mr.render();
    }

}
```

MessageRenderer

MessageProvider

main

```
public class MessageSupportFactory {

    private static MessageSupportFactory instance = null;
    private Properties props = null;
    private MessageRenderer renderer = null;
    private MessageProvider provider = null;

    private MessageSupportFactory() {
        props = new Properties();
        try {
            props.load(new FileInputStream("msf.properties"));

            // ottiene i nomi delle classi per le interfacce
            String rendererClass = props.getProperty("renderer.class");
            String providerClass = props.getProperty("provider.class");
            renderer = (MessageRenderer) Class.forName(rendererClass).newInstance();
            provider = (MessageProvider) Class.forName(providerClass).newInstance();
        }
        catch (Exception ex) {
            ex.printStackTrace();
        }
    }

    static {
        instance = new MessageSupportFactory();
    }

    public static MessageSupportFactory getInstance() {
        return instance;
    }

    public MessageRenderer getMessageRenderer() {
        return renderer;
    }

    public MessageProvider getMessageProvider() {
        return provider;
    }

}
```

main

```

public class HelloWorldDecoupledWithFactory {

    public static void main(String[] args) {

        MessageRenderer mr = MessageSupportFactory.getInstance().getMessageRenderer();
        MessageProvider mp = MessageSupportFactory.getInstance().getMessageProvider();
        mr.setMessageProvider(mp);
        mr.render();

    }
}

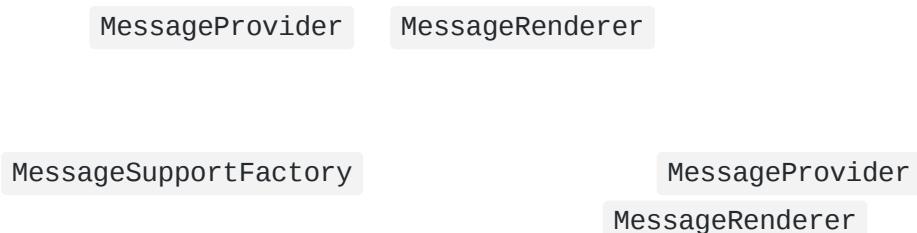
```

```

# msf.properties

renderer.class=StandardOutMessageRenderer
provider.class=HelloWorldMessageProvider

```



```

public class HelloWorldSpring {

    public static void main(String[] args) throws Exception {
        // ottiene il riferimento a bean factory
        BeanFactory factory = getBeanFactory();
        MessageRenderer mr = (MessageRenderer) factory.getBean("renderer");
        MessageProvider mp = (MessageProvider) factory.getBean("provider");
        mr.setMessageProvider(mp);
        mr.render();
    }

    // Possibilità di scrivere il proprio metodo getBeanFactory()
    // a partire da Spring DefaultListableBeanFactory class
    private static BeanFactory getBeanFactory() throws Exception {

        DefaultListableBeanFactory factory = new DefaultListableBeanFactory();
        // creare un proprio lettore delle definizioni
        PropertiesBeanDefinitionReader rdr = new PropertiesBeanDefinitionReader(factory);
        // caricare le opzioni di configurazione
        Properties props = new Properties();
    }
}

```

```
    props.load(new FileInputStream("beans.properties"));
    rdr.registerBeanDefinitions(props); return factory;

}
```

MessageSupportFactory

HelloWorld

MessageRenderer

MessageRenderer

getBeanFactory()

HelloWorldMessageProvider

```
# File di configurazione

#Message renderer
renderer.class=StandardOutMessageRenderer
# Chiede a Spring di assegnare l'effettivo provider alla
# proprietà MessageProvider del bean Message renderer
renderer.messageProvider(ref)=provider

#Message provider
provider.class=HelloWorldMessageProvider
```

public class HelloWorldSpringWithDI {

```
    public static void main(String[] args) throws Exception {

        BeanFactory factory = getBeanFactory();
        MessageRenderer mr = (MessageRenderer) factory.getBean("renderer");
        // nota che non è più necessaria nessuna injection manuale
        // del message provider al message renderer
        mr.render();

    }

    private static BeanFactory getBeanFactory() throws Exception {

        DefaultListableBeanFactory factory = new DefaultListableBeanFactory();
        PropertiesBeanDefinitionReader rdr = new PropertiesBeanDefinitionReader(factory);
    }
}
```

```

Properties props = new Properties();
props.load(new FileInputStream("beans.properties"));
rdr.registerBeanDefinitions(props);

return factory;

}
}

main()
MessageRenderer
render()
MessageProvider
MessageProvider
MessageRenderer

```

```

<beans>
    <bean id="renderer" class="StandardOutMessageRenderer">
        <property name="messageProvider">
            <ref local="provider"/>
        </property>
    </bean>
    <bean id="provider" class="HelloWorldMessageProvider"/>
</beans>

```

```

public class HelloWorldSpringWithDIXMLFile {

    public static void main(String[] args) throws Exception {
        BeanFactory factory = getBeanFactory();
        MessageRenderer mr = (MessageRenderer) factory.getBean("renderer");
        mr.render();
    }

    private static BeanFactory getBeanFactory() throws Exception {
        BeanFactory factory = new XmlBeanFactory(new FileSystemResource("beans.xml"));
        return factory;
    }
}

```

MessageProvider

```
<beans>
    <bean id="renderer" class="StandardOutMessageRenderer">
        <property name="messageProvider">
            <ref local="provider"/>
        </property>
    </bean>
    <bean id="provider" class="ConfigurableMessageProvider">
        <constructor-arg>
            <value>Questo è il messaggio configurabile</value>
        </constructor-arg>
    </bean>
</beans>
```

ConfigurableMessageProvider

ConfigurableMessageProvider

MessageProvider

```
public class ConfigurableMessageProvider implements MessageProvider {

    private String message;

    public ConfigurableMessageProvider(String message) {
        this.message = message;
    }

    public String getMessage() {
        return message;
    }
}
```

try-catch

MessageWriter

World

Hello

!

```
public class MessageWriter implements IMessageWriter {  
  
    public void writeMessage() {  
        System.out.print("World");  
    }  
  
}
```

World

Hello

!

writeMessage()

```
public class MessageDecorator implements MethodInterceptor {  
  
    public Object invoke(MethodInvocation invocation) throws Throwable {  
        System.out.print("Hello ");  
        Object retVal = invocation.proceed();  
        System.out.println("!");  
        return retVal;  
    }  
}
```

ProxyFactory

```

public static void main(String[] args) {

    MessageWriter target = new MessageWriter();
    ProxyFactory pf = new ProxyFactory();
    // aggiunge advice alla coda della catena dell'advice
    pf.addAdvice(new MessageDecorator());
    // configura l'oggetto dato come target
    pf.setTarget(target);
    // crea un nuovo proxy in accordo con le configurazioni
    // della factory MessageWriter
    proxy = (MessageWriter) pf.getProxy();
    proxy.writeMessage();
    // Come farei invece a supportare lo stesso comportamento
    // con chiamata diretta al metodo dell'oggetto target?

}

```

HandlerInterceptorAdaptor

MethodInterceptor

```

public class MyService {

    public void doSomething() {
        for (int i = 1; i < 10000; i++) {
            System.out.println("i=" + i);
        }
    }
}

```

```
public class ServiceMethodInterceptor implements MethodInterceptor {
```

```

    public Object invoke(MethodInvocation methodInvocation) throws Throwable {

        long startTime = System.currentTimeMillis();
        Object result = methodInvocation.proceed();
        long duration = System.currentTimeMillis() - startTime;
        Method method = methodInvocation.getMethod();
    }
}
```

```

        String methodName = method.getDeclaringClass().getName() + "." + method.getName();
        System.out.println("Method '" + methodName + "' took " + duration + " milliseconds to run");

        return null;
    }
}

```

```

<beans>
    <bean id="myService" class="com.test.MyService"></bean>
    <bean id="interceptor" class="com.test.ServiceMethodInterceptor"></bean>
    <bean id="interceptedService" class="org.springframework.aop.framework.ProxyFactoryBean">
        <property name="target">
            <ref bean="myService"/> </property>
        <property name="interceptorNames">
            <list>
                <value>interceptor</value>
            </list>
        </property>
    </bean>
</beans>

```

- PROPAGATION_REQUIRED
- PROPAGATION_SUPPORTS
- PROPAGATION_MANDATORY

- PROPAGATION_REQUIRE_NEW
 - PROPAGATION_NOT_SUPPORTED
 - PROPAGATION_NEVER
 - PROPAGATION_NESTED
-
- BeanFactory
 Pippo
-
- BeanFactory
 BeanFactory
-
- getBean()
-
- BeanFactory
-
- autowire="name"
 set()

- `autowire="type"`
`set(ArgumentType arg)`
- `autowire="constructor"`

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BeanFactory ApplicationContext BeanFactory

BeanFactory ApplicationContext

ApplicationContext

BeanFactory

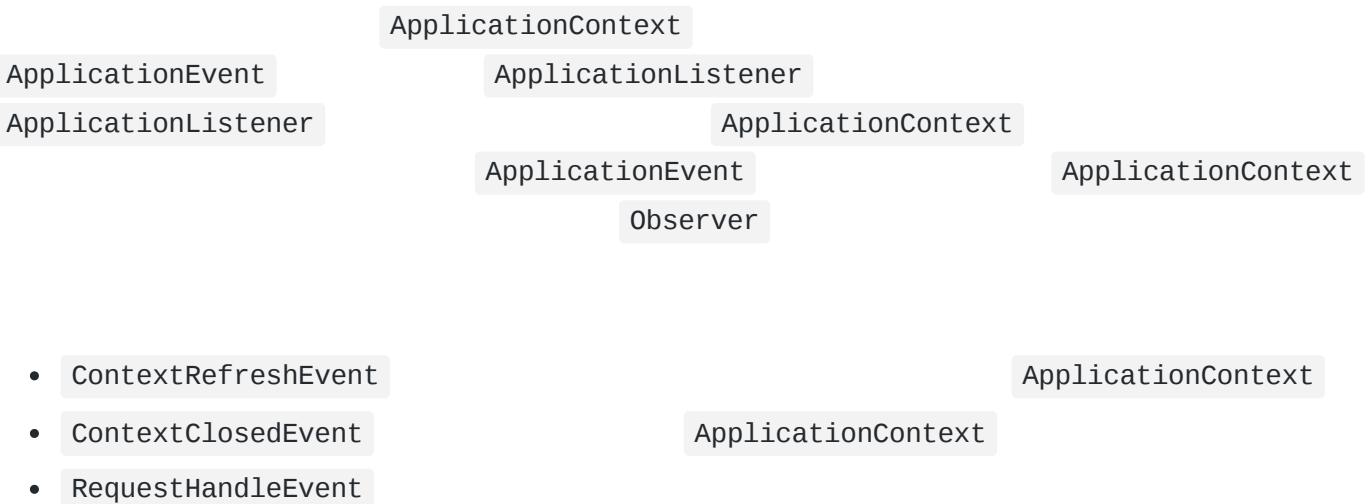
ApplicationContext

- •
•

ApplicationContext
ApplicationContextAware

```
setApplicationContext()
```

```
public class Publisher implements ApplicationContextAware {  
  
    private ApplicationContext ctx;  
  
    // Questo metodo sarà automaticamente invocato da IoC container  
    public void setApplicationContext(ApplicationContext applicationContext) throws BeansException {  
        this.ctx = applicationContext;  
    }  
  
}
```



```
ApplicationContext.xml
```

```
<bean id="emailer" class="example.EmailBean">  
    <property name="blackList">  
        <list>  
            <value>black@list.org</value>  
            <value>white@list.org</value>  
            <value>john@doe.org</value>  
        </list>  
    </property>  
</bean>  
  
<bean id="blackListListener" class="example.BlackListNotifier">  
    <property name="notificationAddress" value="spam@list.org"/>  
</bean>
```

```
ApplicationContext
```

```
public class EmailBean implements ApplicationContextAware {

    private List blackList;

    public void setBlackList(List blackList) {
        this.blackList = blackList;
    }

    public void setApplicationContext(ApplicationContext ctx) {
        this.ctx = ctx;
    }

    public void sendEmail(String address, String text) {

        if (blackList.contains(address)) {
            BlackListEvent evt = new BlackListEvent(address, text);
            ctx.publishEvent(evt); return;
        }
    }
}
```

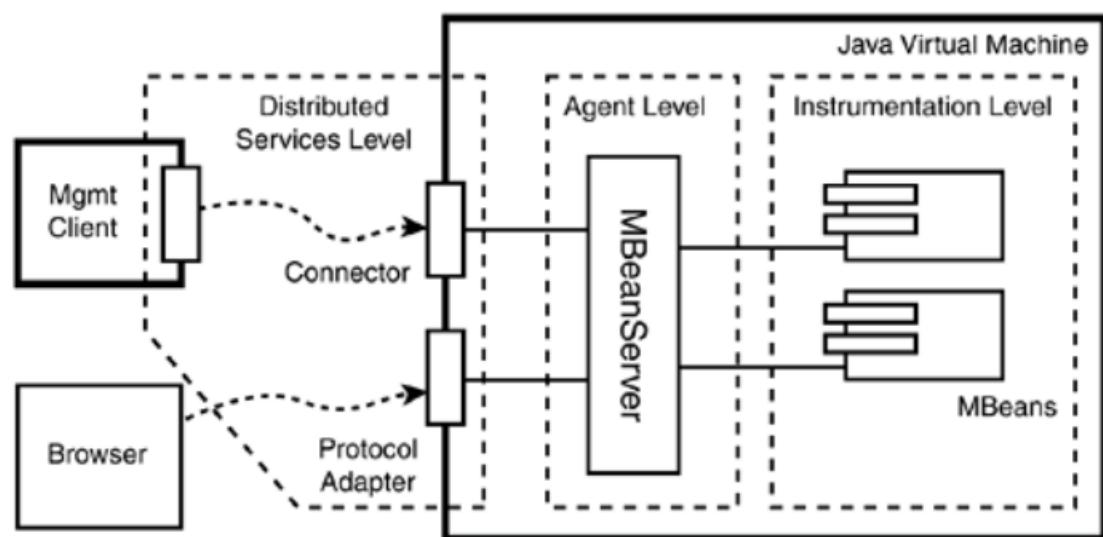
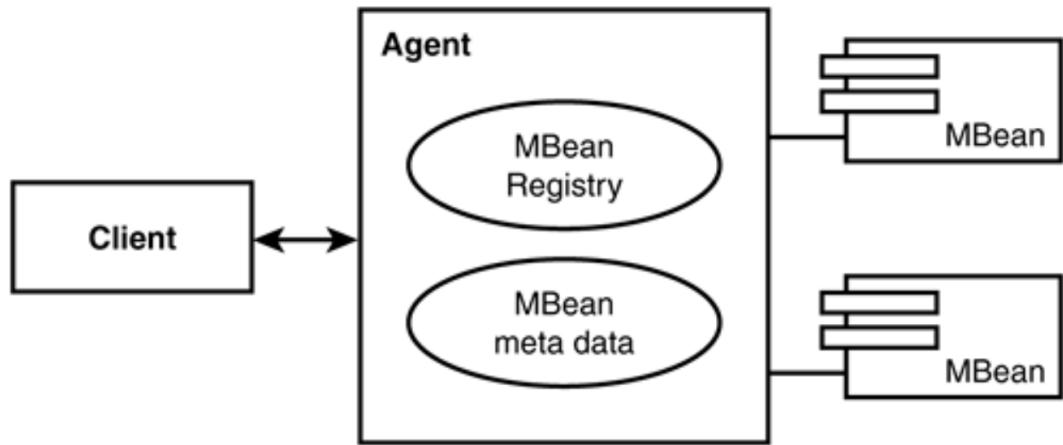
Notifier

```
public class BlackListNotifier implement ApplicationListener {

    private String notificationAddress;

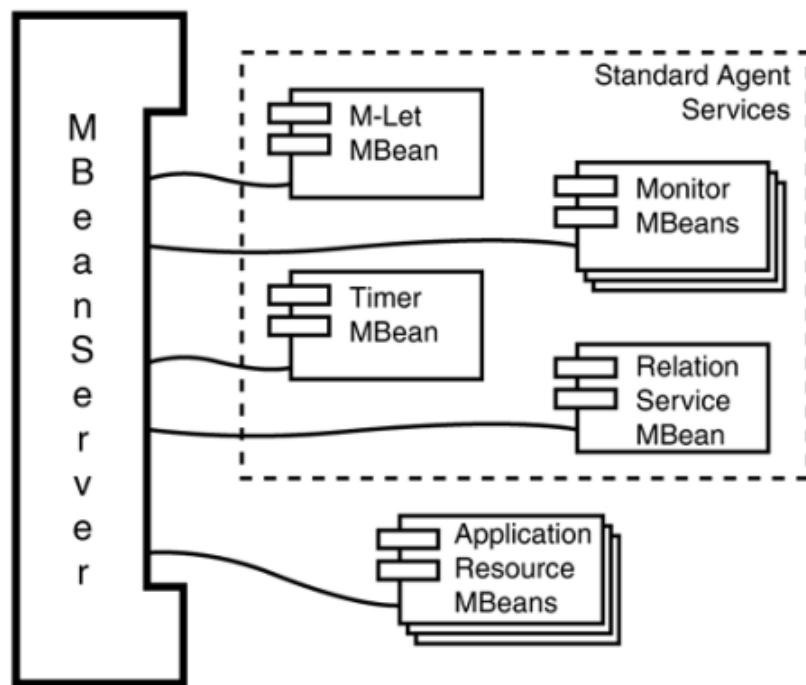
    public void setNotificationAddress(String notificationAddress) {
        this.notificationAddress = notificationAddress;
    }

    public void onApplicationEvent(ApplicationEvent evt) {
        if (evt instanceof BlackListEvent) {
            // invio dell'email di notifica all'indirizzo appropriato
        }
    }
}
```

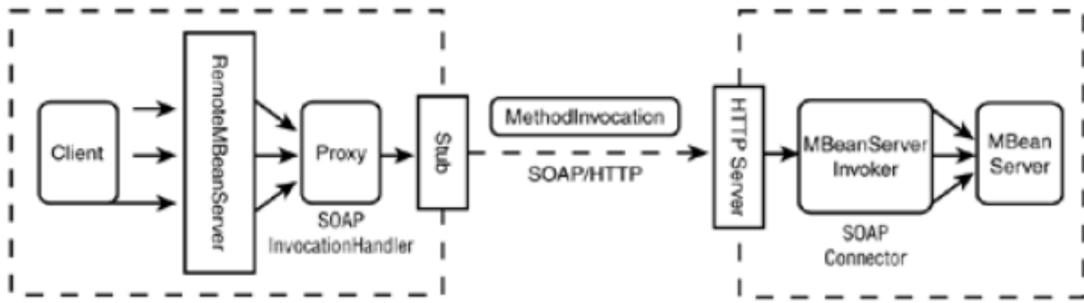



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DynamicMBean



-
-



getter

setter

```

public interface UserMBean{

    public long getId();
    public void setId(long id);
    public boolean isActive();
    public void setActive(boolean active);
    public String printInfo();
}

public class User implements UserMBean { ... }

public class Student extends User {

    /* anche questa classe può essere registrata come un UserMBean */
}

```

```
...
```

```
}
```

```
ObjectName
```

```
ObjectName username = new ObjectName("example:name=user1");

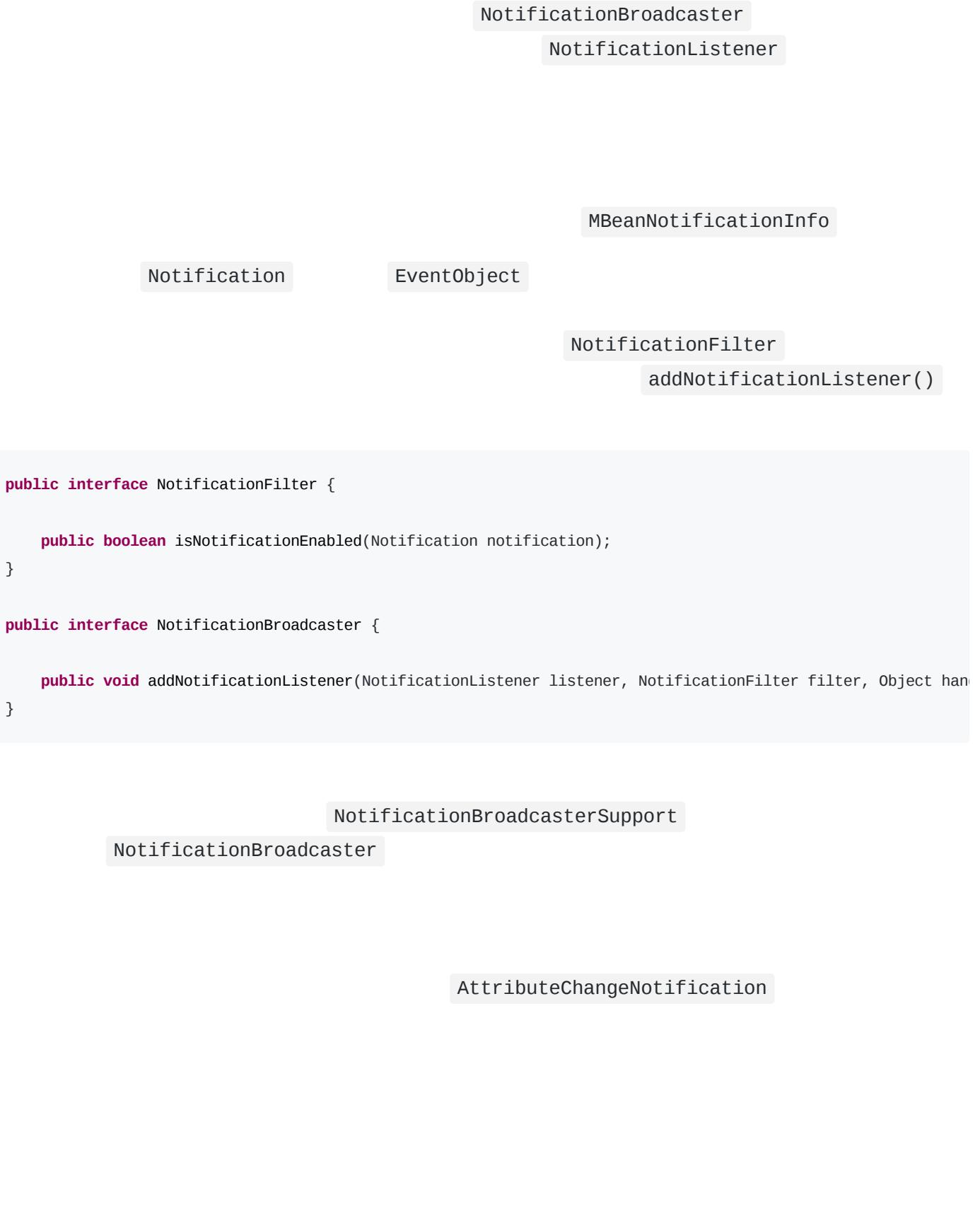
List serverList = MBeanServerFactory.findMBeanServer(null);
MBeanServer server = (MBeanServer)serverList.iterator().next();

/* oppure se prima si deve creare il MBeanServer
MBeanServer server = MBeanServerFactory.createMBeanServer(); */

server.registerMBean(new User(), username);
```

```
ObjectName username = new ObjectName("example:name=user1");

Object result = server.invoke(
    username, // nome MBean
    "printInfo", // nome operazione
    null, // no param
    null); // void signature
```



Metodi della classe **MBeanInfo**

<code>public String getClassName()</code>	Restituisce il nome della classe di MBean
<code>public String getDescription()</code>	Restituisce una descrizione di MBean
<code>public MBeanAttributeInfo[] getAttributes()</code>	Restituisce un array di oggetti, uno per ogni attributo di management
<code>public MBeanOperationInfo[] getOperations()</code>	Restituisce un array di oggetti, uno per ogni operazione di management
<code>public MBeanConstructorInfo[] getConstructors()</code>	Restituisce un array di oggetti, uno per ogni costruttore pubblico di MBean
<code>public MBeanNotificationInfo[] getNotifications()</code>	Restituisce un array di oggetti, uno per ogni tipo di notifica che MBean può emettere

MBeanInfo

MBeanFeatureInfo

MBeanInfo

getBeanInfo()

BeanInfo

Pippo

```
public class DynamicUser extends NotificationBroadcasterSupport implements DynamicMbean {  
  
    // Attributi  
    final static String ID = "id";  
    private long id = System.currentTimeMillis();  
    public Object getAttribute(String attribute) throws ... {  
  
        if (attribute.equals(ID))  
            return new Long(id);  
        throw new AttributeNotFoundException("Missing attribute " + attribute);  
    }  
  
    // operazioni  
    final static String PRINT = "printInfo";  
  
    public String printInfo() {  
        return "Sono un MBean dinamico";  
    }  
  
    public Object invoke(String actionName, Object[] params, String[] signature) throws ... {  
  
        if (actionName.equals(PRINT))  
            return printInfo();  
        throw new UnsupportedOperationException("Unknown operation" + actionName);  
    }  
  
    // da definire all'interno della classe DynamicUser  
    public MBeanInfo getMBeanInfo() {  
  
        final boolean READABLE = true;  
        final boolean WRITABLE = true;  
        final boolean IS_GETTERFORM = true;  
        String classname = getClass().getName();  
        String description = "Sono un MBean dinamico";  
  
        MBeanAttributeInfo id = new MBeanAttributeInfo(ID, long.class.getName(),  
                                                       "id",  
                                                       READABLE,  
                                                       !WRITABLE,  
                                                       !IS_GETTERFORM);  
        MBeanConstructorInfo defcon = new MBeanConstructorInfo("Default", "Creates", null);  
        MBeanOperationInfo print = new MBeanOperationInfo(PRINT,  
                                                       "Prints info",  
                                                       null,  
                                                       String.class.getName(),  
                                                       MBeanOperationInfo.INFO);  
    }  
}
```

```
        return new MBeanInfo(classname,description,
                new MBeanAttributeInfo[] { id },
                new MBeanConstructorInfo[] { defcon },
                new MBeanOperationInfo[] { print },
                null);
    }
}
```

invoke MBeanInfo()

MBeanInfo()

ModelMBean

RequiredModelMBean

```
public interface ModelMBean extends DynamicMBean,
PersistentMBean,
ModelMBeanNotificationBroadcaster {

    public void setModelMBeanInfo( ModelMBeanInfo inModelMBeanInfo) throws ... ;

    public void setManagedResource(Object mr, String mr_type) throws ... ;
}

public class RequiredModelMBean implements ModelMBean, ... {

    ...
}
```

Descriptor

Descriptor

DescriptorAccess

```
public interface Descriptor extends Serializable, Cloneable
{
    public String[] getFields();
    public void setField(String name, Object value);
    public void removeField(String name);

    ...
}
```

•
•
•
•

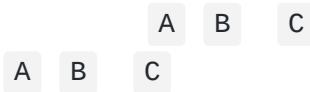
MLetMBean

addURL()

getMBeansFromURL()

addURL()

```
<MLET CODE = class | OBJECT =
    serfile
    ARCHIVE = "archiveList"
    [CODEBASE = codebaseURL]
    [NAME = MBeanName]
    [VERSION = version] >
    [arglist]
</MLET>
```



```
<MLET CODE=com.mycompany.Foo
      ARCHIVE="MyComponents.jar,acme .jar"
    </MLET>
```

NotificationListener

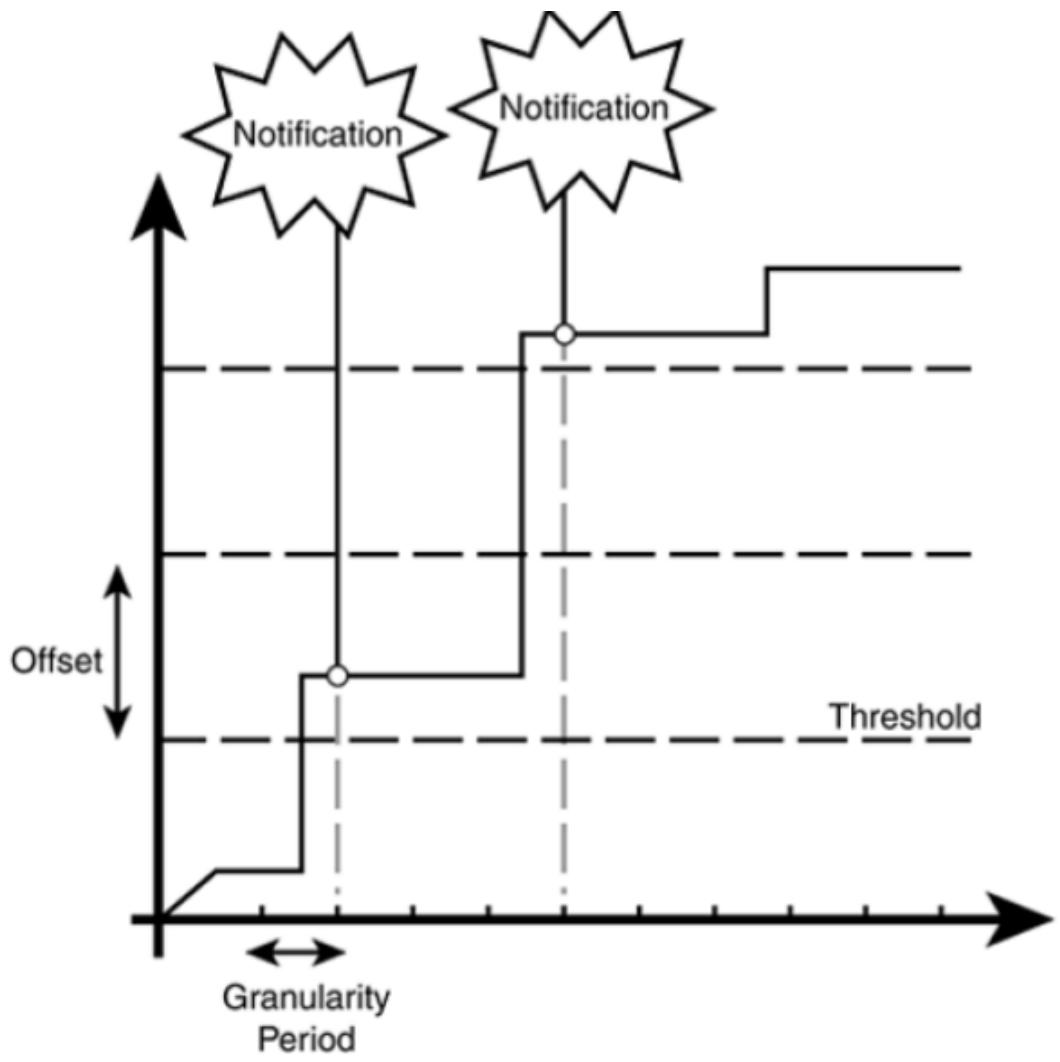
```
// fa partire il servizio di timer
List list = MBeanServerFactory.findMBeanServer(null);
MBeanServer server = (MBeanServer)list.iterator().next();
ObjectName timer = new ObjectName("service:name=timer");
server.registerMBean(new Timer(), timer);
server.invoke(timer, "start", null, null);

// configurazione di notification time
Date date = new Date(System.currentTimeMillis() + Timer.ONE_SECOND * 5);

server.invoke(timer, // MBean
             "addNotification", // metodo
             new Object[] { // args
               "timer.notification", // tipo
               "Schedule notification", // messaggio
               null, // user data
               date}, // time
             new String[] { String.class.getName(),
                           String.class.getName(),
                           Object.class.getName(), // signature
                           Date.class.getName()})
           );

// registra il listener MBean
server.addNotificationListener(timer, this, null, null);
```

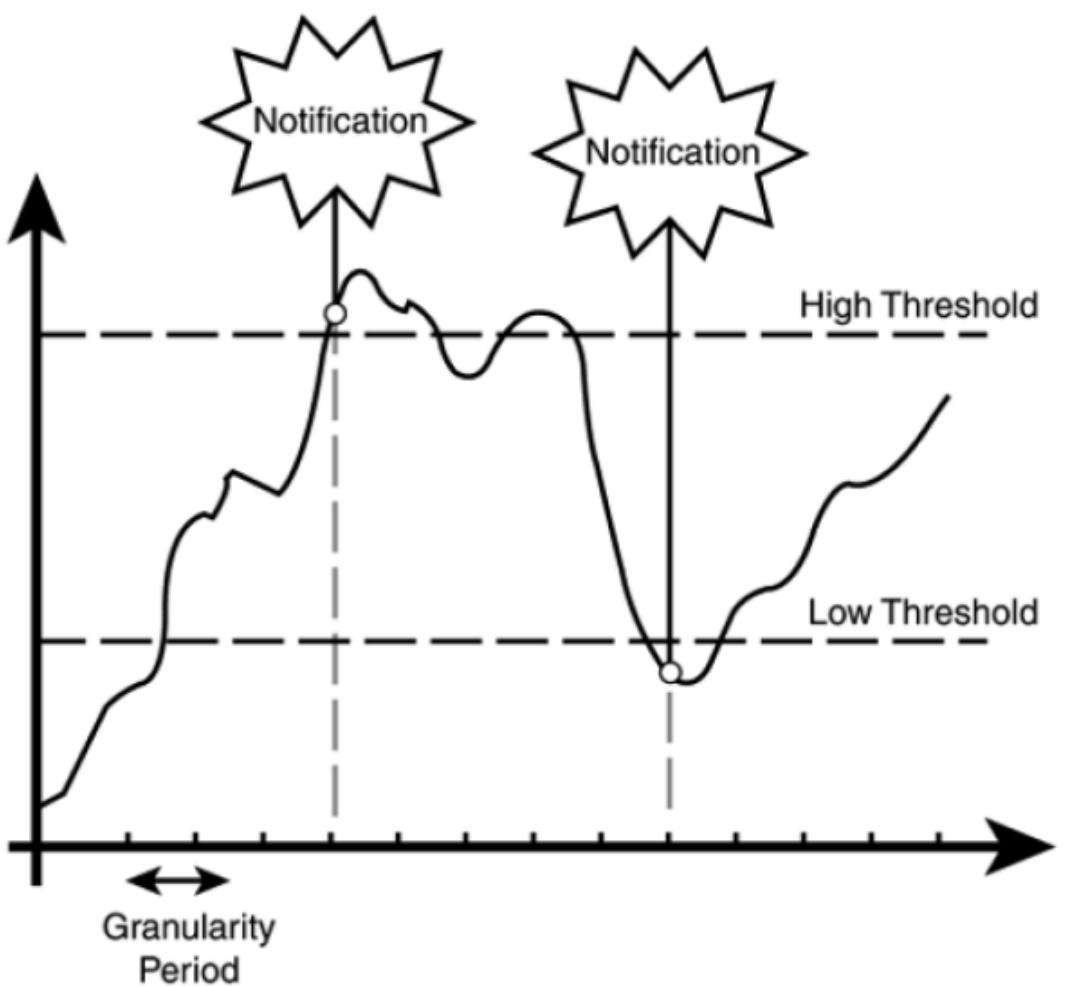
getter setter



• Integer

x

• Integer Float



Mbean A

MBean B

MBean A

MBean B

```
// lato cliente

JMXServiceURL url = new JMXServiceURL("service:jmx:rmi:///jndi/rmi://" + "localhost:9999/server");

JMXConnector jmxc = JMXConnectorFactory.connect(url, null);

MBeanServerConnection mbsc = jmxc.getMBeanServerConnection;

mbsc.createMBean(...);
```

```
// lato servitore

MBeanServer mbs = MBeanServerFactory.createMBeanServer();
JMXServiceURL url = new JMXServiceURL("service:jmx:rmi:///jndi/rmi://" + "localhost: 9999/server");
JMXConnectorServer cs = JMXConnectorServerFactory.newJMXConnectorServer(url, null, mbs);
cs.start();
```

JMXServiceURL

JMXConnectorServerFactory

HelloMBean.java:

sayHello add Name CacheSize

```
package com.example.mbeans;

public interface HelloMBean {

    // operazioni (signature)
    public void sayHello();
    public int add(int x, int y);

    // attributi
    public String getName();
    public int getCacheSize();
    public void setCacheSize(int size);
}
```

Hello.java

HelloMBean

```
package com.example.mbeans;

public class Hello implements HelloMBean {

    public void sayHello() {
        System.out.println("hello, world");
    }

    public int add(int x, int y) {
        return x + y;
    }
}
```

```

/* metodo getter per l'attributo Name.
 * Spesso gli attributi sono utilizzati per fornire indicatori di monitoraggio
 * come uptime o utilizzo di memoria. Spesso sono read-only. In questo caso l'attributo è una stringa */
public String getName() {
    return this.name;
}

/* invece anche metodi getter e setter */
/* invece anche metodi getter e setter */
public int getCacheSize() {
    return this.cacheSize;
}

/* perché synchronized? Mantenere uno stato consistente per evitare modifiche concorrenti.
 * No notifiche concorrenti, non ci sono container che si occupano della sincronizzazione
 * quindi serve synchronized, prima non necessario con i container si occupano
 * internamente della sincronizzazione */
public synchronized void setCacheSize(int size) {
    this.cacheSize = size;
    System.out.println("Cache size now " + this.cacheSize);
}

private final String name = "My First MBean";
private int cacheSize = DEFAULT_CACHE_SIZE;
private static final int DEFAULT_CACHE_SIZE = 200;
}

```

Main.java

HelloWorld

```

package com.example.mbeans;
import java.lang.management.*;
import javax.management.*;

public class Main {

    public static void main(String[] args) throws Exception {
        // ottiene il server MBean
        MBeanServer mbs = ManagementFactory.getPlatformMBeanServer();
        // costruisce ObjectName per MBean da registrare
        ObjectName name = new ObjectName("com.example.mbeans:type=Hello");
        // crea istanza di HelloWorld MBean
        Hello mbean = new Hello();
        // registra l'istanza
        mbs.registerMBean(mbean, name);
        System.out.println("Waiting forever... ");
        Thread.sleep(Long.MAX_VALUE);
    }
}

```

Notification

```
package com.example.mbeans;
import javax.management.*;

public class Hello extends NotificationBroadcasterSupport implements HelloMBean {

    public void sayHello() {
        System.out.println("hello, world");
    }

    public int add(int x, int y) {
        return x + y;
    }

    public String getName() {
        return this.name;
    }

    public int getCacheSize() {
        return this.cacheSize;
    }

    public synchronized void setCacheSize(int size) {
        int oldSize = this.cacheSize;
        this.cacheSize = size;

        /* In applicazioni reali il cambiamento di un attributo di solito produce effetti di gestione.
         * Ad esempio, cambiamento di dimensione della cache può generare eliminazione o
         * allocazione di entry */
        System.out.println("Cache size now " + this.cacheSize);
        /* Per costruire una notifica che descrive il cambiamento avvenuto: "source" è ObjectName di MBean
         * che emette la notifica (MBean server sostituisce "this" con il nome dell'oggetto);
         * mantenuto un numero di sequenza */
        Notification n = new AttributeChangeNotification(this,
                sequenceNumber++,
                System.currentTimeMillis(),
                "CacheSize changed",
                "CacheSize",
                "int",
                oldSize,
                this.cacheSize);
        // Invio della notifica usando il metodo sendNotification() ereditato dalla superclasse
        sendNotification(n);
    }

    ...

    @Override
    /* metadescrizione */
    public MBeanNotificationInfo[] getNotificationInfo() {
```

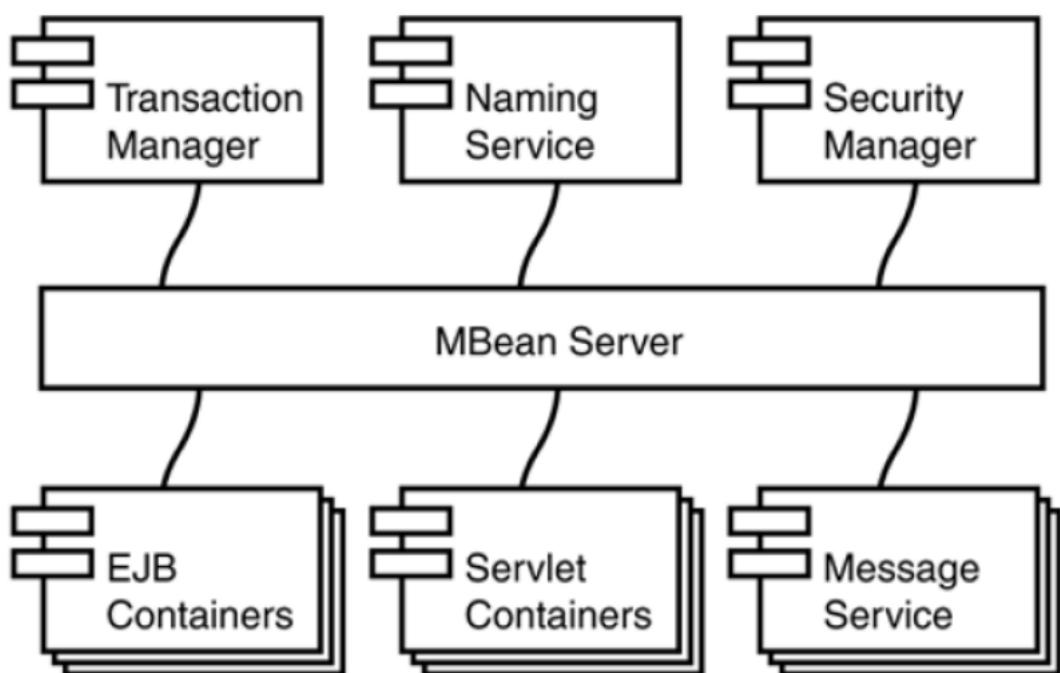
```

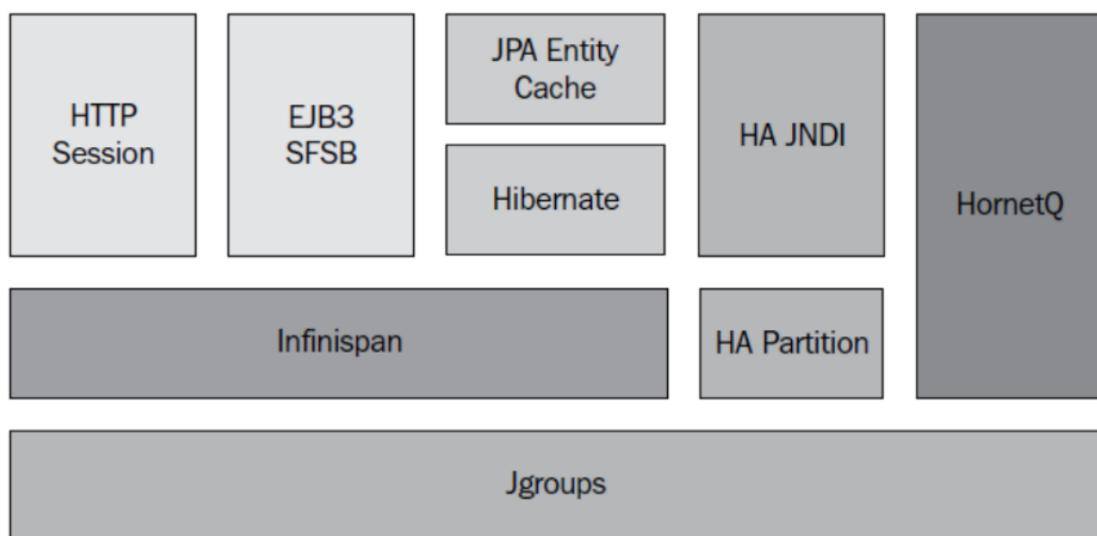
String[] types = new String[] { AttributeChangeNotification.ATTRIBUTE_CHANGE };
String name = AttributeChangeNotification.class.getName();
String description = "è stato cambiato un attributo!";
MBeanNotificationInfo info = new MBeanNotificationInfo(types, name, description);

return new MBeanNotificationInfo[] {info};
}

private final String name = "My first MBean";
private int cacheSize = DEFAULT_CACHE_SIZE;
private static final int DEFAULT_CACHE_SIZE = 200;
private long sequenceNumber = 1;
}

```





```
run.bat -c all  
./run.sh -c all
```

JGroups.jar

jbosscache.jar

•
•

cluster-service.xml

deploy

PartitionConfig

ClusterPartition

```
<mbean code="org.jboss.ha.framework.server.ClusterPartition"  
name="jboss:service={jboss.partition.name:DefaultPartition}">
```

```

...
<attribute name="PartitionConfig">
<Config>
<UDP mcast_addr="${jboss.partition.udpGroup:228.1.2.3}"
mcast_port="${jboss.hapartition.mcast_port:45566}"
tos="8"

...
<!-- ping per scoprire i membri che appartengono al cluster -->
<PING timeout="2000"
down_thread="false" up_thread="false"
num_initial_members="3"/>

...
<!-- per fondere gruppi già scoperti -->
<MERGE2 max_interval="100000"
down_thread="false" up_thread="false"
min_interval="20000"/>

...
<!-- timeout per failure detection -->
<FD timeout="10000" max_tries="5"
down_thread="false" up_thread="false" shun="true"/>

<!-- questo protocollo verifica se un membro sospetto è realmente morto eseguendo nuovamente
il ping di quel membro. -->
<VERIFY_SUSPECT timeout="1500" down_thread="false"
up_thread="false"/>

...
<pbcast.STATE_TRANSFER down_thread="false" up_thread="false"/>
```

PING

MERGE2

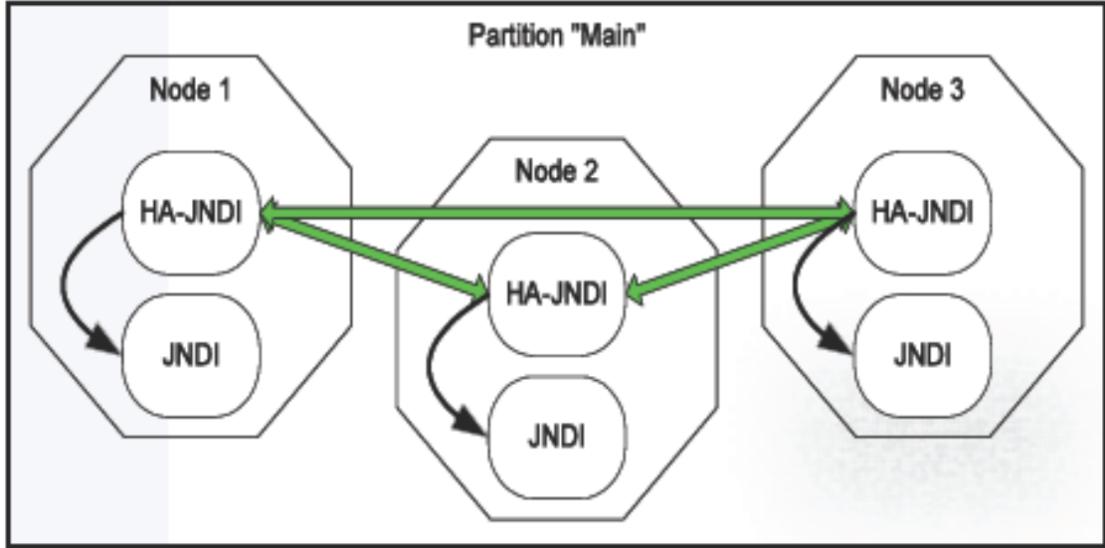
FD

```
<mbean code="org.jboss.ha.framework.server.ClusterPartition"
name="jboss:service=DefaultPartition">
    <attribute name="PartitionName">${jboss.partition.name:DefaultPartition}</attribute>
    <!-- indirizzo usato per determinare il nome del nodo -->
    <attribute name="NodeAddress">${jboss.bind.address}</attribute>
    <!-- deadlock detection abilitata o no -->
    <attribute name="DeadlockDetection">False</attribute>
    <!-- Max time (in ms) di attesa per il completamento del trasferimento di stato -->
    <attribute name="StateTransferTimeout">30000</attribute>
    <!-- configurazione protocolli JGroups -->
    <attribute name="PartitionConfig">...</attribute>
</mbean>
```

PartitionName

PartitionConfig

NameNotFoundException



Nodo 1

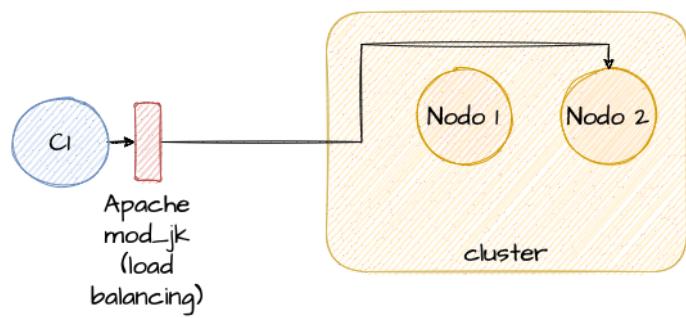
Nodo 1

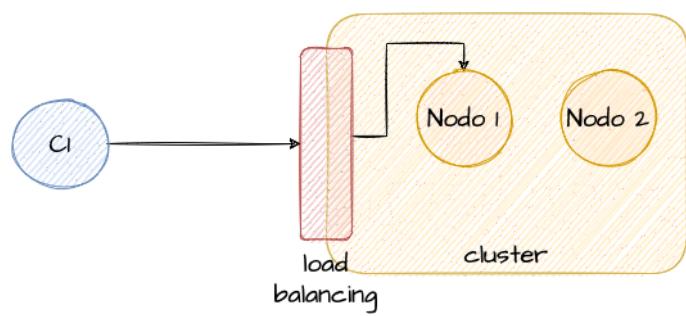
Nodo 2

Nodo 1

Nodo 3

•





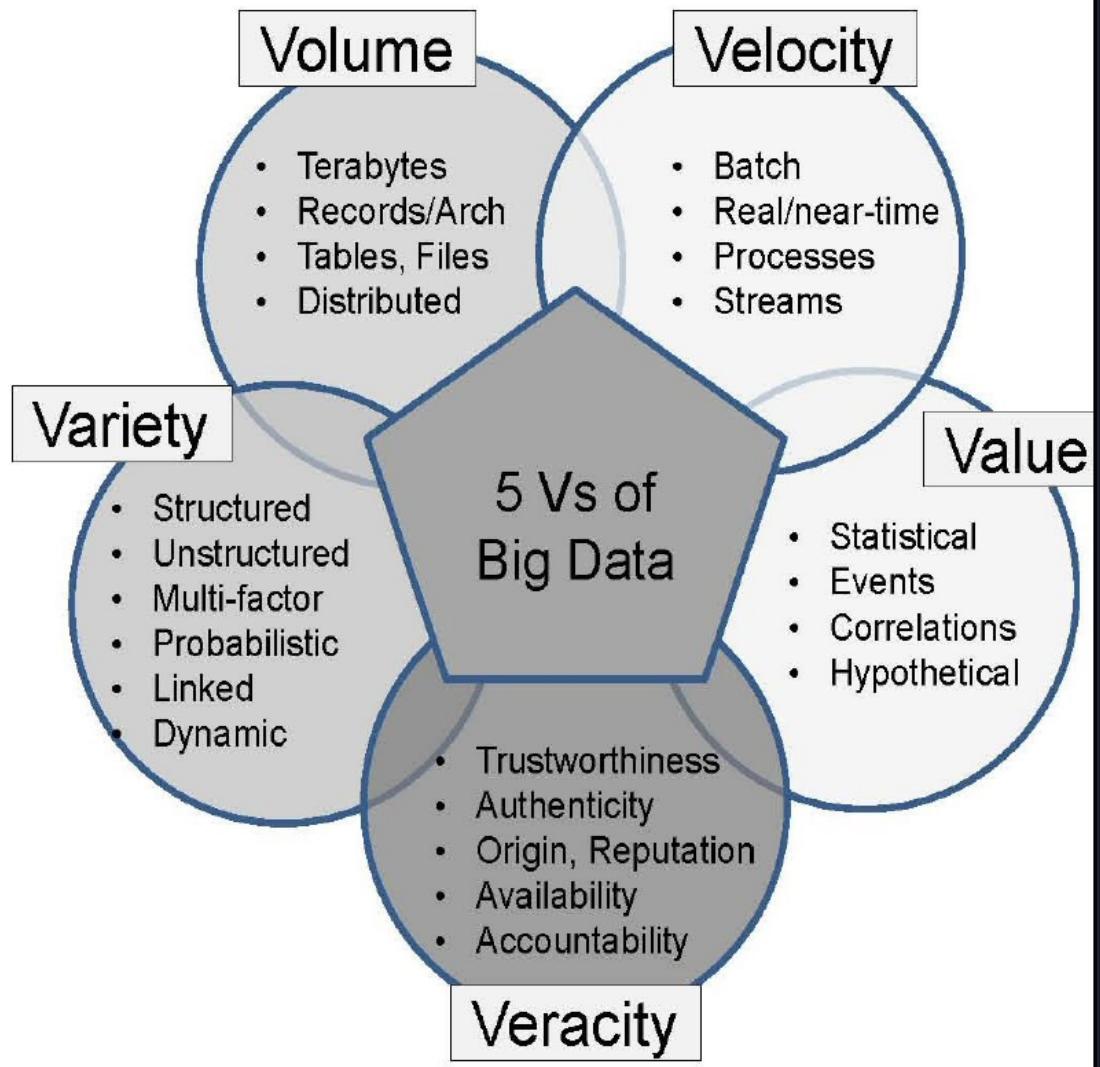
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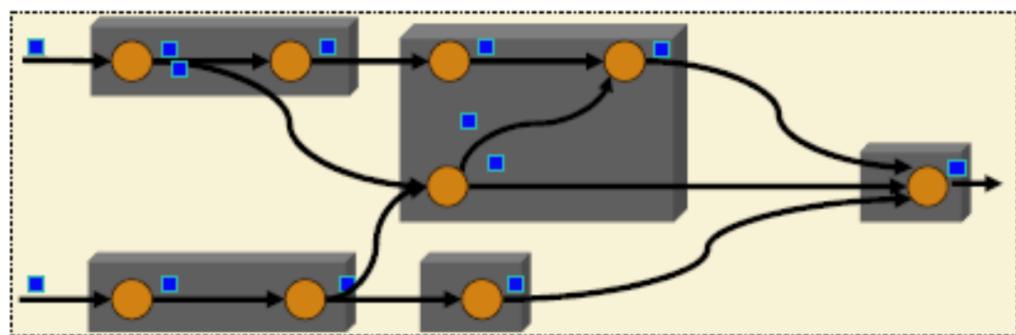
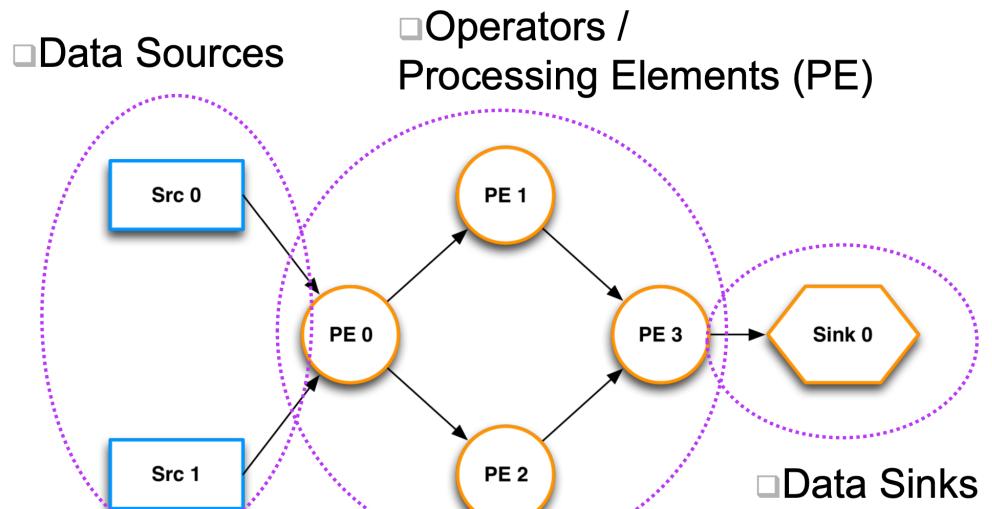
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- @Clustered
-
-
-
-
- standalone.xml
- standalone-full.xml
- standalone-ha.xml
- standalone-full-ha.xml

- standalone-load-balancer.xml
-

- -
 -
 - -
 -
 -
 -
 -
 -





Instance

Job

Node

PE

operator

PE

Stream 2

Stream 1

PE

Stream 3

Stream 3

Stream 4

Stream 5

Node

istanza1

C D

instance2

A B

istanza1

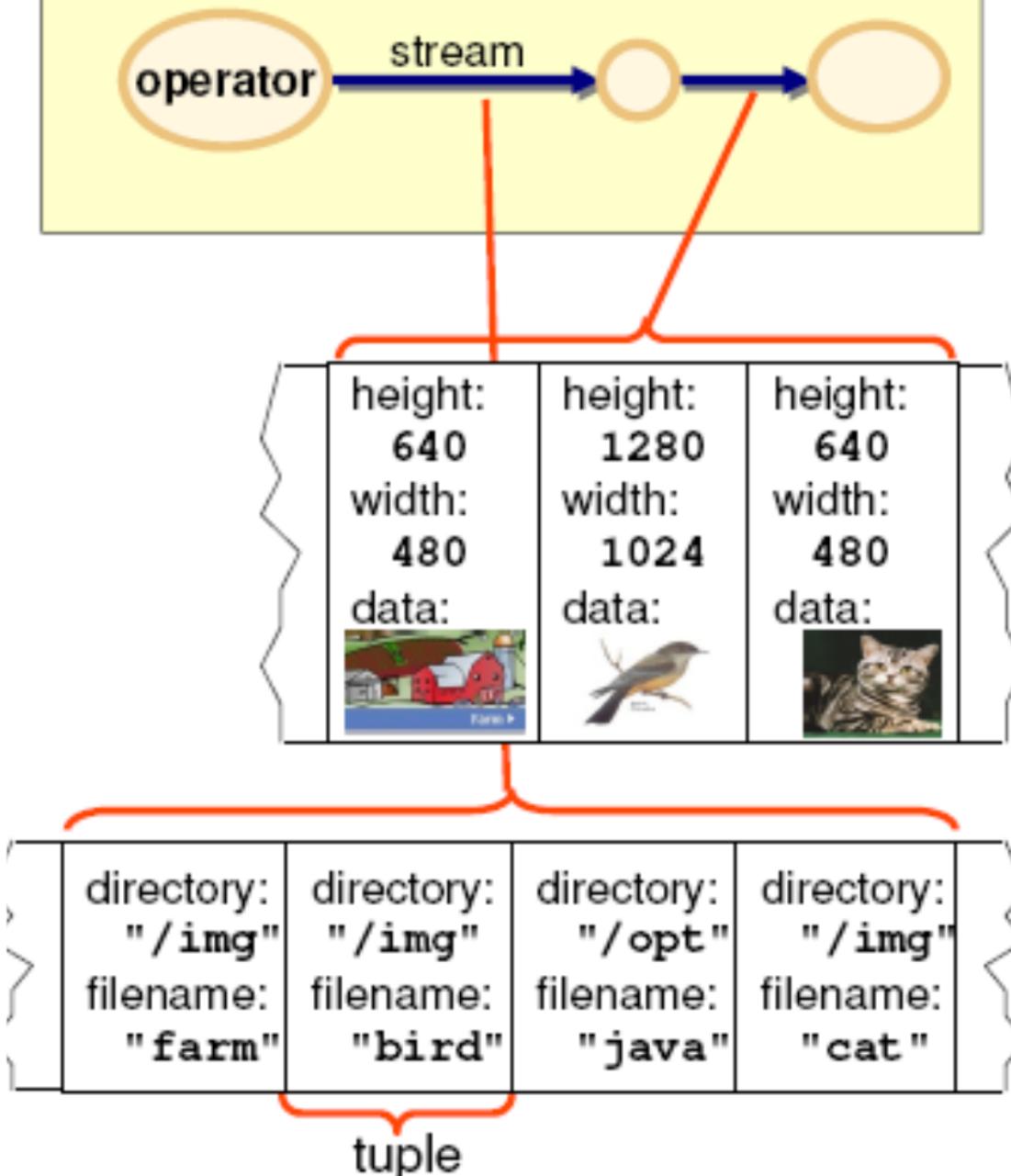
A B C D

istanza2

B

B

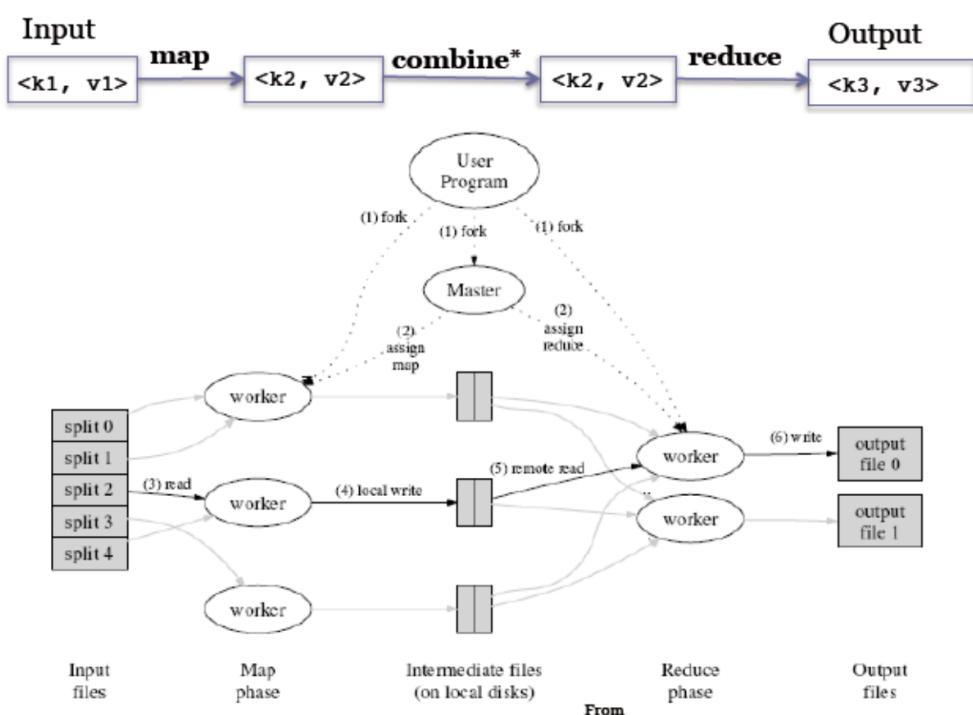
Streams Application



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$\langle \text{key}, \text{ value} \rangle$

- hello world hello moon
- goodbye world goodnight moon

```
<hello, 1>
<world, 1>
<hello, 1>
<moon, 1>
```

```
<goodbye, 1>
<world, 1>
<goodnight, 1>
<moon, 1>
```

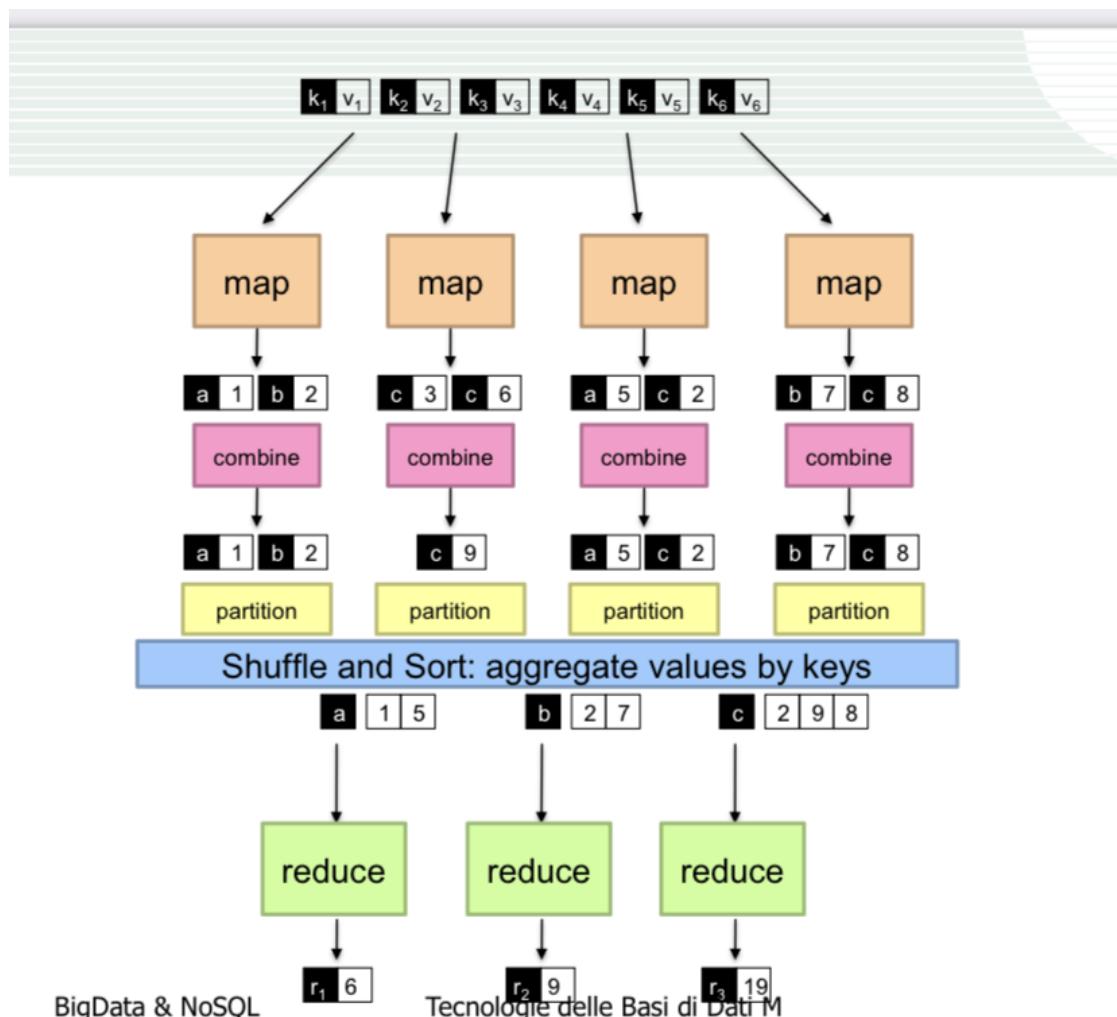
```
<moon, 1>
<world, 1>
<hello, 2>
```

```
<goodbye, 1>
<world, 1>
<goodnight, 1>
<moon, 1>
```

```
<goodbye, 1>
<goodnight, 1>
<moon, 2>
```

```
<world, 2>  
<hello, 2>
```

-
-
-



select

Thread	Asynchronous Event-driven
Blocca applicazione/richieste con listener-worker thread	Un solo thread, che fa ripetutamente fetching di eventi da una coda
Usa modello incoming-request	Usa una coda di eventi e processa eventi presenti
Multithreaded server potrebbe bloccare una richiesta che coinvolge eventi multipli	Salva stato e passa poi a processare il prossimo evento in coda
Usa context switching	No contention e NO context switch
Usa ambienti multithreading in cui listener e worker thread spesso acquisiscono incoming-request lock	Usa framework con meccanismi per cosiddetto I/O asincrono (callback, NO poll/select, O_NONBLOCK)

sendReply

```
request = readRequest(socket);
reply = processRequest(request);
sendReply(socket, reply);
```

readRequest

read

```
startRequest(socket);
listen("requestAvail", processRequest);
listen("processDone", sendReplyToSock);
```

startRequest

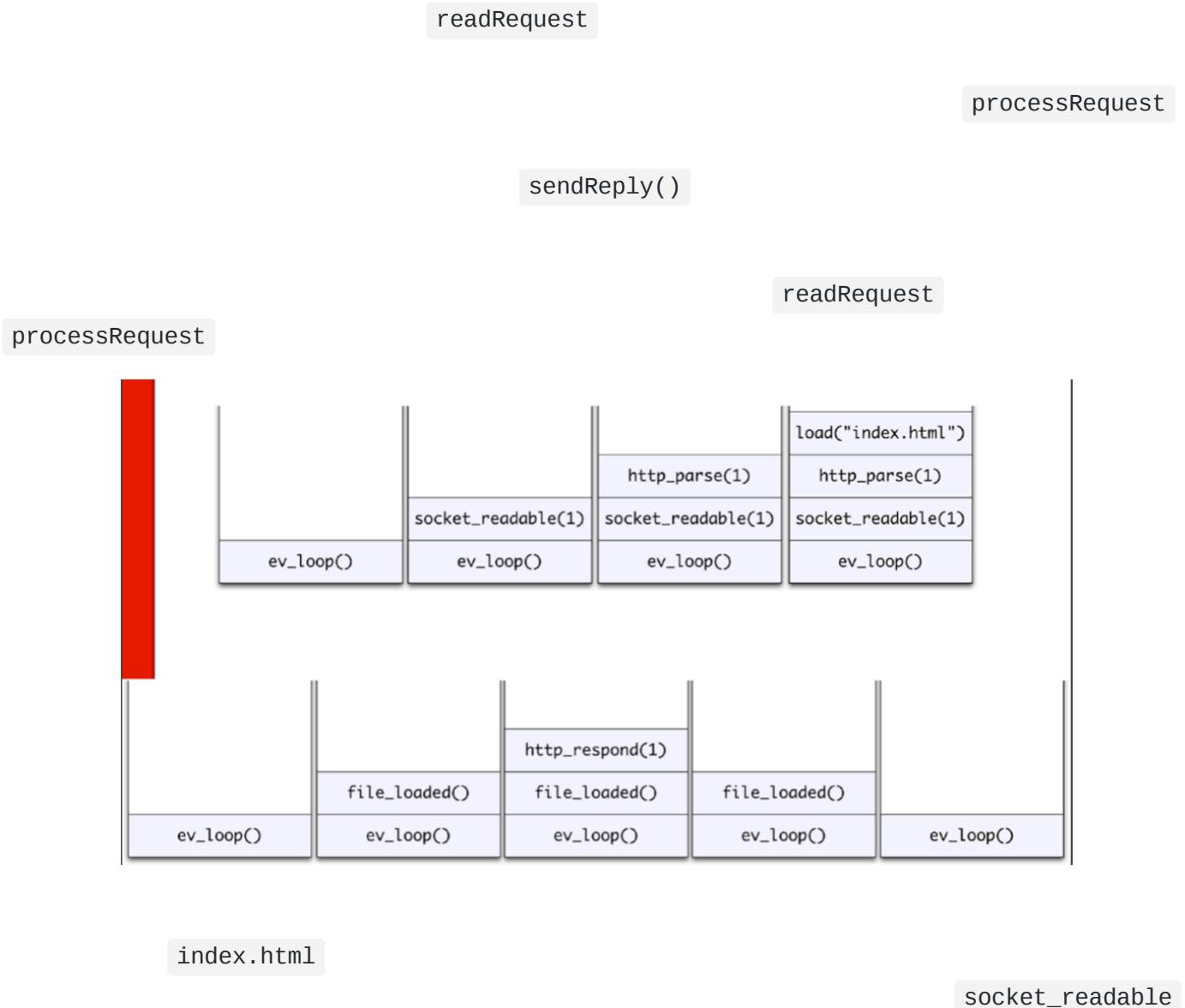
listen

processDone

```

readRequest(socket, function(request) {
  processRequest(request,
    function (reply) {
      sendReply(socket, reply);
    });
}

```



```

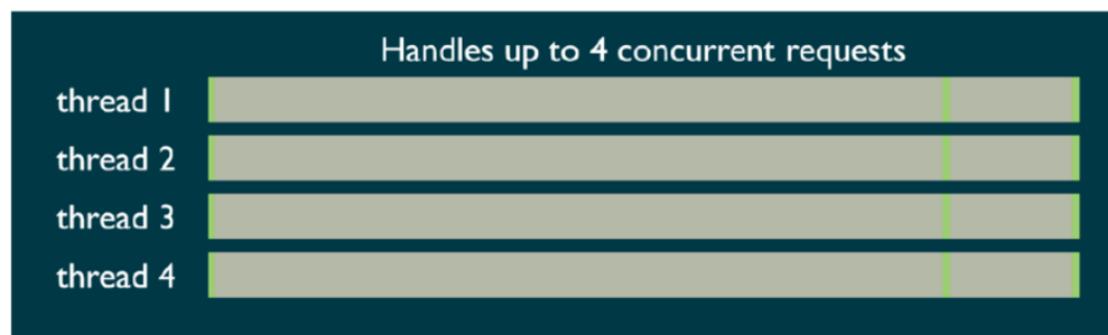
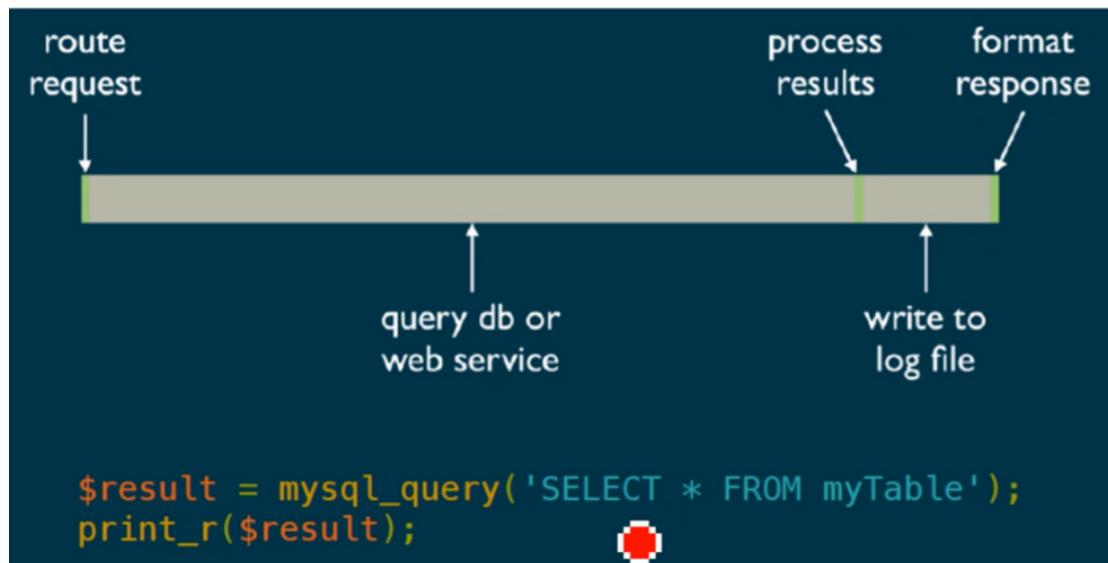
while(true) {
  if (!eventQueue.notEmpty()) {

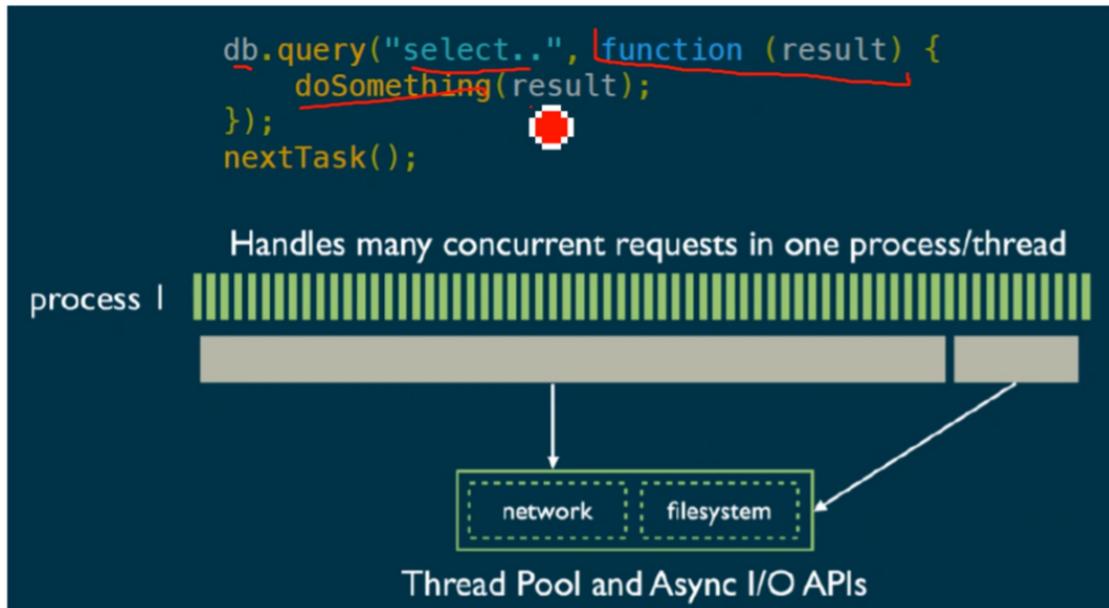
```

```
    eventQueue.pop().call();  
}  
}
```

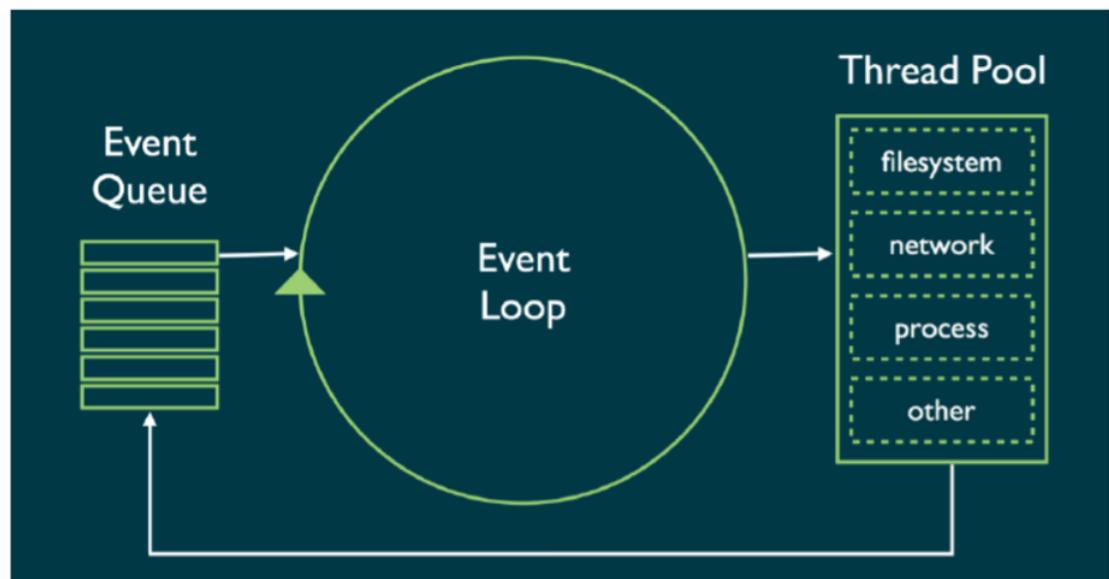
```
    call()
```

```
    push()
```





doSomething



```
require
```

```
// carica il modulo http per creare un http server
var http=require('http');
// configura HTTP server per rispondere con Hello World
var server=http.createServer(function(request,response) {
  response.writeHead(200, {"Content-Type":"text/plain"});
  response.end("Hello World\n");
});
// ascolta su porta 8000
server.listen(8000);
// scrive un messaggio sulla console terminale
console.log("Server running at http://127.0.0.1:8000/");
```

World

Hello

```
require
```

```
read
```

```
var fs = require("fs");
// modulo fs richiesto oggetto fs fa da wrapper a chiamate bloccanti sui file
// read() a livello SO è sincrona bloccante mentre
// fs.readFile è non-bloccante
fs.readFile("smallFile", readDoneCallback); // inizio lettura

function readDoneCallback(error, dataBuffer) {
  // convenzione Node per callback: primo argomento è oggetto
  // js di errore
  if (!error) {
    console.log("smallFile contents", dataBuffer.toString());
  }
}
```

```
var readableStreamEvent = fs.createReadStream("bigFile");
readableStreamEvent.on('data', function (chunkBuffer) {
    console.log('got chunk of', chunkBuffer.length, 'bytes');
});
//operazione eseguita ogni volta che arriva un chunck di dati

readableStreamEvent.on('end', function() {
    // Lanciato dopo che sono stati letti tutti i datachunk fine dello stream
    console.log('got all the data');
});

readableStreamEvent.on('error', function (err) {
    console.error('got error', err);
});
//gestione a evento dell'errore
```

```
var writableStreamEvent = fs.createWriteStream('outputFile');
writableStreamEvent.on('finish', function () {
    console.log('file has been written!');
});

writableStreamEvent.write('Hello world!\n');
writableStreamEvent.end();
```

```
var net = require('net');
net.createServer(processTCPconnection).listen(4000);
```

processTCPconnection

```
// lista di client connessi
var clients = [];
function processTCPconnection(socket) {

    // aggiunge il cliente alla lista
    clients.push(socket);
    socket.on('data', function (data) {
        // invia a tutti i dati ricevuti
        broadcast("> " + data, socket);
    });

    socket.on('end', function () {
        // remove socket
        clients.splice(clients.indexOf(socket), 1);
    });
}

// invia messaggio a tutti i clienti
function broadcast(message, sender) {

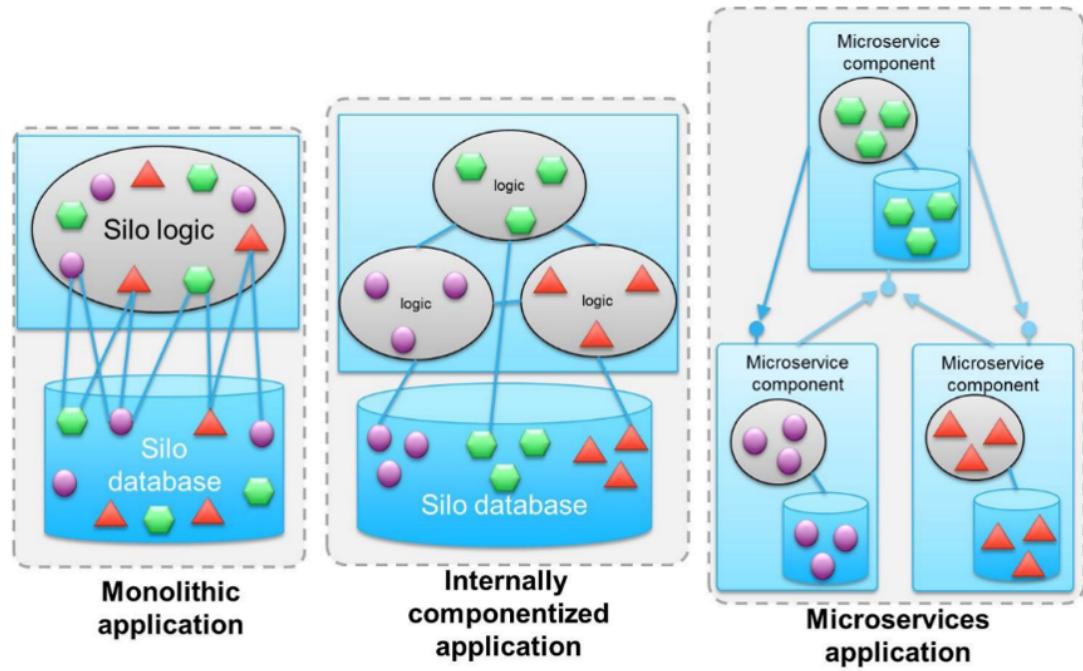
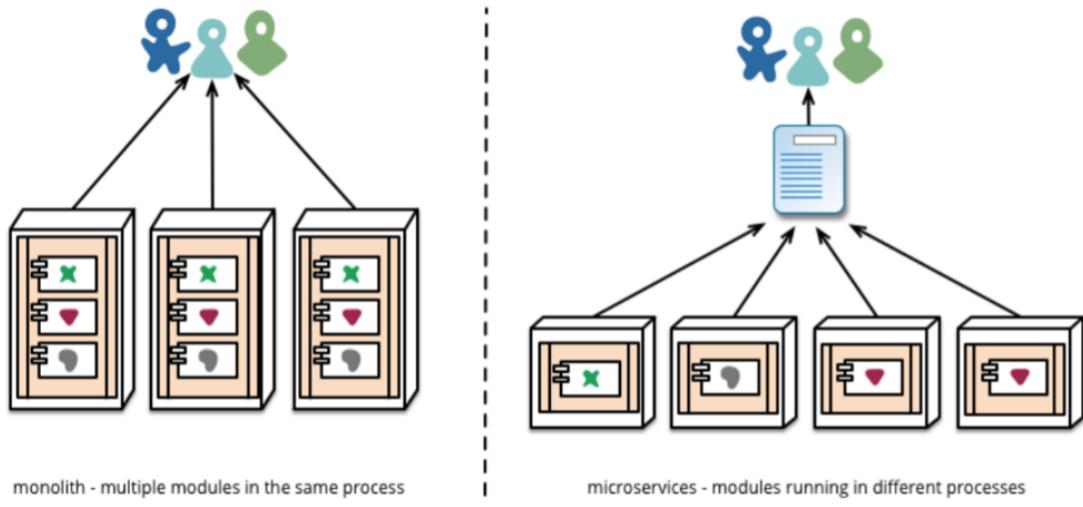
    clients.forEach(function (client) {
        if (client === sender)
            return;
        client.write(message);
    });
}
```

processTCPConnection

Sinatra

```
var express=require('express');
var app=express();
app.get('/', function(req,res) {res.send('Hello World!'); });
var server=app.listen(3000,function() {
  var host=server.address().address;
  var port=server.address().port;
  console.log('Listening at http://%s:%s',host,port);
});
```

Hello World!

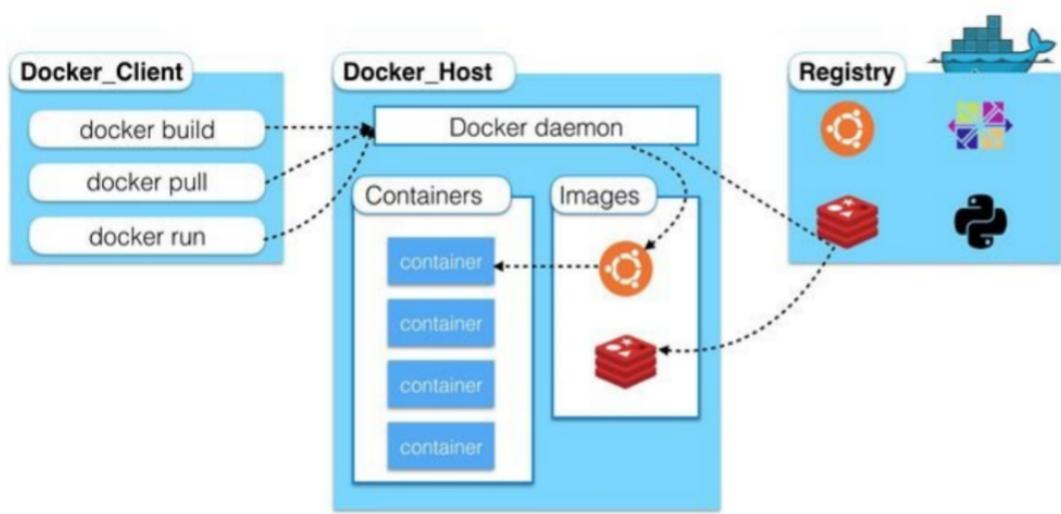




visor

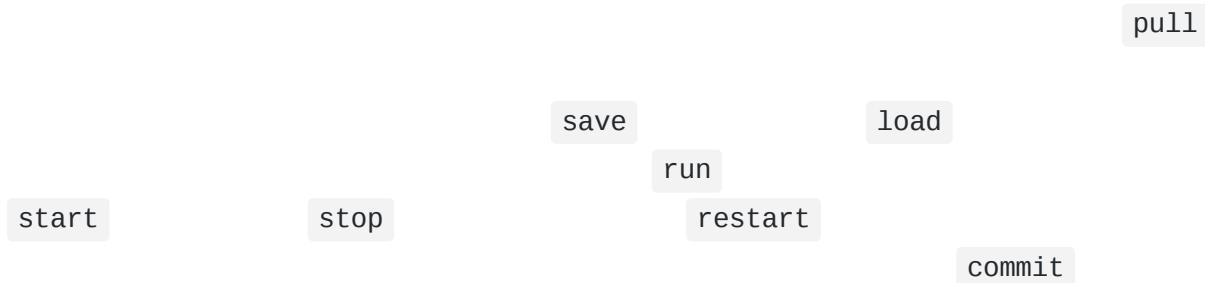
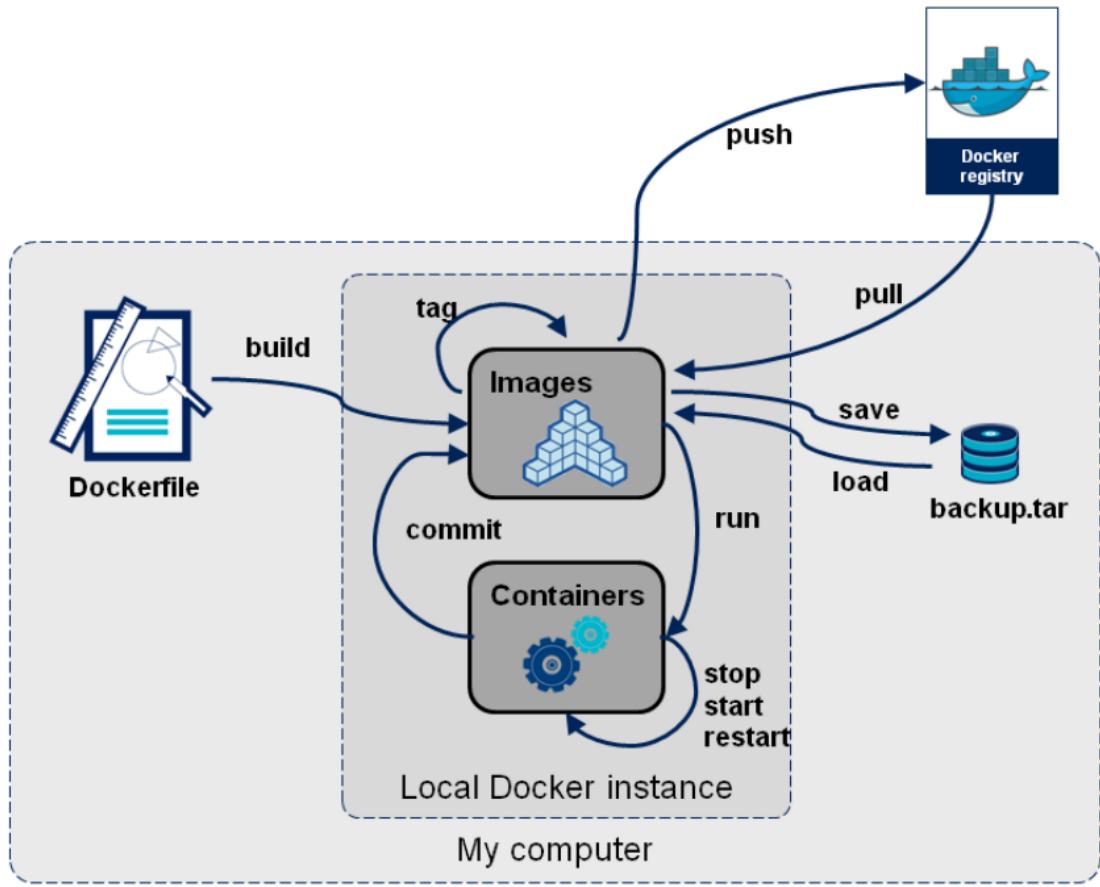
- Container engine

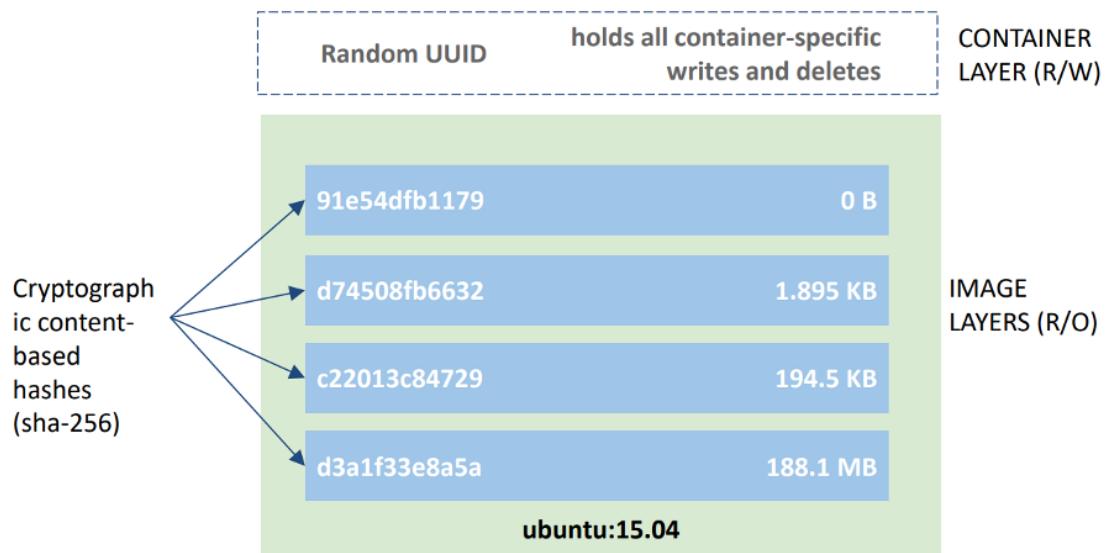
	Process	Container	VM
Definition	A representation of a running program.	Isolated group of processes managed by a shared kernel.	A full OS that shares host hardware via a hypervisor.
Use case	Abstraction to store state about a running process.	Creates isolated environments to run many apps.	Creates isolated environments to run many apps.
Type of OS	Same OS and distro as host,	Same kernel, but different distribution.	Multiple independent operating systems.
OS isolation	Memory space and user privileges.	Namespaces and cgroups.	Full OS isolation.
Size	Whatever user's application uses.	Images measured in MB + user's application.	Images measured in GB + user's application.
Lifecycle	Created by forking, can be long or short lived, more often short.	Runs directly on kernel with no boot process, often is short lived.	Has a boot process and is typically long lived.



`docker run`

run started stopped moved deleted

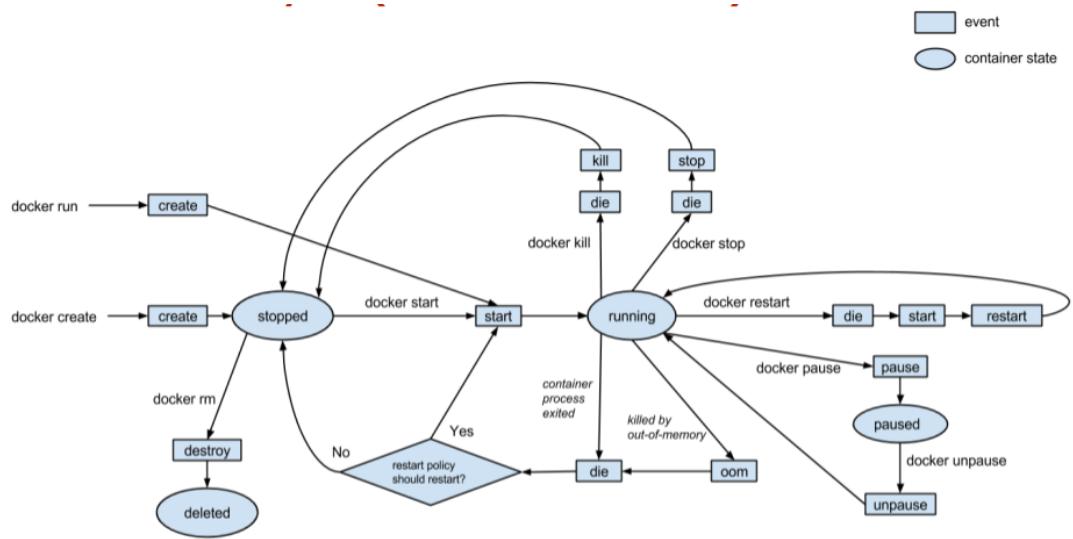


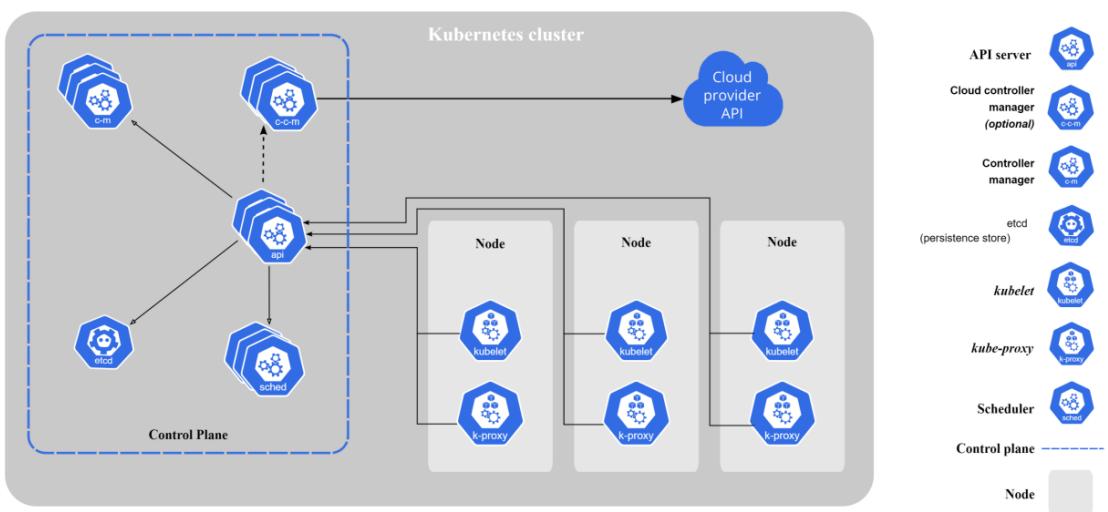


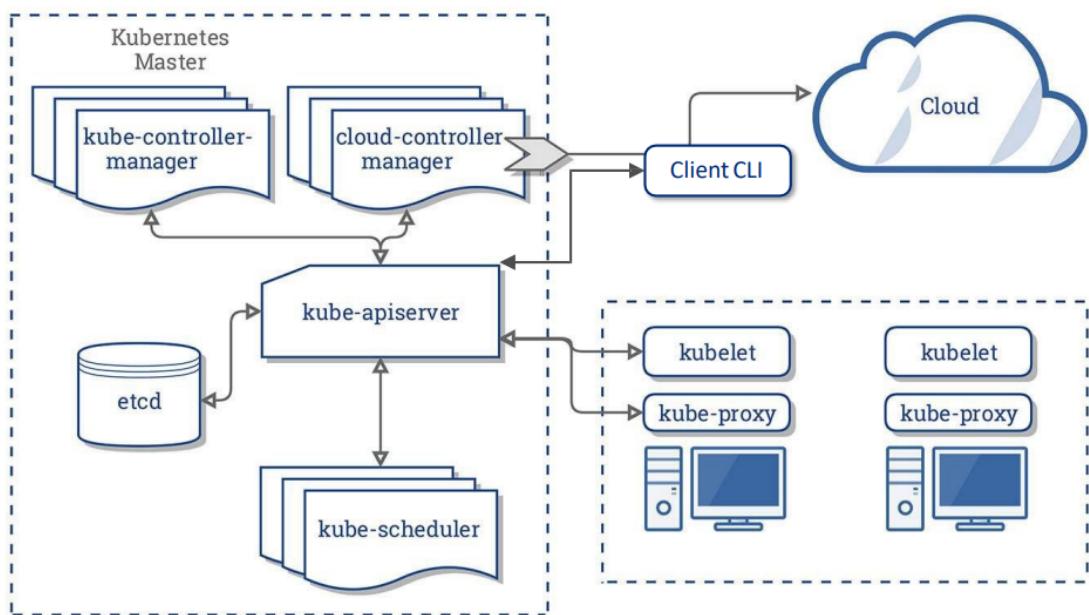
[hostname[:port]]/[username]/reponame[:tag]

run

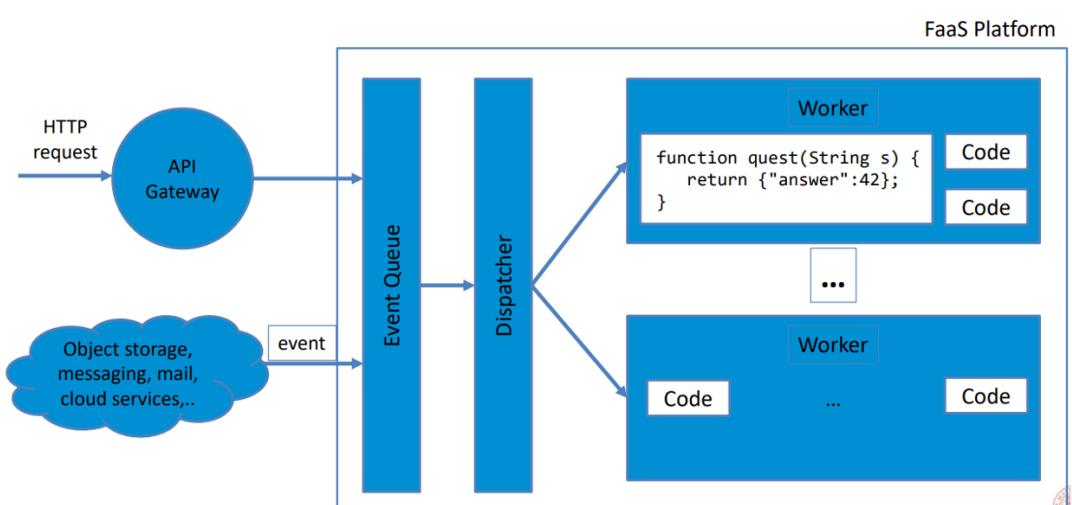
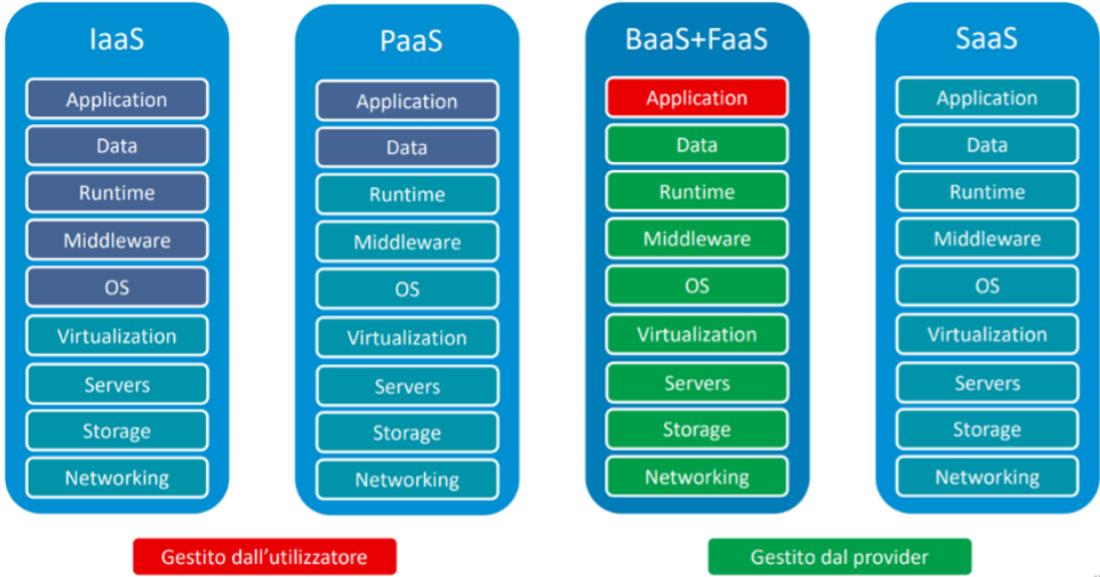








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