CORBA Component Model Architectural Overview

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Presentation Contents

- Container/Home Architecture
- CCM and EJB
- Extended CCM Components
- Mapping Component IDL Declarations to Legacy IDL
- Packaging and Deployment Descriptors
- CCM Metamodels
- Market Prospects

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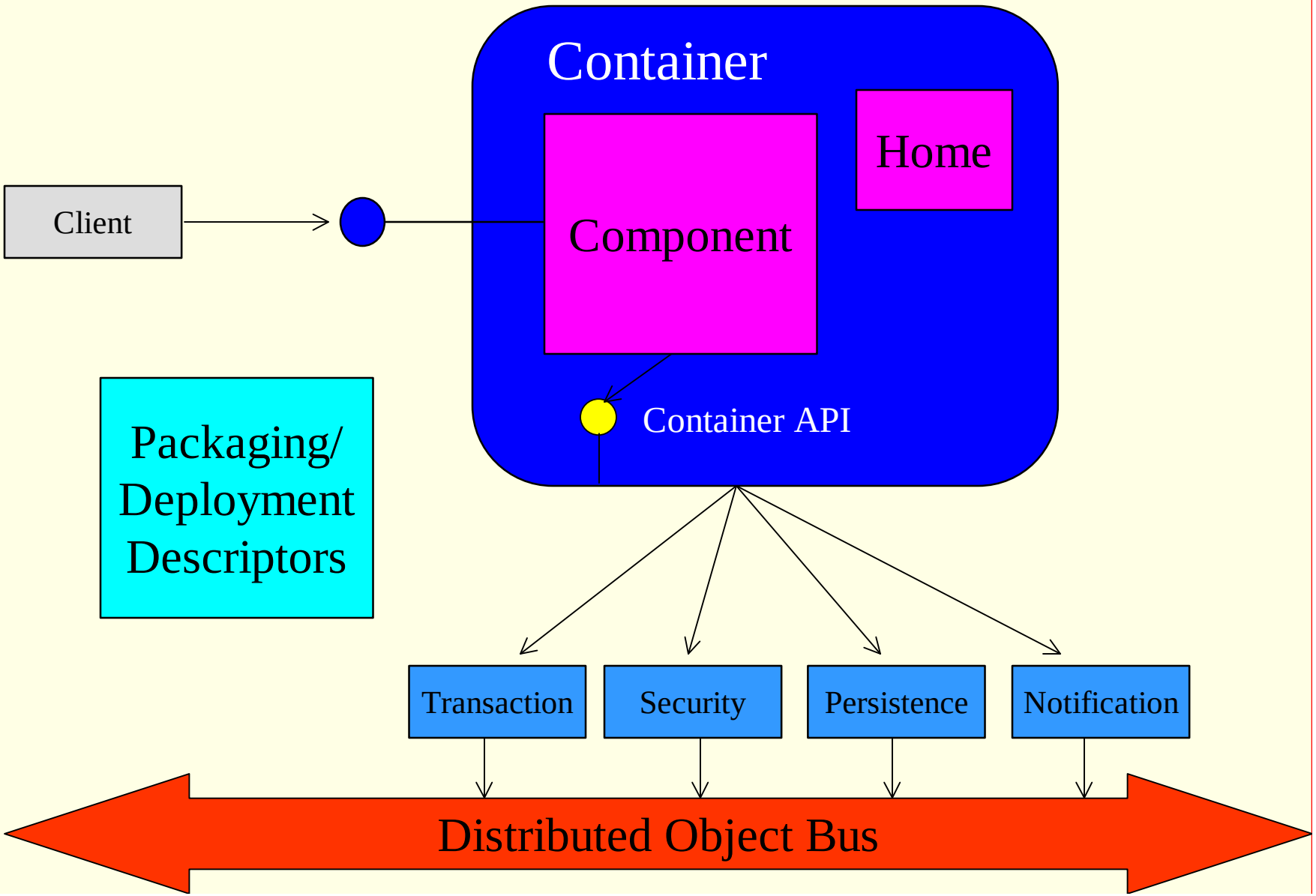
A Component in a Container
Generic Industry Model



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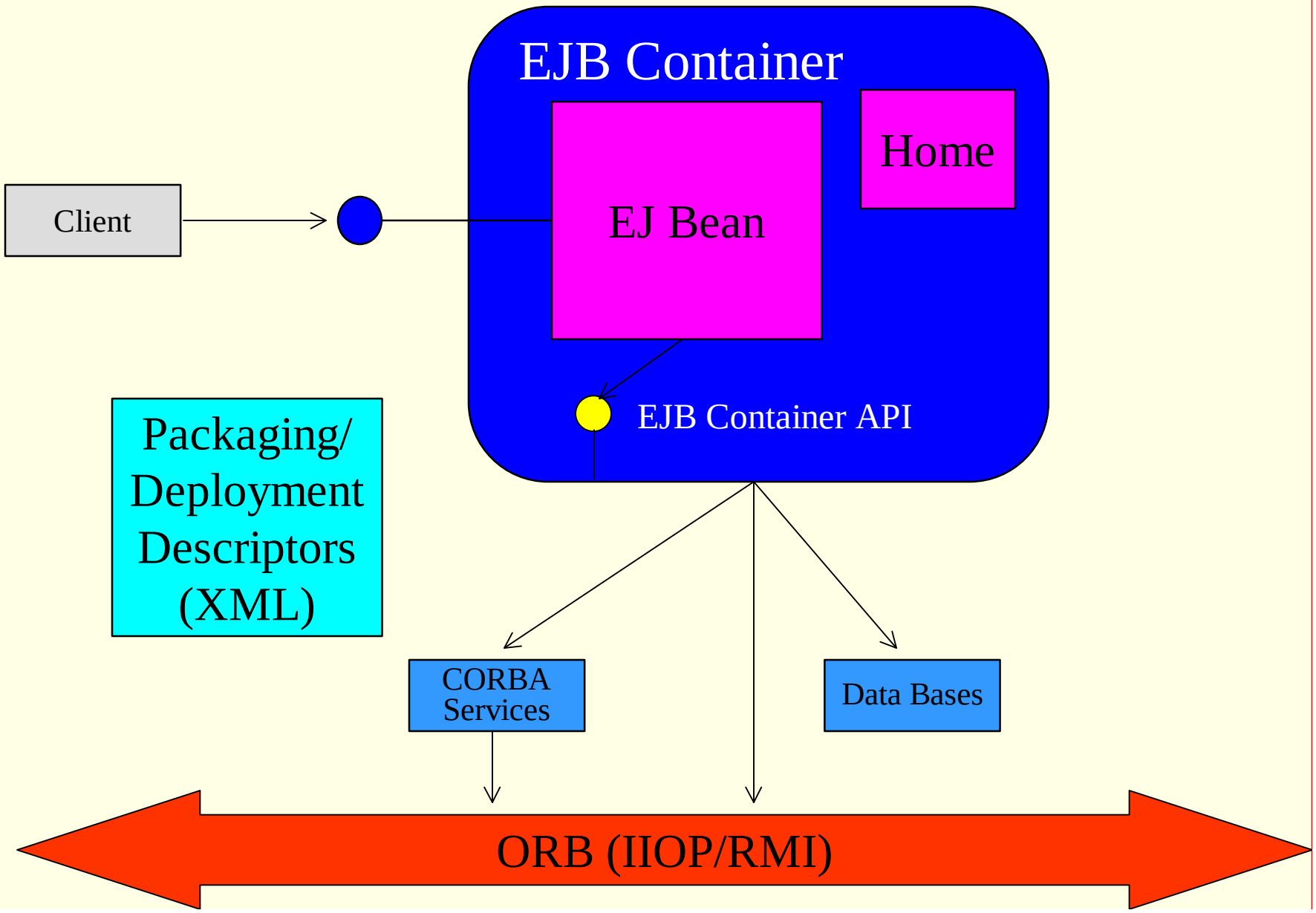
EJB Components and Containers Today



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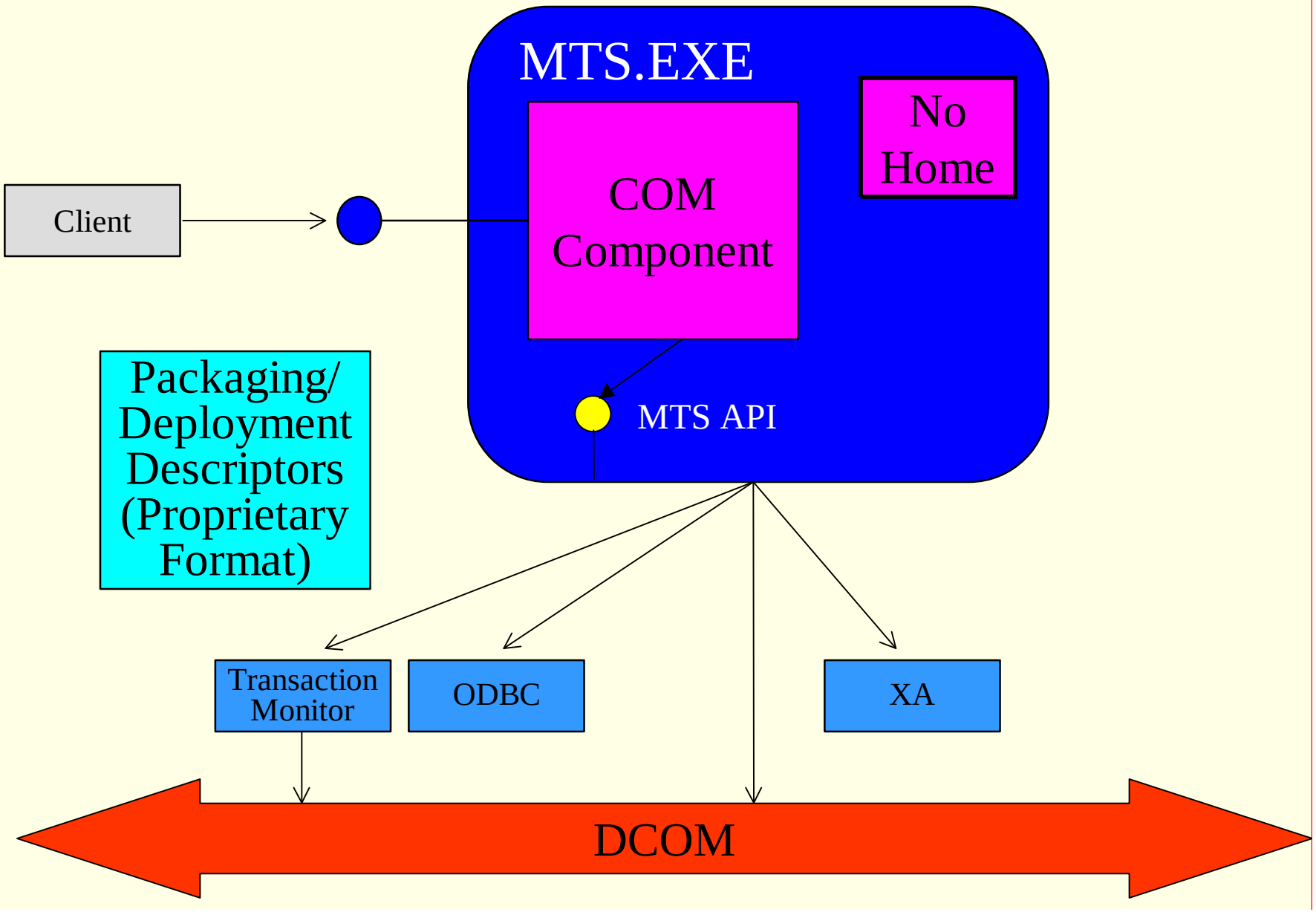
Microsoft Transaction Server



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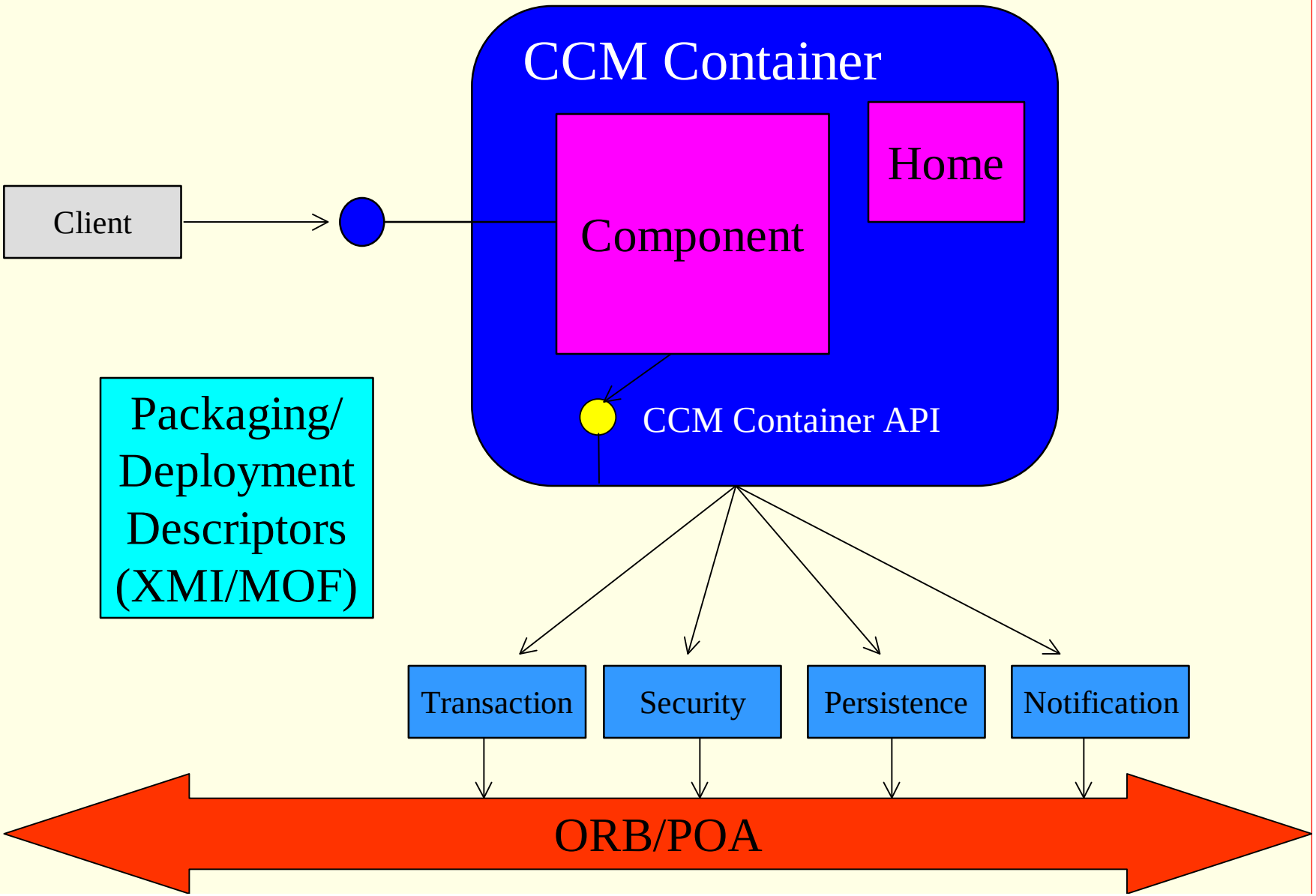
CORBA Components



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CCM and EJB

- CCM is a language-neutral superset of the EJB model
  - CCM has additional features
  - CCs that do not use the additional features are *basic* CCs
  - CCs that use the additional features are *extended* CCs
- For basic CCs that are programmed in Java, the EJB 1.1 APIs are mandatory
  - Where this conflicts with the standard IDL-Java mapping, the EJB APIs take precedence over IDL-Java
  - Thus, a basic, Java CC *is* an EJB
- CCM defines a CORBA container for EJBs
  - Standardizes the already-common use of CORBA by EJB containers
- CCM packaging/deployment descriptors more complex than EJB's
  - Programming language must be reflected
    - Can't assume language is Java
  - Operating system must be reflected
    - Can't assume Java VM
- Component Implementation Definition Language (CIDL) is new

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An Extended CC Can...

- Expose multiple interfaces
- Declare the interfaces that it calls (*uses*)
- Declare its event emission/publication and consumption
- Have multiple *segments* with different persistence characteristics

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Declaring a Component in IDL

```
component RenderableARUpdate
{
   //ARUpdate and Render are interfaces declared elsewhere
   //arUpdate and render are facet identifiers
   provides ARUpdate arUpdate;
   provides Render render;

   //Customer and GeneralLedger are interfaces declared elsewhere
   //customer and gl are receptacle identifiers
   uses Customer customer;
   uses GeneralLedger gl;

   //ARUpdateComplete, CollectionsAlert, and OrderInitiated
   //are valuetypes declared elsewhere
   publishes ARUpdateComplete arUpdateComplete;
   emits CollectionsAlert collectionsAlert;
   consumes OrderInitiated orderInitiated;
};
```

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Declaring a Home in IDL

```
home AcmeARUpdateHome manages RenderableARUpdate
{
   //CollectionsPolicy is defined elsewhere
   factory CreateARUpdate (in CollectionsPolicy policy);
   finder FindARUpdate (in CollectionsPolicy policy);
};
```

Declaring a Basic Component

```
component ARUpdateComp supports ARUpdate { };
home AcmeARUpdateHome manages ARUpdateComp
{
   //CollectionsPolicy is defined elsewhere
   factory CreateARUpdate (in CollectionsPolicy policy);
   finder FindARUpdate (in CollectionsPolicy policy);
};
```

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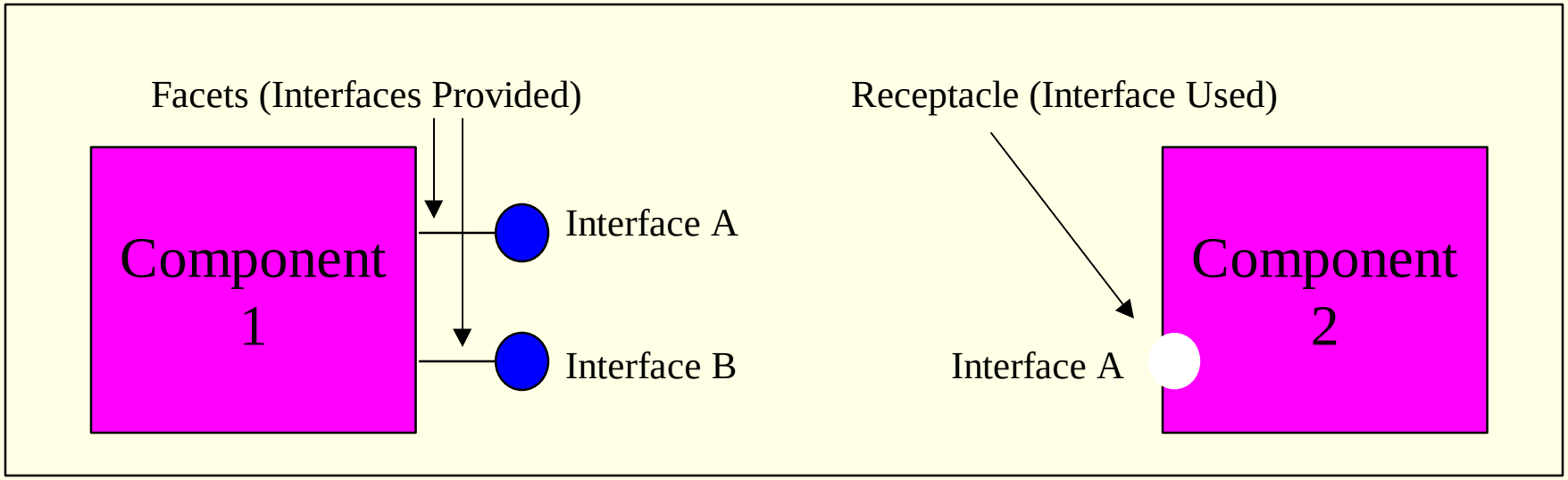
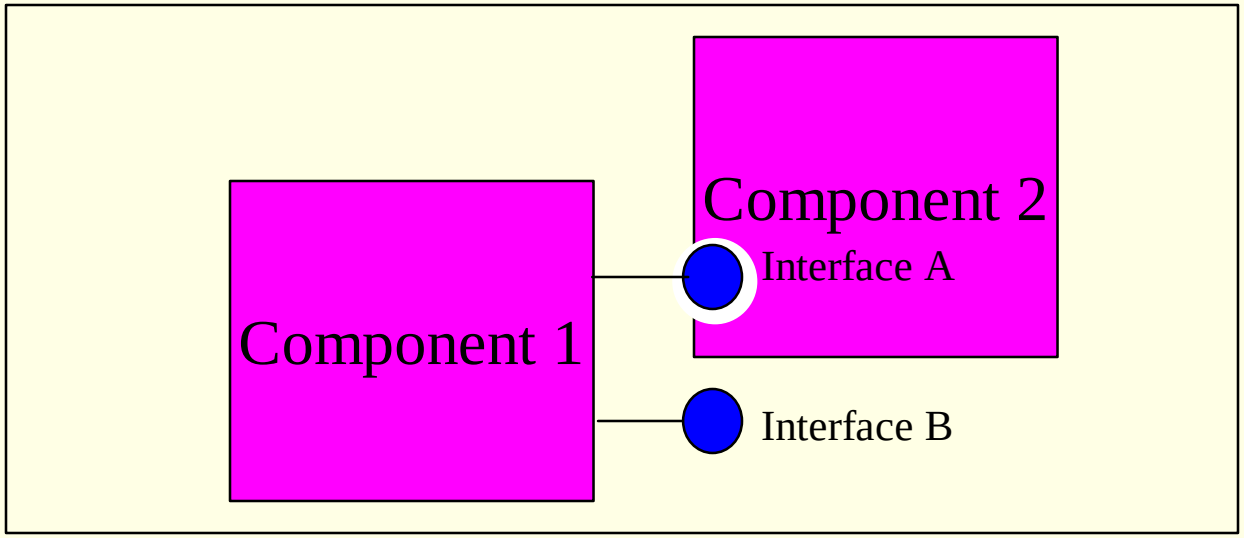
Facets and Receptacles





Events

- Simple event model
- Events are valuetypes derived from Components::EventBase (empty, abstract)
- Push model
- Container mediates access to CosNotification channels

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Event Sources

- Two types: *publisher* and *emitter*
- *Publisher*
  - Client subscribes to event source by directly calling the component
  - Component mediates subscription to event channel
  - Component is only source of events for channel (dedicated channel per component)
- *Emitter* is a simple push consumer
  - Intended for connection to an arbitrary event channel during configuration
  - Client subscription is not by call to component
    - Ordinary means for subscribing to an event channel are used

Declaring a Home With a Primary Key

```
component Customer { };

//SocSec# is a valuetype defined elsewhere
home CustomerHome manages Customer primaryKey SocSec#
{
};
```

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The Philosophy of Homes
A Concession to Reality

- Predicated on the realization that one grand instance manager for a type is impossible to achieve in practice
  - Very difficult to achieve in one large, hermetically-sealed enterprise
  - Enterprises are increasingly *not* sealed
    - Mergers and acquisitions
    - Business to business electronic commerce coming
- Allows there to be multiple managers of a large type extent
  - One Customer home might use social security#
  - Another Customer home might use an internal customer# as the primary key

Home Finders

```
module Components {

  interface HomeFinder {

    CCMHome find_home_by_component_type(in CORBA::RepositoryId comp_repid);

    CCMHome find_home_by_home_type (in CORBA::RepositoryId home_repid);

    CCMHome find_home_by_name (in string home_name);
  };
};
```

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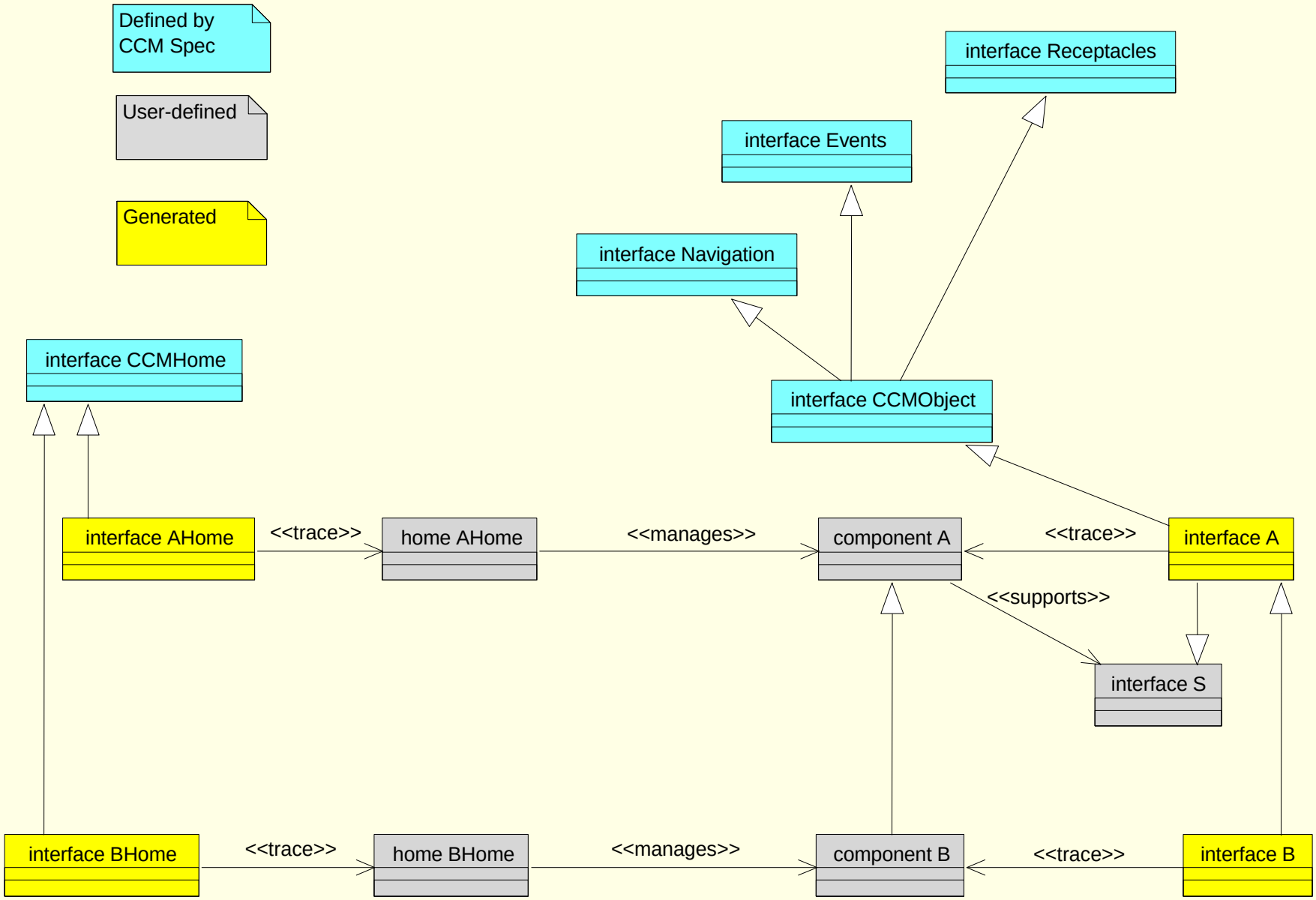
Mappings to Legacy IDL



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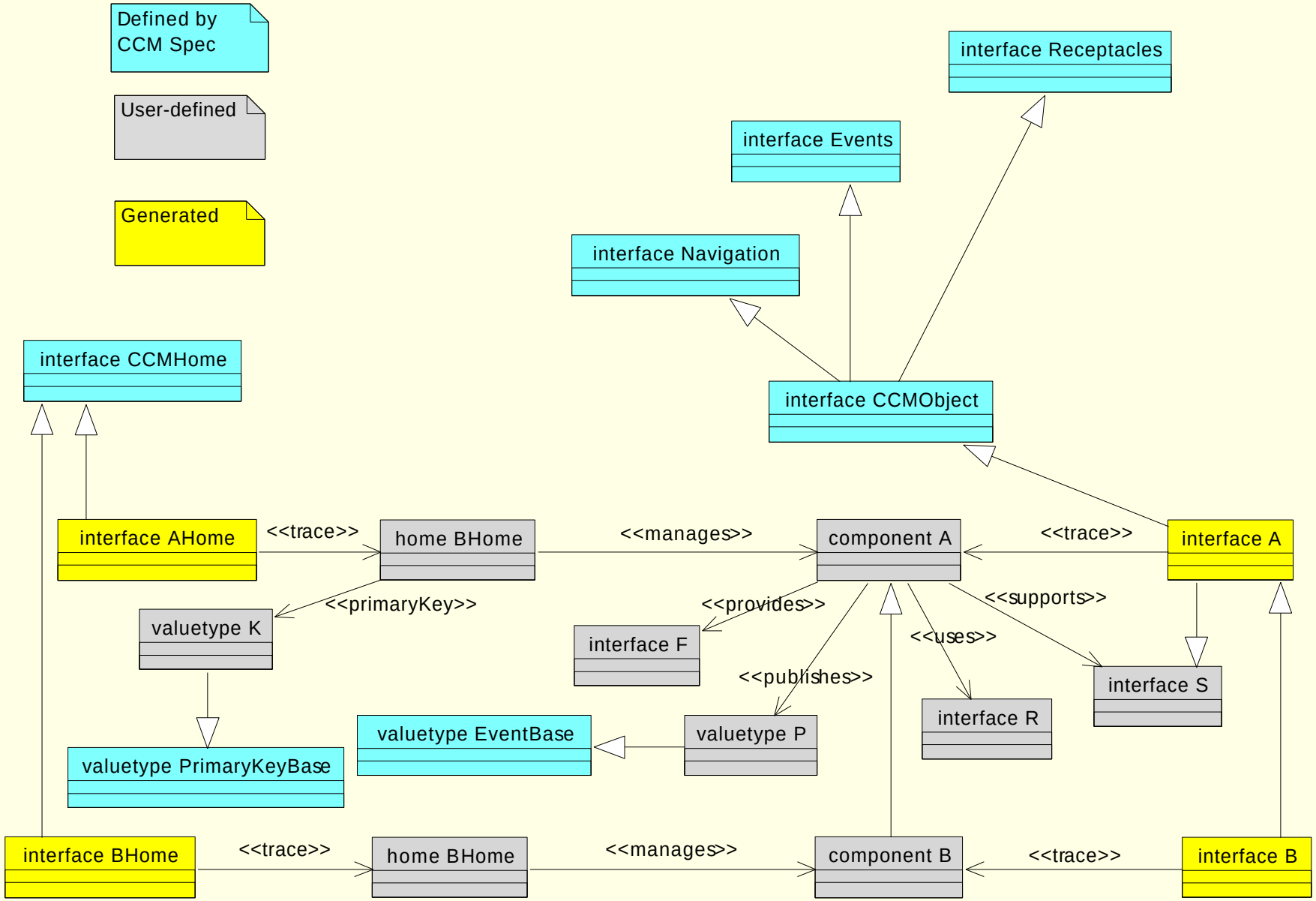
Mappings to Legacy IDL



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Home Operations Generated from Primary Key Declaration

<*component_type*> create (in <*key_type*> key);

<*component_type*> find_by_primary_key (in <*key_type*> key);

void remove (in <*key_type*> key);

<*key_type*> get_primary_key (in <*component_type*> comp);

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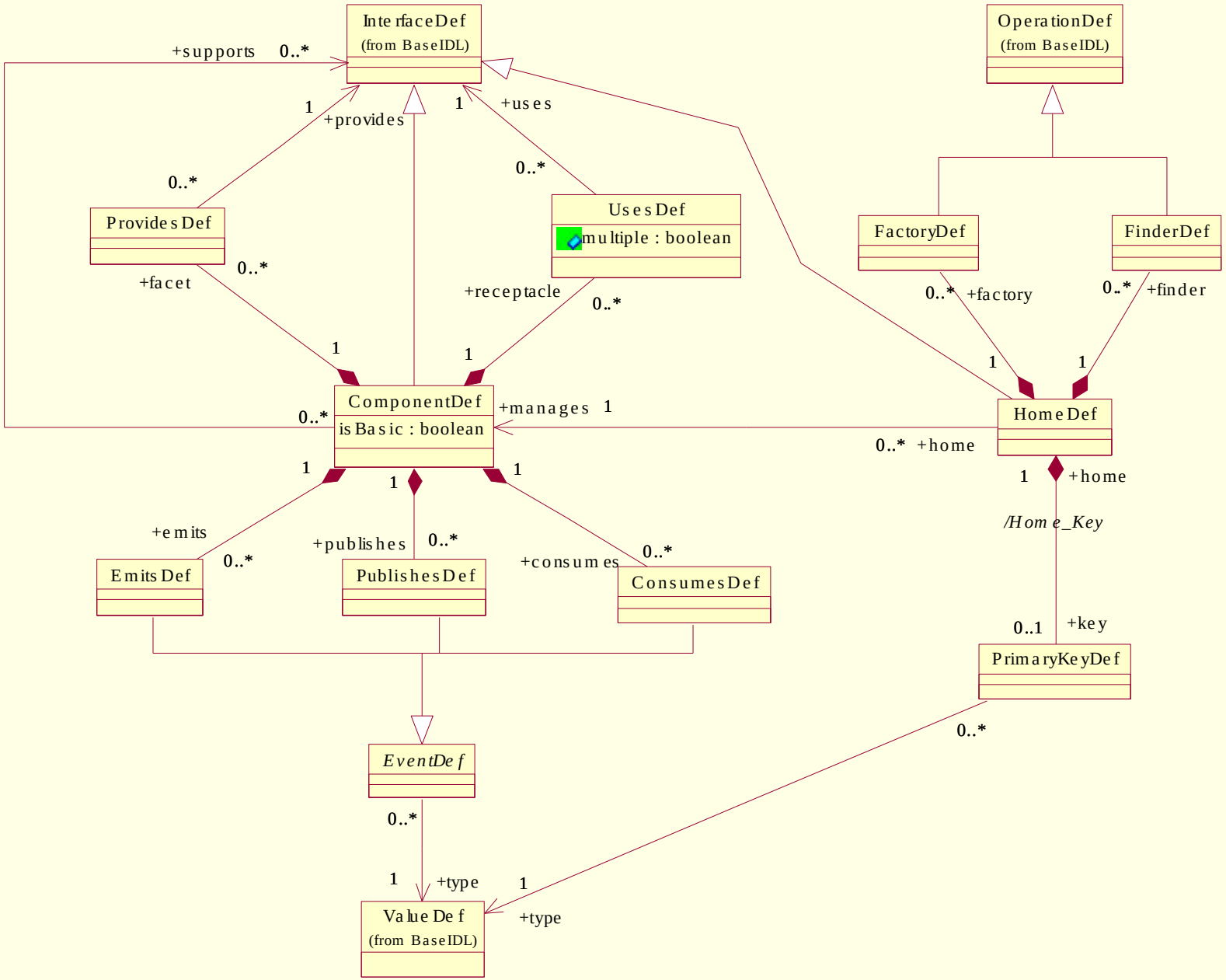
Metamodel of IDL Extensions



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Component Implementation Definition Language (CIDL)

```
import RenderableARUpdate;
import AcmeARUpdateHome;
composition service AcmeARUpdateComposition
{
   home executor AcmeARUpdateHomeImpl
   {
      implements AcmeARUpdateHome;
      manages AcmeARUpdateImpl;
   };
};
```

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Component Categories
Pre-Defined Lifecycle Characteristics

- **Service**
  - Behavior, no state beyond lifetime of transaction, no identity
  - Models single independent execution of an "operation"
  - Examples: CICS tx, "command object," MTS "stateless" component
- **Session**
  - Behavior, transient state, non-persistent identity
  - Models transient state for lifetime of client
  - Examples: iterator, MTS "stateful" component
- **Process**
  - Behavior, persistent state (not visible to client), persistent identity (visible to client only through user-defined operations)
  - Able to roll back its state changes
  - Models a long-lived business process (workflow)
  - Example: loan application
- **Entity**
  - "Uninteresting" behavior (attribute accessors and mutators), persistent state, identity via primary key
  - Models business entities in the real world with non-transient existence
  - Examples: customers, accounts
  - Able to roll back its state changes

Container API Categories

- Service
- Session
- Process
- Entity
- EJBSession
- EJBEntity

Basic vs. Extended Containers

- **Basic**
  - **Corresponds to EBJ 1.1 container functionality**
  - **Simple persistence (single segment), container manages objref creation**
- **Extended**
  - **Adds advanced persistence (multiple segments), event model, component involved in objref creation**

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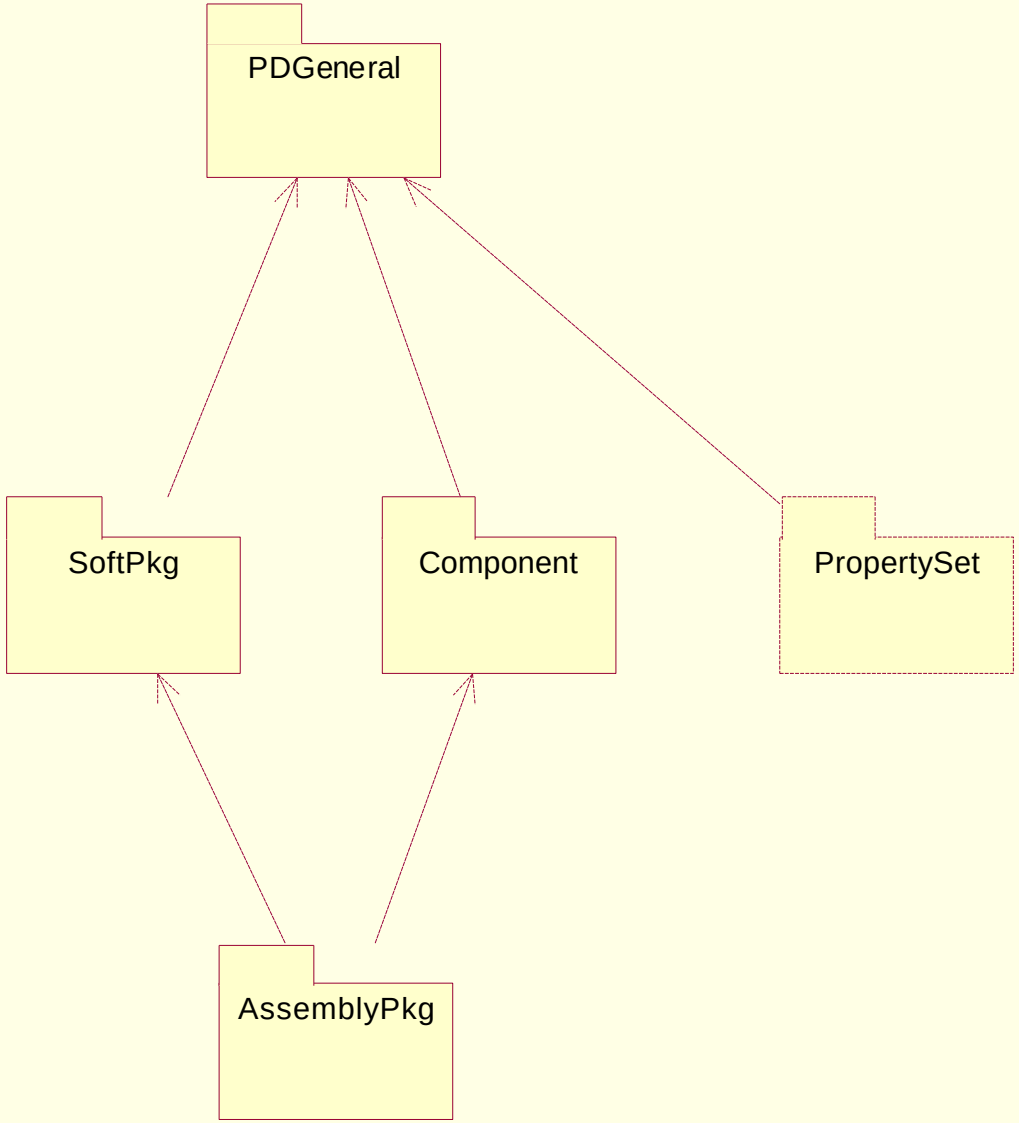
Packaging and Deployment Descriptors



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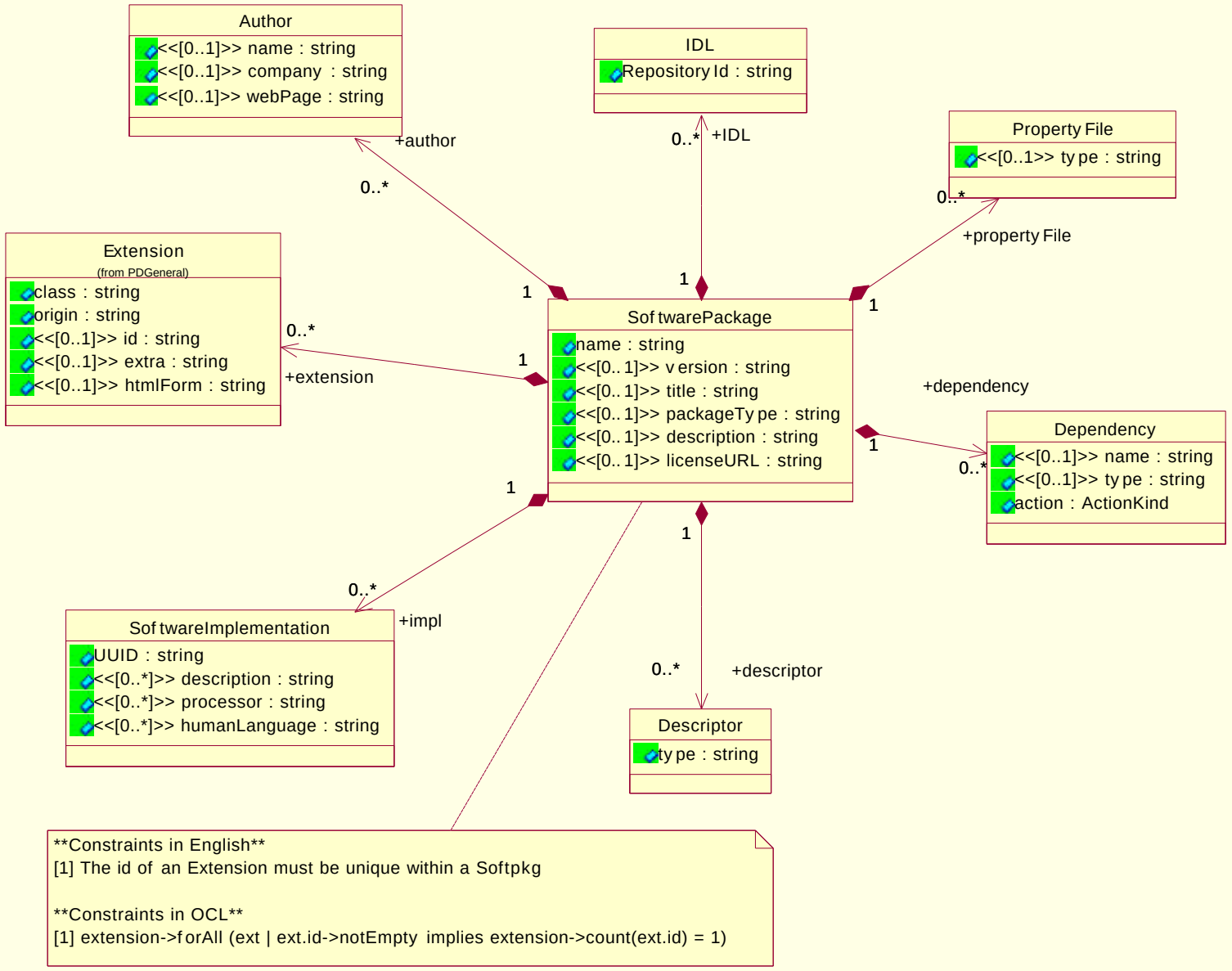
The Softpkg Descriptor



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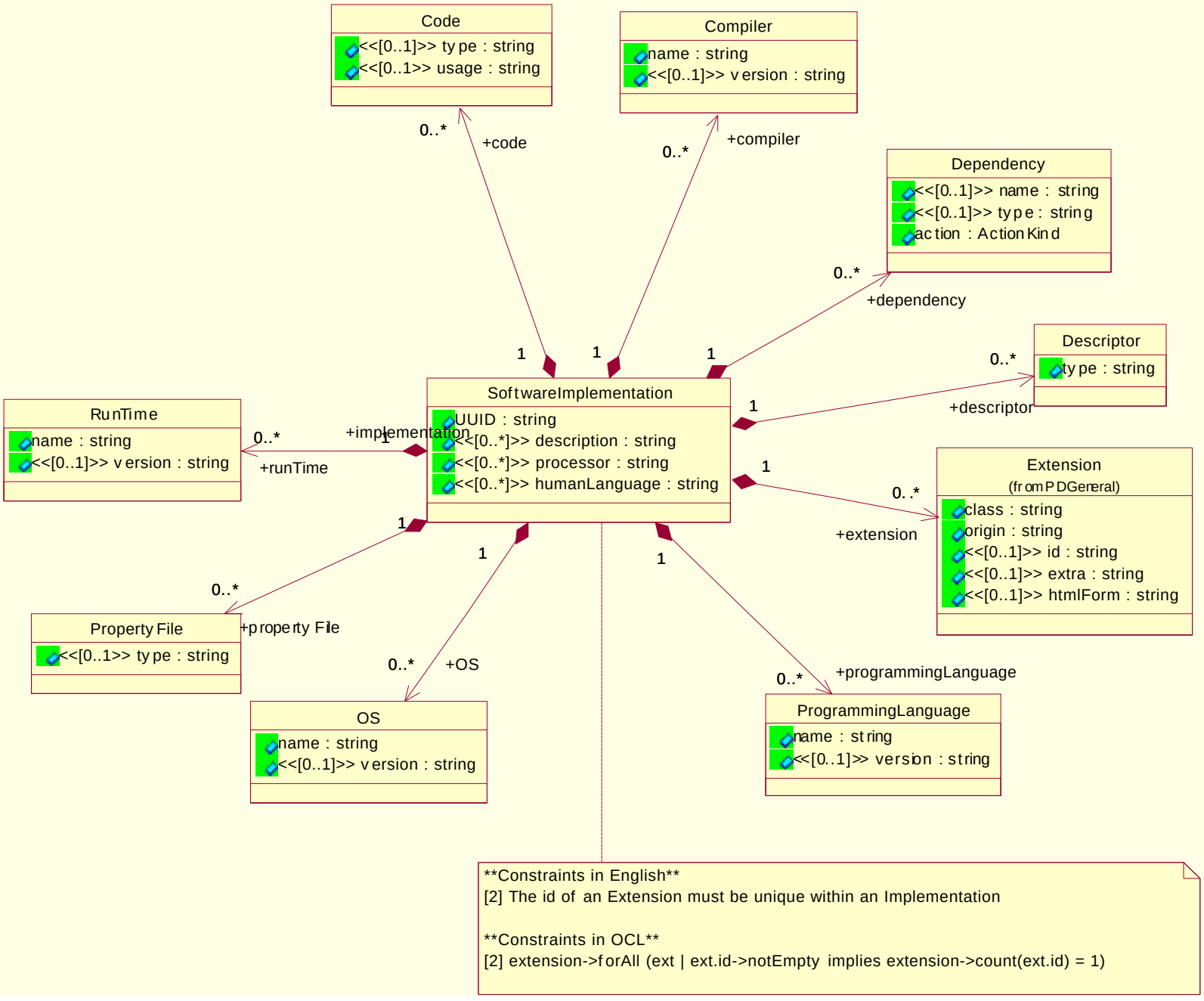
The Implementation Descriptor



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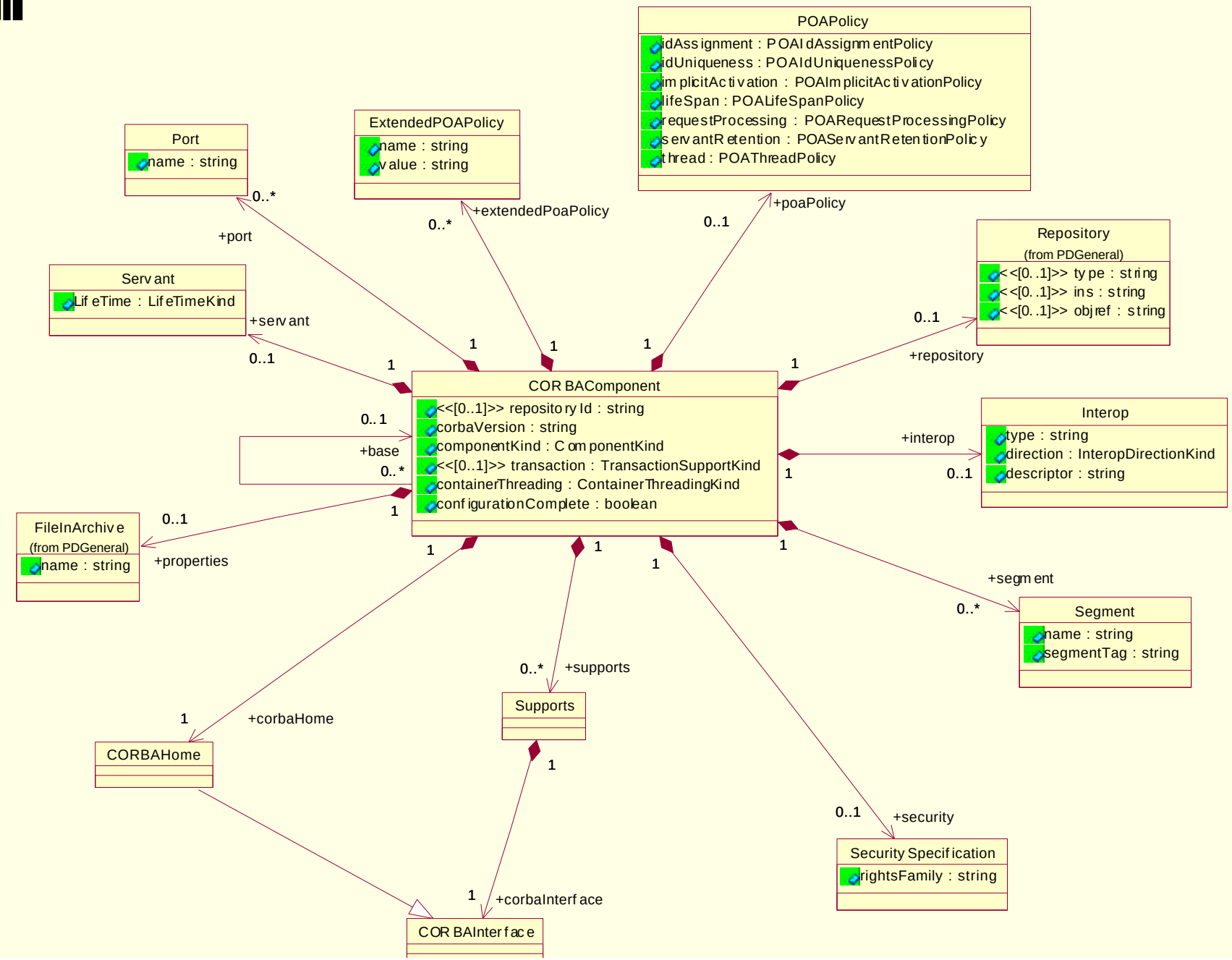
The Component Descriptor



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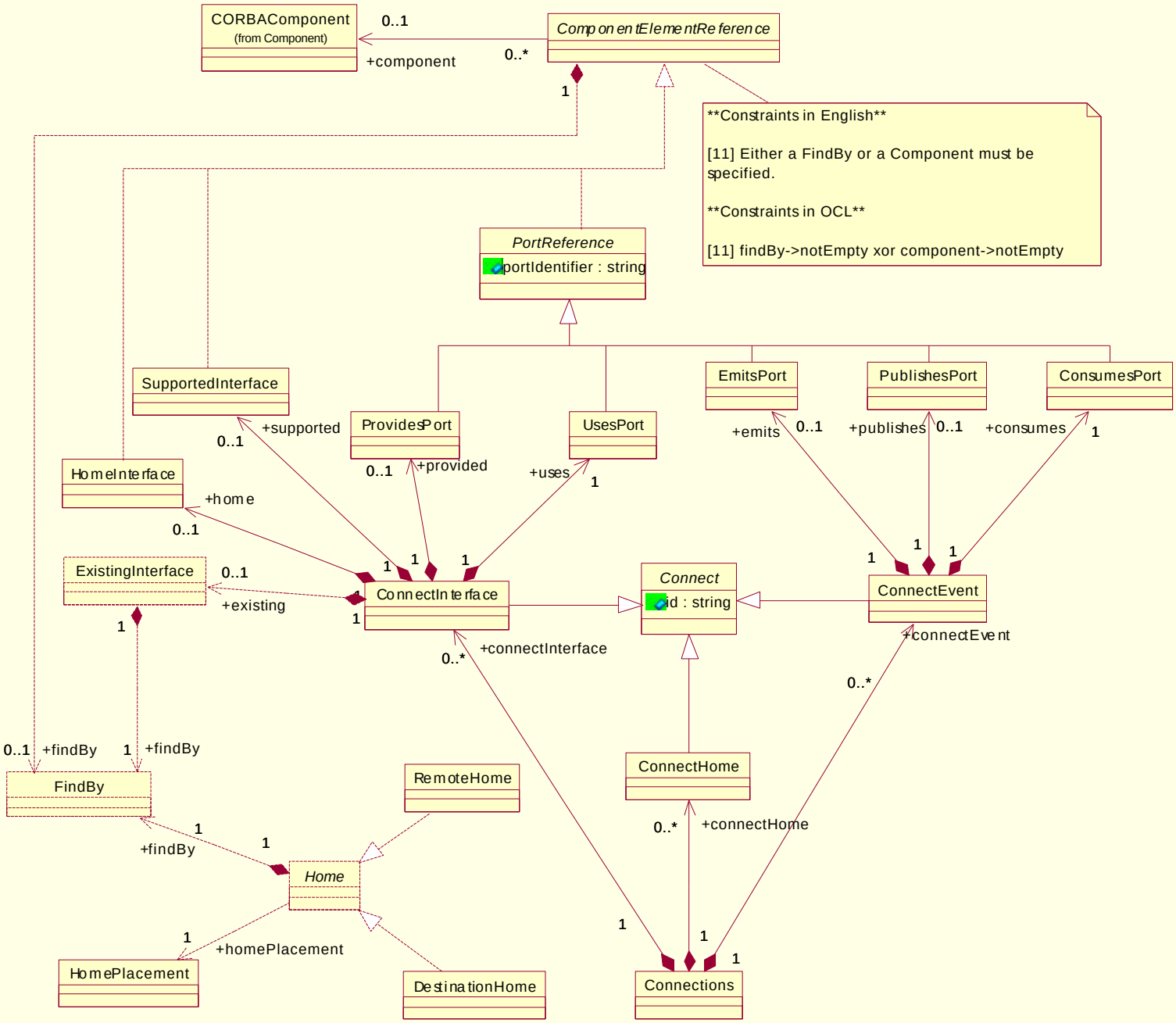
The Assembly Descriptor



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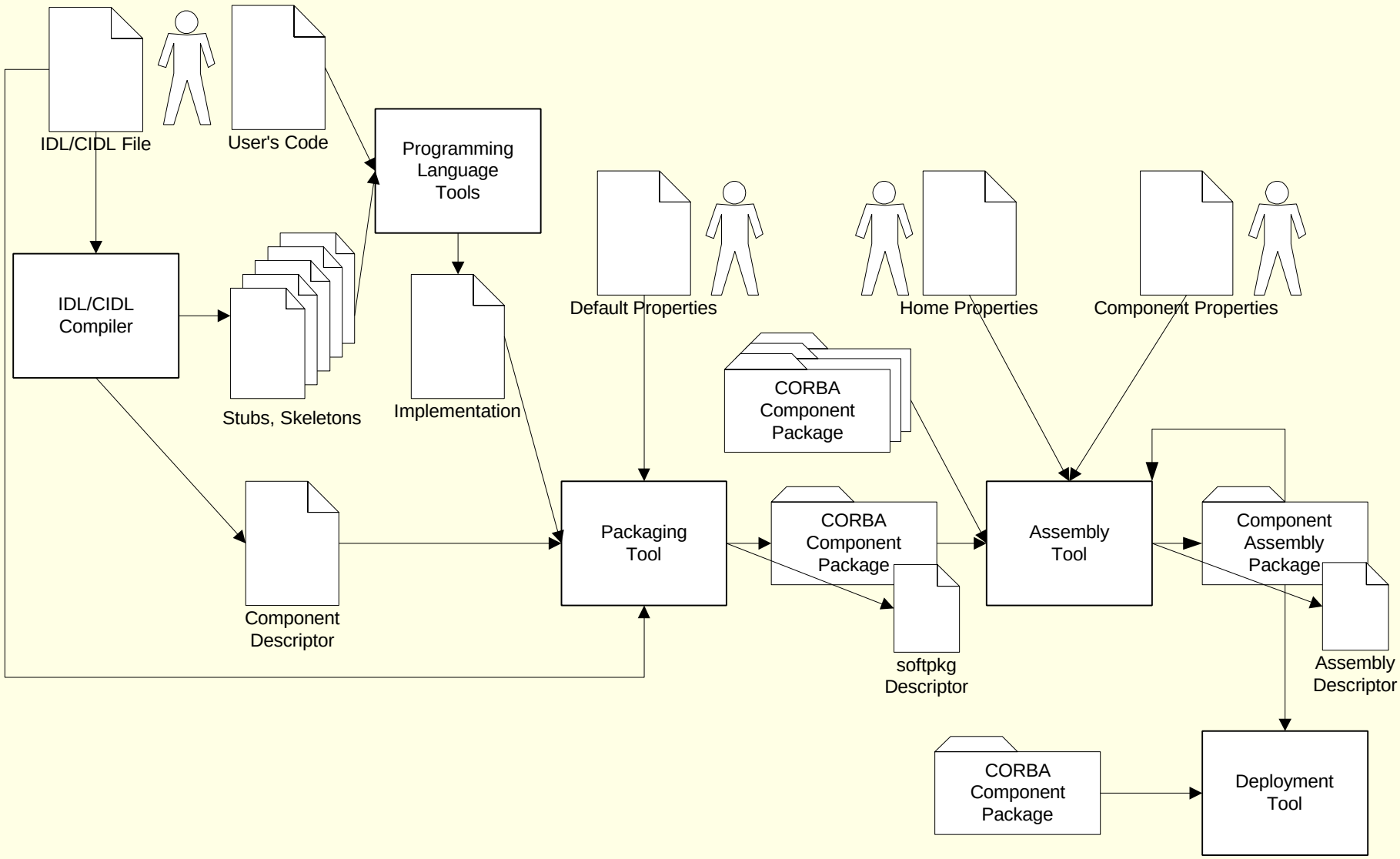
Typical Construction/Deployment Scenario



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Configuration APIs
Implemented by Installation/Assembly Tools

Points to location of component package

```
interface ComponentInstallation {
   boolean install(in string implUUID, in string component_loc) raises InvalidLocation;
   boolean replace(in string implUUID, in string component_loc) raises InvalidLocation;
   boolean remove(in string implUUID) raises UnknownImplId;
};
```

Points to location of assembly package

```
interface AssemblyFactory {
   Cookie create(in string assembly_loc) raises InvalidLocation;
   Assembly lookup(in Cookie c) raises InvalidAssembly;
   boolean destroy(in Cookie c) raises InvalidAssembly;
};

enum AssemblyState {INACTIVE, INSERVICE};

interface Assembly {
   boolean build();
   boolean tear_down();
   AssemblyState get_state();
};
```

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CCM Metamodels
MOF Compliance

- The OMG Metaobject Facility (MOF)
  - A concession to reality
  - Predicated on the realization that one grand metamodel is unrealistic
  - Instead, provides a modest set of common constructs for defining metamodels
  - The common constructs allow common tools to manage the storage, retrieval, and manipulation of models in metadata repositories

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Changes to ORB Core

- Directly related to components
  - The string, "ComponentHomeFinder" is added to the list of valid ObjectID values input to ORB::resolve_initial_references
  - New operation on CORBA::object
    - get_component
- General cleanup
  - Attributes can raise exceptions
  - Optional keyword "local" as modifier of interface
    - Local interfaces are CORBA object interfaces, but the resulting type cannot be marshaled or remotely invoked.
    - Intended to obviate the need for PIDL, and to formalize the current practice of defining special "locality-constrained" cases of CORBA interfaces
  - "import" <imported_scope> ;
    - Mechanism for importing external name scopes
    - Obviates need for doing so in terms of file scopes
    - <imported_scope> may be fully qualified scoped IDL name or a repository id
  - Repository id declaration
    - Portable, standard mechanism, obviates #pragmas
    - AB insisting on using repository ids for versioning

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CCM's Market Prospects

- Negatives
  - App server vendors already using EJB programming model
  - ORB vendor commitment to extended components is questionable
- Positives
  - The distributed component industry is still in a very early stage
    - Iona, Inprise, BEA, Component Broker comprise only a "first wave" of ORBs
  - There are dozens of in-house corporate ORBs
  - Need for interoperable, portable components with multiple interfaces and declarable events will increase over time
- User interests
  - The CCM standard is controlled by an open process
  - EJB controlled by one company
    - JSR process not nearly as open as OMG
  - Users should emphasize to Sun that EJB 2.0 should align with CCM
    - Just as CCM aligned with Java 1.1