

Unified Modeling Language (UML) FAQ From jGuru

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Location: <http://www.jguru.com/faq/UML>

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What is UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=926>

Created: Nov 12, 1999 Modified: 1999-12-23 13:01:08.093

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (<http://www.jguru.com/guru/viewbio.jsp?EID=13>)

The Unified Modeling Language (UML®) is a language for specifying, constructing, visualizing, and documenting the artifacts of a software-intensive system. Analogous to the use of architectural blueprints in the construction industry, UML provides a common language for describing software models, and it can be used in conjunction with a wide range of software lifecycles and development processes.

UML represents a unification and evolution of several of the object-oriented analysis and design methods that appeared in the late 1980's and early 1990's, particularly the Booch method (Grady Booch), the Object Modeling Technique (James Rumbaugh et al.) and Object-Oriented Software Engineering (Ivar Jacobson et al.). Adopted as a standard by the [Object Management Group](#) (OMG™) in late 1997, UML has been accepted by the software community as the primary notation for object-oriented analysis and design.

UML is a registered trademark of the Object Management Group, Inc.

Who developed UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=927>

Created: Nov 12, 1999 Modified: 1999-11-23 14:58:25.633

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (<http://www.jguru.com/guru/viewbio.jsp?EID=13>)

Numerous companies and individuals contributed to the development of UML including Rational Software, Microsoft, Hewlett-Packard, Oracle, and IBM. However, the primary leaders of the effort were Grady Booch, James Rumbaugh, and Ivar Jacobson (commonly referred to as the *Three Amigos*).

What is the current status of UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=928>

Created: Nov 12, 1999 Modified: 1999-11-23 14:59:16.226

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (<http://www.jguru.com/guru/viewbio.jsp?EID=13>)

The final draft for UML 1.3 was completed in June 1999 and should be formally approved by the [Object Management Group](#) (OMG) in the near future.

Comments and alternative answers

[UML 1.3 was adopted in November, 1999. The UML 1.4...](#)

[Brian Lyons](#), Feb 2, 2000

UML 1.3 was adopted in November, 1999. The UML 1.4 revision is currently scheduled to be completed in August 2000, and will likely be adopted 2-3 months afterwards.

There is already talk of the UML 2.0 RFP, but it has not been issued yet, so it is likely that UML 2.0 will be completed sometime in 2001. The word on the street is that UML 2.0 will involve a significant change to the underlying metamodel.

Who are the *Three Amigos*?

Location: <http://www.jguru.com/faq/view.jsp?EID=929>

Created: Nov 12, 1999 Modified: 1999-11-23 15:00:10.989

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (http://www.jguru.com/guru/viewbio.jsp?EID=13)

Grady Booch, James Rumbaugh, and Ivar Jacobson, leaders of the method unification effort that led to the creation of UML, are commonly referred to as the *Three Amigos*.

Where can I find out more about UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=930>

Created: Nov 12, 1999 Modified: 2000-08-25 09:58:05.853

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (http://www.jguru.com/guru/viewbio.jsp?EID=13)

The web site for the [UML Revision Task Force](#) contains the latest information and downloads with respect to UML updates. Other valuable links include Rational's [UML Resource Center](#), OMG's [UML Resource Page](#), and Cris Kobryn's [UML Resource Page](#). To learn more about UML, check out the books and articles listed in the Object-Oriented Analysis and Design section of this [bibliography](#) on object technology.

Comments and alternative answers

□ [The cetus UML Links page \(http://www.cetus-links.o...](#)

[Brian Lyons](#), Feb 2, 2000

The cetus UML Links page (http://www.cetus-links.org/oo_uml.html) has dozens and dozens of links. There is information here for the beginner and for the master.

□ [how to start learning rational rose](#)

[jeetendra patil](#), Feb 23, 2001

how to start learning rational rose

Are there Web-specific elements of the UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=11073>

Created: Feb 3, 2000 Modified: 2000-02-03 08:38:40.91

Author: [Brian Lyons](http://www.jguru.com/guru/viewbio.jsp?EID=10952) (http://www.jguru.com/guru/viewbio.jsp?EID=10952)

UML is a general language designed to support numerous software languages and technologies. But the designers of the language have provided mechanisms for organizations to extend the language for particular needs.

While the OMG provides no officially sanctioned extensions, there are some out there. As they are just exercising the extension mechanisms provided, they are still valid UML.

Jim Conallen has authored a book entitled [Building Web Applications with UML](#) (ISBN: 0201615770) and provides much of the information from the book online at: <http://www.conallen.com/technologyCorner/webextension/welcome.html>

Sun is working on a Java Specification Request (JSR) for UML/EJB mapping. There is information on it here: http://web2.java.sun.com/aboutJava/communityprocess/jsr/jsr_026_uml.html

Are there any Computer-Aided Software Engineering (CASE) tools that support UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=12384>

Created: Feb 8, 2000 Modified: 2000-07-08 05:48:24.609

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (http://www.jguru.com/guru/viewbio.jsp?EID=13)

There are a number of CASE tools that provide varying levels of support for UML including creating and managing UML diagrams, code generation to various languages, and reverse engineering of source code into UML. Here is a partial list of sources.

Product	Company
Argo/UML (Free)	Tigris
Rational Rose 2000	Rational Software
GDPro	Advanced Software Technologies
SELECT Enterprise	Princeton Softech
Together	TogetherSoft
With Class	MicroGold
System Architect 2001	Popkin Software
Platinum Paradigm Plus	Computer Associates
Software through Pictures/UML	Aonix
Visio 2000	Microsoft
MagicDraw UML	No Magic
Visual UML	Visual Object Modelers
UMLStudio	PragSoft
JVISION	Object Insight
SoftModeler	Softera
UML Studio	Stingray (Rogue Wave)
Objectteering/UML	SOFTEAM
MetaEdit+	MetaCase Consulting

(Note: Just about every product in this table is trademarked.)

Comments and alternative answers

[The company I work for, ProxySource, has a free UML...](#)

[Dave Rosen](#), Feb 23, 2001

The company I work for, ProxySource, has a free UML design tool called ProxyDesigner. Here are the details:

Product	Company
ProxyDesigner (free)	ProxySource.com

What tools are good for generating UML diagrams from Java class definitions?

Location: <http://www.jguru.com/faq/view.jsp?EID=12386>

Created: Feb 8, 2000 Modified: 2000-02-08 08:02:51.942

Author: [John Moore](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=13>) Question originally posed by [John Zukowski](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=7>)

There are a number of tools for working with UML, and most of them support both Java code generation from UML diagrams and reverse engineering into UML from Java source code or Java byte code. See the [related question](#) in this FAQ on UML tools.

Comments and alternative answers

All the tools in the related question are full-fledged...

Johannes Brodwall, Aug 15, 2000

All the tools in the related question are full-fledged CASE tools, which I find to be of questionable usefulness. I know that [JRefactory](#) can generate class diagrams from source code without involving a gigantic framework. Are there other tools with a similiar function?

What are parameterized classes in UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=29392>

Created: Mar 28, 2000 Modified: 2000-03-28 18:52:08.204

Author: [John Moore](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=13>) Question originally posed by [anantha chary](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=18544>)

Some object-oriented languages such as C++ and Ada support the concept of parameterized classes. C++ calls this facility “templates”, and Ada calls it “generics”; UML uses the C++ term. Java does not currently support the concept of parameterized classes, but it is a topic of research and is being considered for future versions of Java. See, for example, [JSR-000014 Add Generic Types To The Java Programming Language](#) and [A Generic Java Language Extension](#).

To understand templates, suppose that you have an application where you need a list of objects of class Customer. In Java, you could create a list (e.g., using `LinkedList`) and then put customers on the list, but the list itself is not restricted to objects of class Customer; i.e., no type checking is performed when objects are added to the list. You could create an object of another class, say `Company`, and then add that object to the list. Furthermore, the list is actually a list of `Objects`, so if you remove an object from the list you must cast it to an appropriate type in order to perform meaningful operations. You could, of course, create a new class, say `CustomerList`, which would only allow objects of class `Customer` and which would return objects of class `Customer`, and this new class could be implemented using a Java `LinkedList` object in its private fields. But creating a whole new class which implements all of the `List` functionality just for `Customers` would be a lot of work. And what if you also wanted a list of `Company` objects? Templates would greatly simplify the creation of these specialized classes.

Using pseudocode with a C++/Java-like syntax, we might declare a `List` template as follows:

```
template <class Element>
public class List
{
    // ...

    public void add(Element e)
    {
        ...
    }

    public Element get(int index)
    {
        ...
    }

    public boolean isEmpty()
    {
        ...
    }

    ... // other List methods
}
```

Notice that many of the list operations are defined in terms of a type parameter called `Element`. Notice also that the template doesn't actually define a class, but it defines a way of creating a class based on a given `Element` type. In order to use a template, we must first create a class

based on the template, a process commonly referred to as instantiation, and then use the newly created list class for creating list objects. Some languages allow both of these steps to be combined in a single statement. Again using a C++/Java like syntax, we might use the above template as follows:

```
// instantiate the template List class for Customers
class CustomerList = new List<Customer>;

// create an object of class CustomerList
CustomerList custList = new CustomerList();

// create a new customer object
Customer c = new Customer();

... // do something with the customer object

// put the customer on the list
custList.add(c)
```

Many useful classes (e.g., list) and algorithms (e.g., sort) have the property that the types of objects they work with are not important to their overall purpose. Templates provide a mechanism which retains all of the benefits of strong typing but allow parameterization of classes by types.

Where can I get UML diagrams for the core Java packages?

Location: <http://www.jguru.com/faq/view.jsp?EID=34016>

Created: Apr 9, 2000 Modified: 2000-04-12 18:53:36.459

Author: [John Zukowski](http://www.jguru.com/guru/viewbio.jsp?EID=7) (http://www.jguru.com/guru/viewbio.jsp?EID=7)

Java Report has a version online available at

<http://www.javareport.com/java2interactive/index.html> for the 1.2 version of Java.

What is aggregation?

Location: <http://www.jguru.com/faq/view.jsp?EID=46339>

Created: May 8, 2000 Modified: 2000-05-08 19:03:34.709

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (http://www.jguru.com/guru/viewbio.jsp?EID=13)

Aggregation is a special kind of association that specifies a whole/part relationship between the aggregate (whole) and a component part. When compared to an ordinary association, some distinguishing characteristics of aggregation include:

- aggregation is an asymmetric relationship
- aggregation is a transitive relationship
- aggregation implies stronger coupling
- behavior (copy, delete, etc.) is normally propagated across an aggregation.

Since aggregation is not symmetric, it is important to visually distinguish which class is the aggregate and which is a component part. Therefore UML adorns the association line with a small open diamond at the aggregate end.

The decision to use aggregation is largely a matter of judgement. James Rumbaugh suggests that, when in doubt, use an ordinary association.

Is there an official UML certification process?

Location: <http://www.jguru.com/faq/view.jsp?EID=47131>

Created: May 10, 2000 Modified: 2000-05-10 18:39:34.527

Author: [Steven Newton](http://www.jguru.com/guru/viewbio.jsp?EID=44606) (http://www.jguru.com/guru/viewbio.jsp?EID=44606) Question originally posed by [Meadowlark Bradsher](http://www.jguru.com/guru/viewbio.jsp?EID=16913) (http://www.jguru.com/guru/viewbio.jsp?EID=16913)

Depending on what you mean by "official", there are some initiatives towards testing for competency in object-oriented design and analysis, and the UML is part of the package. Sun's Level II Certified Solution Developer test and IBM's Object-Oriented Analysis and Design Test both show knowledge of UML as part of the objectives.

Take a look at these websites:

- [Object-Oriented Analysis and Design Test](#)
- [Certified Solution Developer](#)
- [UML Certification](#)

Comments and alternative answers

[The IBM certification test 089 \(indicated in the O...](#)

[John Moore](#), Jul 3, 2000

The IBM certification test 089 (indicated in the Object-Oriented Analysis and Design link above) has been replaced by test 886. See <http://www-4.ibm.com/software/ad/certify/edu486c.html> for a description of the new test.

What is the difference between composition and aggregation?

Location: <http://www.jguru.com/faq/view.jsp?EID=51520>

Created: May 18, 2000 Modified: 2000-05-18 18:18:30.382

Author: [John Moore](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=13>)

Both aggregation and composition are special kinds of associations. Aggregation is used to represent ownership or a whole/part relationship, and composition is used to represent an even stronger form of ownership. With composition, we get coincident lifetime of part with the whole. The composite object has sole responsibility for the disposition of its parts in terms of creation and destruction. In implementation terms, the composite is responsible for memory allocation and deallocation

Moreover, the multiplicity of the aggregate end may not exceed one; i.e., it is unshared. An object may be part of only one composite at a time. If the composite is destroyed, it must either destroy all its parts or else give responsibility for them to some other object. A composite object can be designed with the knowledge that no other object will destroy its parts.

Composition can be used to model by-value aggregation, which is semantically equivalent to an attribute. In fact, composition was originally called *aggregation-by-value* in an earlier UML draft, with "normal" aggregation being thought of as *aggregation-by-reference*. The definitions have changed slightly, but the general ideas still apply. The distinction between aggregation and composition is more of a design concept and is not usually relevant during analysis.

Finally, a word of warning on terminology. While UML uses the terms *association*, *aggregation*, and *composition* with specific meanings, some object-oriented authors use one or more of these terms with slightly different interpretations. For example, it is fairly common to see all three UML relationships grouped under a single term, say *composition*, and then to discuss object-oriented relationships as being either inheritance (generalization) or composition.

Comments and alternative answers

[For more clear understanding](#)

[Wang bin](#), May 2, 2001

Pls give some examples. Thanks

How do I represent a thread in UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=56322>

Created: May 24, 2000 Modified: 2000-05-24 19:38:08.19

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (http://www.jguru.com/guru/viewbio.jsp?EID=13) Question originally posed by [Ajatashatru Singh](http://www.jguru.com/guru/viewbio.jsp?EID=54310) (http://www.jguru.com/guru/viewbio.jsp?EID=54310)

In class diagrams you could elect to show that a class extends class `Thread` (using a generalization relationship) or that it implements interface `Runnable` (using either the “lollipop” notation or a realization relationship), but UML has the concept of an *active class* just for this purpose. Graphically, the rectangle for an active class uses thick lines for its border, and it can be annotated with one of two predefined UML stereotypes for active classes – `process` and `thread`. For Java threads, I would use the active class notation with the `thread` stereotype.

Other UML features which can be useful for representing thread-related information include:

- Operations (i.e., method declarations) can be stereotyped as `concurrent`, which is equivalent to Java's `synchronized` property.
- State diagrams in UML support the concept of concurrent substates.
- Interaction diagrams (the UML name which encompasses both sequence diagrams and collaboration diagrams) allow the specification of asynchronous messages.
- Activity diagrams use a synchronization bar to specify forking and joining of concurrent activities.

Are there any good books out on UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=60073>

Created: May 31, 2000 Modified: 2000-05-31 18:28:49.974

Author: [John Zukowski](http://www.jguru.com/guru/viewbio.jsp?EID=7) (http://www.jguru.com/guru/viewbio.jsp?EID=7)

The definitive guides are from Grady Booch, Jim Rumbaugh, and Ivar Jacobson:

- [The Unified Modeling Language User Guide](#)
- [The Unified Modeling Language Reference Manual](#)
- [The Unified Software Development Process](#)

In addition, you may find the Martin Fowler / Kendall Scott [UML Distilled](#) book of use.

Comments and alternative answers

[There is also a book called Instant UML by Pierre-Alain...](#)

[Patrick Shugart](#), Jun 6, 2000

There is also a book called *Instant UML* by Pierre-Alain Muller (Wrox Press, 1997). We used it in my Information System Design course at school.

How can I represent an exception in UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=62790>

Created: Jun 2, 2000 Modified: 2000-06-02 04:49:28.831

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (http://www.jguru.com/guru/viewbio.jsp?EID=13) Question originally posed by [Ajatashatru Singh](http://www.jguru.com/guru/viewbio.jsp?EID=54310) (http://www.jguru.com/guru/viewbio.jsp?EID=54310)

In class diagrams, Java programmers could use a generalization relationship to show that a class extends one of the classes in the `Throwable` hierarchy such as `Exception`, but a better approach would be to use UML's stereotype notation with the keyword *exception* as the stereotype enclosed in guillemets, as in «*exception*». This notation would also work well with languages such as C++, where there is no specific generalization hierarchy required for an exception class. If your diagramming tool supports it, you could also use color coding for exception classes or designate a special exception icon to be used for this stereotype.

Additionally, if this level of detail is desired, you could use a dependency stereotyped as

«throws» to associate specific methods with the exception class, or you could use an additional exception compartment within the class rectangle which lists the exceptions associated with that class. Finally, you could use a message stereotyped as «throw» in a sequence diagram or collaboration diagram to indicate the active throwing and catching of an exception.

Note that UML treats exceptions as kind of signal, but I prefer using terminology more specific to that of exceptions.

What process should I follow for object-oriented analysis and design?

Location: <http://www.jguru.com/faq/view.jsp?EID=69075>

Created: Jun 8, 2000 Modified: 2000-06-08 17:42:39.886

Author: [Vibhu Srinivasan](http://www.jguru.com/guru/viewbio.jsp?EID=31125) (http://www.jguru.com/guru/viewbio.jsp?EID=31125) Question originally posed by [Ajatashtru Singh](http://www.jguru.com/guru/viewbio.jsp?EID=54310) (http://www.jguru.com/guru/viewbio.jsp?EID=54310)

There are a number of different ways whereby you can perform OO analysis and design. Outlined here are some steps (process) which have been used by me for object analysis and design

The whole process follows a well known approach called incremental iterative development. So what does that mean?

This approach differs from the traditional waterfall approach. In this approach the software is developed in increments. New functionality is added during every increment. There is a very fine line as to what is an increment and what is an iteration. Basically you iterate a number of times in an increment. An increment is typically for a small period, say a few weeks, depending on the project. Each increment goes through

Use Case Analysis-> OO Analysis & Design--> Coding --> Testing--> Refactoring (Order need not be strictly followed)

1) Use Case Analysis. This is a requirements gathering phase where use cases are written. A discovery phase to see what you have to do. For more on use cases check out the website by a well known use case specialist Alistair Cockburn.

<http://members.aol.com/acockburn/>

2) OO Analysis and Design. Here you take a subset of use cases and start identifying the object model. UML notation is a very powerful way of coming up with this model. Use tools like whiteboard (a lot), Visio for UML drawing for class, sequence diagrams etc.

You have three levels of object modelling as per Martin Fowler: Conceptual, Specification, and Implementation. For more of this check out

www.martinfowler.com

3) Then you go through coding and unit testing at code level. Testing should drive the coding process. First you write test cases and then write code to pass those test cases. A OOD framework for java projects is junit.

In the end do refactoring.

Check out www.refactoring.com

Comments and alternative answers

□ [There is one book which we recommend that contains...](#)

[Stuart Zakon](#), Nov 20, 2000

There is one book which we recommend that contains a full description of a process/methodology built around the UML. The book is ***Applying UML and Patterns*** by Craig Larman.

For a detailed review, please see: http://www.objectsbydesign.com/books/applying_uml.html

IBM has chosen this book as the recommended preparation for their UML certification exam, and Martin Fowler recommends Larman's book in his own *UML Distilled*.

Where can I find out more about the Rumbaugh Method?

Location: <http://www.jguru.com/faq/view.jsp?EID=91694>

Created: Jun 30, 2000 Modified: 2000-06-30 04:15:12.803

Author: [John Moore](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=13>) Question originally posed by [Menasria samir](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=90305>)

Details of the Rumbaugh method, more formally known as the Object Modeling Technique (OMT), are contained in the following two books:

[Rumbaugh 1991] J. Rumbaugh, M. Blaha, W. Premerlani, F. Eddy, and W. Lorenzen, *Object-Oriented Modeling and Design*, Prentice-Hall, 1991.

[Rumbaugh 1996] James Rumbaugh, *OMT Insights: Perspectives on Modeling from the Journal of Object-Oriented Programming*, SIGS Books (Cambridge University Press), 1996.

You should also be aware that James Rumbaugh was one of the creators of the Unified Modeling Language (UML), which has largely superseded OMT.

Where can I find help (suggested readings, mock exams, links, etc.) in preparing for the IBM certification test *OOA&D in UML (test 486)*?

Location: <http://www.jguru.com/faq/view.jsp?EID=94233>

Created: Jul 3, 2000 Modified: 2000-07-03 06:54:30.861

Author: [John Moore](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=13>) Question originally posed by [Hiep Dotrong](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=93153>)

IBM provides suggested readings, a practice exam, and other resources – see <http://www-4.ibm.com/software/ad/certify/edu486c.html>. Also, check out the OOA&D and Patterns sections of my Object-Oriented Bibliography at <http://www.softmoore.com/OOBibliography.html>.

Comments and alternative answers

□ [Also, you may see Objects by Design's overview of the...](#)

[Stuart Zakon](#), Aug 2, 2000

Also, you may see Objects by Design's overview of the IBM certification test and our preparation recommendations. See <http://www.objectsbydesign.com/tools/certification.html>.

What is an association class?

Location: <http://www.jguru.com/faq/view.jsp?EID=100819>

Created: Jul 12, 2000 Modified: 2000-07-12 19:20:10.403

Author: [John Moore](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=13>)

An association class is used to model an association as a class. Association classes often occur in many-to-one and many-to-many associations where the association itself has attributes.

As an example, consider a many-to-many association between classes Person and Company. The association could have properties; e.g., salary, jobClassification, startDate, etc. In this case, the association is more correctly modeled as an association class with attributes rather than trying to fold the attributes into one of the classes in the association.

An association class is rendered by a dashed line from the association to the class rectangle. Each link in the association is an object of the association class. An association class is essentially a class attached to an association; the association itself is modeled as a class.

Here are some pointers to consider when modeling with association classes:

1. You can't attach the same class to more than one association; an association class **is** the association.
2. The name of the association is usually omitted since it is considered to be the same as that of the attached class.
3. Distinguish between the use of an association class as a modeling technique and the implementation of the association class. There can be several ways to implement an association class.

Comments and alternative answers

[Can someone provide an example implementation of an...](#)

[Mario L. Peralta](#), Aug 14, 2000

Can someone provide an example implementation of an association class?

[I usually implement an association class in following...](#)

[Andrei Lopatenko](#), Sep 4, 2000

I usually implement an association class in following way. If we have relations between Persons and Classes then I declare (in a simplest way)

```
interface CanBeAssociated {
    public addAssociation(Association assoc);
}

class Person implements CanBeAssociated{
    ...
    private Vector Associations;
    public addAssociation(Association assoc){
        ...
    }
}

class Class implements CanBeAssociated{
    private Vector Associations;
    public addAssociation(Association assoc){
        ...
    }
}

class cAssociation extends UML.Association {
    addSource(CanBeAssociated source) {
        ...
        source.addAssociation(this);
    }
    addTarget(CanBeAssociated target) {
        ...
    }
}
```

```

        target.addAssociation(this);
    }
}

```

For associations I create

```

obj assoc = new cAssociation();
assoc.addSource(person1);
assoc.addTarget(class1);
assoc.addTarget(class2);
...

```

Of course this is only a sketch.

[Can association classes, and associations in general,...](#)

[fred rosenberg](#), Jan 30, 2001

Can association classes, and associations in general, be implemented in EJB?

How do I model the static and a dynamic aspects of the User Interface of a system?

Location: <http://www.jguru.com/faq/view.jsp?EID=110835>

Created: Jul 25, 2000 Modified: 2000-07-25 19:10:40.393

Author: [Nilanjan Sengupta](http://www.jguru.com/guru/viewbio.jsp?EID=109891) (http://www.jguru.com/guru/viewbio.jsp?EID=109891) Question originally posed by [Jean Tessier](http://www.jguru.com/guru/viewbio.jsp?EID=105071) (http://www.jguru.com/guru/viewbio.jsp?EID=105071)

Static aspects of the user interface can be modelled by identifying *boundary classes*. The candidate classes are generally identified from sequence and collaboration diagrams. Among the candidate UI classes are all the objects which are directly interacted upon by the actor. These boundary classes represent the static aspects of your GUI development.

The dynamic nature of your GUI can be depicted in your sequence and collaboration diagrams. Sequence diagrams capture the dynamic nature of your object interactions over a certain period of time, while collaboration diagrams depict the behavior of objects in the context of various other associated objects.

How would you use UML to model multiple relationships between the same two classes? For example, an employee has both a permanent address and a temporary address.

Location: <http://www.jguru.com/faq/view.jsp?EID=124085>

Created: Aug 10, 2000 Modified: 2000-08-12 04:42:05.872

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (http://www.jguru.com/guru/viewbio.jsp?EID=13) Question originally posed by [tom joseph](http://www.jguru.com/guru/viewbio.jsp?EID=111563) (http://www.jguru.com/guru/viewbio.jsp?EID=111563)

One way to show this is to simply use multiplicity on the relationship – an employee is "has" one or two addresses, as shown in the following class diagram:



But if it is important to show that one address is temporary and one is permanent, then a better way to model this would be to use two separate relationships with rolenames, as indicated below.



This second diagram would correspond more closely to the following code fragment:

```
public class Employee
{
    private Address permanantAddress;
    private Address temporaryAddress;

    //...
}
```

Note that this second approach is practical only when the maximum multiplicity is small.

Comments and alternative answers

[The second model can be preferred if you want to be... sreether ganges](#), Sep 1, 2000

The second model can be preferred if you want to be more accurate and treat the association between a member and his permanent address as Composition (a filled diamond) as opposed to a simple aggregation, and the member could treat the temporary address as a mere association. Home would be a good example of Permanent Address and the Client place where one works would be a good example of Temporary Address.

[Actually, I wouldn't use either approach. Not... Paul Reed](#), Oct 10, 2000

Actually, I wouldn't use either approach. Not that they are bad, but they are restrictive. What may be one person's shipping address may be another person's mailing address. In this case, I would have 3 classes – Person, Address, and perhaps Locale. Locale would be an association class defining the association between Person and Address. This class would also define the type of address it is (shipping, mailing, etc.).

OOAD helps us in breaking down a problem domain into, so to speak, a set of classes that collaborate to provide a solution. These set of classes collaborate thru method calls. OOAD does not, however, provide us with any techniques that can be used to help us think thru the implementations for these methods. One of the techniques that comes to mind is flow charts. Are there any others? Can you suggest any literature (books, websites, etc)?

Location: <http://www.jguru.com/faq/view.jsp?EID=214930>

Created: Sep 25, 2000 Modified: 2000-09-25 19:38:49.855

Author: [Siva Visveswaran](http://www.jguru.com/guru/viewbio.jsp?EID=46210) (http://www.jguru.com/guru/viewbio.jsp?EID=46210) Question originally posed by [Amar Gunda](http://www.jguru.com/guru/viewbio.jsp?EID=111878) (http://www.jguru.com/guru/viewbio.jsp?EID=111878)

There are *at least* two schools of thoughts here:

1. If you talk to XP (eXtreme Prgoramming)folks they'll scoff at the idea of having any abstractions other than the code itself. To a large extent they may be right because beyond a certian level (of abstraction) models become useless, and the code is both the detailed design & the documentation. You can go the XP sites for more information.
2. If instead you take a more conventional approach, a Visio chart or even an Activity diagram (that UML provides) will help you work at that level.

How should a boundary object be implemented in the Java language?

Should it be implemented as:

1. An ordinary class that contains public functions that pass parameters to a Control Object?
2. An interface class that contains predefined functions that will be implemented by the control object?
3. Something else?

Location: <http://www.jguru.com/faq/view.jsp?EID=226303>

Created: Oct 10, 2000 Modified: 2000-10-11 19:31:12.668

Author: [Paul Reed](http://www.jguru.com/guru/viewbio.jsp?EID=226283) (http://www.jguru.com/guru/viewbio.jsp?EID=226283) Question originally posed by [Mohd Hatta](http://www.jguru.com/guru/viewbio.jsp?EID=107007) (http://www.jguru.com/guru/viewbio.jsp?EID=107007)

My boundary classes are ordinary classes that have an association with what I call a use case controller class. It is the use case controller class that coordinates all the messaging between the entity classes. In a sense the use case controller implements the sequence diagram messaging.

Now, your boundary classes may indeed implement some other well defined interfaces, particularly if these boundary classes are all very similar (i.e., GUI, Reporting, etc.).

Comments and alternative answers

□ [Representing Boundary Classes in Java](#)

[Ashok Mollin](#), May 9, 2001

Boundary classes are best represented as an interface.

What is the difference between sequence diagrams and collaboration diagrams?

Location: <http://www.jguru.com/faq/view.jsp?EID=226474>

Created: Oct 11, 2000 Modified: 2000-10-11 04:43:07.139

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (http://www.jguru.com/guru/viewbio.jsp?EID=13) Question originally posed by [Anupam Khandelwal](#) (http://www.jguru.com/guru/viewbio.jsp?EID=28821)

Sequence diagrams and collaboration diagrams are essentially semantically equivalent. You can use either to model the dynamic aspects of a system in terms of objects interacting by exchanging messages. The difference is more in how the information is presented than in the underlying semantics of the diagram. Sequence diagrams emphasize the time ordering of messages, whereas collaboration diagrams depict more of an organizational structure and are more space efficient. Many UML tools will automatically convert from one diagram type to the other.

UML probably included both diagrams for historical reasons, since both were in widespread use (although with different names) before the development of UML. In practice, many organizations tend to prefer one over the other, but there doesn't seem to be a clear favorite overall.

How do you represent a CORBA IDL file with UML? Is there a standard way to do it? Is there a standard symbol?

Location: <http://www.jguru.com/faq/view.jsp?EID=251544>

Created: Nov 11, 2000 Modified: 2000-11-14 05:17:33.375

Author: [Richard Raszka](http://www.jguru.com/guru/viewbio.jsp?EID=7963) (http://www.jguru.com/guru/viewbio.jsp?EID=7963) Question originally posed by [Miguel Leon](http://www.jguru.com/guru/viewbio.jsp?EID=111854) (http://www.jguru.com/guru/viewbio.jsp?EID=111854)

A CORBA IDL file can be represented by as a CLASS that is an Interface stereotype. The reason for this is that the IDL file defines an interface specification for an implementation of the class that has been defined. In a tool such as Rational Rose this will be represented by a circle or rectangular box with the stereotype of <<Interface>> above the class name.

Any implementation classes will be derived from this interface class (IDL) that has been defined.

How would you use UML to model the following relationship? A user has many privileges, one privilege is authorized to one domain. The code is as follows:

```
public class User
```

```

{
  private Vector privileges;
}

public class Domain
{
  private Vector domainEntites;
}

public class Privilege
{
  private User theUser;
  private Domain theAuthorizedDomain;
}

```

One choice would be to use aggregation and association.

```

                1      1
User<>-----Privilege----->Domain
  1   0..n      |----->User
                1      1

```

Another choice would be to use association and association class.

```

  1      0..n
User----->Domain
  |
  Privilege

```

Which of these is better? Are there other alternatives?

Location: <http://www.jguru.com/faq/view.jsp?EID=254047>

Created: Nov 15, 2000 **Modified:** 2000-11-15 18:15:12.29

Author: [Paul Reed](http://www.jguru.com/guru/viewbio.jsp?EID=226283) (<http://www.jguru.com/guru/viewbio.jsp?EID=226283>) **Question originally posed by** [jerry chin](http://www.jguru.com/guru/viewbio.jsp?EID=60541) (<http://www.jguru.com/guru/viewbio.jsp?EID=60541>)

Although you can create an Association class for 1:M and even 1:1 relationships (thanks Mr. Moore), they are quite rare in practice. Association classes are typically used in a m:m context. I assume a domain can have more than one privilege? and you have already stated that a privilege can only be related to one domain. I also assume more than one user can have the same privilege? Then your class diagram should look like:

```

0..* 0..* 0..* 1
User-----Privilege-----Domain
  |
  Responsibility

```

I am having problems with how this appears in the message but I have added a Responsibility class because it captures the information about the association between you the user and a given privilege (like the date you added it etc). So, it is the association class that should extend from the association between User and Privilege. With your previous solution, a privilege could only be related to one user and one domain...not what you want. With all of this I am assuming a privilege is some type of application functionality? I have had to implement a similar design and this solution worked quite well.

How do you represent an attribute of a class that is a container type, such as a vector of objects of some other class?

Location: <http://www.jguru.com/faq/view.jsp?EID=254062>

Created: Nov 15, 2000 **Modified:** 2000-11-15 18:17:03.747

Author: [Paul Reed](http://www.jguru.com/guru/viewbio.jsp?EID=226283) (http://www.jguru.com/guru/viewbio.jsp?EID=226283) Question originally posed by [David Salahi](http://www.jguru.com/guru/viewbio.jsp?EID=244534) (http://www.jguru.com/guru/viewbio.jsp?EID=244534)

Typically this is implied when you model the classes in a class diagram. Let's say you have Customer and Order with a 1:M relationship between them (A Customer can have 0 or more orders). By defining the relationship between these two classes with a simple association and stating that it is navigable, then the Customer class in this case must have an attribute defined which is a Vector (or array depending on your language choice and personal considerations...although vectors allow a lot more flexibility than arrays in Java when dealing with UML associations).

The name of this attribute in Customer is really up to you. Many modeling and code generation tools, such as Rational Rose, will assign the variable name (which is of type Vector perhaps) based on the UML Role you assign at the Order-end of the association. If you don't specify a Role name, then you can choose some default naming scheme (usually something like "myOrders" or "theOrders". So, for Java, the attribute in the Customer class might look like:

```
Vector myOrders = New Vector();
```

What is the status of the UML-EJB Mapping Specification (JSR 26)?

Location: <http://www.jguru.com/faq/view.jsp?EID=258101>

Created: Nov 20, 2000 Modified: 2000-11-20 19:28:32.376

Author: [davide mora](http://www.jguru.com/guru/viewbio.jsp?EID=10213) (http://www.jguru.com/guru/viewbio.jsp?EID=10213) Question originally posed by [John Zukowski](http://www.jguru.com/guru/viewbio.jsp?EID=7) (http://www.jguru.com/guru/viewbio.jsp?EID=7)

I have attach the reply that I received from the manager (Jack Greenfield) of the project a couple of weeks ago. We plan to implement it in our open-source UML designer (perfekt.sourceforge.net).

- > Thank you for your interest in JSR-000026. It is currently
- > in the expert group stage, meaning that the Call For
- > Experts (CAFE) was issued and replies were received. The
- > CAFE period is now closed.
- >
- > Under the rules of the Java Community Process (JCP), as
- > described at <http://java.sun.com/aboutJava/communityProcess>,
- > work on the specification proceeds in the expert group until
- > the specification is published for participant review.
- >
- > At that point, companies that have signed the Java
- > Specification Participant Agreement (JSPA) have access
- > to the participant review draft on a private web site.
- > From there, work continues in the expert group until
- > the specification is published for public review. At that
- > point, the general public has access to the public review
- > draft on the public web site.
- >
- > If your company is a JCP participant, you will have access
- > to the participant review draft when it is published. We
- > expect the participant review for JSR-000026 to start
- > shortly.

What is difference between object diagrams and class diagrams?

Location: <http://www.jguru.com/faq/view.jsp?EID=262429>

Created: Nov 25, 2000 Modified: 2000-11-25 06:17:17.524

Author: [John Moore](http://www.jguru.com/guru/viewbio.jsp?EID=13) (http://www.jguru.com/guru/viewbio.jsp?EID=13) Question originally posed by [Praveen kumar](http://www.jguru.com/guru/viewbio.jsp?EID=84503) (http://www.jguru.com/guru/viewbio.jsp?EID=84503)

As described in the [UML 1.3 specification](#)

A class diagram is a graph of Classifier elements connected by their various static relationships. Note that a "class" diagram may also contain interfaces, packages, relationships, and even instances, such as objects and links. Perhaps a better name would be "static structural diagram", but "class diagram" is shorter and well established.

An object diagram is a graph of instances, including objects and data values. A static object diagram is an instance of a class diagram; it shows a snapshot of the detailed state of a system at a point in time. The use of object diagrams is fairly limited, mainly to show examples of data structures.

Tools need not support a separate format for object diagrams. Class diagrams can contain objects, so a class diagram with objects and no classes is an "object diagram." The phrase is useful, however, to characterize a particular usage achievable in various ways.

The basic idea is that class diagrams focus on classes and object diagrams focus on objects, but it is possible to mix classes and objects on the same diagram for various purposes, so the separation is not rigid. Class diagrams show the logical, static structure of a system and are central the Unified Modeling Language. Object diagrams play a smaller role in UML. They are used primarily for documenting test cases and scenarios, and for discussing examples.

What concepts are modeled by the different UML diagrams?

Location: <http://www.jguru.com/faq/view.jsp?EID=264410>

Created: Nov 28, 2000 Modified: 2000-11-28 18:23:29.65

Author: [jim conallen](http://www.jguru.com/guru/viewbio.jsp?EID=242550) (http://www.jguru.com/guru/viewbio.jsp?EID=242550) Question originally posed by [Praveen kumar](http://www.jguru.com/guru/viewbio.jsp?EID=84503) (http://www.jguru.com/guru/viewbio.jsp?EID=84503)

First I must emphasize that diagrams in UML are simply carefully crafted views into the underlying model. So for example if you see a class diagram that shows classes A and B, and there are no relationships drawn between them, it doesn't mean that in the model there are none. It just means that the author of this particular diagram decided not to show any relationship between them, and that most likely the *purpose* for this diagram was to express some other concept of the system.

UML diagrams can be categorized into Structural and Behavioral.

Structural:

Class diagram - shows structural relationships between classes and interfaces. These diagrams peek into the underlying structure of the classes in the system. Much of the analysts and designers work is done in these diagrams, since most case tools allow classes and relationships to be defined in them. When a relationship is added in a class diagram, it is added to the underlying class model.

I try to keep my class diagrams all focused on a single topic, and try to keep the number of classes less than 20. I like to create separate diagrams for each major behavioral process. For example I might have a separate diagram for expressing the structural relationships involved in an object to relational mapping mechanism. Only those relationships and classes that participate in this process are expressed in this diagram. In other diagrams of the model these same classes may also appear and possibly with additional relationships suitable for expressing whatever the diagram's purpose was to show.

Component diagram - shows components and their dependencies on each other. A component is in this sense a distributable part of the system (DLL, EXE, Java .class or JAR file, etc.). Components realize classes and most likely have dependencies on each other. For example my VB EXE might have a dependency on the ADODB recordset ActiveX control, or my Enterprise Java Bean which has a dependency on my vendor's ejb.jar implementation.

The component diagram is useful for expressing these dependencies which are not only useful

during development, but also during deployment.

Deployment diagram - shows the nodes in the system and which processes (i.e. components) are running in each. In a web application there are nodes for the client, web server, application server and database server. The components running in the client are the web browser, and any JavaScript or Applets. The web server runs all the ASP/JSP/PHP/CFM pages and code. The application server contains all the transactional components (MTS/EJB) and owns the bulk of the business logic. The database node might also execute some key stored procedures, but mostly runs the database code.

Object diagram - shows an example of object instances that are participating in a specific scenario, and the relationships between them. Each object (not a class!) in these diagrams represents an object instance. This diagram is useful for getting an understanding in to the nature of the structural relationships in a collaboration (not the dynamics). I like to use this diagram to get an idea of what and how many object instances are involved in a particular collaboration. In an object diagram of a web application's shopping cart there might be many objects instances of a LineItem class. Each would have it own object name and state (each one representing one line in the cart).

I like to use object diagrams to flesh out scenarios. They help me better understand the nature and characteristics of a specific behavior. I have to admit that I don't create many of these (except when modeling web app storyboards), and prefer sequence diagrams to express the behavior of scenarios.

Behavioral Diagrams:

Use Case diagram - shows the system's use cases as icons, and their relationships to other use cases and the actors of the system. This diagram IMHO is mostly a container for other behavioral diagrams. The real meat of a use case is of course in the specification which is a textual document.

Sequence diagram - shows a specific scenario of execution in the system in terms of object instances. This diagram focuses on the time ordered messages between objects that collaborate to accomplish some task (e.g., process a payment, or search a catalog).

Collaboration diagram - closely related to the object diagram and sequence diagram. This diagram expresses a single scenario like the sequence diagram, but in this case the focus is not on time but rather object instances. It still contains ordered messages between objects but in a collaboration diagram you can position the object instances anywhere, and better express a combination of structural and behavioral concepts.

Statechart diagram - shows a state machine. Great for expressing the state of a user interface or workflow, where the interface disables certain functions according to some state of operation. In real-time architectures, the state chart is the principal diagram for expressing the system's behavior, and the principal source for code generation.

Activity diagram - flow chart on steroids. This diagram is great for expressing process flow. I like to create an activity diagram for each use case in the system. This helps me ensure that there are no loose ends in a use case's textual description.

How do you use a use case model to help in creating an object model?

Location: <http://www.jguru.com/faq/view.jsp?EID=265123>

Created: Nov 29, 2000 Modified: 2000-11-30 18:53:27.606

Author: [jim conallen](http://www.jguru.com/guru/viewbio.jsp?EID=242550) (http://www.jguru.com/guru/viewbio.jsp?EID=242550) Question originally posed by [Pang Kien](http://www.jguru.com/guru/viewbio.jsp?EID=242394) (http://www.jguru.com/guru/viewbio.jsp?EID=242394)

The use case model is a collection of use case specifications (textual documents) and UML elements (the ovals, stick people, and a bunch of lines connecting them) that describe the

functional requirements of the system. The process of discovering the analysis model (which is what I think you are really asking for) from the use case model (and the non-functional requirements) is called Analysis (The Unified Software Development Process, by Ivar Jacobson).

Every organization does analysis a little differently but the essence is pretty much the same. Here is my simple prescriptive recipe:

1. For each use case create an activity diagram. This ensures that the use case doesn't have any loose ends, and provides a good overall picture of it. For each principal scenario in the use case create a sequence diagram with the single actor and a single object representing the "System". Use natural language to express the messages between the actor and the system. I like to paste fragments of actual use case text along the left side of the sequence diagram to help describe the scenario better.
2. Print out the use case text and with different color highlighters identify key nouns and key verb phrases. Key nouns would be things like "Customer", "Product", "Cart", "Order", etc. Action phrases would be things like "searches the catalog for matching items", or "adds the item to the cart".
3. Using Jacobson's analysis stereotypes (boundary, control and entity), create analysis classes in the model that match up to the text. The nouns are candidate "entity" objects and the verbs are "controller" objects. Sprinkle interface classes in the model to connect up the actor to the control classes (depending upon the architecture this may be done differently).
4. For each of the sequence diagrams, replace the "System" object with appropriate analysis objects, and make sure you can express all the scenarios with your objects. You may need to create new ones in order to get the task done (not everything appears in the use case after all).

If you can successfully express all the scenarios with analysis objects you are ready to transform the analysis model into a design model. At this point the system's architecture plays a big role and will govern how this workflow actually happens.

There are a zillion ways to do this so don't take what is written here as the defacto standard.

What are some recommendations for designing classes that we can enter and retrieve information from a database.

Location: <http://www.jguru.com/faq/view.jsp?EID=280170>

Created: Dec 17, 2000 Modified: 2000-12-18 17:51:25.46

Author: [Paul Reed](http://www.jguru.com/guru/viewbio.jsp?EID=226283) (http://www.jguru.com/guru/viewbio.jsp?EID=226283) Question originally posed by [Sunita Raja](http://www.jguru.com/guru/viewbio.jsp?EID=237498) (http://www.jguru.com/guru/viewbio.jsp?EID=237498)

There are several choices here. Depending on your technology platform my answer varies. If you are in the Microsoft world and NOT using Java, then I would recommend 3 layers of classes. Entity classes will obviously model your business (i.e., Order, Customer). I then create a 1:1 class map to entity classes that I call data translation classes. These classes do nothing but build SQL statements and are the interface to the Entity classes to get data. Because Microsoft changes their data access strategy at least every 6 months (i.e., DAO, ADO, RDO)...I then have one class that actually executes the SQL statement. This class is the interface to the data translation classes. Again, the reason I do this is to combat Microsoft's ever changing data access strategy. If a new strategy emerges, I only have to replace this data access class...the entity and translation classes are none the wiser.

If you are in the Java world on any platform, then we have the stability of JDBC and its prominence in this space. However, I still have a data translation class for every entity class that does both building of SQL and executing the SQL using JDBC. If you look at Sun's Pet Store sample you will see they do the very same thing.

Lastly, you can also look at some of the persistence tools out there...like TOPLink from Web Gain. These are classes that make the whole OO to Relational transition a bit less of a headache...but at a price.

What are the differences between 'uses' and 'has a' relationships?

Location: <http://www.jguru.com/faq/view.jsp?EID=282040>

Created: Dec 19, 2000 Modified: 2000-12-19 12:58:19.417

Author: [John Mitchell](http://www.jguru.com/guru/viewbio.jsp?EID=4) (http://www.jguru.com/guru/viewbio.jsp?EID=4) Question originally posed by [satya maddipati](http://www.jguru.com/guru/viewbio.jsp?EID=237605) (http://www.jguru.com/guru/viewbio.jsp?EID=237605)

A **uses** relationship denotes an *Association* -- see section 2.5.2.2 of the UML v1.3 specification for more information.

A **has a** relationship denotes an *Attribute* -- see section 2.5.2.5 of the UML v1.3 specification for more information.

Strictly speaking, they are very similar. In modeling a system, you can often use either one. A simple guideline of when to use one versus the other is whether or not the facet that you're modeling is something "intrinsic" to the nature of that specific object. I.e., the Name is an intrinsic part of an Employee and so the Name makes sense as an attribute of the Employee. On the other hand, a Customer is merely associated with a particular Order since the Customer is not intrinsic to the nature of the Order itself.

Comments and alternative answers

[A 'Has' relationship can also be modelled as an As...](#)

[Dan Christopherson](#), Dec 21, 2000 [1]

A 'Has' relationship can also be modelled as an Association with Aggregation. This (IMHO) is more typical if the 'had' class has behavioral elements.

[Re: A 'Has' relationship can also be modelled as an As...](#)

[Ram Nath](#), May 12, 2001

- Uses is used when modeling with usecases in the usecase diagram. Now uses is replaced with <include> keyword in the latest uml specs. "Has a" relationship is used to show the composition relationship and it is shown in the class diagram.

Modeling: One 'ell' or two?

Location: <http://www.jguru.com/faq/view.jsp?EID=284801>

Created: Dec 22, 2000 Modified: 2000-12-22 17:25:09.332

Author: [John Mitchell](http://www.jguru.com/guru/viewbio.jsp?EID=4) (http://www.jguru.com/guru/viewbio.jsp?EID=4)

Yes, the dictionary allows *modeling* to be spelled with either a single *ell* or two *ell*'s but when it comes to software development and modeling -- "modelling" is spelled **modeling**.

How should a Java interface be modeled in UML? Should I use <<type>>, <<interface>>, or something else and why?

Location: <http://www.jguru.com/faq/view.jsp?EID=287099>

Created: Dec 27, 2000 Modified: 2000-12-27 10:44:34.304

Author: [John Zukowski](http://www.jguru.com/guru/viewbio.jsp?EID=7) (http://www.jguru.com/guru/viewbio.jsp?EID=7) Question originally posed by [Erik Winlöf](http://www.jguru.com/guru/viewbio.jsp?EID=44108) (http://www.jguru.com/guru/viewbio.jsp?EID=44108)

The UML book series from Booch, Rumbaugh, and Jacobson seem to use <<interface>> as the stereotype name, so I would be inclined to follow their lead.

Comments and alternative answers

□ [You can also use the so-called "lollipop"...](#)

[Steven Newton](#), Dec 27, 2000

You can also use the so-called "lollipop" notation, where an interface is represented by a small circle. See "UML Distilled" by Martin Fowler. Personally, I'd go with whatever the tool I was using provided.

□ [I side with the tool being used, for pragmatism over...](#)

[Raymond Blum](#), Jan 31, 2001

I side with the tool being used, for pragmatism over purism. I started out insisting on a stereotype of <<interface>> but then found that when I generated code from my model, the tool I was using couldn't care less about the stereotype, whereas it *did* generate interfaces properly where the lollipop notation was used on diagrams.

How do I indicate static methods within a UML class diagram?

Location: <http://www.jguru.com/faq/view.jsp?EID=288631>

Created: Dec 28, 2000 Modified: 2000-12-29 12:09:17.521

Author: [jim conallen](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=242550>) Question originally posed by [Robert Stephens](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=283597>)

Simply preface the method with a dollar sign (\$). For example:

```
$ GetInstance() : MyObject
```

Indicates a method called `GetInstance` that accepts no arguments and returns an object of type `MyObject`. The dollar sign identifies it as a static method.

Comments and alternative answers

□ [You can do it by assigning a 'classifier' scope type...](#)

[Stephane Boisson](#), Jan 2, 2001

You can do it by assigning a 'classifier' scope type to this method or attribute. By default, the scope type is 'instance' (the other scope type). In UML notation you show this by underlining the attribute or operation. It may print in italic form or prefixed by a dollar sign, depending of tools/people.

□ [Whoops! I have a correction. Using a dollar sign is...](#)

[jim conallen](#), Jan 5, 2001

Whoops! *I have a correction.* Using a dollar sign is a rather old (and possibly tool specific) way to identify static methods.

Looking at the latest reference guides (Rumbaugh's UML Reference Guide) it indicates that static operations are identified with an underline. Instance methods are not underlined.

How should I model Java Servlets and JSPs in UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=334159>

Created: Feb 20, 2001 Modified: 2001-02-20 18:47:11.058

Author: [swarraj kulkarni](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=121306>) Question originally posed by [Ben Bailey](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=319243>)


As such, there are no specific notations for Servlets and JSPs in standard UML. But you can create the stereotypes for these elements. For example have <<HttpServlet>> as the stereotype and let your specific servlet classes extend this stereotype.

Though JSP becomes a servlet after compilation, it does not have the standard base class

because it depends on the container vendor implementation. So instead of having any specific vendor class as stereotype, have plain <<JSP>> as your stereotype.

You can refer the related question: [Web components and UML](#)

Comments and alternative answers

 [This question can either have a very simple answer...](#)
[jim conallen](#), Feb 26, 2001

This question can either have a very simple answer or a complicated one.

Simple:

Model them with classes stereotyped <<Servlet>>, or <<JSP>> as swarraj suggested. Although imho, there isn't really much need to stereotype them since you could indicate that they were servlet or jsp pages just by having them realize the HttpServlet or HttpJspPage interfaces. Since most modeling tools today are rather stingy about the use of stereotypes (only one allowed - even though the most current spec allows multiple), I like to reserve the use of stereotypes for things that can not be expressed in any other way - and that have profound impact on the understanding of the model.

Complex:

Warning: I have made this topic a focus of my career lately and so my opinions are rather strong in this area - so don't take what I write too seriously :-).

When I first made the transition to web applications from client server I wanted to apply my proven and successful OO best practices, but hit a minor stumbling block when it came to design modeling web pages (MS ASP at the time). The principal issue is that there is one conceptual web page, yet it manifests itself very differently on the server and the client. For example any given web page contains both the code to fill its dynamic content while being built on the server as well as the client scripts and hyperlinks that characterize it on the client. Mixing these two in the same class in a UML model seemed to me very confusing.

I couldn't just ignore the client side stuff, since it was (*imho*) architecturally significant. Navigational routes, client side scripts, forms/fields, applets, etc. were all important to me as an architect and designer - and needed to be part of the design model. The big question then became how do you properly model these types of things alongside the page creation stuff (JSP and Servlet interactions with server side resources)? The solution needed to be consistent with current Java modeling techniques, and most important at the same level of abstraction and detail (two key modeling concepts).

The crux of the solution that I've put forward is to model these separate aspects of the web page as separate classes (one for client tier and one for server tier). They are both realized by the same component, and it is through this component realization that the concept of a page makes itself clear as a single entity. It is also through the component that URLs are realized.

Because it is a complex solution it's best that I just point you to a recent introductory article I wrote for the Jan edition of [Software Development Magazine \(Jan 2001\)](#). Or this older one from the [Communications of the ACM \(vol 42, No. 10\)](#) (which is apparently available on the net as a PDF.)

Finally the shameless plug, I have written a book detailing this much further: "Building Web Applications with UML", in the Addison Wesley Object Technology Series. Although this book is pretty much focused on ASP technologies the concepts can be applied to JSP/Servlet, PHP and even CFM. I am presently working on the next edition that will include (and even focus on) J2EE implementations.

Any tips on taking IBM's OOAD with UML certification test?

Location: <http://www.jguru.com/faq/view.jsp?EID=352620>

Created: Mar 15, 2001 Modified: 2001-03-16 09:13:13.172

Author: [Tony Chen](http://www.jguru.com/guru/viewbio.jsp?EID=352618) (http://www.jguru.com/guru/viewbio.jsp?EID=352618) Question originally posed by [mahendrasr nath reddy](http://www.jguru.com/guru/viewbio.jsp?EID=349349) (http://www.jguru.com/guru/viewbio.jsp?EID=349349)

Read [UML Distilled](#) and [Applying UML and Patterns](#) first, then try the [IBM ICE Test](#). Good luck!

Comments and alternative answers

[IBM's OOAD with UML certification test](#)

[swamy nathan sridhar](#), Apr 2, 2001

Hi Tony chen, Reddy, I am also preparing for this certification. I have attended the IBM ICE test after studying UML distilled and applying UML and Patterns. The questions need more practical experiance than theoretical. Pls. advice me some more books. my e-mail: shreedev@hotmail.com

[Related FAQ](#)

[John Moore](#), Apr 26, 2001

See also the related FAQ <http://www.jguru.com/faq/view.jsp?EID=94233>

[Read the books examples closely!](#)

[James Brannan](#), May 25, 2001

Read the examples closely, I took the test and I noted similarity between the book and the test. James

Where can I learn (more) about CORBA (Common Object Request Broker Architecture)?

Location: <http://www.jguru.com/faq/view.jsp?EID=431188>

Created: May 30, 2001

Author: [John Mitchell](http://www.jguru.com/guru/viewbio.jsp?EID=4) (http://www.jguru.com/guru/viewbio.jsp?EID=4)

Check out the [jGuru CORBA FAQ](#).

Where can I learn (more) about Java's EJB (Enterprise JavaBeans)?

Location: <http://www.jguru.com/faq/view.jsp?EID=431189>

Created: May 30, 2001

Author: [John Mitchell](http://www.jguru.com/guru/viewbio.jsp?EID=4) (http://www.jguru.com/guru/viewbio.jsp?EID=4)

Check out the [jGuru EJB FAQ](#).

Where can I learn (more) about Java's reusable software components, JavaBeans?

Location: <http://www.jguru.com/faq/view.jsp?EID=431197>

Created: May 30, 2001

Author: [John Mitchell](http://www.jguru.com/guru/viewbio.jsp?EID=4) (http://www.jguru.com/guru/viewbio.jsp?EID=4)

Check out the [jGuru JavaBeans FAQ](#).

Where can I learn (more) about using design patterns with Java?

Location: <http://www.jguru.com/faq/view.jsp?EID=431238>

Created: May 30, 2001

Author: [John Mitchell](http://www.jguru.com/guru/viewbio.jsp?EID=4) (http://www.jguru.com/guru/viewbio.jsp?EID=4)

Check out the [jGuru Patterns FAQ](#).

Where can I learn (more) about software development processes?

Location: <http://www.jguru.com/faq/view.jsp?EID=431239>

Created: May 30, 2001

Author: [John Mitchell](http://www.jguru.com/guru/viewbio.jsp?EID=4) (http://www.jguru.com/guru/viewbio.jsp?EID=4)

Check out the [jGuru Process FAQ](#).

Where can I learn (more) about Java's support for developing multi-threaded programs?

Location: <http://www.jguru.com/faq/view.jsp?EID=431248>

Created: May 30, 2001

Author: [John Mitchell](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=4>)

Check out the [jGuru Threads FAQ](#).

Where can I learn (more) about Java development tools?

Location: <http://www.jguru.com/faq/view.jsp?EID=431253>

Created: May 30, 2001

Author: [John Mitchell](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=4>)

Check out the [jGuru Tools FAQ](#).

Comments and alternative answers

Documentation location and a modest comment.

[Shahram Khorsand](#), May 31, 2001

As you may have figured it out the forums you have chosen to send your question to is specialized to specific topics. Please respect that and do not send any question to all the forums.

The information you are looking for may be found at:

<http://java.sun.com/docs/books/tutorial/?frontpage-spotlight>.

Good Luck!

Where can I find a glossary of UML-related terms?

Location: <http://www.jguru.com/faq/view.jsp?EID=431979>

Created: May 31, 2001

Author: [John Zukowski](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=7>) Question originally posed by [John Zukowski](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=7>)

Kendall Scott has written several UML-related books and maintains a [dictionary](#) of over 600 related terms for them.

How should I model parameter passing in JSP and the relationship between JSP and JavaBeans using UML?

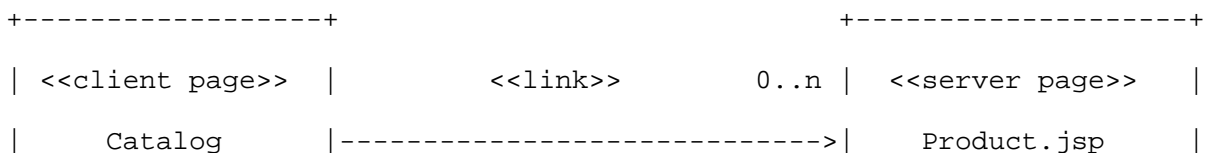
Location: <http://www.jguru.com/faq/view.jsp?EID=431982>

Created: May 31, 2001

Author: [jim conallen](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=242550>) Question originally posed by [Shirley Leung](#) (<http://www.jguru.com/guru/viewbio.jsp?EID=421051>)

Parameters

There are two principal ways to model parameters being passed from a HTML source on the client to a <<server page>> on the server. The first is to put them in a tag value, called parameters. For example:



```

+-----+
{parameters="prodid"} +-----+
|
| <<build>> |
|
|
|
| v
|
+-----+
| <<client page>> |
| Product.html |
+-----+

```

In the above example the link from Catalog to Product.jsp indicates that a standard anchor tag is used (i.e. <a>) and that appended to the url is the parameter prodid. At design time this parameter is not given any value, since it is likely to be runtime generated thing. Also note that in this catalog page there are potentially many links to product pages, all with potentially different prodid params.

Multiple parameters can be passed simply by adding them in the string just as you would append them to the url. For example if the parameters tag value was "action=add&prodid&qty". It would indicate that at design time the parameter action was always set to add, and the values for prodid and qty are either not specified, or are specified at runtime.

If the parameters being passed to the server are more complex, and where it might be useful to document heavily each and every one. Then you might want to model them as an association class on the <<link>> association. This lets you not only specify all the parameters, but gives you an opportunity to specify datatypes, and default values for each. This of course is overkill for most simple parameter usages, but is handy for those special occasions.

```

+-----+
| <<client page>> | <<link>> | <<server page>> |
| HomeMonitor |----->| HomeControl.jsp |
+-----+
|
|
|
|
|
|
+-----+
| <<parameters>> |
| ControlInfo |
+-----+
| homeid : long |
| deviceid : long |

```

```

| action : enum      |
| value : string     |
+-----+

```

Beans

Modeling bean usage in a JSP begins with a <<use bean>> stereotyped directional association from a <<server page>> class to the bean.

```

+-----+
| <<server page>> |          <<use bean>> mySched : Schedule |
| Calendar.jsp   |----->| DutyScheduleBean |
+-----+
|                                     |
|                                     | {scope=session} |
+-----+

```

The role name corresponds to the `jsp:usebean id` attribute, the role specifier `Schedule` corresponds to the type attribute, and the tag value for `scope` is the use bean scope attribute. The `beanname` attribute is another valid tag value that can be specified at design time.

```

<jsp:usebean id="mySched" class="com.mycompany.myproj.mysubsys.DutyScheduleBean"
type="com.mycompany.myproj.comiface.Schedule" scope="session">

```

Recommendations for evaluating UML models? I am trying to put together a set of review guidelines for evaluating UML models that the developers assemble for the respective projects. If you were a reviewer, what would you be looking for to pronounce that the approach or solution is acceptable and sound for the various types of UML diagrams such as Use Cases, Class Diagram, Sequence diagram, etc.)?

Location: <http://www.jguru.com/faq/view.jsp?EID=431990>

Created: May 31, 2001

Author: [jim conallen](http://www.jguru.com/guru/viewbio.jsp?EID=242550) (http://www.jguru.com/guru/viewbio.jsp?EID=242550) Question originally posed by [krishnan meenakshi](http://www.jguru.com/guru/viewbio.jsp?EID=2858) (http://www.jguru.com/guru/viewbio.jsp?EID=2858)

There are three principal dimensions that I'd evaluate UML models on:

- **Communicability** - How well do the diagrams communicate the individual messages that the design team wants to convey. Are the diagrams simple enough to understand without having to resort to looking at the source code?
- **Completeness** - Is the model complete (i.e. are all classes that participate in the interactions and collaborations modeled)?
- **Style** - Are the diagrams layed out in a consistent manner. Are color and other other adornments used consistantly? Are all the extensions (profiles) that are used compatiable with each other?

How do we express the relationships between EJB Entity Beans in UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=431997>

Created: May 31, 2001

Author: [jim conallen](http://www.jguru.com/guru/viewbio.jsp?EID=242550) (http://www.jguru.com/guru/viewbio.jsp?EID=242550) Question originally posed by [Peter Lin](http://www.jguru.com/guru/viewbio.jsp?EID=387708) (http://www.jguru.com/guru/viewbio.jsp?EID=387708)

I wish I had a quick answer for you, but the real answer lie in the activities of the JSR 26

committee. This group is currently working on a formal extension (profile) to the UML for modeling EJBs. I've seen some draft work, but can't say with any authority what the final outcome will be.

With that comment aside, I'd suggest that you model relationships with associations, and draw them in class diagrams. Component diagrams, are only suitable for expressing dependencies (a weak form of relationship).

Associations are used to model the concept of an instance maintaining a relationship to another instance. A dependency just shows that the class is dependent on another element. That is, if the interface changes or something like that, as opposed to a state change in the dependent object.

If I'm not object-oriented savvy, from what books can I learn UML?

Location: <http://www.jguru.com/faq/view.jsp?EID=432000>

Created: May 31, 2001 Modified: 2001-06-01 07:43:45.343

Author: [John Zukowski](http://www.jguru.com/guru/viewbio.jsp?EID=7) (http://www.jguru.com/guru/viewbio.jsp?EID=7) Question originally posed by [John Zukowski](#) (http://www.jguru.com/guru/viewbio.jsp?EID=7)

Check out the [UML Explained](#) book from Kendall Scott. It provides a non-technical introduction to UML. See [DevX](#) for a review.

Comments and alternative answers

Another suggestion.

[Michael Wax](#), Jun 1, 2001

I would also suggest [UML Distilled](#) by Martin Fowler. It is very readable.

What is the difference between an API and a framework?

Location: <http://www.jguru.com/faq/view.jsp?EID=432443>

Created: Jun 1, 2001

Author: [Michael Wax](http://www.jguru.com/guru/viewbio.jsp?EID=242559) (http://www.jguru.com/guru/viewbio.jsp?EID=242559) Question originally posed by [Ka-Hing Cheung](#) (http://www.jguru.com/guru/viewbio.jsp?EID=246129)

Here is a less formal definition:

A framework is a set of classes which handles the flow necessary to perform a complex task, but which requires plug-in classes specific to your application (database, app server), and which allows for additional plug-in classes to extend the functionality. For example, you could have a framework which handles the general flow of an online store. This framework would handle tasks such as "put item in shopping cart", "generate order on checkout", etc. On the other hand, you would need to provide the classes which enable the framework to persist the shopping cart to the database of your choice, to connect to a credit-card processor, to send orders to a warehouse, among other things. Further, if you wanted to decided that you wanted to offer monogramming, you would need to provide classes to do so, and the framework should make it easy to plug these in.

An API is really no more than a set of method signatures and other information necessary to use a class or set of classes. The API is totally distinct from the implementation. For example, a number of vendors have implemented the servlet API, each in a different way. The API by itself has no implementation.

A class library would have an API, as would a framework.