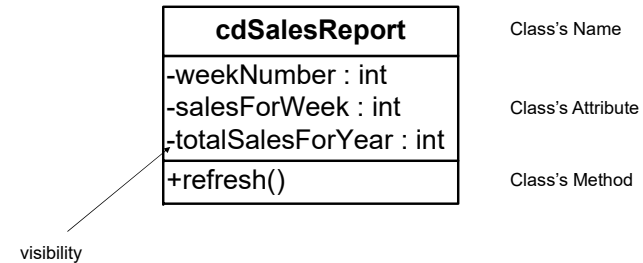


Last week

- Virtualization
- Introduction to UML
 - Use case diagram
 - Class diagram

1

A class element



3

Class Diagram

- Used in requirements, design and implementation:
 - Conceptual, to represent general entities in system
 - Specification, where we specify what each entity (class) will do (but not how)
 - List the methods/actions
 - Implementation
 - Detailed class diagram of actual software (Java or C++)
- List attributes, same as data model (to be introduced)
- List methods/operations/functions
 - Activities **naturally** associated with the data in the entity
- We often don't model everything—too hard to read
 - Focus on key parts of system

2

Relationships

Construct	Description	Syntax
Association	A relationship between two or more classifiers that involves connections among their instances.	knows uses refers
Aggregation	A special form of association that specifies a whole-part relationship between the aggregate (whole) and the component part.	has references to
Generalization	A taxonomic relationship between a more general element and a more specific element	Is a kind of
Dependency	A relationship between two modeling elements, in which a change to one modeling element (the independent element) will affect the other modeling element (the dependent element)	
Realization	A relationship between a specific element and its implementation	implements
Composition	If a class cannot exist by itself, and instead must be a member of another class, then that class has a Composition relationship with the containing class. A Composition relationship is indicated by a line with a filled diamond.	has owns

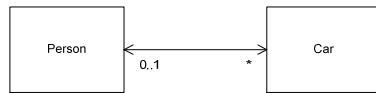
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Association

- Associations describe relationships between classes

- Solid lines are used to describe associations

- Multiplicity
- Navigability: Unidirectional vs. bidirectional



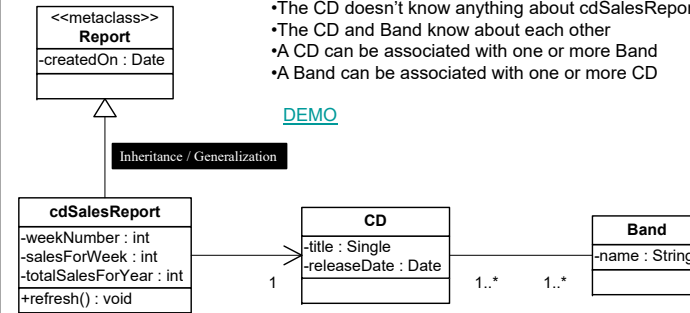
- A person may own 0 to many cars
- A car may have 0 or 1 owner

5

Example

- The cdSalesReport inherits from the Report class
- A cdSalesReport is associated with one CD
- The CD doesn't know anything about cdSalesReport
- The CD and Band know about each other
- A CD can be associated with one or more Band
- A Band can be associated with one or more CD

[DEMO](#)



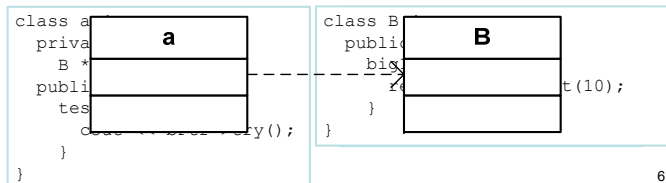
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http://bronze.rational.com:8169/content/jun_03/f_UMLIntro_db.jsp

Dependency

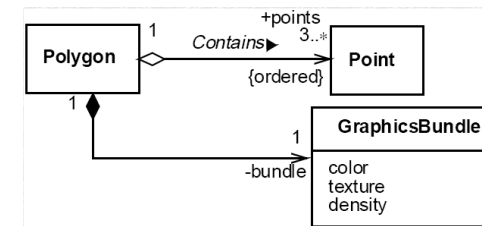
- A dependency exists between two elements if changes to the definition of one element (the supplier) may cause changes to the other (the client).

- one class sends a message to another;
- one class has another as part of its data;
- one class mentions another as a parameter to an operation.



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Example

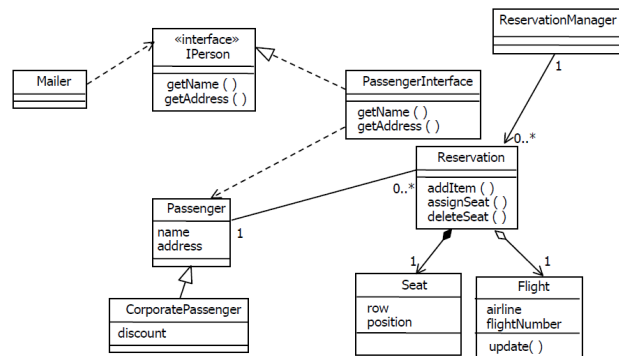


- A polygon contains 3 or more points
- 3 or more points are aggregated in a polygon
- One polygon has one GraphicsBundle, and one GraphicsBundle belongs to exactly one polygon
- Without polygon, graphicsBundle cannot exist by itself.

8

C. Kobryn (1999), "Object Modeling with UML: Introduction to UML"

Sample Class Diagram



Source: Introduction to UML 2.0, T. Quatrani, IBM

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More diagrams

- Use case diagram
- Class diagram
- Deployment diagram
- Sequence diagram
- Communication diagram
- Activity diagram
- State diagram

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Lecture 6

UML (II)



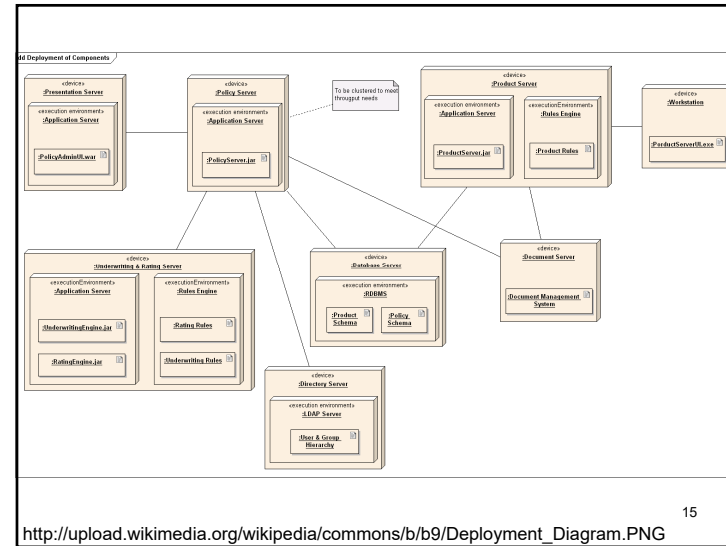
Deployment Diagram

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Deployment Diagrams

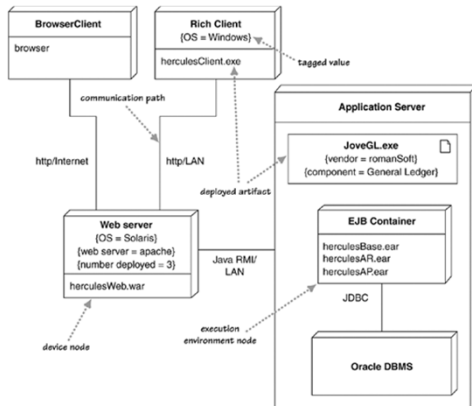
- Deployment diagrams show the physical relationship between hardware and software in a system.
 - Which software or service runs on which machine
- The solid lines represent communication links or dependencies.

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Example



14

Reference: UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third Edition, by Martin Fowler (2003)

Sequence Diagram

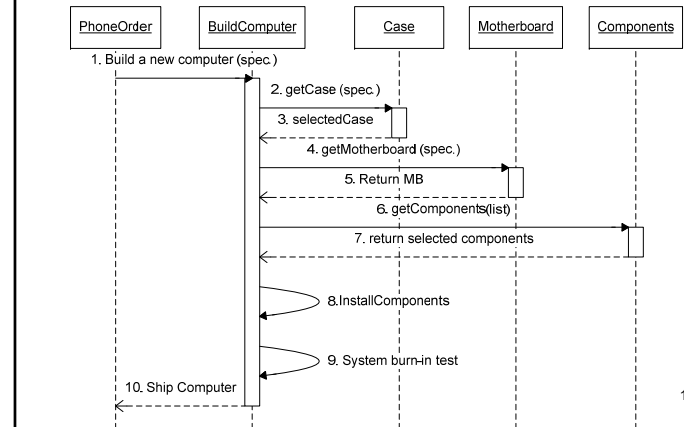
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Sequence Diagram

- Shows a detailed or partial flow for a specific use case
- Shows the calls between different objects in their sequence
- 2-D:
 - Vertical: time/order
 - Horizontal: object instances

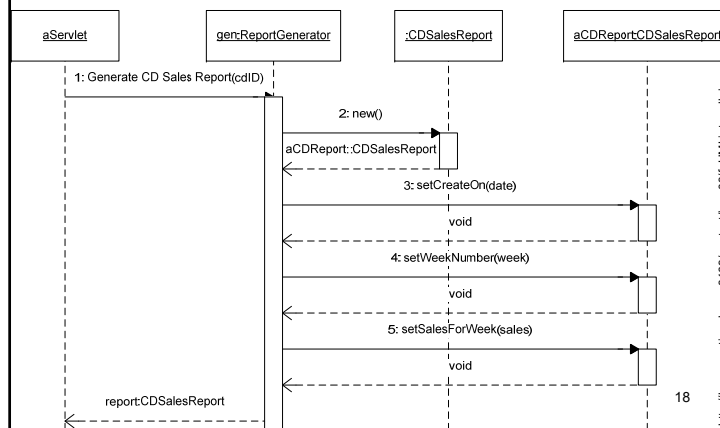
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Example



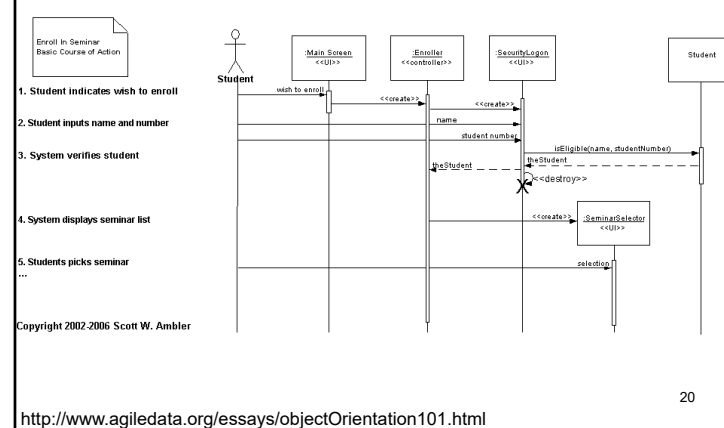
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Example



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Example

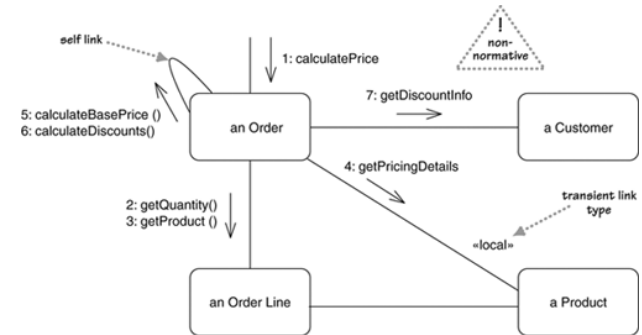


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Communication Diagram

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Communication Diagram

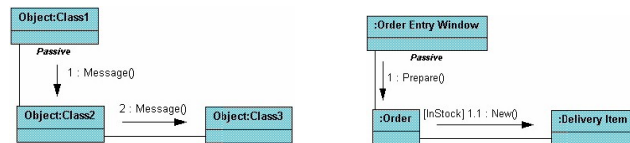


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Reference: UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third Edition, by Martin Fowler (2003)

Communication Diagram

- Show the relationship between objects and the order of messages passed between them.
- Collaboration diagram has almost the same information as sequence diagram, but different view/perspective.



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Source: http://pigseye.kennesaw.edu/~dbraun/csis4650/A&D/UML_tutorial/interaction.htm

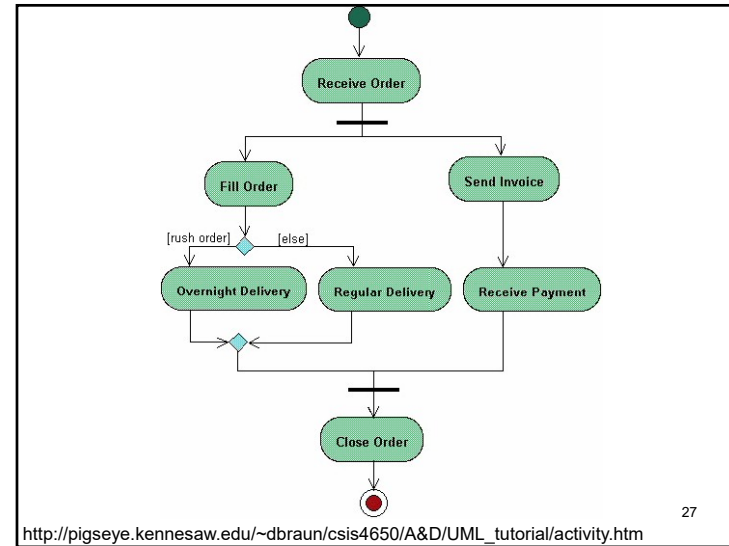
Activity Diagram

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Activity Diagrams

- Activity diagrams are a technique to describe procedural logic, business process, and work flow. (for a use case)
- Activity diagram is very much like flowcharts introduced in early lectures.
- The diagrams describe the state of activities by showing the sequence of activities performed.
- Show activities that are conditional or parallel.

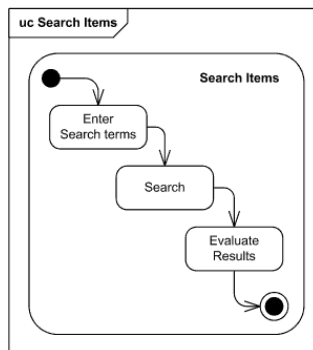
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http://pigseye.kennesaw.edu/~dbraun/csis4650/A&D/UML_tutorial/activity.htm

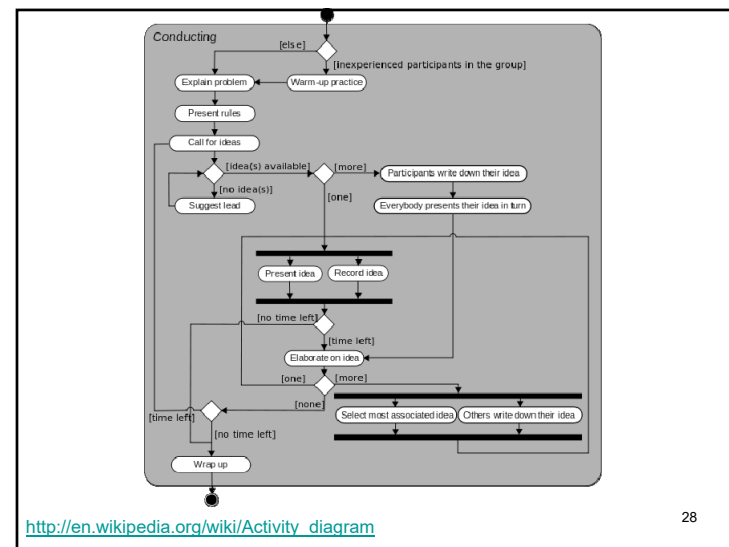
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Activity diagram



<http://www.uml-diagrams.org/uml-25-diagrams.html>

26



http://en.wikipedia.org/wiki/Activity_diagram

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State Machine Diagram

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Conventions

- Notations:
 - State: rounded rectangles
 - Arrows: events causing state transition. Source of these events are not specified.
 - Filled circle: initial state
 - Hollow circle enclosing filled circle: final state
- Terms:
 - Activities: operations that take time to complete.
 - Actions: operations of very short duration.
 - Events: causing transitions or changes in state. Transitions can trigger actions.

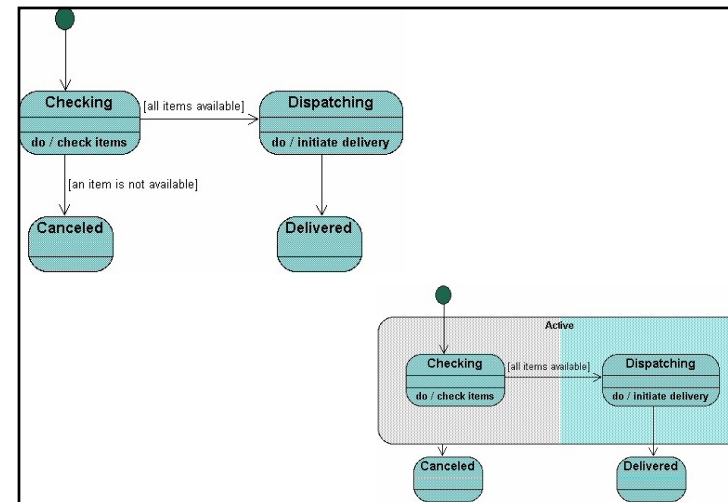
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State Machine Diagram

- Describe all of the **possible states of an object** as events occur. Each diagram usually represents objects of a single class and track the different states of its objects through the system.
- Use state diagrams to demonstrate the **state-dependent behavior of an object** through many use cases of the system.
 - Only use state diagrams for classes where it is necessary to understand the behavior of the object through the entire system.
 - Not all classes will require a state diagram and state diagrams are not useful for describing the collaboration of all objects in a use case.
- One object's state diagram may refer to other objects' state. Often combined with collaboration diagram...

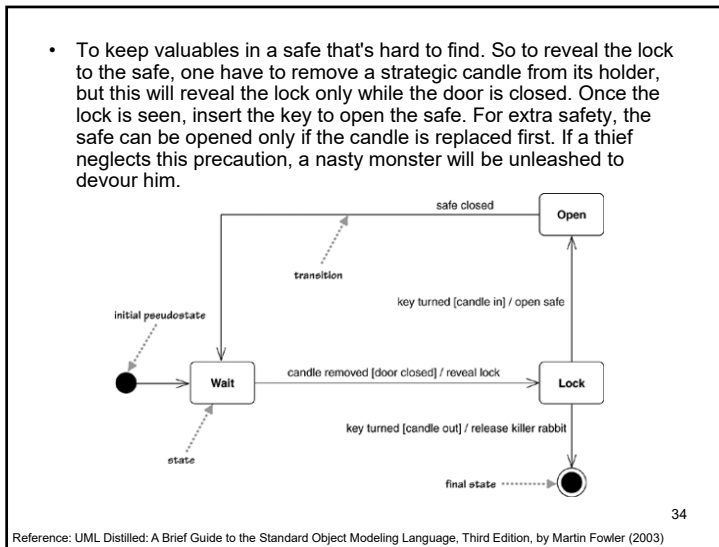
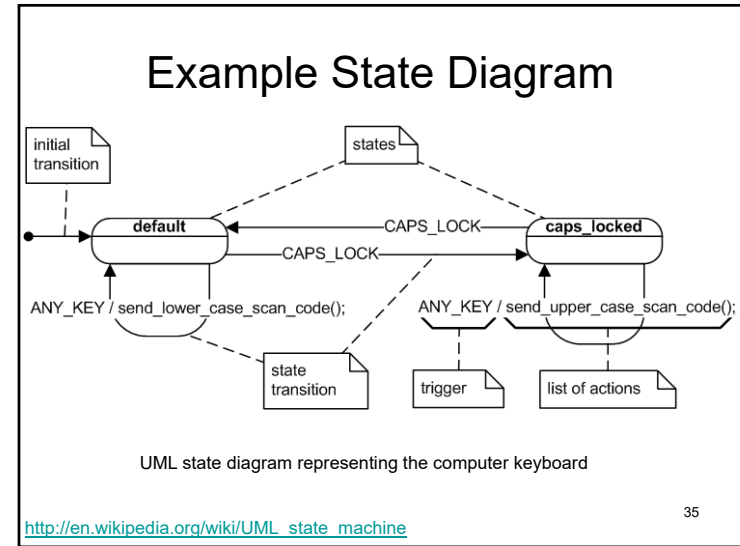
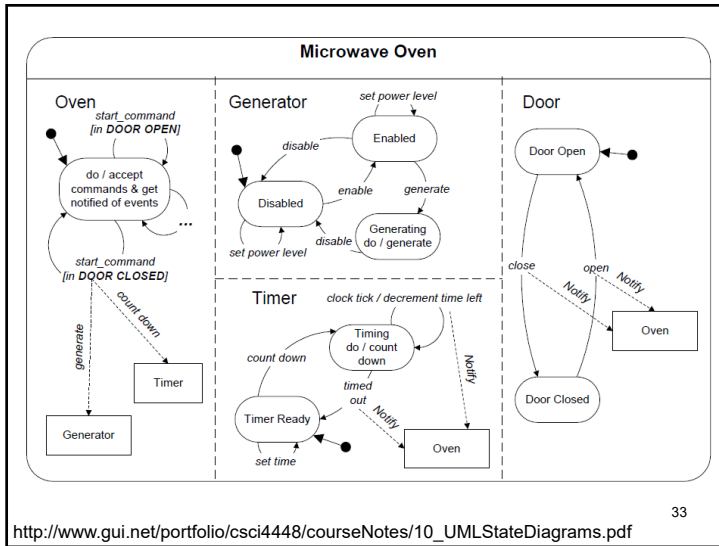
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http://pigseye.kennesaw.edu/~dbraun/csis4650/A&D/UML_tutorial/state.htm



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http://pigseye.kennesaw.edu/~dbraun/csis4650/A&D/UML_tutorial/state.htm



References for UML

- <http://www.agilemodeling.com/essays/umlDiagrams.htm>
- <http://www-01.ibm.com/software/rational/uml/>
- http://atlas.kennesaw.edu/~dbraun/csis4650/A&D/UML_tutorial/index.htm
- <http://www.sparxsystems.com.au/uml-tutorial.html>

UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third Edition, by Martin Fowler (2003), ISBN 0-321-19368-7

Google: [uml examples](#)

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Assignment #3

1. Download and install VirtualBox on one of your computer.
2. Create a virtual machine using the software, and install Windows OS in the virtual machine you created. (contact me if you need Windows iso images)
3. In the Windows OS you installed in the virtual machine, setup:
 - a) Windows Server 2012 R2
 - b) SQL Server 2014 Standard Edition SP1
 - c) SQL Management Studio 2014 w/ SP1Please make screen dumps during your setup of Windows OS, IIS, and SQL Server Express...
4. Configure port forwarding with NAT in VirtualBox to expose services running on the guest as if they are running on the host.
5. You need to get IIS & SQL Server up & running inside the virtual machine setup...

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Assignment #3

Remark:

- Even though the installation process is wizard style (next → next → next → finish), it is better if you understand EVERY question that each dialog asks.
- e.g. During installation of SQL server, it will ask you the authentication method to use (Windows authentication, SQL authentication, ...). You better understand what that means, or you will be burned in the upcoming assignments.

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Assignment #3

- **Due: 11/05/2015 (two weeks)**
- Deliver: A Word document (or PDF) that contains a series of screen dumps (e.g. Alt-PrintScr) that show:
 - The IP address and port number so that I can access your virtual machine.
 - The process of installing Windows
 - The process of installing IIS
 - Show that the installed IIS is working inside the virtual machine
 - The process of installing SQL Server
 - Show that the installed SQL Server is working
- This virtual machine will become your database server & web server for the rest of your term ...

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