UML Modeling

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All diagrams and definitions used in this presentation have been acknowledged in the reference section at the end of the presentation.
Agenda

• What is UML?
• History
• UML Diagrams
• Behavior Diagram
• Structure Diagrams
• Example – Project Work
What is UML

• Unified Modeling Language - Copyright © 1997-2010 Object Management Group, Inc
• a visual language for specifying, constructing and documenting the artifacts of systems
• is becoming a de facto standard diagramming notation
• Objective
  – to provide system architects, software engineers, and software developers with
    • tools for analysis, design, and implementation of software based systems
    • as well as for modeling business and similar processes.
UML - History

• Present version – Revision 2.3 – May 2010
  http://www.omg.org/spec/UML/2.3/Infrastructure/PDF/

• History
  – UML 1
  – 3 scholar/researchers– Booch, Rumbaugh and Jacobson
  – 1994 - Rational Software Corporation where Grady Booch and James Rumbaugh reconciled features of the Booch method and Object Modeling Technique (OMT) to begin work on a UML
  – 1995 - Rational Software Corporation acquired Objectory and with it Ivar Jacobson, the developer of the object oriented software method (OOSE).
OMG

• an international, open membership, not-for-profit computer industry consortium from 1989.
• Most organizations that shape enterprise and Internet computing today are represented in the Board of Directors
• organization may join OMG and participate in standards-setting process like
  – Unified Modeling Language™ (UML®)
  – Model Driven Architecture® (MDA®),
  – middleware standards and profiles are based on the Common Object Request Broker Architecture (CORBA®)

• CA Inc.  CSC  Fujitsu  HSBC  Hewlett-Packard  Hitachi  IBM  Lockheed Martin  Microsoft  Northrop Grumman  Oracle  Unisys
UML Diagrams

- view a software system from different perspectives and varying degrees of abstraction.
  - UML is not a development method
    - But it was designed to be compatible with leading object-oriented software development methods like
    - e.g., Rational Unified Process (RUP) – an iterative software development process framework

- UML 2.2 has 14 diagram types in two categories.
  - 7 static – structural types
    - Emphasizes the static structure of the system using objects, attributes, operations and relationships
  - 7 dynamic – behavior types
    - Emphasizes the dynamic behavior of the system by showing collaborations among objects and changes to internal states of objects – sequence diagrams, activity diagrams, state machine diagrams
Diagrams Overview – UML 2.2

Notation: UML
Common UML diagrams are:

- **Use Case Diagram** – displays relationship among actors & use cases
Common UML diagrams are:

- **Activity Diagram** - displays a special state diagram where most of the states are action states and most of the transitions are triggered by completion of the actions in the source states. This diagram focuses on flows driven by internal processing.
Common UML diagrams are:

- **State Diagram** - displays the sequences of states that an object of an interaction goes through during its life in response to received stimuli, together with its responses and actions.
Behavior Diagram

• **Interaction Diagrams** - Sequence Diagram - displays the time sequence of the objects participating in the interaction. This consists of the vertical dimension (time) and horizontal dimension (different objects).
Structure diagram

- **Class Diagram** - models class structure & contents using design elements such as classes, packages and objects. It also displays relationships such as containment, inheritance, associations and others.
Structure diagram

- **Component Diagram** - displays the high level packaged structure of the code itself. Dependencies among components are shown, including source code components, binary code components, and executable components. Some components exist at compile time, at link time, at run times well as at more than one time.
Structure diagram

- **Deployment Diagram** - displays the configuration of run-time processing elements and the software components, processes, and objects that live on them. Software component instances represent run-time manifestations of code units.
The purpose is to collect, analyze, and define high-level needs and features of the OB/GYN Specialists of Palm Beach Health Information Systems. It focuses on the capabilities needed by the specialists and auxiliary stakeholders and target users, and why these needs exist.

It is a customized health information system meeting the current standards of modern EMR systems. The system consists of 5 major modules: customer demographics, medical instances, prescriptions, scheduling, and billing. The system is meant to replace fragmented outdated processes, which means business process costs can be reduced.
## Work System

### OB/GYN Specialists of Palm Beach Health Information System

<table>
<thead>
<tr>
<th>Customers</th>
<th>Products &amp; Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Patient</td>
<td>• Customer demographics</td>
</tr>
<tr>
<td>• Pharmacists</td>
<td>• Medical Instances</td>
</tr>
<tr>
<td>• Laboratory / Diagnostic centers</td>
<td>• Scheduling</td>
</tr>
<tr>
<td>• Insurance companies</td>
<td>• Prescriptions</td>
</tr>
<tr>
<td>• Physicians</td>
<td>• Billing</td>
</tr>
</tbody>
</table>

### Major Processes and Activities

- The Patient calls in the Administrative Assistant to schedule an appointment with a particular physician (Patient Demographic Use case).
- On the appointment day, the Patient reports at the counter for the Administrative Assistant to update the record.
- On interviewing the patient, the Healthcare professional creates the medical instance record with details like vital, symptoms, examination notes.
- The patient is now examined by the physician and a diagnosis made which is updated on the medical instance record.
- If suggested by the physician, the patient is referred for laboratory/diagnostic tests.
- The physician prescribes a prescription for the patient.
- The administrative assistant then makes a bill and checks out the patient.

### Participants

- Physician,
- Nurses,
- Administrative assistants,
- Other physicians
- Specialists,
- Pharmacists
- Health Care professional

### Information

- Patients Demographics
- Patients history (allergies etc)
- Insurance
- Prescription
- Billing details
- Schedule
- Medical Instance records

### Technologies

- Manual register
- Centralized Health Information System
- HIPAA Compliant Interface
- Data Exchange
- EMR
- Internet
Project Work

• Use Case diagram using RUP – pg 16
Project Work

- Activity diagram using RUP – pg 23
Project Work

• Sequence Diagram using RUP – pg 25
Project Work

- Class Diagram using RUP – pg 29
References

- Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition By Craig Larman
- http://atlas.kennesaw.edu/~dbraun/csis4650/A&D/UML_tutorial/what_is.uml.htm
- Entity Relationship Modeling with UML - A technical discussion on modeling with UML 06/11/03 - Davor Gornik – IBM paper
Thank you