Technology Science Information Networks Computing

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New Media Product Design and Development

Lecture 3. Detailed Design

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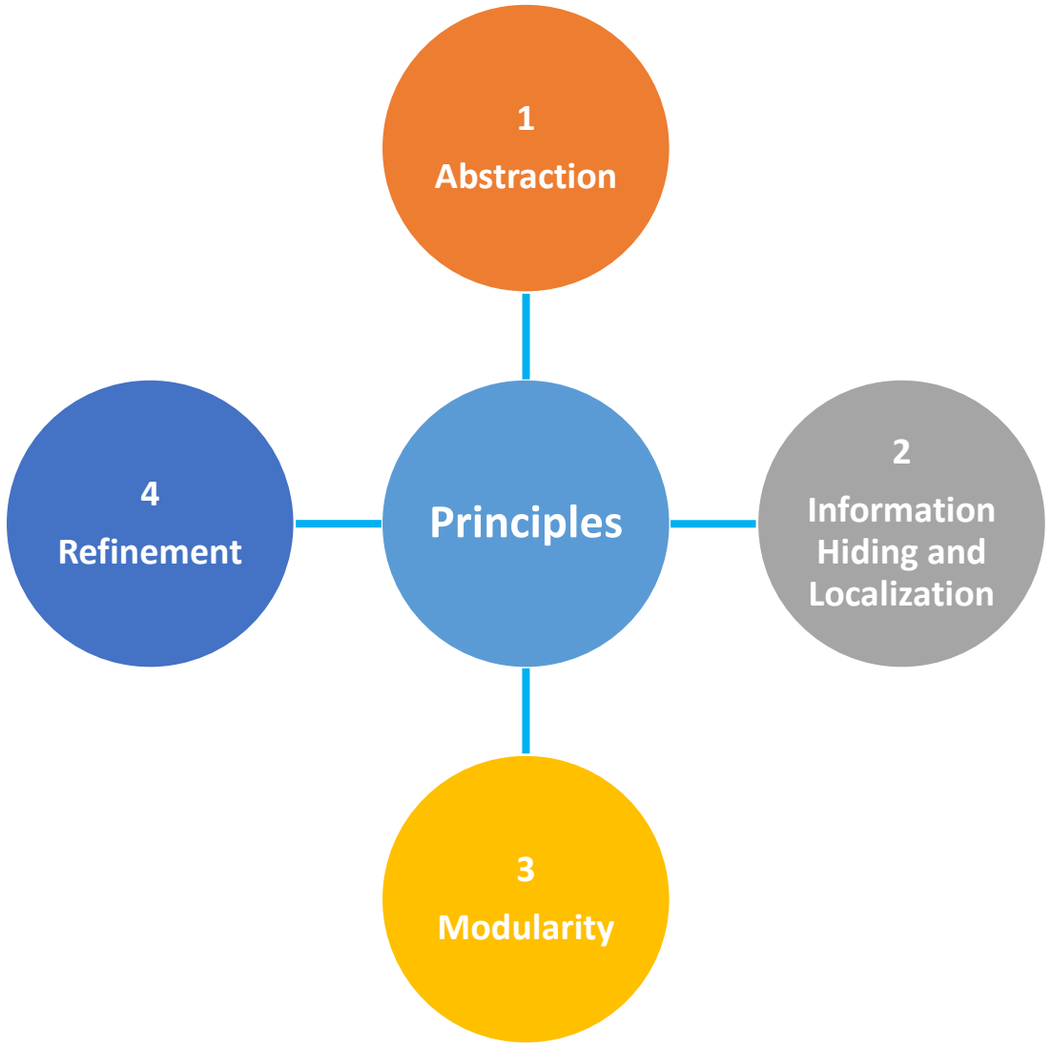
Yangtze Delta Region Institute of Tsinghua University, Zhejiang

Part 02

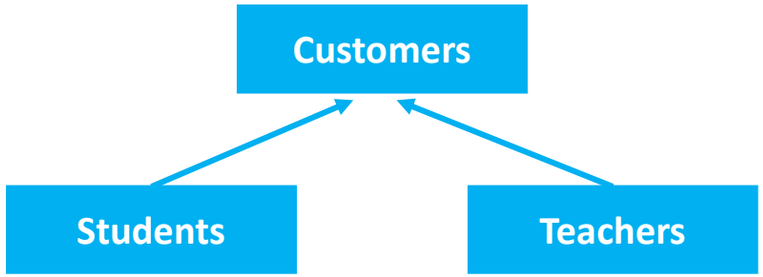
Principles and Views of Detailed Design

Principles of system architecture design

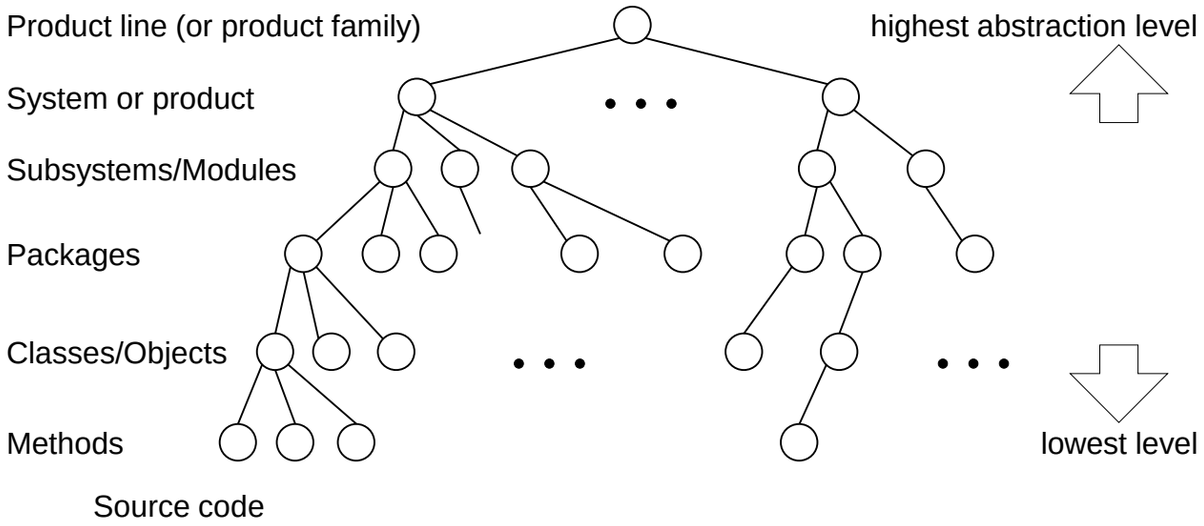


Abstraction

Extract the same parts from different things



Give levels to analyze them

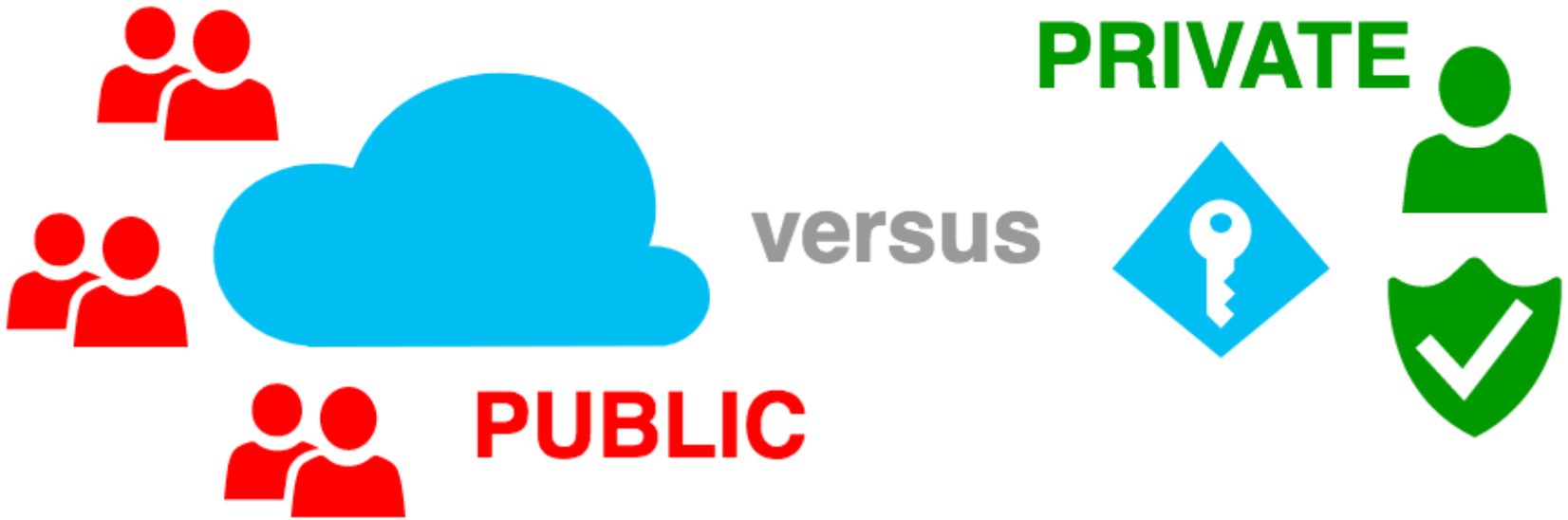


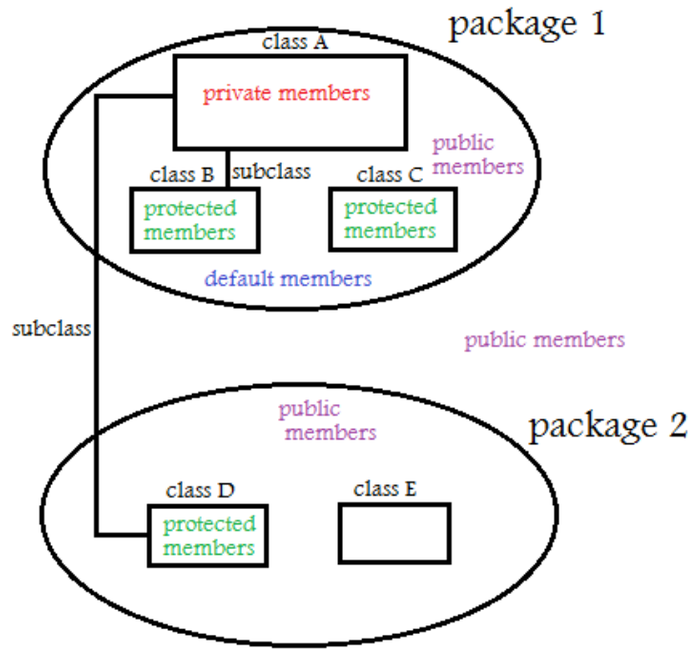
> **Abstraction** is one of the fundamental ways that we as humans cope with complexity."
>
> ——*Grady Booch*

Grady Booch
IBM Fellow

Information hiding and localization

> Modules should be specified and designed so that information contained within a module is inaccessible to other modules that have no need for such information.

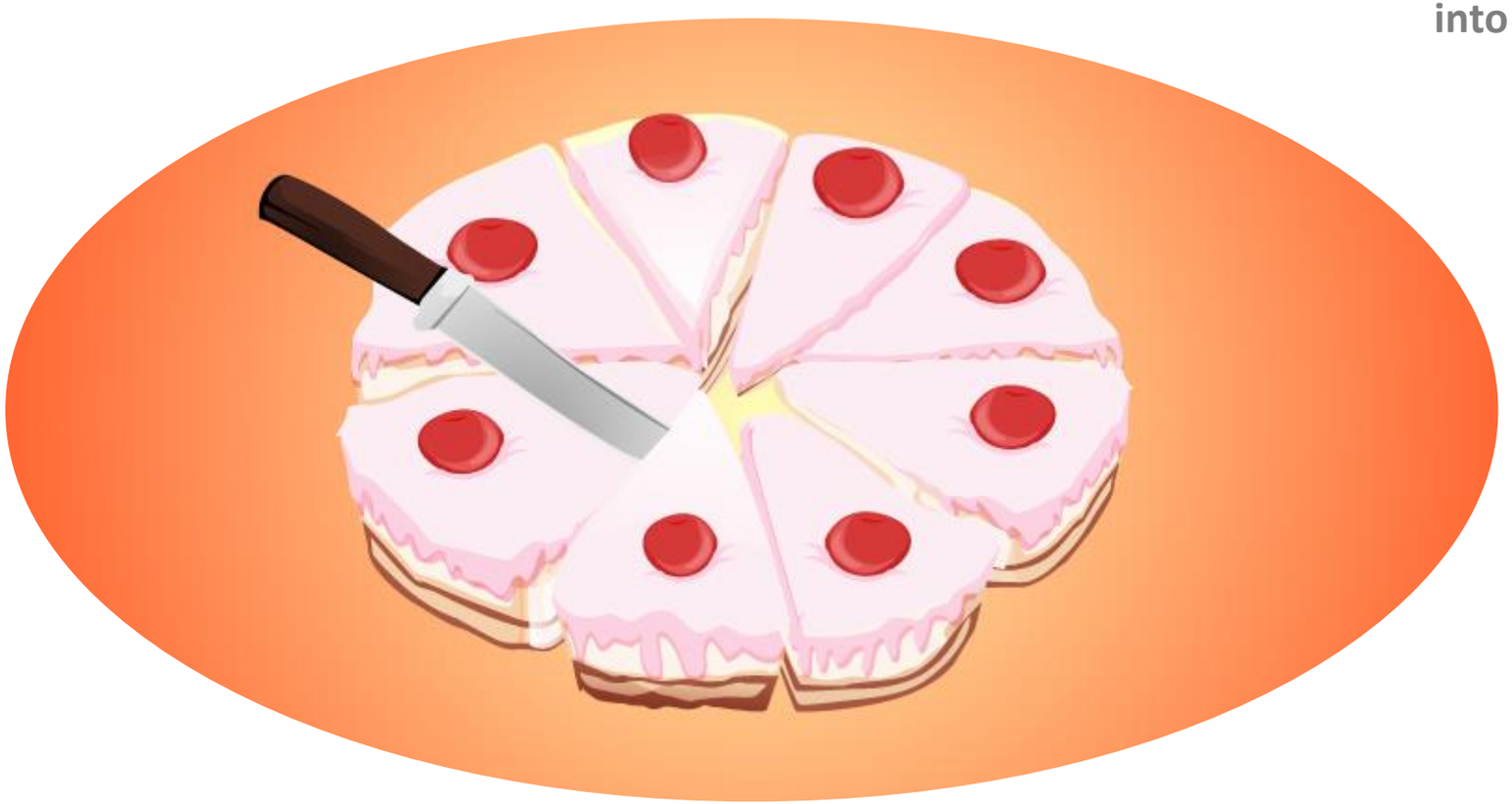




Modularity

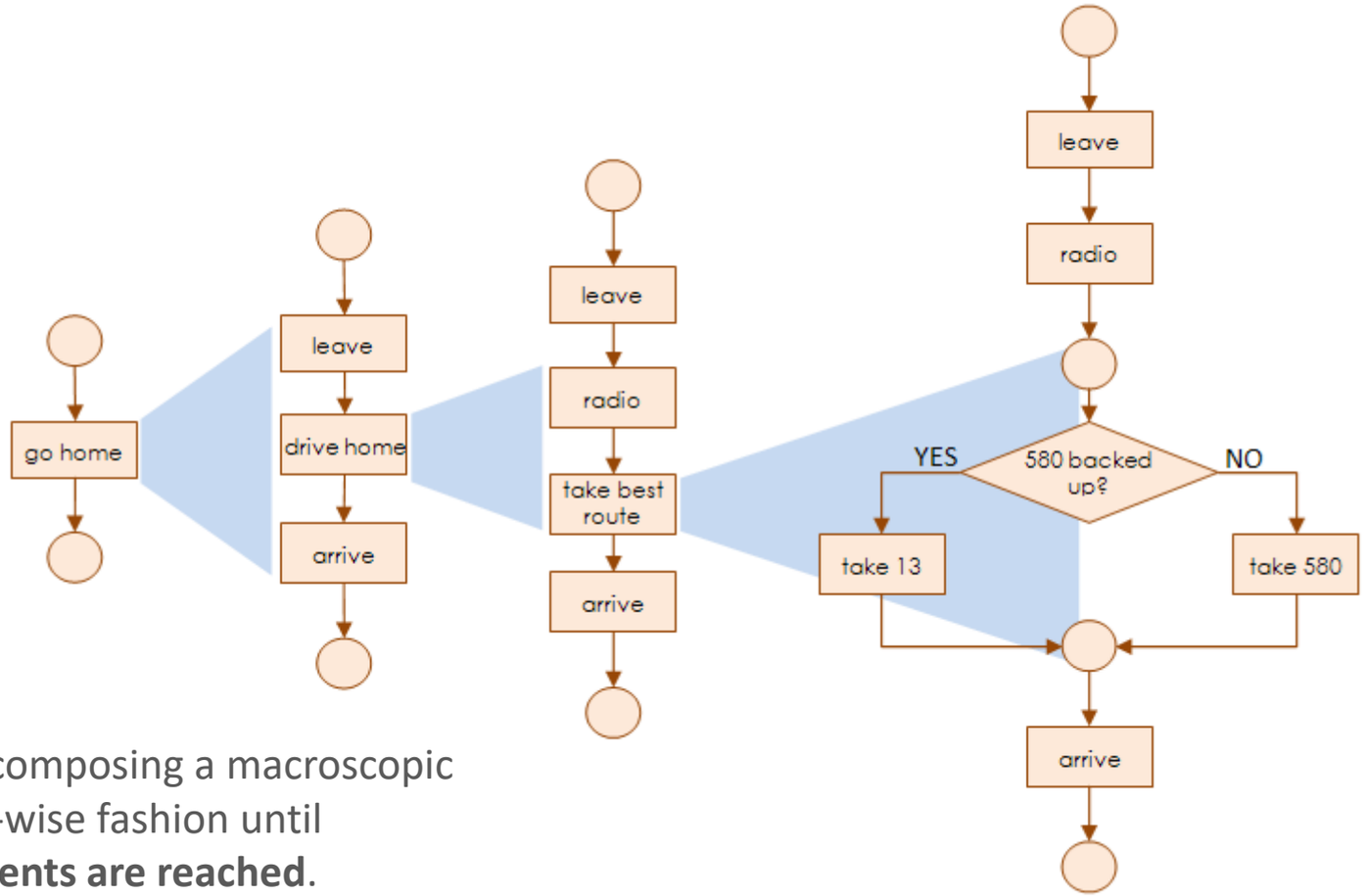
Divide and Conquer

> **Software architecture is divided into components called modules.**



Refinement

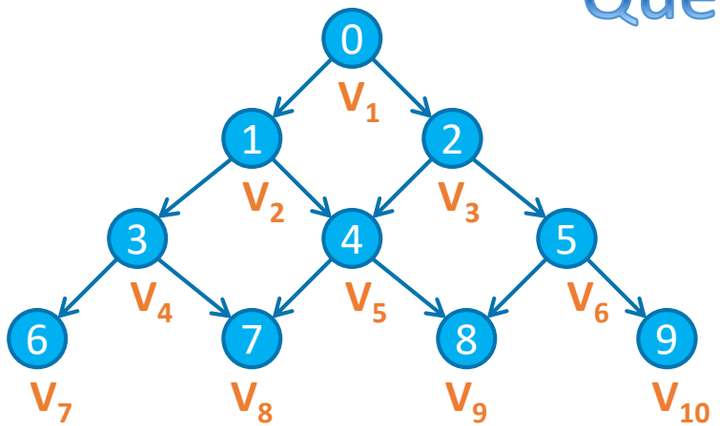
A process of elaboration



- A hierarchy is developed by decomposing a macroscopic statement of function in a step-wise fashion until **programming language statements are reached**.
- In each step, one or several instructions of a given program are decomposed into more detailed instructions.
- Abstraction and Refinement are complementary concepts.

Pseudo-code

BSF



Queue

First In First Out

FIFO

Algorithm Breadth-First Search (BFS)
Require: Initial node v, graph/tree G(V; E), queue Q

```
1: return An ordering on how nodes are visited
2: Enqueue v into queue Q;
3: visitOrder = 0;
4: while Q not empty do
5:      node = dequeue from Q;
6:      if node not visited then
7:          visitOrder = visitOrder +1;
8:          Mark node as visited with order visitOrder;
            //or print node
9:          Enqueue all neighbors/children of node into Q;
10:     end if
11: end while
```

Complexity of the Algorithms 1

Time Complexity

1

```
sum = n*(n+1)/2;          //时间复杂度O(1)
```

2

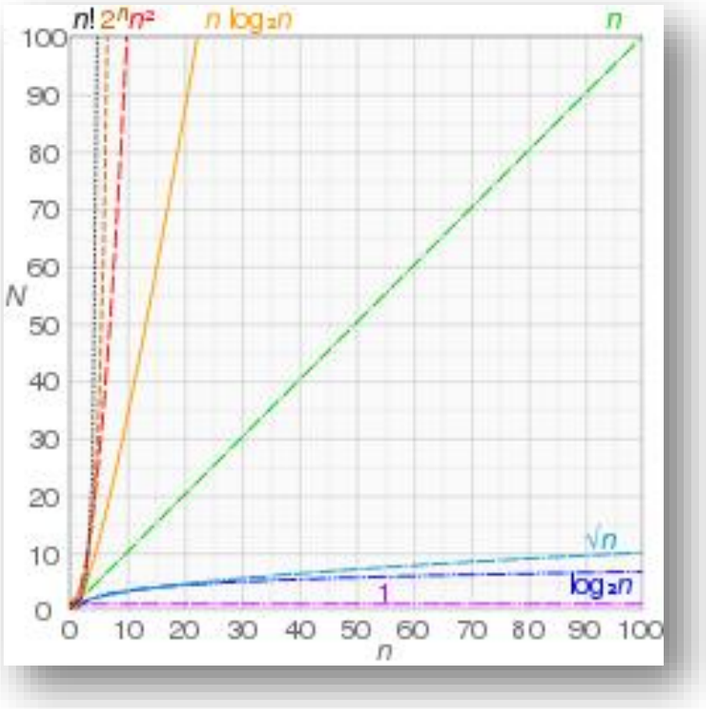
```
for(int i = 0; i < n; i++){
    printf("%d ",i);
}
//时间复杂度O(n)
```

3

```
for(int i = 0; i < n; i++){
    for(int j = 0; j < n; j++){
        printf("%d ",i);
    }
}
//时间复杂度O(n^2)
```

4

```
int i = 1, n = 100;
while(i < n){
    i = i * 2;
}
//设执行次数为x. 2^x = n 即x = log2n
//时间复杂度O(log2n)
```



> **Time complexity** is a concept in computer science that deals with the quantification of the amount of time taken by a set of code or algorithm to process or run as a function of the amount of input. In other words, time complexity is essentially efficiency, or how long a program function takes to process a given input.

Complexity of the Algorithms 2

Space Complexity

Relevant to Time Complexity: S(n)=O(f(n))

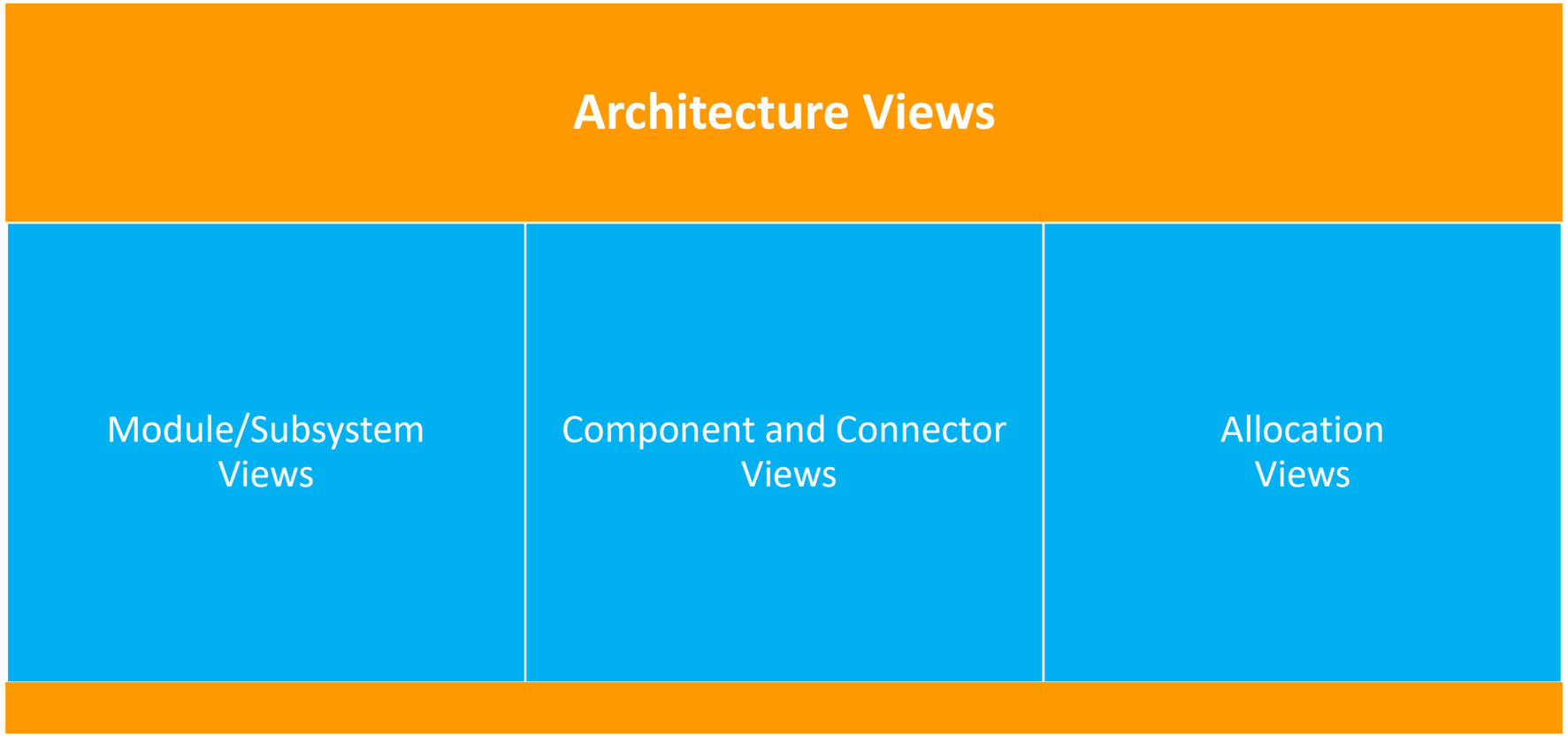
Including:

- Initialized data
- Algorithm data
- Some additional data

> The space complexity of a **recursive program: O(n)**

> **Space complexity** is a straightforward way for professionals to look at the footprint of an algorithm. For instance, engineers may add up memory to store program instructions, memory for variable values, and other types of central or auxiliary memory to get a total number of all of the memory that the program uses with a given number of inputs.

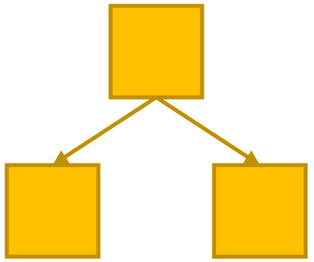
Documenting Software Architecture: Architecture Views



Module/Subsystem Views

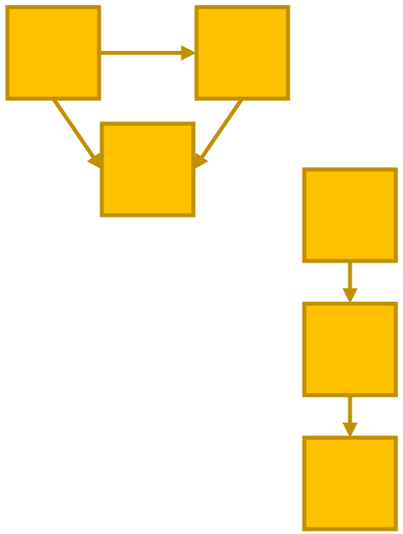
Decomposition View

- Top-down refinement (e.g., simple “block diagram”)



Dependency View

- How parts relate to one another

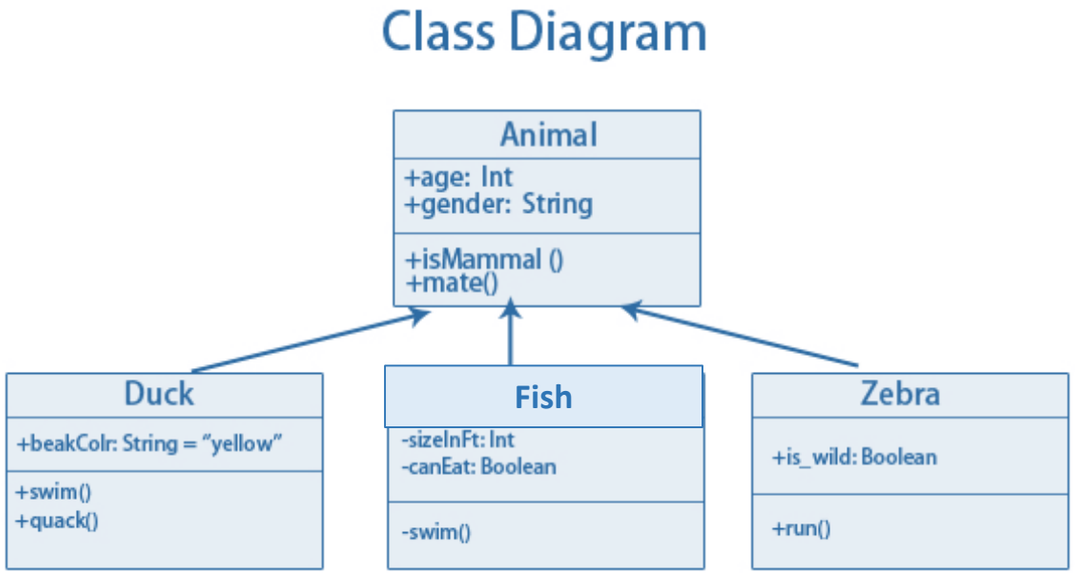


Layered View

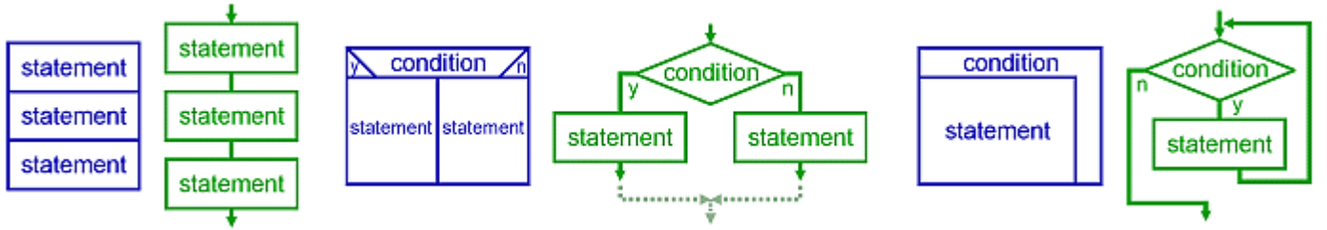
- Special case of dependency view

Class View

- “domain model” in OOA and “class diagram” in OOD



Component and Connector Views



Process View

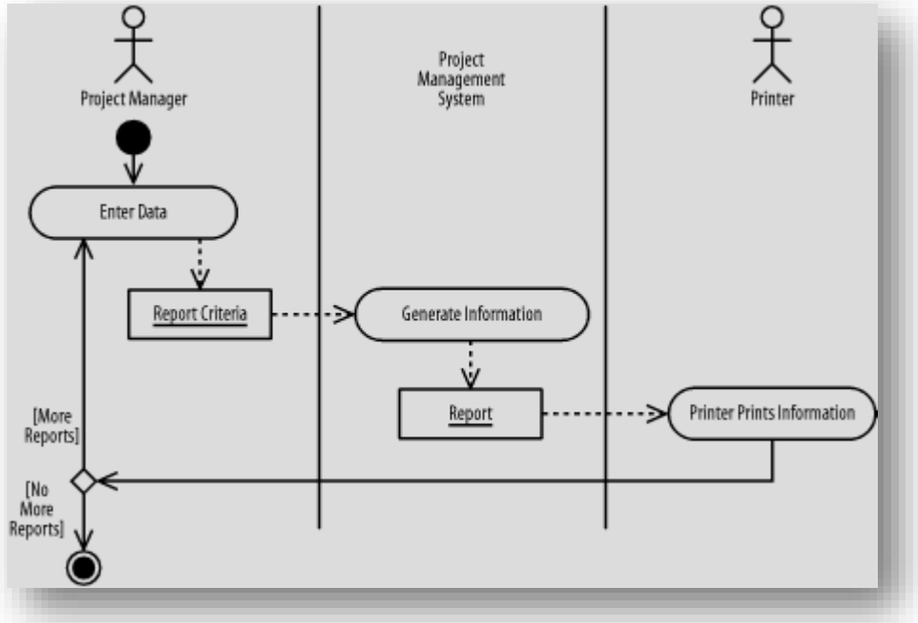
- Defined sequence of activities?
  System represented as a series of communicating processes

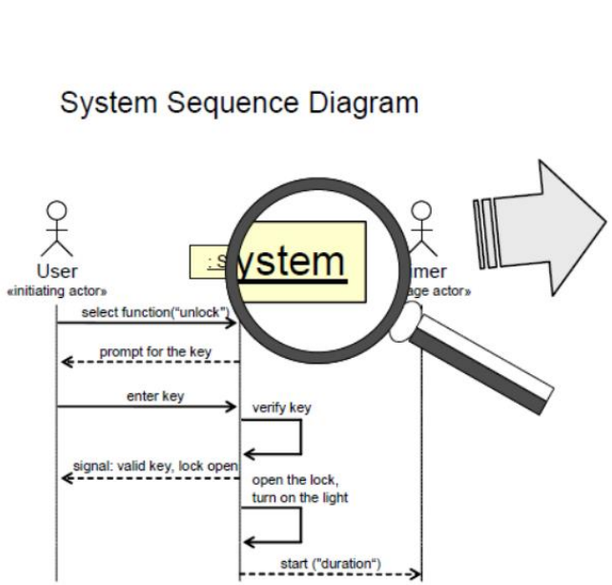
Concurrency View

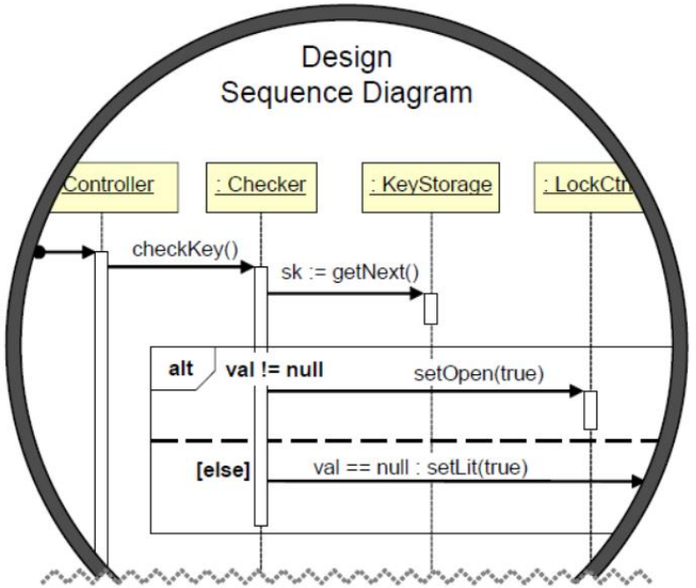
Shared Data View

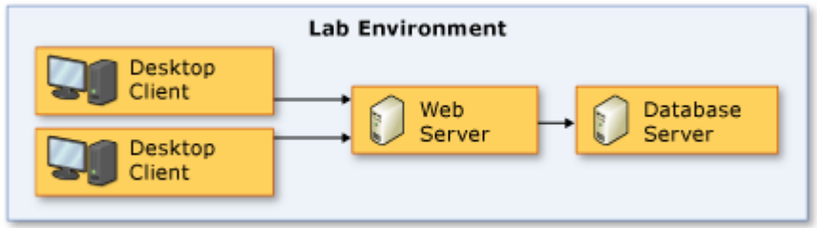
Client/Server View

- E.g., in Web browsing









Allocation Views

Deployment View

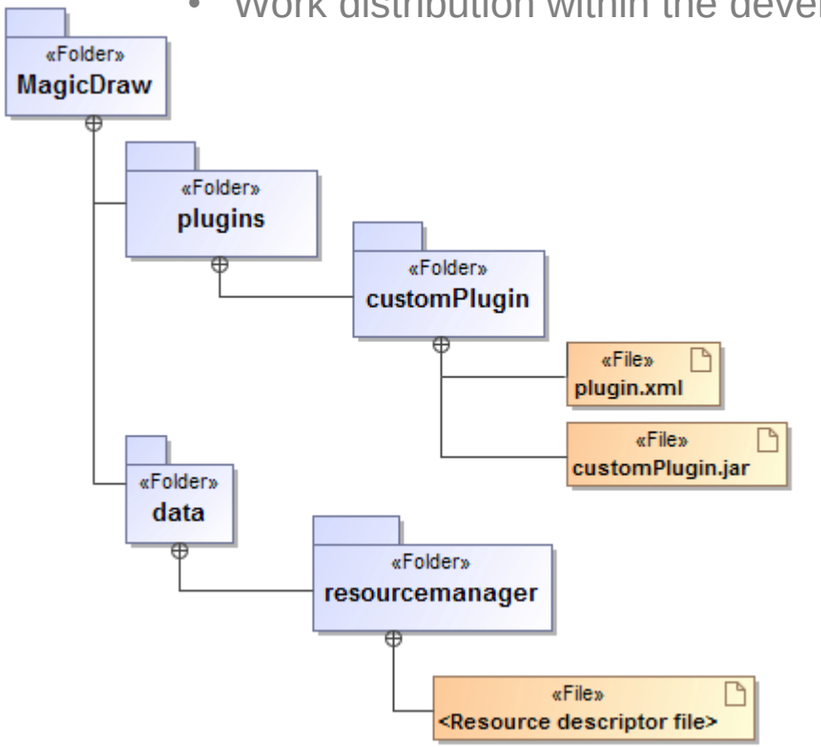
- Software-to-hardware assignment

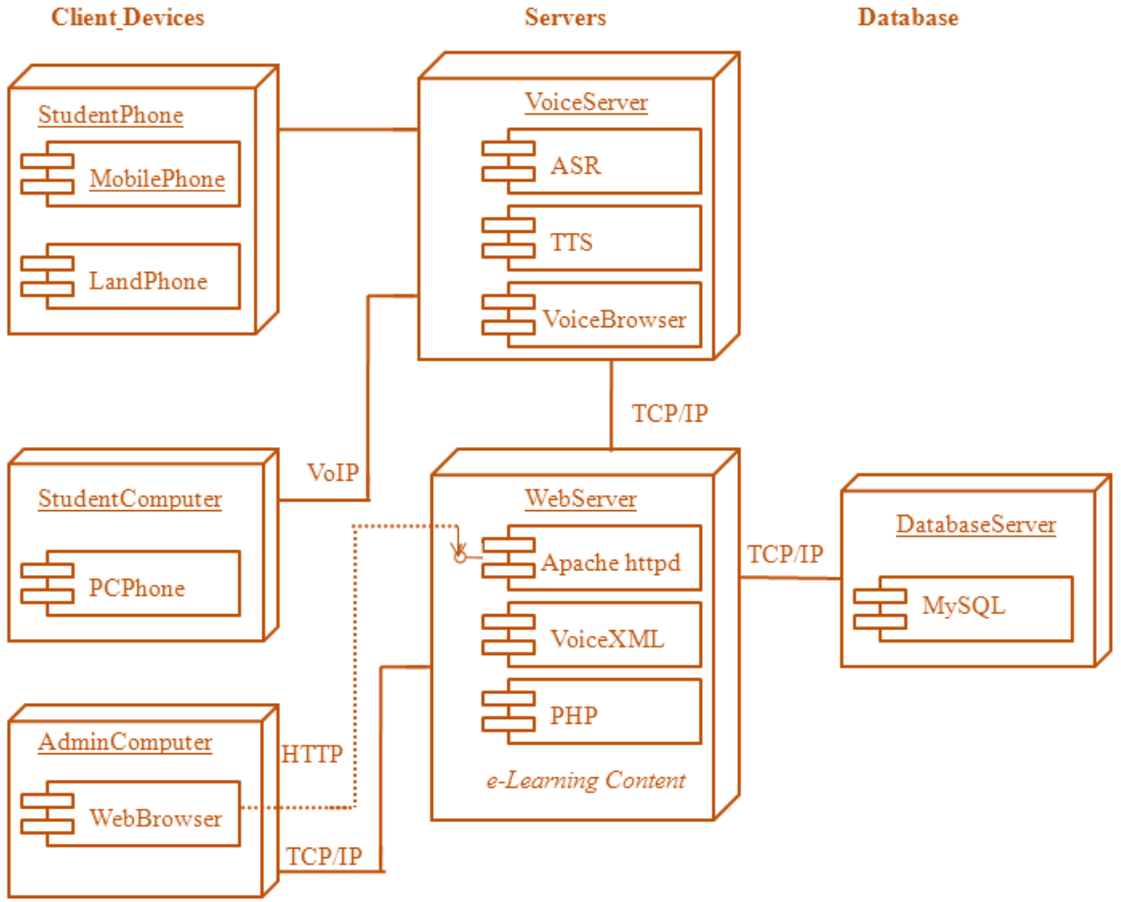
Implementation View

- File/folder structure – “package diagram”

Work Assignment View

- Work distribution within the development team

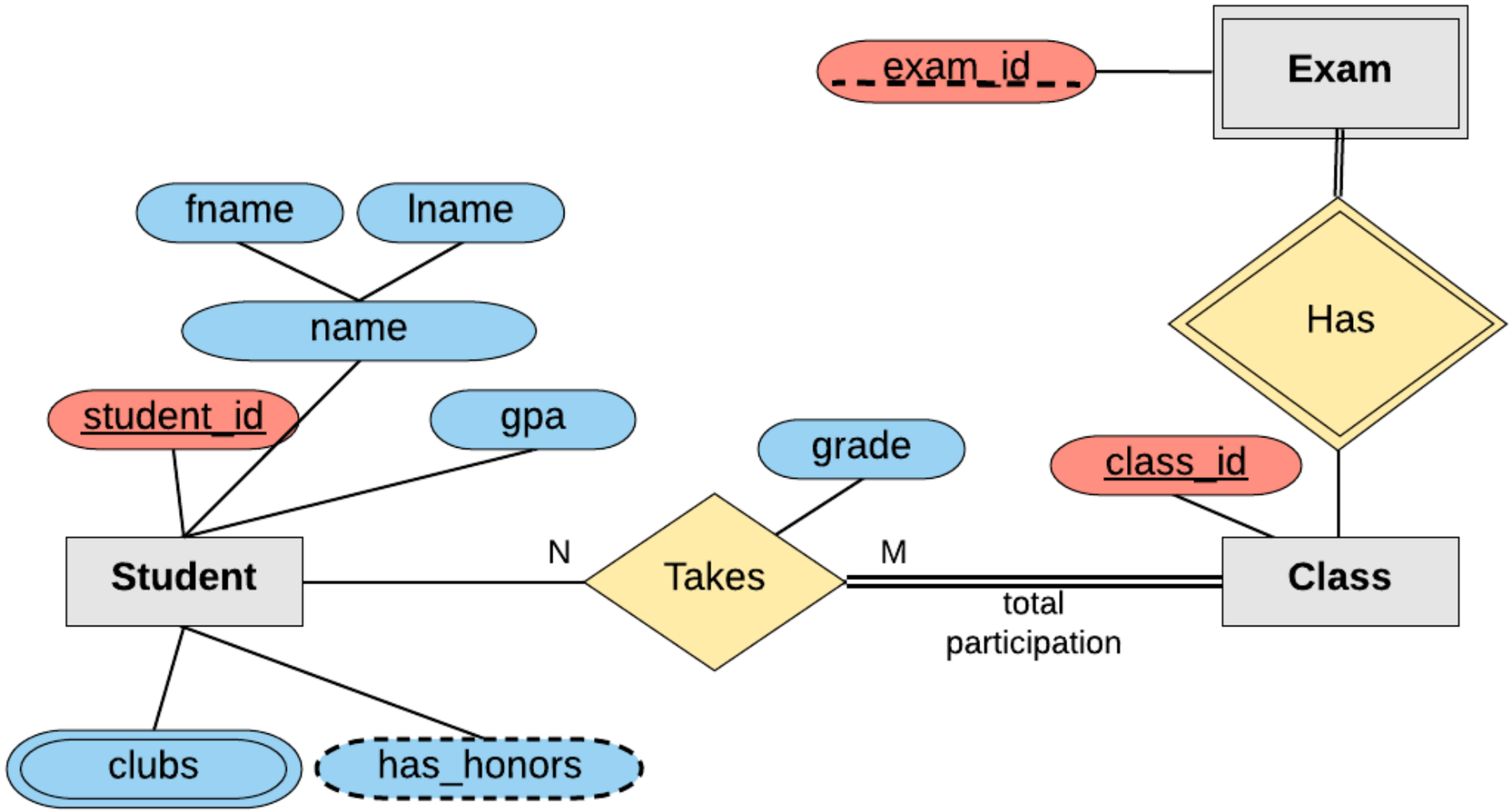




UML A UML deployment diagram for a Speech-Enabled e-Learning System

Data base design 1

ERD



Data base design 2

Documents

档案名称	SYS_ADMIN_MESSAGE
档案用途	管理留言资料档
主键(PK)	SYS_ADMIN_MESSAGE_PK: MESSAGE_ID(Cluster Index)
附键(AK)	

INDEX NAME	栏位	用途
SYS_ADMIN_MESSAGE_FK1	MESSAGE_FROM	FK: ADMIN_INFO(ADMIN_ID)
SYS_ADMIN_MESSAGE_FK2	MESSAGE_TO	FK: ADMIN_INFO(ADMIN_ID)

序号	栏位名称	栏位说明	资料形态	长度	Null	Default
01	MESSAGE_ID	留言编号	Number		X	
02	MESSAGE_NAME	留言标题	Char	200	X	
03	MESSAGE_INFO	留言内容	Text			
04	MESSAGE_TO	收言人员编号	Number		X	
05	READ_FLAG	已读标识	Number		X	0
06	STATE	状态	Number		X	0
06	CREATE_USER_ID	创建人编号	Number		X	1
07	CREATE_DATE	创建日期	Date		X	
08	UPDATE_DATE	更新日期	Date		X	

[注：] 已读标识：0-未读，1-已读，2 已删，3 为彻底删除。
状态：0-正常，1-已删除，2 为彻底删除。

Data base design 3

Scripts

名称	修改日期	类型	大小
Creation_(WIK)SystemFoundation.sql	2016/4/28 16:33	SQL Text File	8 KB
Drop_(WIK)SystemFoundation.sql	2016/4/28 9:34	SQL Text File	2 KB
Initialization_(WIK).sql	2016/6/19 23:10	SQL Text File	2 KB
Table(WIK).doc	2020/3/8 21:55	Microsoft Word ...	333 KB

Drop_(WIK)SystemFoundation.sql - 记事本

文件(F) 编辑(E) 格式(O) 查看(V) 帮助(H)

```
/*****************************************************/
/*                                                   */
/*       王挺制作          DROPd By Dr. Ting Wang  */
/*     LSB(R)版权所有      Copyrights (C)2007-05-03  */
/*                         Last Update   2015-11-05  */
/*****************************************************/
/*****************************************************/
/*    Intelligent Data Framework - Creation          */
/*                资料库生成程式                     */
/*     System Foundation Database (SFD)              */
/*****************************************************/


DROP TABLE WIK_WIKI
DROP TABLE WIK_EXAMINE_WIKI
DROP TABLE WIK_HISTORY_WIKI
DROP TABLE WIK_LABEL
DROP TABLE WIK_WIKI_LABEL_LINK
DROP TABLE WIK_EXAMINE_LABEL_LINK
DROP TABLE WIK_HISTORY_LABEL_LINK
DROP TABLE WIK_WIKI_EXAMINE_INFO
DROP TABLE WIK_WIKI_PRAISE
DROP TABLE WIK_IMAGE
DROP TABLE WIK_BASIC_INFO
DROP TABLE WIK_EXAMINE_BASIC_INFO
DROP TABLE WIK_HISTORY_BASIC_INFO
DROP TABLE WIK_CONTROL
```

Windows (C 第 20 行，第 100%

Initialization_(WIK).sql - 记事本

文件(F) 编辑(E) 格式(O) 查看(V) 帮助(H)

```
/*****************************************************/
/*                                                   */
/*       肖永康制作     Created By     Yongkang.Xiao  */
/*       IDF版权所有        Copyrights (C)2015-12-16  */
/*                          Last Update   2015-12-16  */
/*****************************************************/


INSERT INTO WIK_WIKI (WIKI_TITLE,DEFINITION) VALUES ('水牛','水牛是一种双角偶蹄类哺乳动物')
INSERT INTO WIK_EXAMINE_WIKI (WIKI_TITLE,DEFINITION) VALUES ('西瓜','西瓜是一种凉性水果')
INSERT INTO WIK_HISTORY_WIKI (WIKI_TITLE,DEFINITION) VALUES ('西瓜','西瓜有红瓤也有黄瓤的')
INSERT INTO WIK_LABEL (LABEL_TITLE) VALUES ('绿色')
INSERT INTO WIK_WIKI_LABEL_LINK (LABEL_ID,WIKI_ID) VALUES (1,1)
INSERT INTO WIK_WIKI_EXAMINE_INFO (WIKI_ID,MODIFY_REASON,ADMIN_ID,AGREE,OPINION,WIKI_TITLE) VALUES (1,'存在低级错误',1,1,'说的很对','水牛')
INSERT INTO WIK_WIKI_PRAISE (UP_DOWN,WIKI_ID) VALUES (1,1)
INSERT INTO WIK_IMAGE (WIKI_ID,IMAGE_URL) VALUES (1,'/main/images/ico/member.gif')
INSERT INTO WIK_CONTROL (WIK_CONTROL) VALUES (0)
```

Windows (CRLF) 第 1 行，第 1 列 100%

Creation_(WIK)SystemFoundation.sql - 记事本

文件(F) 编辑(E) 格式(O) 查看(V) 帮助(H)

```
/*****************************************************/
/*                                                   */
/*       王挺制作          Created By Dr. Ting Wang  */
/*     LSB(R)版权所有      Copyrights (C)2007-05-03  */
/*                         Last Update   2015-11-05  */
/*****************************************************/
/*****************************************************/
/*    Intelligent Data Framework - Creation          */
/*                资料库生成程式                     */
/*     System Foundation Database (SFD)              */
/*****************************************************/

CREATE TABLE WIK_WIKI
(
   WIKI_ID              INT                 IDENTITY(1,1)          PRIMARY KEY CLUSTERED,
   WIKI_TITLE           VARCHAR(255)                               NOT NULL,
   DEFINITION           VARCHAR(max)                               NOT NULL,
   BROWSE_NUMBER        INT                 DEFAULT 0              NOT NULL,
   LIKE_ID              INT                 DEFAULT 0              NOT NULL,
   CREATE_USER_ID       INT                 DEFAULT 1              NOT NULL,
   CREATE_DATE          DATETIME            DEFAULT GETDATE()      NOT NULL,
   UPDATE_DATE          DATETIME            DEFAULT GETDATE()      NOT NULL,

)


CREATE TABLE WIK_EXAMINE_WIKI
(
   EXAMINE_WIKI_ID      INT           IDENTITY(1,1)          PRIMARY KEY CLUSTERED,
   WIKI_TITLE           VARCHAR(255)                         NOT NULL,
   DEFINITION           VARCHAR(max)                         NOT NULL,
   BROWSE_NUMBER        INT           DEFAULT 0              NOT NULL,
   STATE  INT           DEFAULT 0                            NOT NULL,
   CREATE_USER_ID       INT           DEFAULT 1              NOT NULL,
   CREATE_DATE          DATETIME      DEFAULT GETDATE()      NOT NULL,
   UPDATE_DATE          DATETIME      DEFAULT GETDATE()      NOT NULL,

)
```

Windows (CRLF) 第 1 行，第 1 列 100%

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《详细设计说明书》

2006

《系统/子系统设计(结构设计)说明》(SSDD)

《接口设计说明》(IDD)

《软件(结构)设计说明》(SDD)

《数据库(顶层)设计说明》(DBDD)

New Media Product Design and Development

Lecture 3-2. The End

THANK YOU

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