1. According to your understanding, please describe what quality attribute scenario is.

2. Please describe the "blackboard" architecture style and point out its advantages and disadvantages.

3. Which of the following tactic can be used to achieve the Availability?

A)Hide information B) Heartbeat

C) Scheduling policy D)Introduce concurrency

10. Which architecture style does the following diagram describe?

A) Blackboard B) Repository

C) Implicit invocation D) Layered

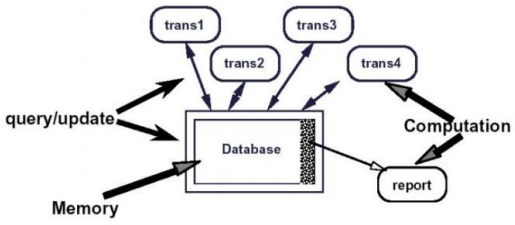

Figure 10

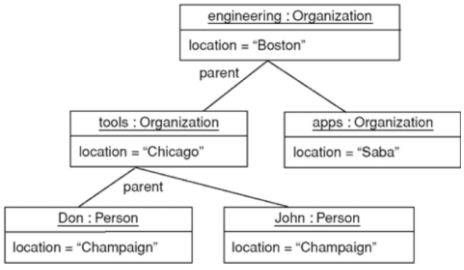

Figure 7

7.Which kind of diagram is the following diagram?

A) Class diagram B)Component diagram

D) Object diagram D) Package diagram

Utility Tree

①A software company plans to develop an intelligent video surveillance system（智能视频监控系统)，The development team analyzed the Quality Attributes, designed architecture and wanted to use Utility Tree to evaluate the architecture, followings are the scenarios.

1) The backend(后端)system should be deployed on an open source Linux system.

2) The system should support Web-based and Android-based clients.3) A request to deliver real time video must be responded less than 3s.

4) Power outage(断电）at site 1 requires traffic redirect to site 3 in less than 5 minutes.

5) An authentication(认证) server should be deployed to support real name authentication.

6) Adding a middleware to system must be less than 10 person months.7) Minimize storage latency on video DB to 300ms.

8) Customer authorization(授权） database works 99.99% of the time.

9) Change Web user interface to a flat UI style must be less than 10 person weeks.

10)Each Video footage(录像）should be stored at least in 3 months.

11)The development of a new Android client must be less than 2 person weeks.

12)Network failure is detected and recovered in< 1.5min

According the scenarios, please construct a Utility Tree.

② There was a system concerned about Performance, Modifiability, Availability and Security. A development team analyzed the Quality attributes, designed architecture and wanted to use Utility Tree to evaluate the architecture, the following are the scenarios.

1)The Power off (电力中断) at Web site 1 requires traffic redirected to Web site 2 in < 3 seconds

2) Credit card transactions are secure 99.999% of the time z Deliver video in real time

3) Change Web user interface in < 4 person-weeks z Network failure detected and recovered in < 1.5 minutes

4) Reduce storage latency on customer DB to < 200ms

5) Add CORBA middleware in < 20 person-month

6)The system is able to be accessed from the intranet(局域网) to support remote invocation and debugging

7)The user password must have least 16 characters mixed with number

③ A software company plans to develop a video sharing Web site. The development team analyzed the Quality Attributes, designed architecture, and wanted to use Utility Tree to evaluate the architecture, followings are the scenarios.

1)The crash of Web server #1 requires traffic redirected to Web server #2 in <5 seconds

2)Credit card transactions are secure 99.999% of the time

3)Deliver video in real time

4)Change Web user interface in < 4 person-weeks

5)Any network failures should be detected and recovered in < 10 minutes User password must have least 16 characters mixed with numbers

6)Reduce storage latency on customer DB to <200ms

7)Add message queue(消息队列)middleware in < 20 person-month

8)The system is able to be accessed from the intranet(局域网) to support remote invocation and debugging

9)User Database accessing is secure 99.99% of the time

④ A software company plans to develop a purchase2pay system. The development team analyzed the Quality Attributes, designed architecture, and wanted to use Utility Tree to evaluate the architecture, followings are the scenarios.

1)Minimize storage latency on customer DB to 200ms
2)Deliver video in real time
3)Maximize average throughput to authentication server
4)Add new product categories
5)User name must have least 5 characters started with letters
6)Change web user interface in <4 person weeks
7)Power output at site 1 requires traffic redirect to site 3 <3s.
8)Network failure is detected and recovered in< 1.5min
9)Customer database authorization works 99.99% of the time

Identify sensitivity point, tradeoffs, risks, non-risks.

① Identify and record risks and non-risks, sensitivity points and tradeoffs are an important task in architecture evaluation. Please *describe the definitions* of risk, non-risk, sensitivity point and tradeoffs and then read the following descriptions and *point out* each description is a risks, non-risks, sensitivity points or tradeoffs

a) There is no way of detecting the failure of the communication line between server and clients.
b) The number of simultaneous connections will significantly affect the number of transaction a database can process per second.
c) Changing the algorithm of encryption could have a impact on both security and performance.
d) The data sampling rate is once per second, and the processing time is less than 30ms.
e) Discount policy for VIP is not clearly described. This could result in replication of functionality.
f) A system with high modularity might have low portability and performance.

② Identify and record risks and non-risks, sensitivity points and tradeoffs is an important task in architecture evaluation. Please describe the definitions of risk, non-risk, sensitivity point and tradeoffs and then read the following descriptions and point out each description is a risks, non-risks, sensitivity points or tradeoffs.

1.Descriptions of architecture evaluation

a)"changing the way of login could have a significant impact on both security and performance."

b)"Rules for 'deposit money' business process are not clearly articulated. This could result in replication of functionality thereby compromising modifiability of the third tier."

c)"The average number of person-days of effort it takes to maintain a system might be sensitive to the degree of encapsulation of its communication protocols and file formats."

d)"Assuming message arrival rates of once per second, a processing time of less than 30ms, and the existence of one higher priority process, a 1second soft deadline seems reasonable."

③ Descriptions of architecture evaluation

a)"although the underlying(底层) framework of this system is good and stable, rules for writing business logic tier of your 3-tier style are not clearly articulated（说明).This could result in replication of functionality thereby compromising modifiability of the third tier."

b)"Changing the timing scheme from a harmonic（谱波）framework to anon-harmonic framework would be easy, but due to implied timing dependencies, there would impact far reaching impacts （极大地影响）toother modules."

c) "In order to achieve the required level of performance in the discrete event generation component, assembly language had to be used thereby(因此）reducing the portability of this component."

d)"Assuming message arrival rates of once per second, a processing time of less than 30ms, and the existence of one higher priority process, a1 second soft deadline seems reasonable."

④ Descriptions of architecture evaluation

a) There is no way of detecting the "live" failure of a critical component.
b) The number of simultaneous database clients will affect the number of transactions a database can process per second.
c)Changing the level of encryption could have a significant impact on both security and performance.
d)"Assuming message arrival rates of once per second, a processing time of less than 30ms, and the existence of one higher priority process, a 1 second soft deadline seems reasonable."
e)"Rules for 'calculate tax rate' business process are not clearly articulated. This could result in replication of functionality thereby compromising(损害) modifiability of the third tier."
f)"The level of confidentiality in a virtual private network might be sensitive to the number of bits of encryption."

Architecture Analysis and Design

① Please analyze the requirements and complete following 4 Questions.

A company plans to develop a software system for a specific kind of sweeping(扫地) robots. The system will control such a robot to move around and clean up the indoor floor. A robot is designed to move in a room randomly. When the robot detects a rubbish(垃圾), it is supposed to gather the rubbish and continue to repeat such a step. If an obstacle(障碍物)blocks in its way, the robot should be able to bypass (绕过) the obstacle and move on. This software system is composed of several modules, containing sensor component, walking component, cleaning component, user interface and so on. The core module receives the information from sensor, and then controls walking and cleaning modules to execute tasks. The user interface of the system is in charge of giving operation orders and displaying the current state.

Following are some detailed requirements of this system.

1) The color of robot may be red, yellow, and blue.

2) When an obstacle is less than 0.5 cm thick, such as a piece of carpet (地毯), the robot is capable of crossing over it and keeping moving within 0.1s.

3) A robot may encounter (遭遇)a malfunction(故障) during working. The average recovery time should be less than 5 minutes.

4) The system could be accessed remotely. Only authorized user can sign in and control and robot.

5) According to the previous market research, the price of this robot is suggested to be $199-$299.

6) The robot will be tested in real environment. The system should provide specific interfaces for this.

7) When a sensor in the robot is changed, the corresponding software component should be updated by 2 developers within 3 days.

8) The time of industrial process for this robot must be less than 3 months.

9) When the robot is going to be power off soon, it could return to power supply(电源) and recharge itself.

10) Given a room within 20 square meters broad, the robot is required to sweep it in less than 1 hour.

11) The user interface is required to be simple and friendly as far as possible.

Questions:

a) Identify and name the related quality attributes according to the requirements.

b) For each quality attribute, give the corresponding quality attribute scenario.

c) For each quality attribute, list at least 2 solutions for archiving the corresponding quality attribute.

d) According to the requirements, which software architecture style is better for this system? Describe the reason and list the advantages and disadvantages of architecture style you choose for the system.

②A company wants to develop a software system used in its intranet （局域网）. The function of this systems is same as Weibo and Twitter. Each department（部门） can publish information about the department using this system, and Employees in this company can follow（关注） one or more departments to receive information published by these departments. When one department publishes a piece of new information, the system will send the information to all the followers （关注者） of this department. After one employee unfollows one department, he/she will not receive information published by this department in future.

Following are some detailed requirements of this system.

1)one employee can follow one or more departments and can unfollow one department at any time.

2)The total unavailable time of the systems should be less than 10 hours in a year.

3)The average recovery time of each system fault should be less than one hour.

4)The system copies the interface(界面）of Weibo, so it's easy to use.

5)Every minor update of this system should be accomplished by 2 developer within 1 days.

6)A hardware firewall is used to separate the system from the Internet.

7)One employee can send private messages to another employee using this system.

8)The loading time from an employee's login to displaying his/her home page should be less than 0.1s.

9)The system provides special interfaces to do automated（自动的）testing.

Please analyze the requirements and complete following 4 questions:

a) Identify and name the related quality attributes according to the requirements.

b)For each quality attribute, give the corresponding quality attribute scenario.

c) For each quality attribute, list at least 2 solutions for archiving the corresponding quality attribute.

d) According to the requirements, which software architecture style is better for this system? Describe the reason and list the advantages and disadvantages of architecture style you choose for the system.

③. A software company plans to develop a Member Service Management system (short for MSM) for a golf club. One of the most important functionality of MSM system is to calculate the discount for each club member according to her level, history activities and records of consumption(消费). The club now has silver, gold and platinum three different member levels, and the member level will be extended in the future. Besides, the way to calculate discount may change from time to time.

Following are some detailed requirements for MSM system.

1)Each Member owns her personalized UI interface.

2)The MSM system should be accessible remotely for testing and debugging using some internal protocols.

3)To become a qualified member, a person must older than 18 years and have a >$500o0 annual income.

4)If a develop wishes to change the UI at design time, the change must be made with no effects in 3 hours.

5)When an unanticipated message from external to MSM system arrives under normal operations of MSM system, the operator(操作人员) must be informed and she can continue to operate without downtime.

6)When a member initiates a "purchase order" transaction under normal operations of MSM system, the transaction must be processed with average latency of two seconds.

7)The MSM should have a Windows look-and-feel(外观),so it is easy for members to accomplish a desired task.

8)when a correctly identified member tries to modify her profile under normal operations of MSM system, the MSM system should maintain an audit trail and the modified data is restored within 10 minutes.

Please analyze the requirements and complete following 4 questions:

a) Identify and name the related quality attributes according to the requirements.

b)For each quality attribute, give the corresponding quality attribute scenario.

c) For each quality attribute, list at least 2 solutions for archiving the corresponding quality attribute.

d) According to the requirements, which software architecture style is better for this system? Describe the reason and list the advantages and disadvantages of architecture style you choose for the system.

④ A Computer Aided Software Engineering（CASE）tool company wants to development an integrated development environment（IDE，集成开发环境）for a new programming language named ‘GO’, which is invented by Google.

This IDE must support programming, compiling（编译）, linking and execution for GO programs. Besides, it also needs to support interactive（交互式） and incremental（增量式） code-editing and covers the full life cycle of software development written by GO language, including software documentation, configuration and deployment.

Following are some detailed requirements of this IDE.

1)The compiling and linking time of a 1000-line GO program must be less than 0.01s.

2)The IDE should be accessible remotely for diagnosis(诊断) and debugging using some diagnosis and debugging protocols.

3)The IDE should support automatically spell-checking (拼写检查）when the developer editing a Go program.

4)The IDE should have a Windows look-and-feel(外观) , so it is easy for the developer to accomplish a desired task.

5)The IDE should be modified and re-deployed in another operating system by 3 developers within 2 months.