Modeling and Perfomance Evaluation of Computer Systems

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Winter 1391
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System Life Cycle

System Life Cycle

1. Requirements Analysis and Specification

System Life Cycle

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1.1. Functional

System Life Cycle

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1.1. Functional

- inputs, outputs, and interaction by users.

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- ie, search in a library based on ISBN, title, and authors.

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- ie, search in a library based on ISBN, title, and authors.
- How the results of a search are displayed.

System Life Cycle

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- inputs, outputs, and interaction by users.
- ie, search in a library based on ISBN, title, and authors.
- How the results of a search are displayed.
- Information about the physical environment and technology

System Life Cycle

1. Requirements Analysis and Specification

1.1. Functional

- inputs, outputs, and interaction by users.
- ie, search in a library based on ISBN, title, and authors.
- How the results of a search are displayed.
- Information about the physical environment and technology
- Another functional requirement of this applicatin is specification of its platform. web-based, linux-based and so on.

System Life Cycle

1. Requirements Analysis and Specification
   1.1. Functional
   1.2. Non-functional

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- QoS :

System Life Cycle

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- QoS : performance, availability, reliability, and security

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- QoS : performance, availability, reliability, and security
- Qualitative and quantitative characterization of the workload

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- Qualitative and quantitative characterization of the workload
- Specific workload types and levels

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- Qualitative and quantitative characterization of the workload
- Specific workload types and levels
- ie: At peak periods

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- Specific workload types and levels
- ie: At peak periods

... The library is expected to receive 50 search requests/sec

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... The library is expected to receive 50 search requests/sec

... Respond within 2 seconds

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- QoS : performance, availability, reliability, and security
- Qualitative and quantitative characterization of the workload
- Specific workload types and levels
- ie: At peak periods

... The library is expected to receive 50 search requests/sec
... Respond within 2 seconds
... To 95% of the requests.

System Life Cycle

1. Requirements Analysis and Specification
2. System Design

System Life Cycle

1. Requirements Analysis and Specification
2. System Design

- How will the requirements be met?

System Life Cycle

1. Requirements Analysis and Specification
2. System Design

- How will the requirements be met?
- Reusing proven software solutions

System Life Cycle

1. Requirements Analysis and Specification
2. System Design

- How will the requirements be met?
- Reusing proven software solutions
- Risk in terms of performance !!

System Life Cycle

1. Requirements Analysis and Specification
2. System Design

- How will the requirements be met?
- Reusing proven software solutions
- Risk in terms of performance !!
- Evaluation of the performance of the third-party solutions

... on overall system performance

System Life Cycle

1. Requirements Analysis and Specification
2. System Design
3. System Development

System Life Cycle

1. Requirements Analysis and Specification
2. System Design
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- May use other system implementations in this application.

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1. Requirements Analysis and Specification
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- May use other system implementations in this application.
- Choosing the best suitable underlying proven applications

System Life Cycle

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- May use other system implementations in this application.
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.... such as DataBase Management System (DBMS)

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.... such as DataBase Management System (DBMS)

.... based on performance needs versus price

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1. Requirements Analysis and Specification
2. System Design
3. System Development
4. System Testing

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- It is usually done concurrently with system development.

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- It is usually done concurrently with system development.
- Load testing

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- It is usually done concurrently with system development.
- Load testing
- Full testing is too time consuming

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- It is usually done concurrently with system development.
- Load testing
- Full testing is too time consuming
- and always there is budget constraints

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- It is usually done concurrently with system development.
- Load testing
- Full testing is too time consuming
- and always there is budget constraints
- Understanding the performance implications

.... and consequences of design and implementation

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4. System Testing
5. System Deployment

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- The system was usually tested in a controlled environment.

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- The system was usually tested in a controlled environment.
- Configuration parameters must be set for optimal performance.

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- The system was usually tested in a controlled environment.
- Configuration parameters must be set for optimal performance.
- Maximum number of TCP connections

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- The system was usually tested in a controlled environment.
- Configuration parameters must be set for optimal performance.
- Maximum number of TCP connections
- Maximum number of threads

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- The system was usually tested in a controlled environment.
- Configuration parameters must be set for optimal performance.
- Maximum number of TCP connections
- Maximum number of threads
- Timeout periods

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- The system was usually tested in a controlled environment.
- Configuration parameters must be set for optimal performance.
- Maximum number of TCP connections
- Maximum number of threads
- Timeout periods
- Database connection pool size

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5. System Deployment
6. System Operation

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(a) Workload

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(a) Workload

- - Peak periods

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(a) Workload

- - Peak periods
- - Characteristics of the arrival process of requests

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(a) Workload

- Peak periods
- Characteristics of the arrival process of requests
- Unusual patterns

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(a) Workload

- - Peak periods
- - Characteristics of the arrival process of requests
- - Unusual patterns
- - The performance of the system depends on

. .... the types of requests it receives.

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5. System Deployment
6. System Operation

(a) Workload
(b) External Performance Metrics

6. System Operation

(a) Workload
(b) External Performance Metrics
- - measurement of user-perceived satisfaction

6. System Operation

(a) Workload
(b) External Performance Metrics
- - measurement of user-perceived satisfaction
. .... response time

6. System Operation

(a) Workload
(b) External Performance Metrics
- - measurement of user-perceived satisfaction
. .... response time
- - measurement of statistics
. .... mean, standard deviation , ...

6. System Operation

(a) Workload
(b) External Performance Metrics
- - measurement of user-perceived satisfaction
. .... response time
- - measurement of statistics
. .... mean, standard deviation , ...
(b) Internal Performance Metrics

6. System Operation

(a) Workload
(b) External Performance Metrics
- - measurement of user-perceived satisfaction
. .... response time
- - measurement of statistics
. .... mean, standard deviation , ...
(b) Internal Performance Metrics
- - internal factors

6. System Operation

(a) Workload
(b) External Performance Metrics
- - measurement of user-perceived satisfaction
. .... response time
- - measurement of statistics
. .... mean, standard deviation , ...
(b) Internal Performance Metrics
- - internal factors
. .... utilization of processors, storage devices, and networks

6. System Operation

(a) Workload
(b) External Performance Metrics
- - measurement of user-perceived satisfaction
. .... response time
- - measurement of statistics
. .... mean, standard deviation , ...
(b) Internal Performance Metrics
- - internal factors
. .... utilization of processors, storage devices, and networks
. .... the number of requests waiting in the various software and hardware queues.

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6. System Operation

System Life Cycle

1. Requirements Analysis and Specification
2. System Design
3. System Development
4. System Testing
5. System Deployment
6. System Operation
7. System Evolution