

Certainly! Here are the answers to the questions:

Assignment 1:

Difference between Process and Thread:

A process is an independent unit of execution with its own memory space, whereas a thread is a lightweight process that exists within a process and shares the same memory space.

Benefits of multi-threaded programming:

Improved performance through concurrency, better resource utilization, enhanced responsiveness, and simplification of complex tasks.

Difference between user Thread and daemon Thread:

User threads are created by applications and are controlled by the user, while daemon threads are background threads that run without user intervention and terminate when all user threads finish execution.

Creating a Thread in Java:

Extending the Thread class or implementing the Runnable interface and passing it to a Thread object.

Different states in the lifecycle of Thread:

New, Runnable, Blocked, Waiting, Timed Waiting, Terminated.

Role of java.rmi.Naming Class:

It provides methods for binding remote objects to names in a naming registry.

RMI (Remote Method Invocation):

It is a Java API that enables communication between distributed objects running in different JVMs.

RMI Registry:

It is a simple server-side object registry that enables clients to obtain references to remote objects.

Basic principle of RMI architecture:

It allows a Java object to invoke methods on an object residing in another JVM as if it were a local object.

Layers of RMI Architecture:

Stub and Skeleton Layer, Remote Reference Layer, Transport Layer.

Binding in RMI:

It is the process of associating a name with a remote object.

Difference between bind() and rebind() methods of Naming Class:

bind() binds a name to a remote object, throwing an exception if the name is already bound, while rebind() overwrites the binding if the name is already bound.

Use of UnicastRemoteObject in RMI:

It is used to export a remote object with a Java RMI runtime to enable remote method invocation.

Assignment 2:

CORBA (Common Object Request Broker Architecture):

It is a standard for building distributed systems, enabling objects to communicate with each other regardless of the programming language or platform.

Protocol used for invoking methods on CORBA objects over the internet:

IIOP (Internet Inter-ORB Protocol).

Naming Service in CORBA:

It provides a directory service for registering and looking up objects in a CORBA environment.

IDL (Interface Definition Language):

It is a language used to describe interfaces to CORBA objects.

How CORBA supports Interoperability:

By defining a standard interface language (IDL) and a standard protocol (IIOP), allowing objects implemented in different languages to communicate seamlessly.

For the remaining assignments, I'll provide answers in subsequent responses to avoid exceeding the character limit. Let's continue with Assignment 3.

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Assignment 3:

Message passing primitives of MPI:

MPI_Send, MPI_Recv, MPI_Isend, MPI_Irecv, etc.

Message Passing Interface methods:

They are functions provided by the MPI library for communication and synchronization between processes in parallel computing.

Compiling and executing MPI programs:

MPI programs are typically compiled using MPI compilers (e.g., mpicc for C) and executed using MPI runtime environments (e.g., mpirun).

Purpose of Communicator in MPI:

A communicator defines a group of processes that can communicate with each other, providing a scope for message passing operations.

MPI_Method to identify the processor id:

MPI_Comm_rank.

MPI_routine that returns the number of processes with a communicator:

MPI_Comm_size.

Basic datatypes in MPI C/Java:

Integers, floating-point numbers, characters, etc. Additionally, MPI supports derived data types.

Let's move on to Assignment 4.

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Assignment 4:

How does Berkeley algorithm synchronize physical clocks?

The Berkeley algorithm synchronizes physical clocks by having a coordinator node periodically collect time information from all other nodes, calculate the average time, and then distribute adjustments to each node's clock.

Issues resolved by Berkeley's algorithm:

Clock drift, where clocks on different nodes may drift apart over time due to varying clock speeds or inaccuracies.

Techniques used to synchronize clocks:

Clock adjustment based on averaging, linear regression, or other statistical methods.

Calculating average time in Berkeley algorithm:

The coordinator node collects the current time from all participating nodes, calculates the average time, and then distributes adjustments to each node's clock based on the difference between its local time and the average time.

Moving on to Assignment 5.

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Assignment 5:

Token ring algorithm for mutual exclusion:

In the token ring algorithm, a token is passed among processes in a logical ring. A process holding the token has the exclusive right to enter the critical section.

Token-based mutual exclusion algorithm:

Algorithms where a special token is passed among processes to regulate access to shared resources.

Advantages of token-based algorithm:

Simplicity of implementation, fairness in resource allocation, and avoidance of contention for accessing critical sections.

Common issue with token-based mutual exclusion algorithms:

Overhead associated with passing the token, potential for deadlock if the token is lost or mismanaged, and inefficiency in scenarios with frequent token passes.

Let's proceed with Assignment 6.

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Assignment 6:

Leader election algorithm using priority values:

The ring-based leader election algorithm often uses priority values assigned to each node to determine the leader.

Advantage of ring-based leader election over the bully algorithm:

The ring-based algorithm typically has better scalability and efficiency in large networks compared to the bully algorithm, which may result in unnecessary message exchanges.

Best-case time complexity of Bully and Ring Leader-Election Algorithm:

The best-case time complexity of both algorithms is $O(\log n)$, where n is the number of nodes in the network. This assumes ideal conditions without failures or network partitions.

Moving on to Assignment 7.

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Assignment 7:

Important components of SOAP-based web services:

SOAP (Simple Object Access Protocol), WSDL (Web Services Description Language), XML (eXtensible Markup Language), and UDDI (Universal Description, Discovery, and Integration).

Disadvantages of SOAP-based web services:

Overhead due to XML parsing, complexity in parsing SOAP messages, and limited support for RESTful principles.

RESTful web services:

REST (Representational State Transfer) is an architectural style for designing networked applications, focusing on stateless communication and resource-oriented APIs.

Advantages of RESTful web services:

Lightweight, scalable, and simpler to implement than SOAP-based services. They also align well with the principles of the web.

Difference between SOAP and RESTful web services:

SOAP uses XML for message format, while RESTful services typically use JSON or XML. SOAP relies on a predefined contract (WSDL), while RESTful services use URLs to represent resources and HTTP methods (GET, POST, PUT, DELETE) to perform operations.