Resource Management Process Management

Foreword

- Generally, process management deals with **assigning processes to the resources (**main resource being the processor itself). There are hundreds of processes, distributed across multiple systems.

- The issue dealt here **is which process is executed on which machine (processor)**

- **A resource Manager** of the distributed system controls the assignment of resources to the individual processes

- **A resource manager** schedules the processes in a distributed system to make use of the system resources in such a manner that **resource usage, response time, network congestion and scheduling overhead** are optimized.

Resource Management

- Distributed Systems have :
  - ➤ Resource multiplicity
  - ➤ Transparency
  - ➤ Resource Interconnection

- *Require* **Process Migration** *facilities in addition to communication facilities*

- *Why migrate processes?*

Introduction

- A resource can be logical, such as a shared file or physical such as CPU.

- The set of available resources in a distributed system acts like a single virtual system

- **Resource manager:** Controls the assignment of resources to processes. Routes the processes to suitable nodes of the system in such a manner that resource usage, response time, network congestion, and scheduling overhead are optimized.

Process Scheduling Techniques

- ***Task assignment approach***:• Each process submitted by a user for processing is viewed as a collection of related tasks. Tasks are scheduled to suitable nodes to improve performance.

- ***Load-balancing approach:*** All the processes submitted by the users are distributed among the nodes of the system.• Equalizes the workload among the nodes.

- ***Load-sharing approach***: Attempts to conserve the ability of the system, assuring that no node is idle while processes wait for being processed.

Desirable features of a good Scheduling Algorithm

- No a priori knowledge about the processes.
- Dynamic in nature.
- Quick decision-making capability.
- Balanced system performance.
- Stability.
- Scalability.
- Fault tolerance.
- Fairness of service.

Task assignment approach

- A process is considered to be composed of multiple tasks.

- Goal is to find an optimal assignment policy for the task of an individual process.

Task assignment approach

- ## *Assumptions:*

  1. A process has already been split into pieces called tasks.

  2. Amount of computation required by each task and speed of each processor are known.

  3. The cost of processing each task on every node of the system is known.

  4. The IPC costs between every pair of task is known.

Task assignment approach

- Assumptions (contd…)

  5. Other constraints, like Resource requirements of the tasks and the available resources at each node are also known.

  6. Reassignment of the tasks is generally not possible.

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Assignment of Tasks

- Goals:
  - ❏ Minimization of IPC costs
  - ❏ Quick turnaround time for the complete process
  - ❏ A high degree of parallelism
  - ❏ Efficient utilization of system resources in general
  - *These goals often conflict with each other.*

Cont…

- Two task assignment parameters
  - Task execution cost and
  - Inter-task communication cost

Example

Total tasks = 6

Total nodes = 2

A task assignment problem (example)

Inter Task Communication Cost						
	t1	t2	t3	t4	t5	t6
t1	0	6	4	0	0	12
t2	6	0	8	12	3	0
t3	4	8	0	0	11	0
t4	0	12	0	0	5	0
t5	0	3	11	5	0	0
t6	12	0	0	0	0	0

Execution costs		
Tasks	N1	N2
t1	5	10
t2	2	∞
t3	4	4
t4	6	3
t5	5	2
t6	∞	4

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