Module 2: Exercise on Design Storage Solution for New Application

Scenario:

An organization is deploying a new business application in their environment. The new application requires 1TB of storage space for business and application data. During peak workload application is expected to generate 4900 IOPS (I/O per second) with typical I/O size of 4KB.
The available disk drive option is 15,000 rpm drive with 100 GB capacity.
Other specifications of the drives are:
Av. Seek time = 5 millisecond
Data transfer rate = 40MB/sec

Task:

You are asked to calculate the required number of disk drives that can meet both capacity and performance requirements of an application.

Solutions:

1. Calculate time required to perform one I/O, which depends on disk service time. Whereas, Disk service time= Av. seek time + rotational latency + data transfer time

   Av. Seek time (given) = 5 millisecond.

   Rotational latency is ½ of the time taken for full rotation. Since rotation speed is given as 15000 revolutions per min; one revolution will take 1/ (15000/60) in sec.

   Therefore time taken for half revolution is 0.5/ (15000/60) = 2ms.

   Data transfer rate is 40MB/s, therefore transfer of 4KB I/O will take,

   4KB/40MB/s = 0.1ms

   Therefore, time required to perform one I/O is = 5 ms + 2ms + 0.1ms = **7.1 msec**

2. Now calculate maximum number of IOPS a disk can perform, which is equal to, 1 / 7.1 ms = 140 IOPS

   For acceptable response time disk controller utilization must be less than 70%, therefore maximum number of IOPS a disk can perform at 70% utilization is 140 X 0.7 = 98 IOPS

3. Now calculate number of disk required to meet:

   a. Application's performance requirement = 4900/98 = 50 disk

   b. Application's capacity requirement = 1TB/ 100 GB = 10 disk

4. Finally, disk required = Maximum (Capacity, Performance)
   = Maximum (10, 50) = 50 disks