Multiple Virtual Storage (MVS)

Lesson 3: MVS Evolution

Lesson Objectives

- In this lesson, you will learn the following topics:
  - Evolution of MVS
  - Concepts of PCP, MFT, and MVT

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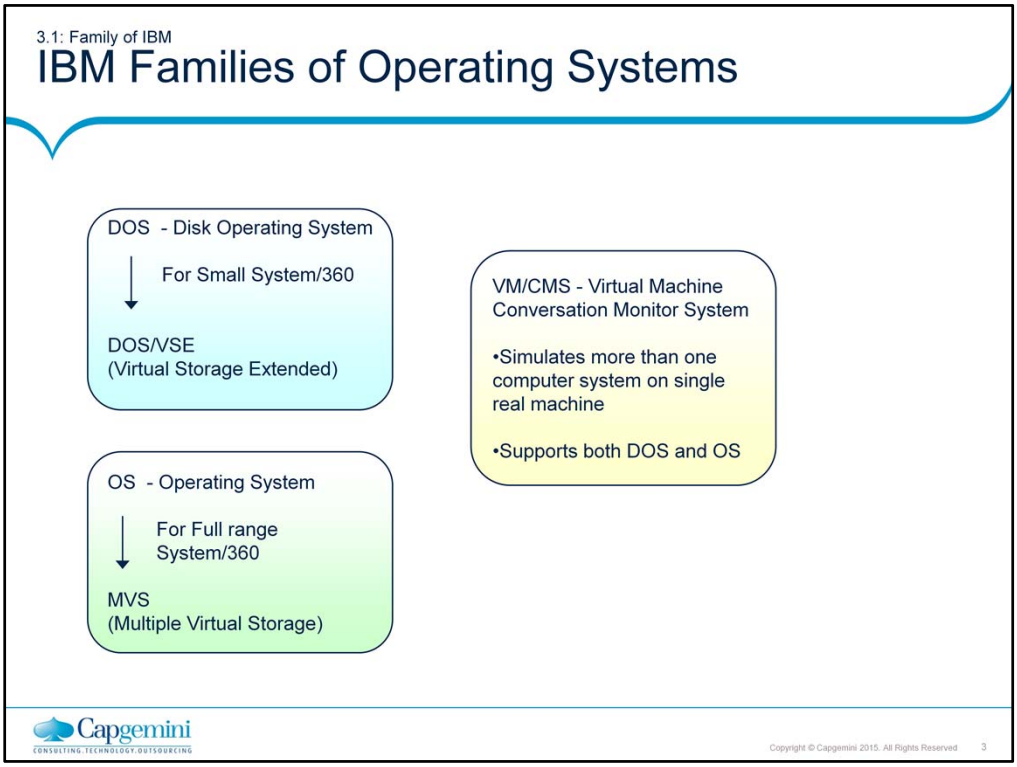
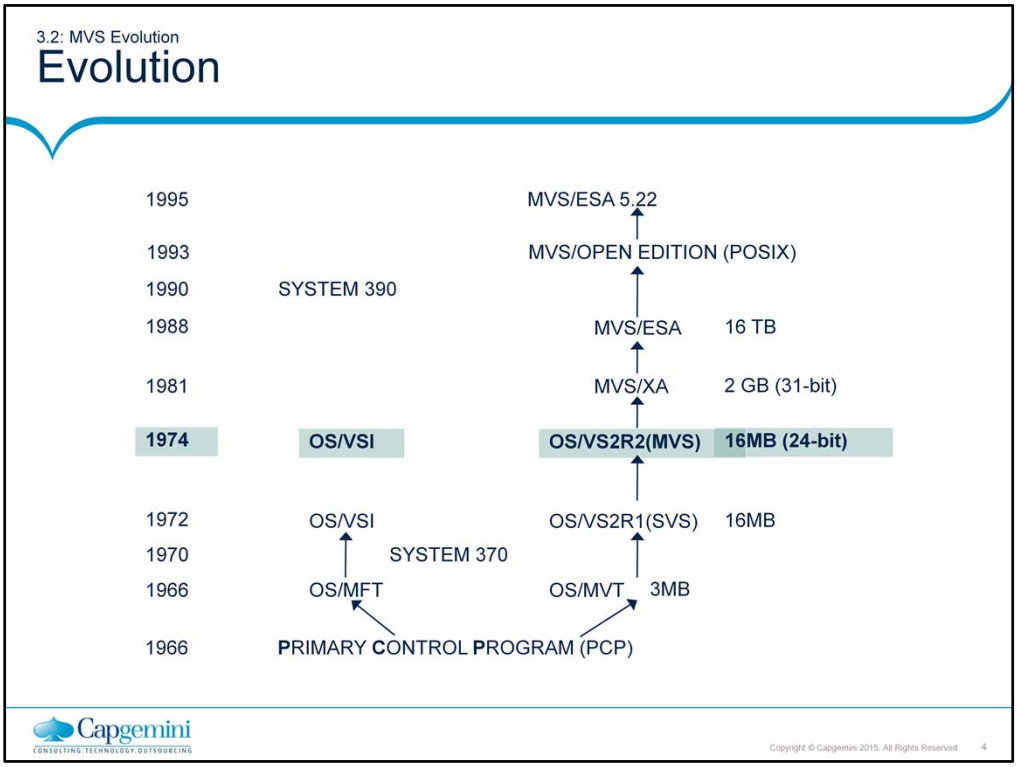


Family of IBM:
Migrating from DOS to OS is a major change.
VM is the third IBM Operating system. It uses multiprogramming and virtual storage techniques to simulate more than one computer system (called as virtual machine) on a single real system.
VM provides a a special operating system called CMS that lets a single terminal user use a virtual machine interactively.
VM is not very popular. Today most of the sites use MVS.

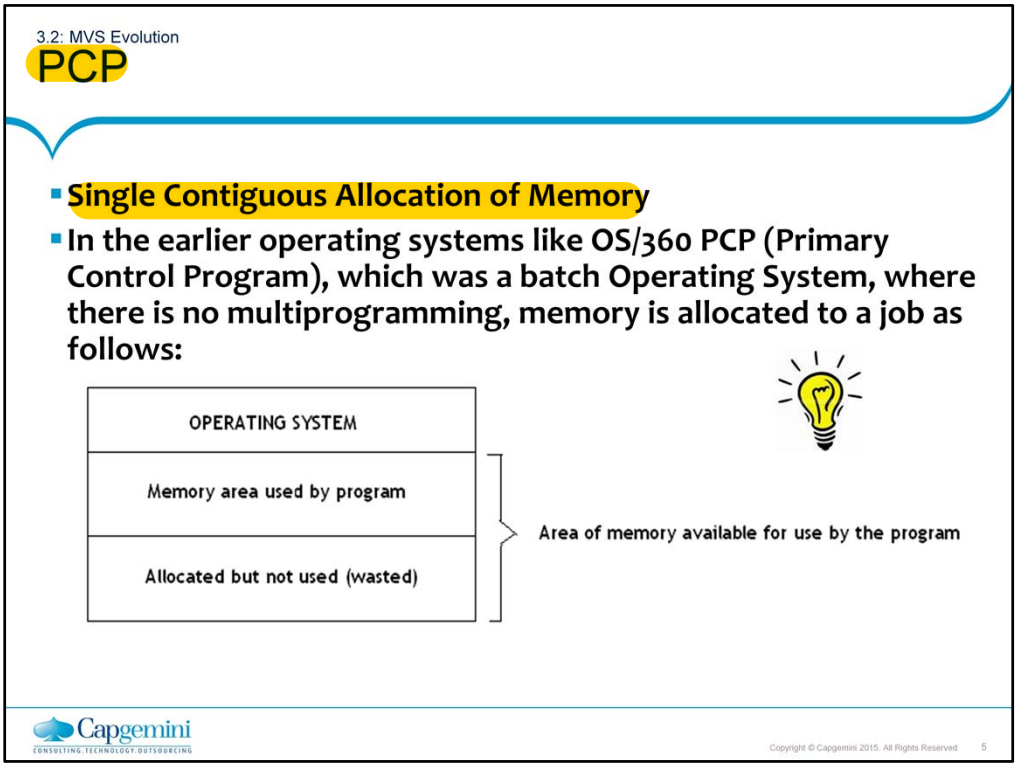
DOS/VSE

DOS stands for Disk Operating System and was designed by IBM for small mainframe computer configurations with limited processing requirements. This was introduced in the mid-1960s and has evolved significantly and is today called DOS/VSE (Virtual storage extended).
For larger configurations, IBM designed OS.



MVS Evolution:
The above slide lists the chronological order of MVS Evolution.
Following are the full forms of the various acronyms used in the slide.
PCP : Primary Control Program
SVS : Single Virtual Storage
MVS : Multiple Virtual Storage
MFT : Multiprogramming with Fixed number of Task
MVT : Multiprogramming with Variable number of Task
MVS/XA : Multiple Virtual Storage / Extended Architecture
MVS/ESA : MVS Enterprise System Architecture.

Note that originally MVS was called as OS/VS2 (Release 1)

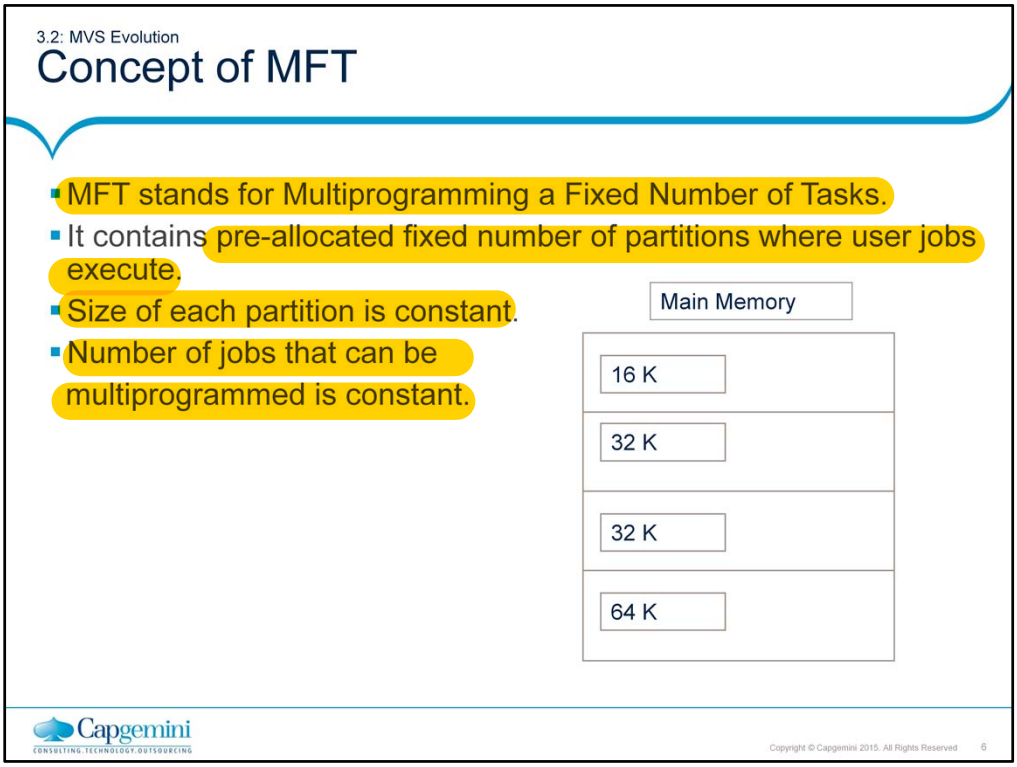


MVS Evolution:
PCP:
In the above diagram, the OS occupies a portion of the memory and the remaining area of the memory is allocated to the user program. If the program is smaller than the remaining memory, then there is some unused space in the memory that goes waste. On the other hand the program that does not fit in memory cannot be executed at all.

Disadvantages:

- The memory is not fully utilized.
- CPU has to wait on the job when an I/O is being performed.
- Some portions of the program in the memory may not be accessed at all.

Hence there is a poor utilization of memory and the CPU and the job size is limited to maximum memory available, after use by the OS.

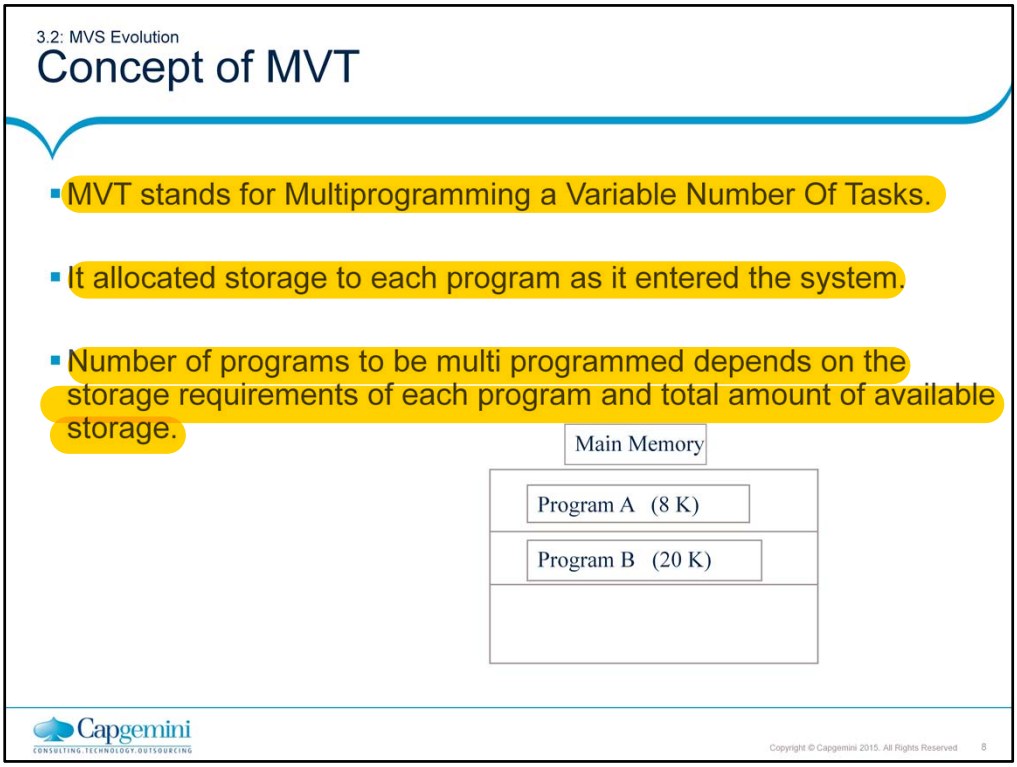


MFT:
This type of memory management is also called Static Partition Specification. Here the size of each partition is decided at the time of installation of the OS. This remains fixed after the OS is loaded and cannot be changed.
To change the size of the partition, the OS must be reinstalled, during which the changes are incorporated.
A Partition Status Table, which is shown in the figure, is used to keep track of the use of partitions.

Partition No	Size	Status
1	8K	In use
2	32K	In use
3	32K	Not in use
4	120K	Not in use
5	520K	Not in use

MFT (contd.):

- When the user gives a job, s/he has to specify the maximum memory needed to run it.
- A partition of sufficient size is then found and assigned.
- This system is satisfactory when the size of the job is almost equal to the partition size.
- If the size of the job is diverse, then there might be a considerable wastage of memory space.
- For example: When a job requires 33K, then partition 4 is used (see table) resulting in a colossal waste of around 87K. At the time of execution of this 33K job, if another job of 80K is to be submitted, assuming partition 5 (520K size) is already in use, then the new job has to wait (as it can be accommodated only in partition 4 or 5).



MVT:
It becomes important that the appropriate partitions are allocated to the appropriate jobs depending upon the size, so that all partitions are effectively utilized with minimum space wastage. This is called Dynamic Specification. It implies that the partitions are created as and when job is processed.
Here too partition status tables are used. When a job is to be processed, a free contiguous area at least as large as the partition desired must be found. Second, if the area found is large than required, then it must be split into allocated and unallocated portions of the system.

3.2: MVS Evolution

Operating System / Virtual Storage (OS/VS 1)

- OS/VS1 was an enhancement on MFT.
- This is like MFT, but the partitions are created in virtual storage than in main storage.
- This virtual storage is back up auxiliary disk storage. The operating system takes care of bringing in active portions of the program from disk (virtual storage) into Central Storage as needed.

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3.2: MVS Evolution

Operating System / Virtual Storage (OS/VS 2)

- OS/ VS2 single virtual storage replaced MVT. This was an enhancement of MVT, with the addition of virtual storage.
- This freed the operating system, as did MVT, from the problem of locating a suitable partition to run the program.
- OS/VS 2 was used on System/370 machine.

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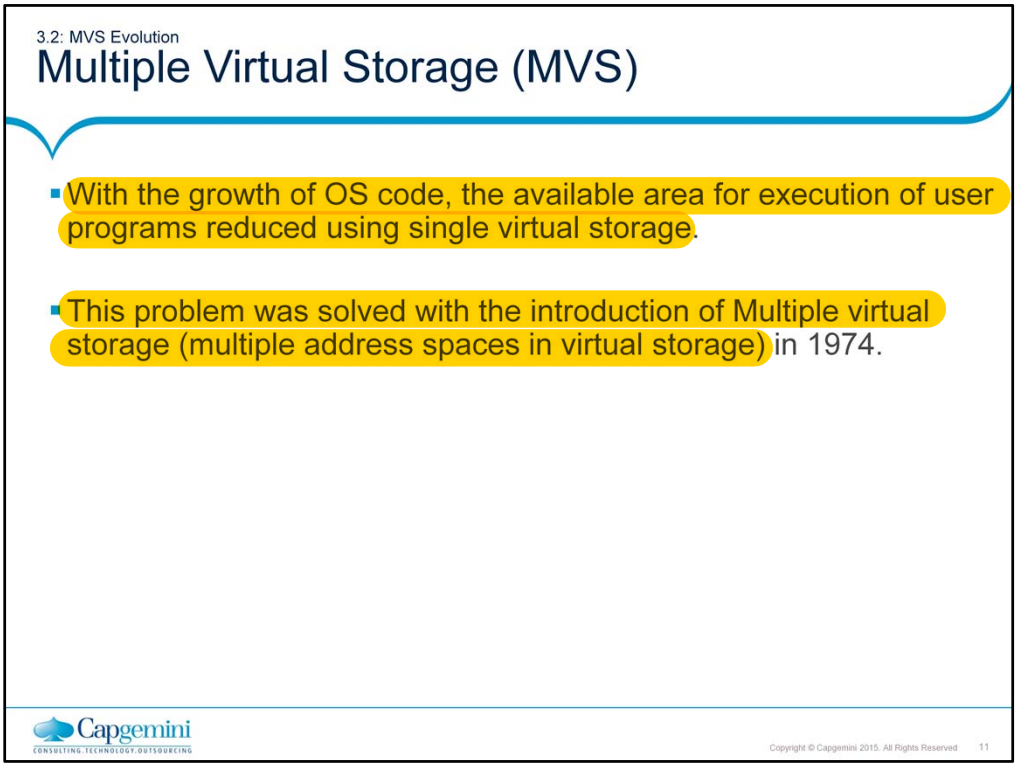
3.2: MVS Evolution
Multiple Virtual Storage (MVS)
With the growth of OS code, the available area for execution of user programs reduced using single virtual storage.
This problem was solved with the introduction of Multiple virtual storage (multiple address spaces in virtual storage) in 1974.
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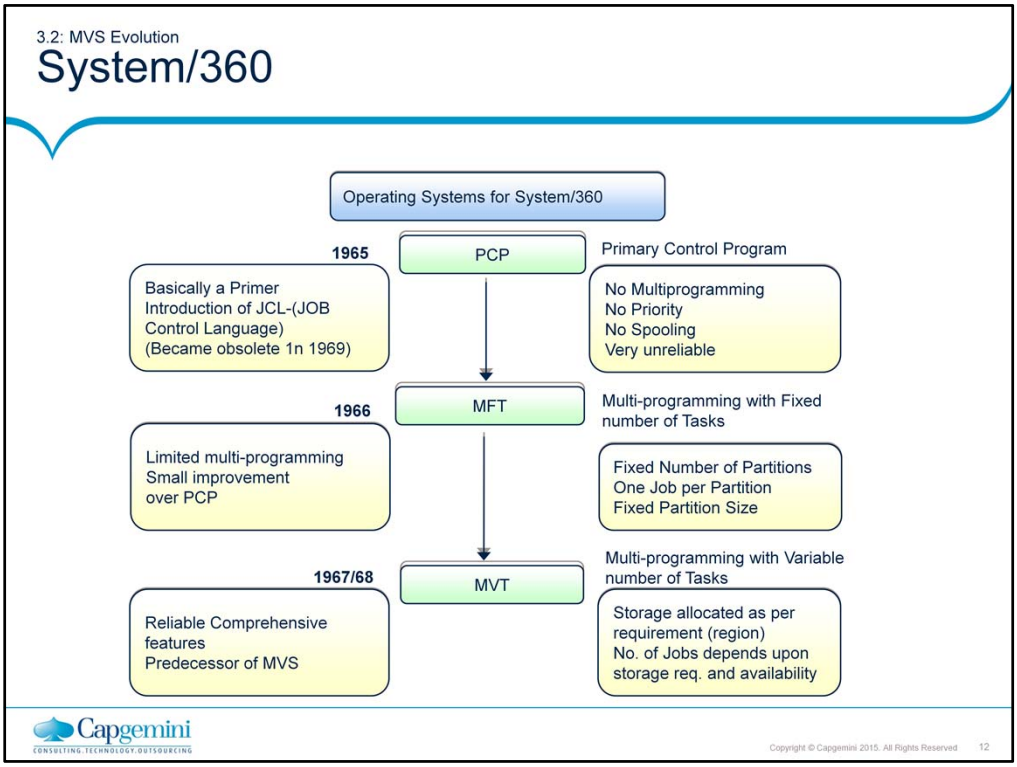

MVS Evolution:
OS System / 360:
In the earlier operating systems like OS/360 PCP (Primary Control Program), which was a batch Operating System, there is no multiprogramming.
After System/360, System/370 was introduced.
Operating System / Virtual Storage (OS/VS 2):
OS/ VS2 single virtual storage replaced MVT. This was an enhancement of MVT, with the addition of virtual storage.
This freed the operating system, as did MVT, from the problem of locating a suitable partition to run the program.
OS/VS 2 was used on System/370 machine.

Limitation System/360:
Limited and inefficient spooling
No Virtual Storage

These limitations was been overcome by using utilities HASP and ASP.

Utilities to overcome S/360 Limitations

- Two utilities were used to overcome the limitations of S/360 :
  - HSAP – Houston Automatic Spooling Priority
    - Developed unofficially (self initiative) by IBM employees
    - Distributed freely to MVT/MFT users
    - Became very popular
    - Eventually owned and supported by IBM
  - ASP - Attached Support Processor
    - Developed (officially) by IBM and intended for MVT
    - Several mainframes can work together under single O/S (predecessor of multi-processing?)
    - Provided better spooling capability
    - Relatively less takers

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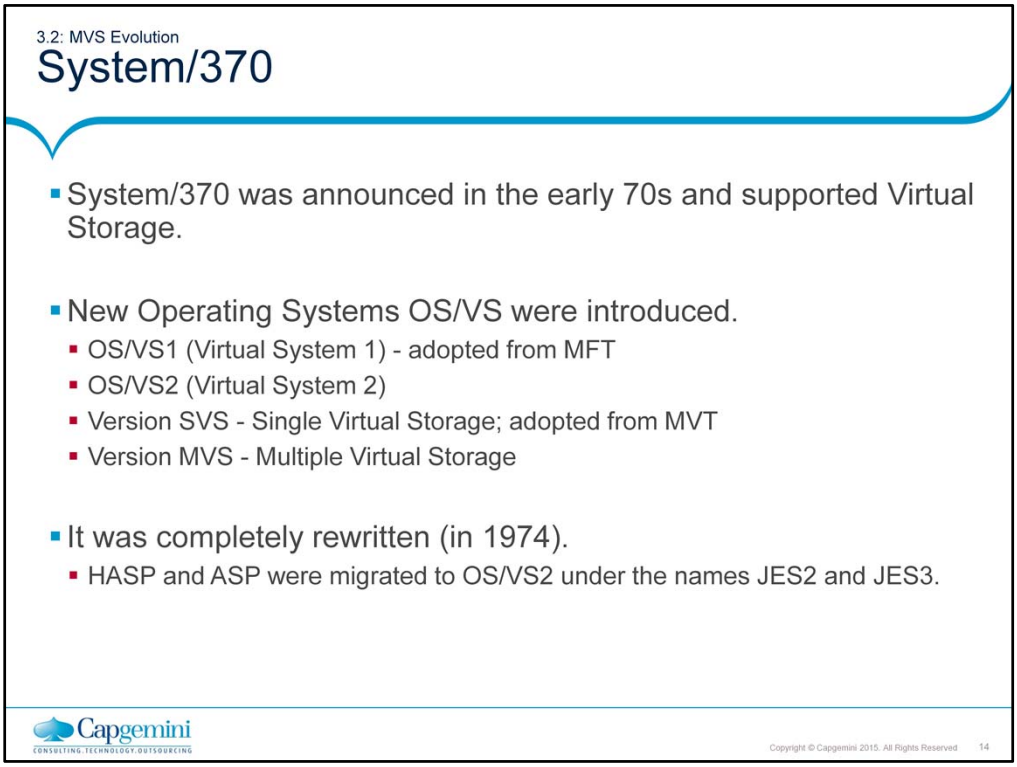
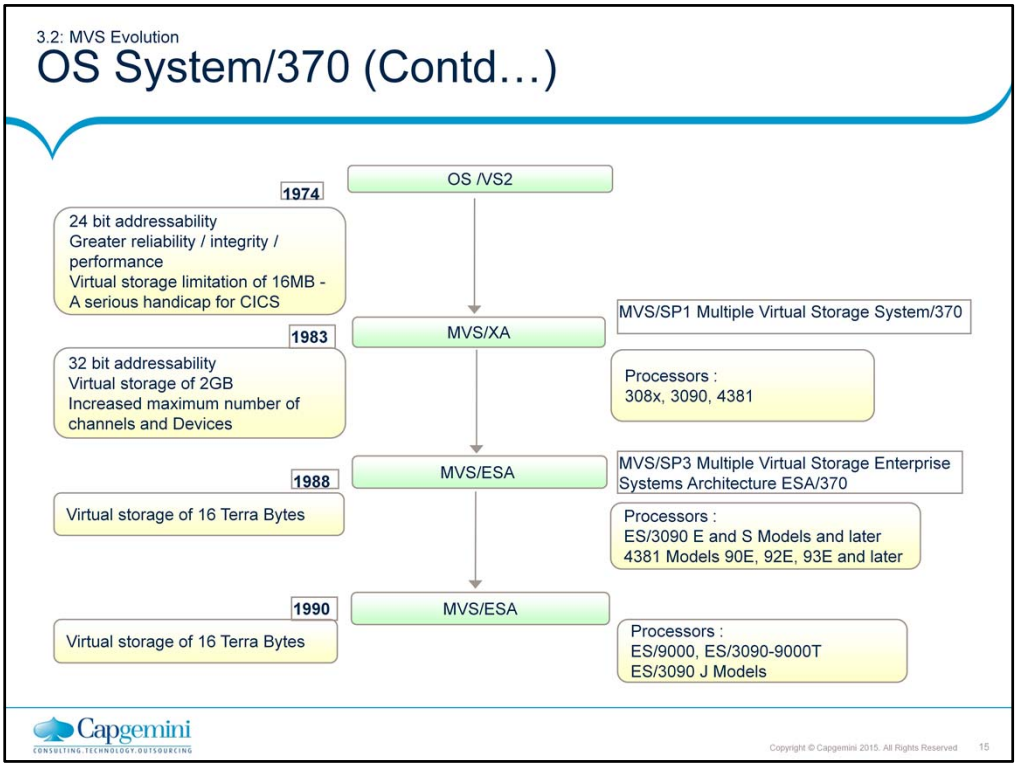


Note: Now, MVS and its derivatives are the mainstay of IBM O/S.


3.2: MVS Evolution
OS System/370 (Contd…)
1974
OS /VS2
24 bit addressability
Greater reliability / integrity / performance
Virtual storage limitation of 16MB - A serious handicap for CICS
MVS/SP1 Multiple Virtual Storage System/370
1983
MVS/XA
32 bit addressability
Virtual storage of 2GB
Increased maximum number of channels and Devices
Processors :
308x, 3090, 4381
1988
MVS/ESA
MVS/SP3 Multiple Virtual Storage Enterprise Systems Architecture ESA/370
Virtual storage of 16 Terra Bytes
Processors :
ES/3090 E and S Models and later
4381 Models 90E, 92E, 93E and later
1990
MVS/ESA
Virtual storage of 16 Terra Bytes
Processors :
ES/9000, ES/3090-9000T
ES/3090 J Models
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3.2: MVS Evolution

MVS/Extended Architecture (MVS/XA)

- The main improvements in this OS were:
  - The enhancement of address space size from 16 MB to 2 GB by the provision for 31 bit addressing.
  - Old programs compiled in 24 bit mode could be marked to run in 16 MB address space (i.e.. below the 16 MB line).
  - The new programs could call the old programs which run below the 16 MB line.
  - The provision of a Channel subsystem to free the processor from controlling I/O devices.
  - Development of Expanded storage.

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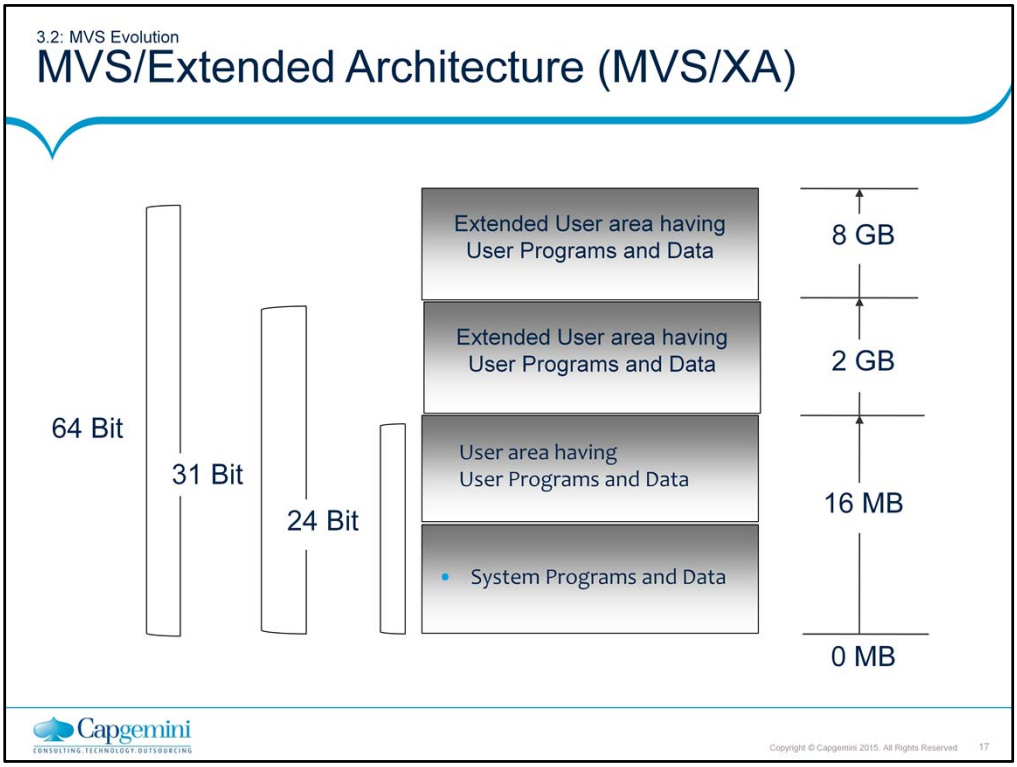
3.2: MVS Evolution
MVS/Extended Architecture (MVS/XA)
64 Bit
31 Bit
24 Bit
Extended User area having User Programs and Data
Extended User area having User Programs and Data
User area having User Programs and Data
System Programs and Data
8 GB
2 GB
16 MB
0 MB
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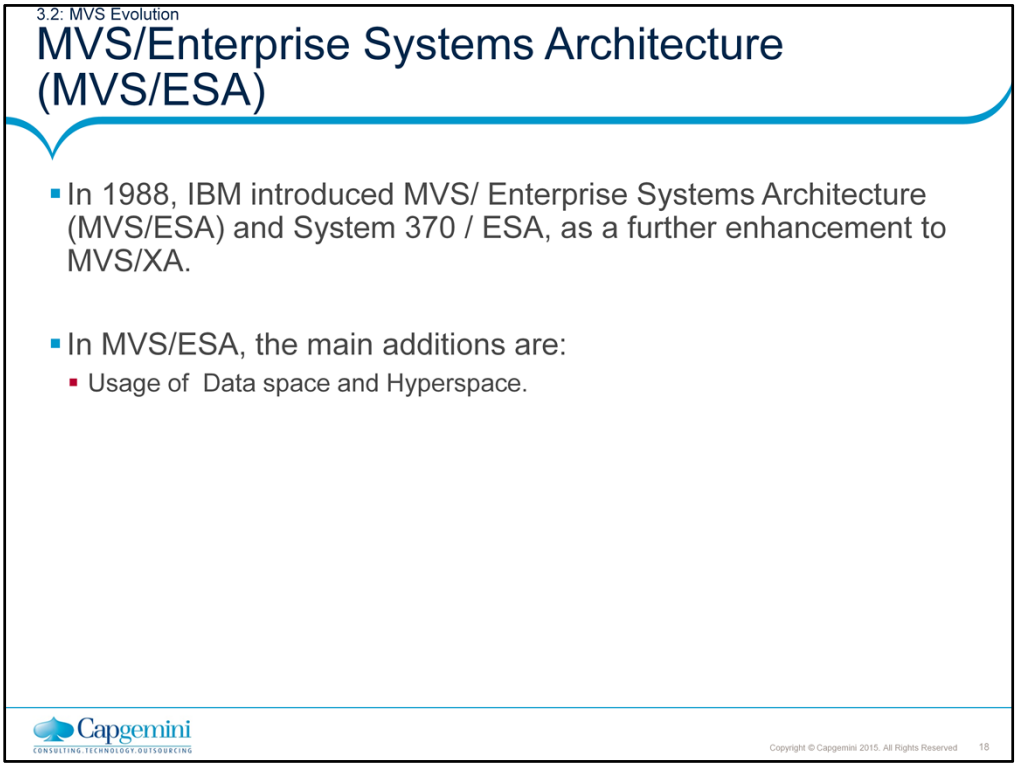

Multiple Virtual Storage Extended Architecture uses 2gb.
MVS Enterprise System Architecture uses more than 2gb.

3.2: MVS Evolution

OS / 390

- The major enhancement was introduction of System 390 machine supporting OS/390 operating system.
- The channel subsystem which so far used electric cables for data transmission to I/O devices now used the ESCON (Enterprise system connection) channels using fiber-optic cables which carry light pulses rather than electrical pulses. Use of light allows high speed information transfer.

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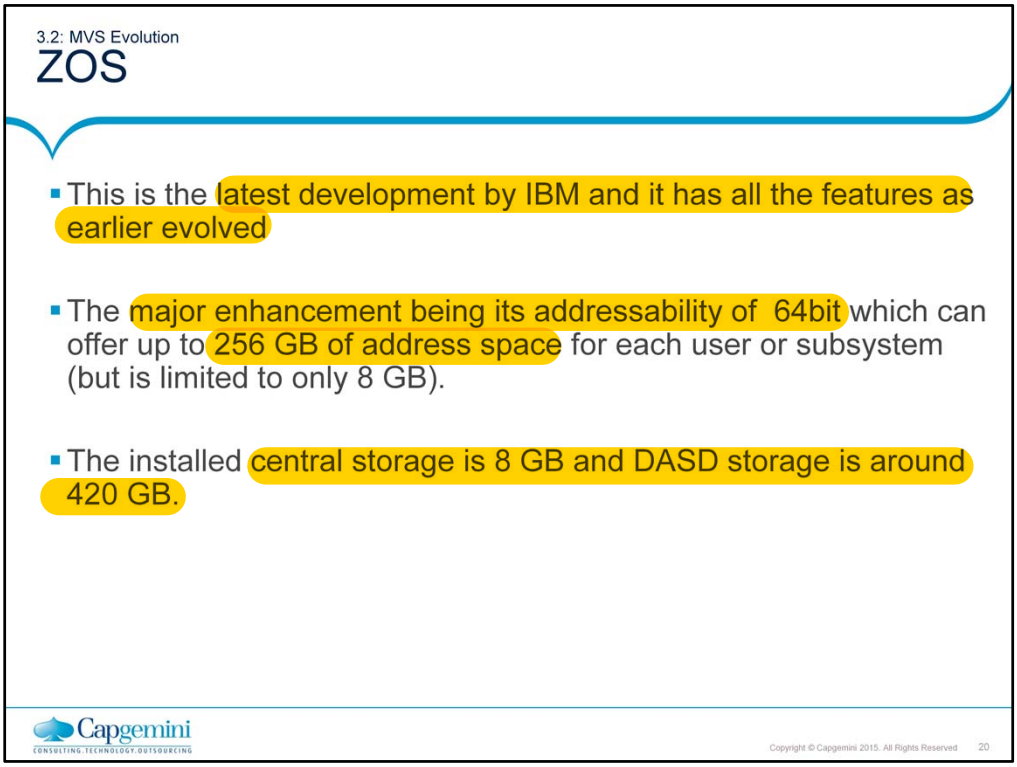
3.2: MVS Evolution
ZOS
This is the latest development by IBM and it has all the features as earlier evolved
The major enhancement being its addressability of 64bit which can offer up to 256 GB of address space for each user or subsystem (but is limited to only 8 GB).
The installed central storage is 8 GB and DASD storage is around 420 GB.
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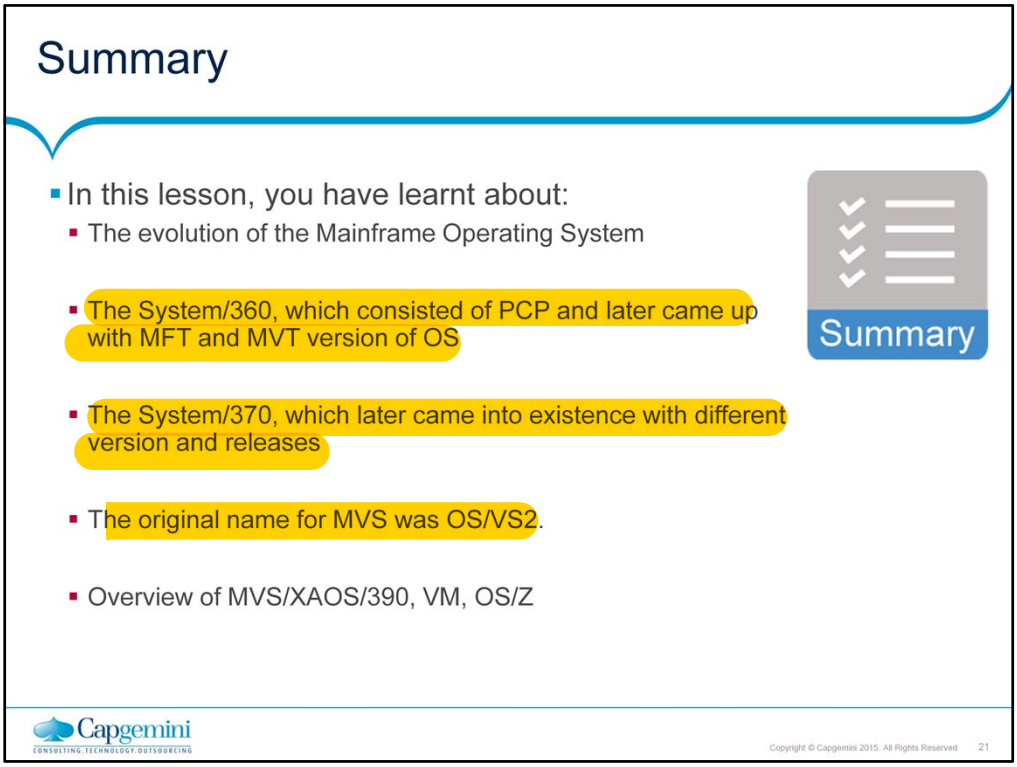
Summary
In this lesson, you have learnt about:
The evolution of the Mainframe Operating System
The System/360, which consisted of PCP and later came up with MFT and MVT version of OS
The System/370, which later came into existence with different version and releases
The original name for MVS was OS/VS2.
Overview of MVS/XAOS/390, VM, OS/Z
Summary
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Review Question

- Question 1: PCP is called as ___.
  - Primary Control Program
  - Priority Control Program
  - Post Control Program

- Question 2: Partition status tables are used both in MFT and MVT.
  - True / False
- Question 3: ___ provided better spooling capability.
  - ASP
  - HASP
  - SVS
  - MVT

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