



CMR INSTITUTE OF TECHNOLOGY
ACADEMIC YEAR 2024-2025
Flipped Classroom REPORT
DEPARTMENT OF CSE

Subject code	BCS601	Course Name	Cloud Computing
Semester / Section	6/B	Prepared By	Dr. Preethi Sheba Hepsiba
Curriculum Gap Identified:			

Summary of Flipped Classes conducted :

Sl No.	Topic	Date	Flipped class / Video Session(Choose from dropdown)	Total number of students
1	Performance in Cloud Computing	21.02.2025	Group Based	67
2	Virtualization Architecture	11.03.2025	Discussion Oriented	71
3	Architectural Challenges in the Cloud	05.05.2025	Discussion Oriented	55
4	XOAR Architecture	05.05.2025	Discussion Oriented	56
5	Cloud Architecture (Google, AWS, Azure)	13.05.2025	Standard Inverted Classroom Model	57

Detailed Report

1	Topic: Performance in Cloud computing	Date: 21.0 2.2025	Discussion Oriented	No. of students: 72
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Flipped Classroom - Performance & Efficiency

Reading: [PDF](#)

Workbook (May be worked out as a team): [Google docs](#)

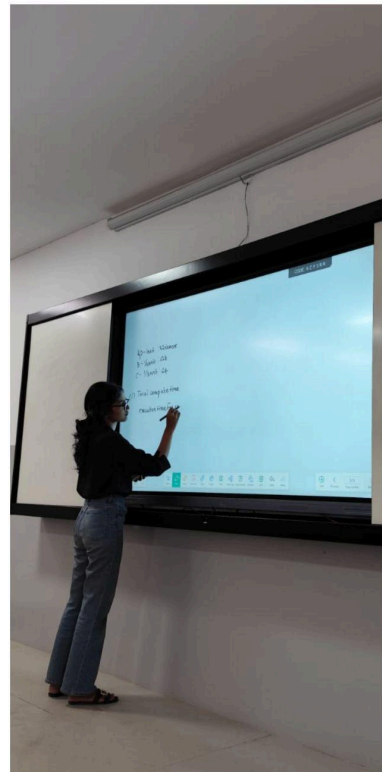
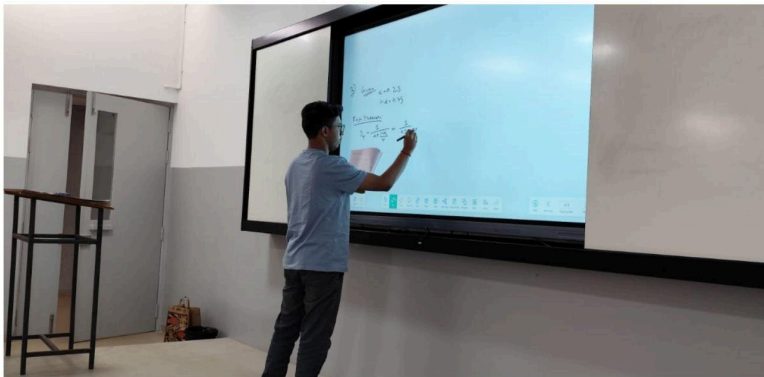
Materials Shared Before class

 **FlippedClass-Reading Material_21Feb.pdf**

Conduction of Flipped Classroom

Students may form groups and discuss to solve some activity questions. Some students explained their answers.

 **In class Activity- fp 2- BCS601 - CC**



Evaluation :

Question #1: L4

- a. Distinguish virtual cores from physical cores and discuss the mapping technique in Wells's paper on upgrading resource utilization and fault tolerance in using virtualized multicore processors.
- b. Study the cache coherence protocol presented in the Marty and Hill paper and discuss its feasibility and advantages to implement on many-core CMP in the future.

Question #3: Amdahl's Law L3

- Consider parallel execution of an MPI-coded C program in SPMD (single program and multiple data streams) mode on a server cluster consisting of n identical Linux servers. SPMD mode means the same MPI program is running simultaneously on all servers but over different data sets of identical workloads.
- Assume that 25 percent of the program execution is attributed to the execution of MPI commands. For simplicity, assume that all MPI commands take the same amount of execution time.
- Note : MPI commands execute **sequentially** within each process, just like any other function call. They are not inherently parallel but help set up or manage parallel execution.
- Answer the following questions using **Amdahl's law**:
- a. Given that the total execution time of the MPI program on a four-server cluster is T minutes, what is the speedup factor of executing the same MPI program on a 256-server cluster, compared with using the four-server cluster? Assume that the program execution is deadlockfree and ignore all other runtime execution overheads in the calculation.
- b. Suppose that all MPI commands are now enhanced by a factor of 2 by using active messages executed by message handlers at the user space. The enhancement can reduce the execution time of all MPI commands by half. What is the speedup of the 256-server cluster installed with this MPI enhancement, computed with the old 256-server cluster without MPI enhancement?

Outcome:

Outcome : Students explored supercomputers. They understood the impact of sequential and parallel workloads on performance. They understood the impact of multiple cores on performance.

They will be able to evaluate performance of an HPC system.

PO/PSO Addressed :

PO1 Engineering knowledge

PO2 Problem analysis

PO9 Individual and team work

PSO2 Design and develop secure, parallel, distributed, networked, and digital systems

2	Topic	Date	Standard Inverted Classroom Model	No. of students:
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Materials Shared Before class

Flipped Classroom - Virtualization

[Papers](#)

[In-Class Activity](#) - Group based - 2 to 3 members

Conduction of Flipped Classroom

Students were split into groups. They were assigned various papers

... > Flipped Classroom > papers

Type People Modified Source

Name	Owner	Last modified	File size
Virtual_hierarchies_to_support_server_consolidation.pdf	me	Mar 4, 2025	231 KB
VIOLIN_purdue.pdf	me	Mar 11, 2025	289 KB
liveMigration_TR.pdf	me	Mar 11, 2025	870 KB
INRIA_virtual_Cluster.pdf	me	Mar 11, 2025	329 KB
Eucalyptus.pdf	me	Mar 11, 2025	338 KB
Dynamic_Heterogeneity_and_the_Need_for_multicore_virtualization.pdf	me	Mar 4, 2025	256 KB
cluster_on_demand_Duke.pdf	me	Mar 11, 2025	346 KB
cellular_disco_stanford.pdf	me	Mar 11, 2025	312 KB

They were given an outline:

In class Activity- fp 2- BCS601 - CC

They could be creative and paraphrase and write about important aspects from the paper. A quiz was conducted in quizziz which tested their basic understanding of the virtualization concepts



Evaluation :

The students had to analyze and read the paper (L4)

 Virtualization-CC _ Quizizz.pdf

LIVE MIGRATION OF VIRTUAL MACHINE BASED ON FULL SYSTEM TRACE AND REPLAY

TRADE AND REPLAY

- Haikun Lin, Hai Jin, XiaoFei Liao, LiFeng Hu, Chen Yu

Affiliation: School of Computer Science and Technology, Huazhong University of Science and Technology, Wuhan, China

Published in: HPDC '09 (High Performance Distributed Computing Conference)

Journal/Conference: ACM, Munich, Germany

Citation: Lin, H., Jin, H., Liao, X., Hu, L., & Yu, C. (2009). Live migration of virtual machine based on full system trace and replay, HPDC '09, ACM.

OBJECTIVE:

To develop a new live VM migration method - CR/TR (Checkpoint/Recovery and Trace/Replay) technologies to reduce:

- Downtime
- Network bandwidth usage
- Total migration time

RELATED WORK:

- Pre-copy migration: Used in motion and Xenmotion but inefficient for memory-heavy workloads
- Built on Revert: a tool for full system logging and replay to enhance live VM migration

METHODOLOGY:

→ Checkpoint / Recovery (CR):

- capture VM's system state (memory, CPU, disk) using copy-on-write (COW).

→ Trace / Replay (TR):

- logs non-deterministic event (like interrupts) and replays them iteratively at the target host

Steps include: Initialization, Checkpointing, Iterative log Transferring, Stop-and-copy, Commitment and Takeover.

EXPERIMENTAL SETUP:

- Hardware: AMD Athlon 3500+, 1GB RAM, Gbit LAN.
- Software: RHEL AS3 Linux, VMlinux, Revert.
- Bandwidth: Limited to 500 Mbit/sec.
- Tested workloads: Daily use VM, kernel compilation, static web pages, Dynamic web Apps, unixbench.

RESULTS:

- Downtime: Reduced by 72.4% compared to pre-copy.
- Total Migration: Covered by 31.5% by avg.
- Data Transfer: 95.9% reduction in sync.
- Performance overhead: less than 8.54%.

Outcome:

The students understood the virtualization architecture in several research based virtual clusters that is the core technology in commercial virtualization technologies.

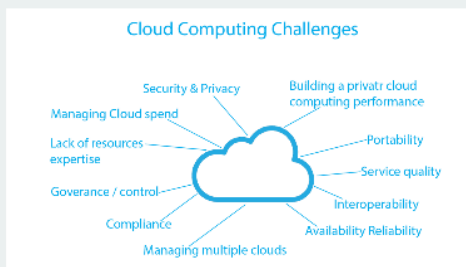
Quiz results : ☒ Virtualization-CC-2025-03-11T15_53_50_836420-fdc19a.xlsx

PO's and PSO's addressed :

- PO1 Engineering knowledge
- PO2 Problem analysis
- PO3 Design/development of solutions
- PO9 Individual and team work
- PO10 Communication
- PSO2 Design and develop secure, parallel, distributed, networked, and digital systems

3	Topic: Architectural Challenges in the cloud	Date: 07.0 4.2025	Standard Inverted Model	No. of students: 55
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Materials Shared Before class



Flipped Classroom - Cloud Challenges

Reading.

In class Activity

Conduction of Flipped Classroom

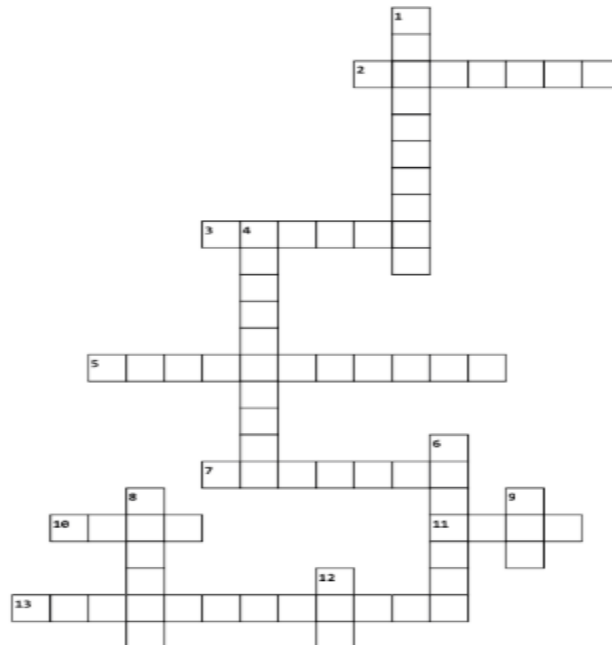
Open Challenges - Reading

The students were asked to read the various challenges in the class for 15 to 20 minutes. They were asked to highlight important points

Evaluation :

Crossword: L4

- Complete a crossword



Across

- 2. type of malware that provides complete administrator level access
- 3. disguises as legitimate software
- 5. The ability to increase and decrease resources according to demand
- 7. to convert to ciphertext
- 10. A type of attack where attacker floods a server with internet traffic
- 11. A type of migration of VM without service interruption
- 13. Can increase if multiple service providers are used

Down

- 1. Amazon's CloudFront Service
- 4. One customer's bad behavior can affect the _____ of the entire cloud
- 6. _____ computing offers various computing resources on an on-demand basis like gas and electricity
- 8. vendor _____ when customers are forced to continue a service because cost of switching is high
- 9. A standard format for packaging and distributing virtual appliances
- 12. Defines the level of services expected from customer

Question #2:

- Write the architectural challenges briefly

Outcome:

Outcome : Students were able to identify and remember key points in the architectural challenges in cloud

PO/PSO Addressed :

PO1 Engineering knowledge

PO2 Problem analysis

PO9 Individual and team work

PSO2 Design and develop secure, parallel, distributed, networked, and digital systems

4

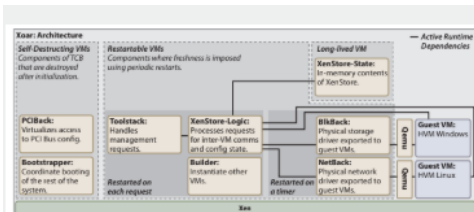
Topic: XOAR

Date:
05.05.2025

Standard Inverted Model

No. of
students:56

Materials Shared Before class



Flipped Classroom

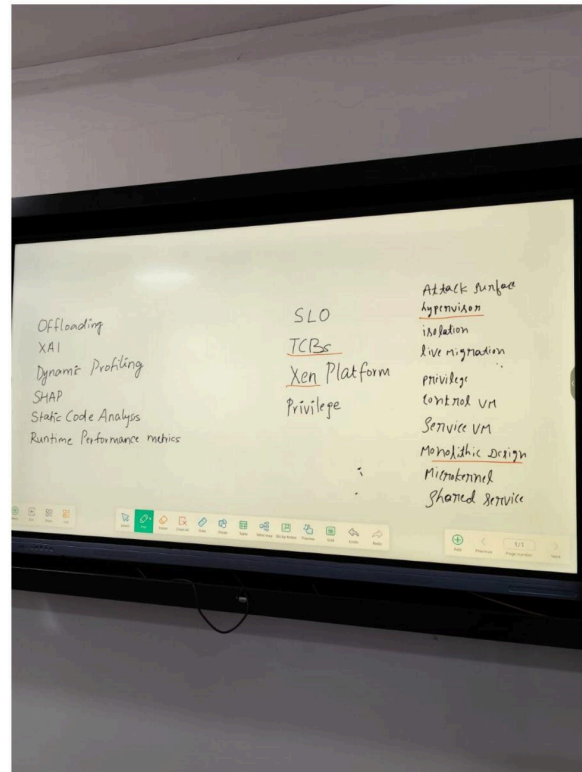
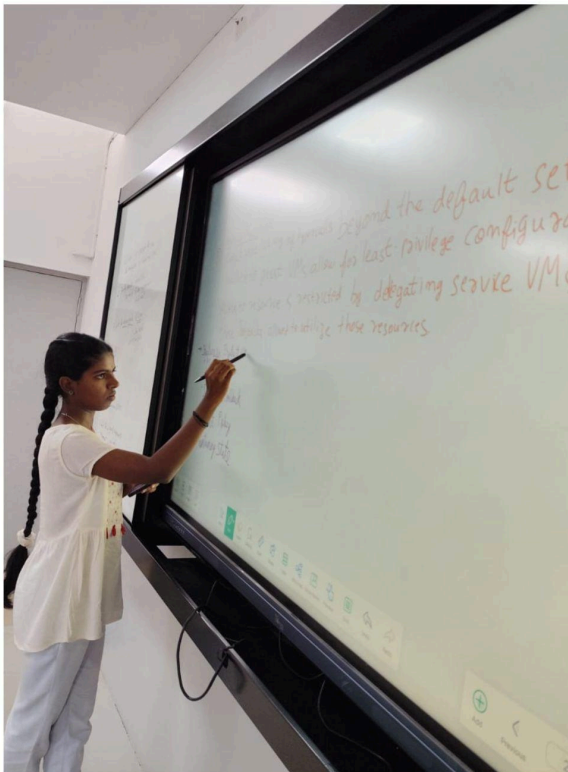
XOAR

Conduction of Flipped Classroom

Paper Reading :

PDF [xoar.pdf](#)

The students were asked to read the first 3 sections of the XOAR architecture for 20 minutes. Certain question were posed which students had to understand and deduce from the paper. Some were asked to come write on the board.



Evaluation :

Question 1

Write any 10 concepts pertaining to XOAR and discussion of the monolithic Xen hypervisor and modular XOAR architecture

Question 2

In 2 or 3 lines, explain the monolithic design of TCB in Xen hypervisor

Question 3

Write the 3 major design goals and the means to achieve them in sub points.
(found in Section 4)

Question 4

Draw neatly the architecture of XOAR

Question 5

Briefly discuss the 4 types of components of XOAR (found in Section 3)

1. Permanent (found in long-lived VMs)
2. Components to boot system (found in Self-destructing VMs)
3. Restartable (found under Restarted on each request)
4. Restarted on a timer(found near arrow for restarted on timer)

Outcome:

Outcome : Students understood the shortcomings of the monolithic architecture of TCB in Xen hypervisor and the design goals and modular architecture of XOAR, a modified version of Xen that is more secure.

PO/PSO Addressed :

PO1 Engineering knowledge

PO2 Problem analysis

PO9 Individual and team work

PSO2 Design and develop secure, parallel, distributed, networked, and digital systems

5	Topic : Cloud Architecture (Google, AWS, Azure)	Date: 13.05.2025	Standard Inverted Classroom Model	No. of students:57
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Materials Shared Before class

BCS601 - Cloud Computing -for Flipped Class session - 12 May 2025



Preethi Sheba Hepsiba <preethisheba.h@cmrit.ac.in>
to MD, Kavya, Saravana ▾

Wed, May 7, 12:34 PM ☆ ↶ ⋮

Seminar Topic

Day : 12 May 2025 (Monday) - 9-10

Google File System Architecture: 6.3.2

-Ganeshha
15-20 minutes

BigTable, NoSQL system architecture: 6.3.3

- Sairam
10 min

Chubby: 6.3.4

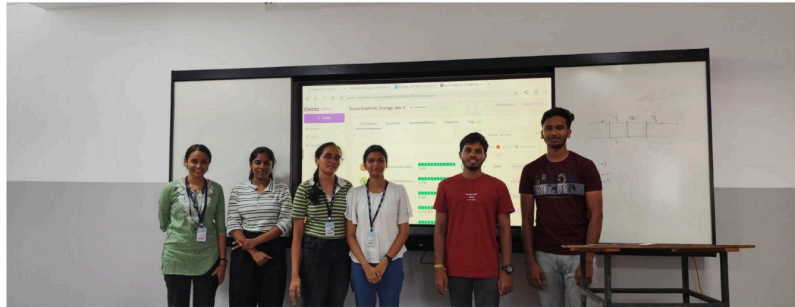
- Kavya
10 min

- Draw the diagram on the board. List out important points and explain.
- Prepare notes from the textbook and some web resources.

Conduction of Flipped Classroom

The students who were assigned to take seminar presented their topics. The rest of the class took down notes and listened to the seminar





Evaluation :

3 sets of quizzes were conducted in quizziz platform to assess the understanding level of students.

1. MULTIPLE CHOICE

30 sec • 1 pt

What is the main design goal of the Google File System (GFS)?

- ☐ Real-time analytics
- ☒ Fault tolerance and high throughput for large data sets
- ☐ Efficient storage of small files
- ☐ Support for relational databases

Bigtable stores data in:

- ☒ A sparse, distributed, multidimensional sorted map
- ☐ Rows and columns like traditional RDBMS
- ☐ JSON documents
- ☐ Key-value pairs only

Chubby is implemented using which consensus algorithm?

- ☒ Paxos
- ☐ Raft
- ☐ Two-Phase Commit
- ☐ ZAB (Zookeeper Atomic Broadcast)

GFS,BigTable,Chubby

Completed

Live Dashboard

Assign homework

Started : May 13, 2025, 01:23 PM (12 days ago) - Ended : May 13, 2025, 01:31 PM (12 days ago)

Test quiz

Accuracy

84%

Completion Rate

97%

Total Students

57

Questions

12

View quiz

Email all parents

Share report

Correct

Incorrect

Unattempted

Name	Accuracy ↑	Points	Score		
JATHIN C DUTTA (1CR22CS072)	✓ 12	100%	12/12	9100	Evaluate
Kavya Madhu (1CR22CS079)	✓ 12	100%	12/12	9570	Evaluate
Keerthi JK (1CR22CS080)	✓ 12	100%	12/12	8750	Evaluate

Outcome:

Outcome : Students understood various concepts pertaining to GFS, BigTable, Chubby and AWS and Azure Cloud.

PO/PSO Addressed :
PO1 Engineering knowledge
PO2 Problem analysis
PO9 Individual and team work
PSO2 Design and develop secure, parallel, distributed, networked, and digital systems