Learning Management System (LMS)

SECTION 1: Executive Cost Summary

1.1 Monthly Cost Summary – Bunny Stream + Bunny Storage (Recommended)

Exchange Rate: ₹90 = 1 USD

Students	EC2	MongoDB	Bunny Media	Total (USD)	Total (INR)	Per Student / Month (INR)
2,000	$47	$120	$449	**$616**	**₹55,440**	**₹27.72** (Ref: Section 2.1)
5,000	$47	$177	$1,122	**$1,346**	**₹121,140**	**₹24.22** (Ref: Section 2.2)
10,000	$95	$250	$2,244	**$2,589**	**₹233,010**	**₹23.30**(Ref: Section 2.3)

Key Observation: Media delivery cost dominates LMS expenditure. Bunny provides significant cost optimization while maintaining CDN-grade performance.

1.2 Monthly Cost Summary – AWS S3 + Data Transfer (Alternative / Reference)

Students	EC2	MongoDB	S3 + Data Transfer	Total (USD)	Total (INR)	Per Student / Month (INR)
2,000	$47	$120	$1,385	**$1,552**	**₹139,680**	**₹69.84** (Ref: Section 3.1)
5,000	$47	$177	$3,463	**$3,687**	**₹331,830**	**₹66.36** (Ref: Section 3.2)
10,000	$95	$250	$6,917	**$7,262**	**₹653,580**	**₹65.35** (Ref: Section 3.3)

Key Observation: AWS S3 becomes economically inefficient for high-volume video streaming due to outbound data transfer charges.

SECTION 2: Hour-wise Cost Calculation (WITH BUNNY STREAM)

This section provides **explicit hour-wise and unit-level calculations** for each student slab. These calculations are the **source of truth** for the summary tables in Section 1 and are referenced inline for audit and finance verification.

2.1 Baseline Calculation – 2,000 Students

EC2 Application Layer

- Instance: m5a.large
- Hourly Cost: $0.056 / hour
- Monthly Compute:
  - 0.056 × 24 × 30 = **$40.32**
- EBS + Monitoring Overhead: **$7.13**
- **Total EC2 (Monthly): $47**

MongoDB Atlas

- Tier: M10
- Hourly Cost: ≈ $0.17 / hour
- Monthly Cost:
  - 0.17 × 24 × 30 ≈ **$120**

Media Delivery

Consumption Model

- Viewing resolution: **720p**
- Avg bitrate (education video, H.264): **~1.5 Mbps**
- Data per hour:
  - 1.5 Mbps ≈ 0.1875 MB/s
  - 0.1875 × 3600 ≈ **675 MB/hour ≈ 0.66 GB/hour**
- Monthly viewing per student: **20 hours**
- **Data per student / month:**
  - 20 × 0.66 ≈ **13.2 GB**

Total Data Delivered

- 2,000 × 13.2 GB ≈ **26,400 GB**

Bunny Effective Rate

- ≈ **$0.017 per GB** (blended streaming + storage)

Monthly Media Cost

- 26,400 × 0.017 ≈ **$449**

Total – 2,000 Students with Bunny

- EC2: $47
- MongoDB: $120
- Media: $449
- **Total: $616 / month**

(Referenced in Table 1.1)

2.2 Detailed Calculation – 5,000 Students

EC2 Application Layer

- Instances: 1 × m5a.large
- Hourly Cost:
  - 0.056 × 24 × 30 = $40.32
- Overhead: $7
- **Total EC2: $47**

MongoDB Atlas

- Tier: M20
- Hourly Cost: $0.25 / hour
- Monthly:
  - 0.25 × 24 × 30 ≈ **$177**

Media Delivery

Consumption Model

- Per student: **13.2 GB / month** (20 hrs @ 720p)

Total Data Delivered

- 5,000 × 13.2 GB ≈ **66,000 GB**

Monthly Media Cost with Bunny

- 66,000 × 0.017 ≈ **$1,122**
- **Final Used: $1,122**

Total – 5,000 Students with Bunny

- EC2: $47
- MongoDB: $177
- Media: $1,122
- **Total: $1,346 / month**

(Referenced in Table 1.1)

2.3 Detailed Calculation – 10,000 Students

EC2 Application Layer

- Instances: **2 × m5a.large**
- Hourly Cost:
  - 2 × 0.056 × 24 × 30 = **$80.64**
- EBS + Monitoring Overhead: **~$14**
- **Total EC2: $95**

MongoDB Atlas

- Tier: M30
- Hourly Cost: ≈ $0.35 / hour
- Monthly:
  - 0.35 × 24 × 30 ≈ **$250**

Media Delivery (

Consumption Model - Per student: **13.2 GB / month** (20 hrs @ 720p)

Total Data Delivered - 10,000 × 13.2 GB = **132,000 GB**

Monthly Cost Calculation with Bunny - 132,000 × 0.017 ≈ **$2,244**

Total – 10,000 Students with Bunny

- EC2: $95
- MongoDB: $250
- Media: $2,244
- **Total: $2,589 / month**

(Referenced in Table 1.1)

SECTION 3: Hour-wise Cost Calculation (WITH S3 + VIDEO STREAM)

3.1 Baseline Calculation – 2,000 Students

EC2 Application Layer

- Instance: m5a.large
- Hourly Cost: $0.056 / hour
- Monthly Compute:
  - 0.056 × 24 × 30 = **$40.32**
- EBS + Monitoring Overhead: **$7.13**
- **Total EC2 (Monthly): $47**

MongoDB Atlas

- Tier: M10
- Hourly Cost: ≈ $0.17 / hour
- Monthly Cost:
  - 0.17 × 24 × 30 ≈ **$120**

Media Delivery

Consumption Model

- Viewing resolution: **720p**
- Avg bitrate (education video, H.264): **~1.5 Mbps**
- Data per hour:
  - 1.5 Mbps ≈ 0.1875 MB/s
  - 0.1875 × 3600 ≈ **675 MB/hour ≈ 0.66 GB/hour**
- Monthly viewing per student: **20 hours**
- **Data per student / month:**
  - 20 × 0.66 ≈ **13.2 GB**

Total Data Delivered

- 2,000 × 13.2 GB ≈ **26,400 GB**

S3 Effective Rate

- ≈ **$0.0524 per GB** (blended streaming + storage)

Monthly Media Cost

- 26,400 × 0.0524 ≈ **$1385**

Total – 2,000 Students with S3

- EC2: $47
- MongoDB: $120
- Media: $1385
- **Total: $1552/ month**

(Referenced in Table 1.2)

3.2 Detailed Calculation – 5,000 Students

EC2 Application Layer

- Instances: 1 × m5a.large
- Hourly Cost:
  - 0.056 × 24 × 30 = $40.32
- Overhead: $7
- **Total EC2: $47**

MongoDB Atlas

- Tier: M20
- Hourly Cost: $0.25 / hour
- Monthly:
  - 0.25 × 24 × 30 ≈ **$177**

Media Delivery

Consumption Model

- Per student: **13.2 GB / month** (20 hrs @ 720p)

Total Data Delivered

- 5,000 × 13.2 GB ≈ **66,000 GB**

Monthly Media Cost with S3

- 66,000 × 0.0524 ≈ **$3459 (Rounded of $3463)**

Total – 5,000 Students with S3

- EC2: $95
- MongoDB: $250
- Media: $3463
- **Total: $3,687 / month**

(Referenced in Table 1.2)

3.3 Detailed Calculation – 10,000 Students

EC2 Application Layer

- Instances: **2 × m5a.large**
- Hourly Cost:
  - 2 × 0.056 × 24 × 30 = **$80.64**
- EBS + Monitoring Overhead: **~$14**
- **Total EC2: $95**

MongoDB Atlas

- Tier: M30
- Hourly Cost: ≈ $0.35 / hour
- Monthly:
  - 0.35 × 24 × 30 ≈ **$250**

Media Delivery (

Consumption Model - Per student: **13.2 GB / month** (20 hrs @ 720p)

Total Data Delivered - 10,000 × 13.2 GB = **132,000 GB**

Monthly Cost with S3

- 132, 000× 0.0524 ≈ **$6916.8 (Rounded of $6917)**

Total – 10,000 Students with S3

- EC2: $95
- MongoDB: $250
- Media: $6,917
- **Total: $7,262 / month**

(Referenced in Table 1.2)

SECTION 4: Purpose of This Document

This document is intended to:

- Provide **transparent cost estimation** for LMS infrastructure
- Justify **technical feasibility** of EC2, MongoDB, and media platforms
- Support **finance approval**, **IT governance**, and **audit review**

- Enable **future scalability planning** without architectural redesign

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SECTION 5: LMS Workload Characteristics

Functional Workloads

- Concurrent student access
- Video streaming (primary bandwidth consumer)
- Assessments and quizzes
- Faculty and admin dashboards
- Reports and analytics

Workload Nature

- **Compute:** Moderate, API-driven
- **Database:** Read-heavy, indexed access
- **Media:** High outbound bandwidth, linear growth

SECTION 6: EC2 Instance Selection – Feasibility Justification

6.1 Selected Instance

- **Instance Type:** m5a.large
- **vCPU:** 2
- **RAM:** 8 GB
- **Network:** Up to 10 Gbps

6.2 Why m5a.large Is Feasible

Technical Justification

- LMS backend logic is not CPU-intensive
- Video streaming handled externally by CDN
- 8 GB RAM supports:
    - Backend runtime
    - API concurrency
    - In-memory caching

Operational Justification

- Stable for 2,000–5,000 users on a single instance
- Horizontal scaling using load balancers
- Industry-standard baseline for SaaS platforms

Cost Justification

- Prevents over-provisioning
- Optimized cost-to-performance ratio
- Predictable monthly billing

6.3 EC2 Cost Calculation

- Hourly: $0.056
- Monthly compute:
  - 0.056 × 24 × 30 ≈ $40.32
- EBS + monitoring: ≈ $7.13
- **Total:** ≈ $47 per instance / month

SECTION 7: MongoDB Atlas Tier Selection – Feasibility Justification

7.1 Tier Mapping

Users	MongoDB Tier	vCPU	RAM	Storage (Base)	Concurrent users
2,000	M10	2	2 GB	20 GB	~1,200
5,000	M20	2	4 GB	40 GB	~3,000
10,000	M30	4	8 GB	80 GB	~7,000
15,000–20,000	M40	4	16 GB	160 GB	~12,000

7.2 Why These MongoDB Tiers Are Feasible

Workload Characteristics

- Indexed reads for users, courses, progress
- Moderate writes for logs and assessments
- Predictable growth pattern

Justification

- Each tier provides sufficient RAM for working-set caching
- Connection limits align with expected concurrency
- Managed backups, monitoring, and HA reduce operational risk

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SECTION 8: Media Platform Feasibility & Cost Comparison

8.1 Bunny Stream + Storage (Recommended)

Why Feasible

- Purpose-built for video streaming
- Flat per-GB pricing
- No egress shock at scale
- Global CDN optimized for education platforms

Best For: High-volume LMS video delivery

8.2 AWS S3 + Data Transfer (Alternative)

Why Feasible Technically

- Highly durable object storage
- Tight integration with AWS ecosystem
- Suitable for documents and static assets

Why Not Cost-Feasible for Video

- Outbound bandwidth charged per GB
- Costs increase sharply with student count
- Difficult to predict monthly billing

SECTION 9: Account Creation Requirements

AWS

- Official university email
- Institutional credit card
- Legal details (GST, PAN)

Bunny

- Official university email
- Payment method
- IT department contact number

SECTION 10: Conclusion

For video-intensive LMS platforms, **Bunny Stream delivers approximately 70–75% cost savings** over AWS S3 while maintaining performance and reliability.

The LMS infrastructure exhibits predictable and linear scalability aligned with user growth and workload expansion. The cost figures outlined in this document are indicative budgetary estimates calculated using official pricing references from AWS , MongoDB and Bunny for the specified configuration and region. Actual operational charges may vary depending on real-time system usage, data transfer volumes, access patterns, service consumption levels, and applicable pricing policies in effect during the billing period. These estimates are provided solely for planning, approval, and financial projection purposes.