Archiving Subsystem for Moodle

Long-term Archiving of Quizzes, Assignments, and More

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Imagine it’s 2029

A student misses some score for final graduation
and contests the grade of an exam from the winter term 2026/27

Can you prove exactly what was answered
and how it was graded?

Let’s have a look into our Moodle!

- The course was reset for the next semester – twice
- Existing attempts were deleted during roll-over
- Three questions were edited
- The teacher with their private archives left the university
- That fancy question type plugin is no longer installed
- Moodle had a breaking major update since then

Moodle is a learning platform, not an archive system

How do we archive today?

- "Print to PDF" (by hand) for every single attempt
- Or actually print it ... on paper ... and put it in a cabinet
- Or keep course backups forever and hope Moodle can restore them in 2029
- Or simply don't, because it's cumbersome

Or maybe already using the Quiz Archiver?

A real archive must be ...



Complete

Everything that was graded: answers, attachments, feedback, metadata

Assignment, Quiz, ...



Trustworthy

Identical to exam and provably unaltered since the time of archiving

SHA256 & TSP



Independent

Readable for 10+ years, without requiring an ancient Moodle instance

PDF/A, HTML & ZIP



Compliant

Kept safe according to legal requirements but deleted once the period is over

Policies & GDPR

... and all of that without constantly having to worry about it!

From Quiz Archiver to the Archiving Subsystem

Similar but tackling the bigger picture!

The journey so far

How we actually got where we are today ...

2023

Quiz Archiver

First public release of the Quiz Archiver plugin – still actively maintained

2024

Stakeholder Workshop

Requirements and user stories from 58 people representing 46 universities

2025

Prototype Release

Public prototype release of the Archiving Subsystem, presented at MoodleMoot DACH and the Moodle University Conference

2025

v1.0.0 Release

First stable release with quiz support, Moodle data and local dir storage, simple triggers

2026

v1.1.0 Release

Adds assignment archiving, S3 object storage, Moodle 5.3 support, and various core improvements

Today

v1.2.0 Release

Event-based archiving, single-user archives, reworked archiving UI, searchable archives ... Submitted to Moodle Marketplace 🎉

What's new

All compatible features we developed in the last year also landed in the Quiz Archiver

- PDF/A-3b compliant reports
- Parallel archive job processing
- Latest attempts only exports
- MathJax 4 & JACK questions
- More report options
- Question ID, version, tags, ...
- Archive structure customization
- New filename variables
- Live job status updates
- Chunked uploads
- Moodle 5.3+ (LTS) support
- Moodle Archiving Worker

Everything you love about the **Quiz Archiver**
is also part of the **Archiving Subsystem**!

Quiz Archiver vs. Archiving Subsystem

Everything Quiz Archiver can do ... and a lot more

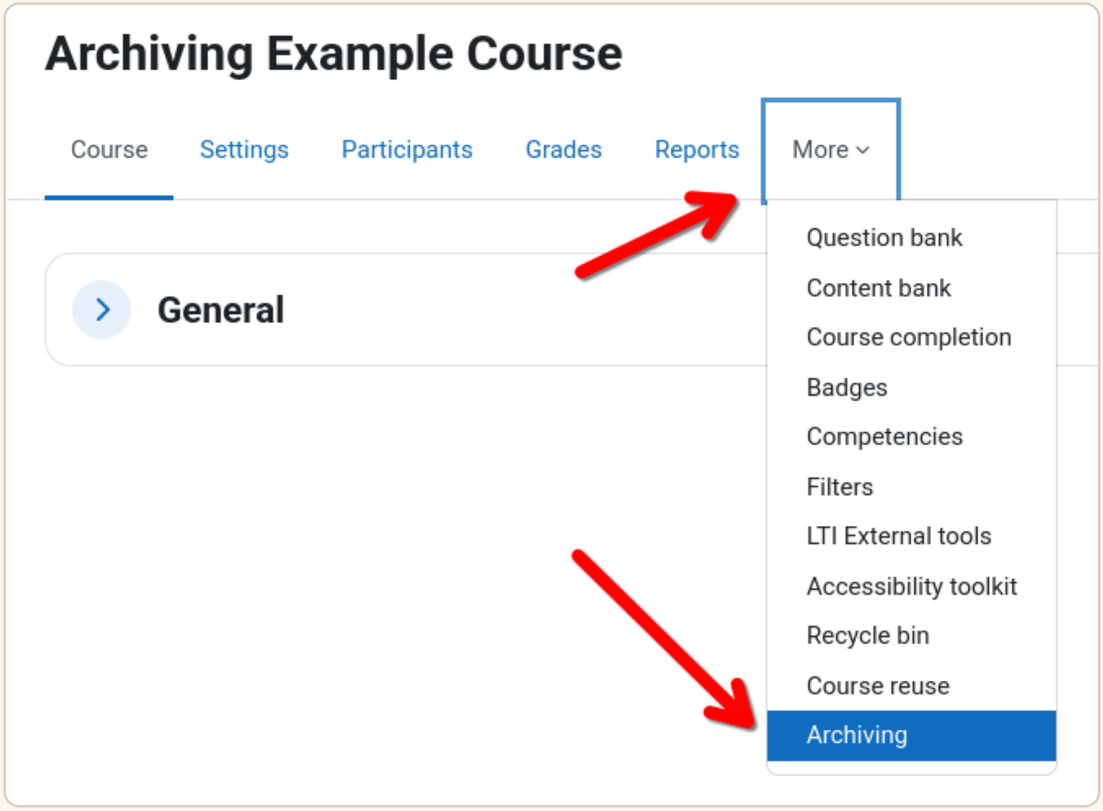
	Quiz Archiver	Archiving Subsystem
PDF/A report generation	✓	✓ (same worker service)
ZIP Archive creation with attachments	✓	✓ (same worker service)
Checksums, TSP signing, job policies, ...	✓	✓
Scope	Single quiz	Course-wide overview of all activities
Activities	Quiz	Quiz, Assignment, ... Extendable
Triggers	Manual	Manual, Scheduled, Event-based, ... Extendable
Storage	Moodle	Moodle, Local directory, SMB, NFS, S3, ... Extendable
Integration	–	Flexible API Extendable

Walkthrough

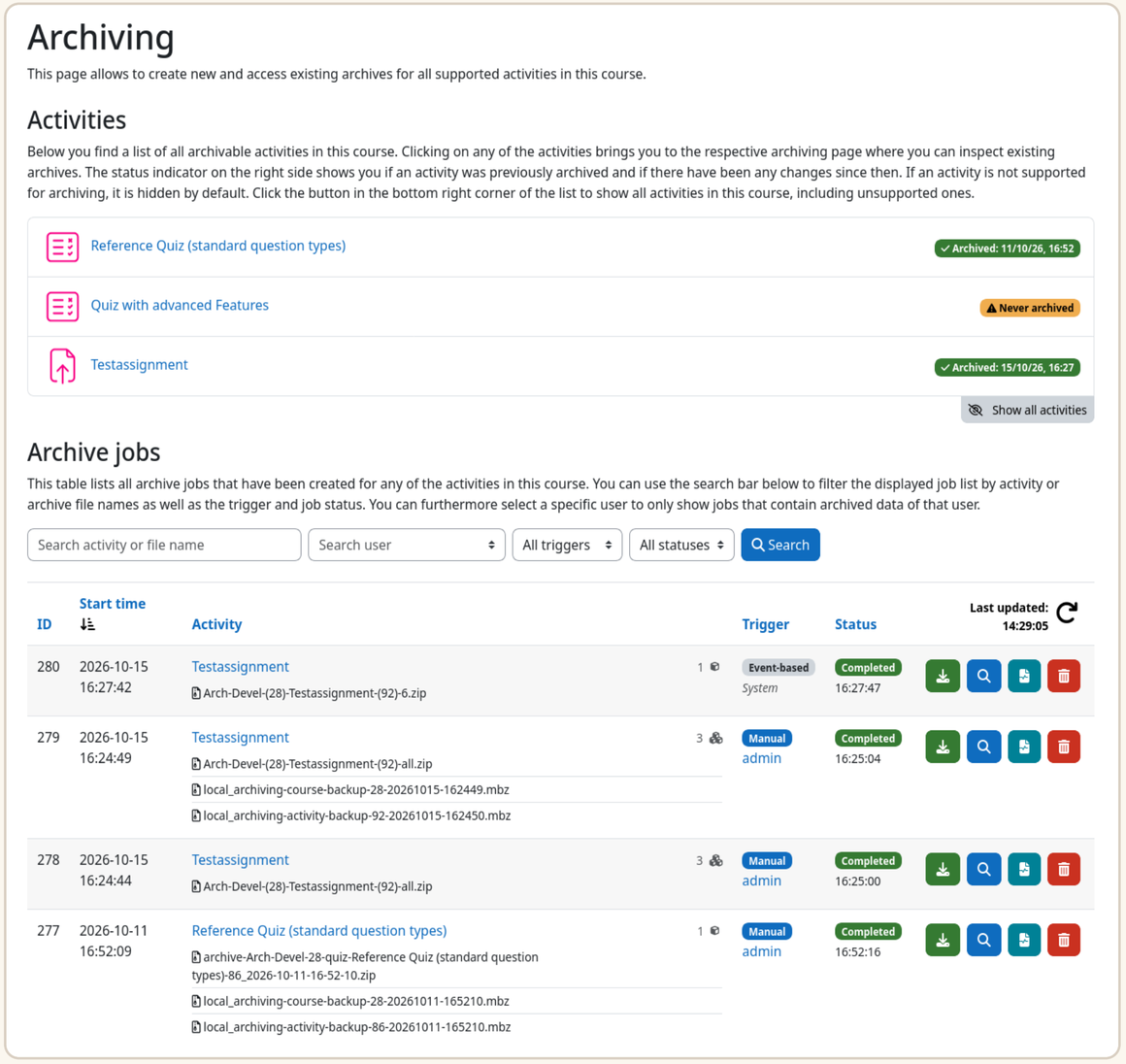
Archiving an activity with the new Archiving Subsystem

Where to find it

Each course gets its own archiving overview accessible via **More → Archiving**



Course archiving overview

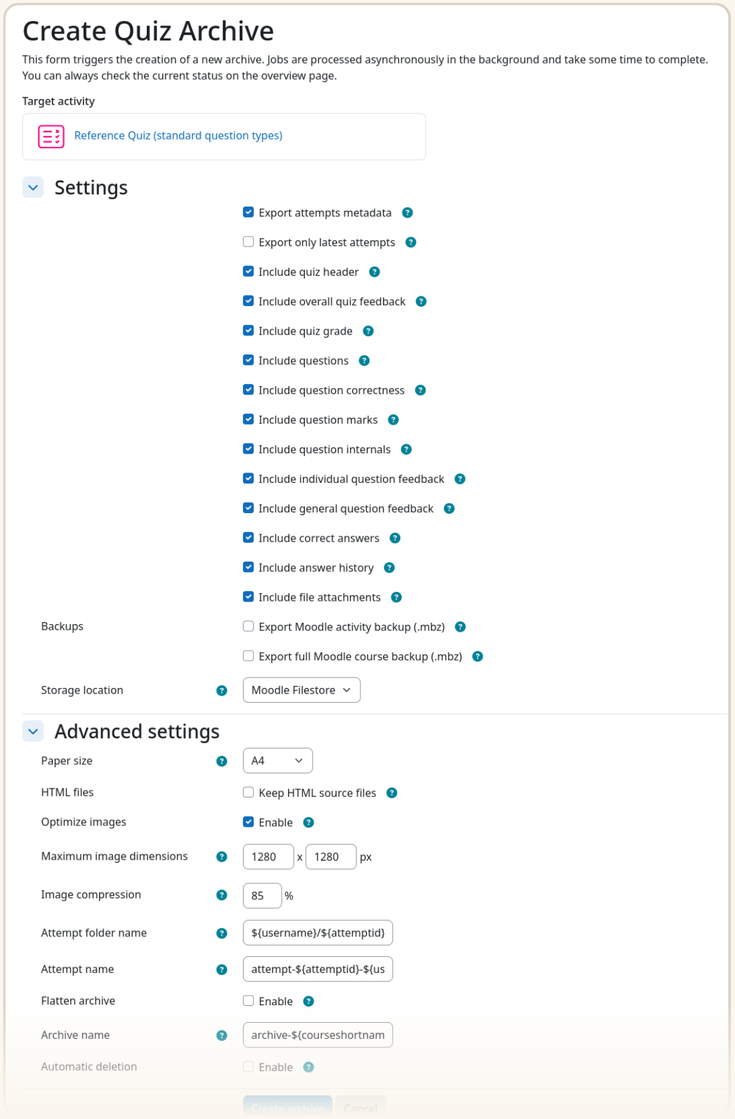


- Lists all activities in the course
- Archiving status per activity
- Detects changes since last archive

- Lists all created archive jobs
- Shows who / what created a job
- Access files, details, and logs

- Search by activity or file name
- Filter by trigger or status
- Find archives with target user data

Creating an archive



Select what to export

- Example solutions, attachments, backups, ...

Choose storage location

- Moodle, local directory, network storage, ...

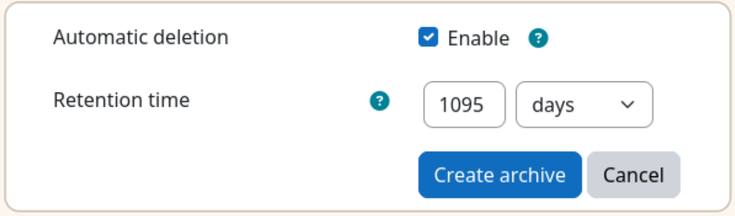
Configurable file names

- `attempt-${attemptid}-${username}`

Customize your archive

- Additional files, compression, directory layout, ...

Retention time



What’s inside: Quizzes

Every attempt as PDF/A – rendered exactly as seen in Moodle

User	DU Demo User 1
Email address	demouser1@invalid.localhost
ID number	*None*
Course	Archiving Development (Course-ID: 28)
Quiz	Reference Quiz (standard question types) (Quiz-ID: 58)
Started	Saturday, 19 April 2025, 4:05 PM
Status	Finished
Completed	Saturday, 19 April 2025, 4:07 PM
Duration	1 min 49 secs
Grade	**Not yet graded** out of 100.00
Marks	Not yet graded/15.00
Feedback	*None*
Archived	Sunday, 13 September 2026, 11:15 AM

Question ID: 12588 | Version: v6 | ID number: – | Tags: –

Information

Flag question

v6 (latest)

This is an example description containing text, images and math formulas.

Text

> Lorem ipsum dolor sit amet, consectetur adipiscing elit. Morbi placerat sollicitudin dui molestie efficitur. Duis in lectus mattis, accumsan orci vitae, maximus nisi. In cursus tempor efficitur. Quisque tincidunt, nibh ac pellentesque gravida, mauris tortor feugiat turpis, in posuere eros dui vitae nisl. Ut at lobortis lectus, sed lobortis metus. Cras libero sem, porta sit amet nibh eget, dapibus viverra enim. Donec id fringilla magna.
>
> Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia curae; Mauris in malesuada lectus. Phasellus auctor facilisis justo, non volutpat erat convallis lacinia. Nullam sed elit a purus hendrerit rhoncus non at massa. Nunc euismod elit quis turpis fringilla, eget tincidunt odio bibendum. Proin et massa vel mauris fringilla

Question ID: 12558 | Version: v2 | ID number: – | Tags: –

Question 1

Correct

Mark 1.00 out of 1.00

Flag question

v2 (latest)

Select the correct answers.

- a. Correct
- b. False
- c. Correct

Your answer is correct.

This is the general feedback.

The correct answers are: Correct, Correct

Response history

Step	Time	Action	State	Marks
1	19/04/25, 16:05:20	Started	Not yet answered	
2	19/04/25, 16:06:23	Saved: Correct ; Correct	Answer saved	
3	19/04/25, 16:07:09	Attempt finished	Correct	1.00

Frage 4

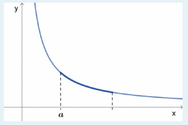
Teilweise richtig

Erreichte Punkte 2,00 von 4,00

Frage markieren

Gegeben ist die Funktion $f(x) = \frac{1}{x}$.

Bestimmen Sie die linke Grenze a des Intervalls $[a, 2]$ so, dass das Rotationsvolumen V_x um die x-Achse den Wert $\frac{\pi}{2}$ annimmt.



1. Geben Sie zunächst das Bestimmungsintegral zur Berechnung des Rotationsvolumens V_x an:

Hinweis: Bitte füllen Sie **alle** Felder aus.

$$V_x = \boxed{\text{pi}} \cdot \int_{\boxed{\text{a}}}^{\boxed{2}} \boxed{\text{(1/x)^2}}\, dx = \frac{\pi}{2}$$

Ihre letzte Antwort wurde folgendermaßen interpretiert:

$$\pi$$

Ihre letzte Antwort wurde folgendermaßen interpretiert:

$$\left(\frac{1}{x}\right)^2$$

Richtige Antwort, gut gemacht!

$\pi \cdot \int \left(\frac{1}{x}\right)^2 dx$ ist richtig.

Richtige Antwort, gut gemacht!

Die untere Integrationsgrenze ist richtig, die obere Integrationsgrenze ist richtig.

2. Geben Sie nun die linke Intervallgrenze a an: $a = \boxed{(24/3}$

Ihre letzte Antwort wurde folgendermaßen interpretiert:

$$\left(\frac{24}{39}\right)^{\frac{1}{3}}$$

Ihre Antwort ist leider falsch.

$a = \frac{-2}{13\vec{r}}$ ist leider falsch.

Musterlösung:

a) Das Rotationsvolumen V_x einer Funktion $f(x)$ um die x- Achse mit $x \in [a, b]$ wird allgemein folgendermaßen beschrieben:

$$V_x = \pi \cdot \int_a^b (f(x))^2\, dx$$

Mit der Funktion $f(x) = \frac{1}{x}$ und den Grenzen a und $b = 2$ ergibt sich für das Bestimmungsintegral:

$$V_x = \pi \cdot \int_a^2 \frac{1}{x^2}\, dx$$

Um die untere Grenze a zu bestimmen, führen wir die Integration durch:

$$V_x = \pi \cdot \int_a^2 \frac{1}{x^2}\, dx = \left[-\frac{\pi}{x}\right]_a^2$$

$$= -\frac{\pi}{2} - \left(-\frac{\pi}{a}\right) = \frac{\pi}{a} - \frac{\pi}{2}$$

Das Rotationsvolumen $V_x = \frac{\pi}{2}$ ist vorgegeben, wir müssen also nur noch die Gleichung

Frage 29

Teilweise richtig

Erreichte Punkte 1,33 von 2,00

Frage markieren

Gegeben ist die Abbildungsmatrix

$$A = \begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix}.$$

sowie die Punkte

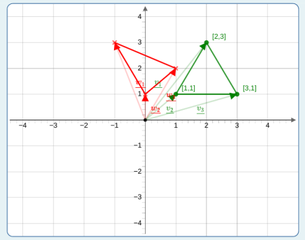
$(2, 3)$

$(1, 1)$

$(3, 1)$

die über ihre Ortsvektoren $\underline{v}_1, \underline{v}_2, \underline{v}_3$ dargestellt werden.

Berechnen Sie die zugehörigen Bildpunkte $\underline{w}_1, \underline{w}_2, \underline{w}_3$ und positionieren Sie sie in der Grafik.



Ihre Antwort ist teilweise korrekt.

Der 1. Bildpunkt mit dem Ortsvektor $\underline{w}_1$ ist korrekt.

Der 2. Bildpunkt mit dem Ortsvektor $\underline{w}_2$ ist korrekt.

Die rot unterstrichenen Einträge sind falsch.

$$\boxed{1.0}, \boxed{2.0}$$

Der 3. Bildpunkt mit dem Ortsvektor $\underline{w}_3$ ist nicht korrekt.

Musterlösung:

Die Abbildung der Punkte (x_i, y_i) erfolgt mit Hilfe der zugehörigen Ortsvektoren $\begin{pmatrix} x_i \\ y_i \end{pmatrix}$. Diese Ortsvektoren werden mit der Matrix multipliziert. Dies ergibt die Ortsvektoren $\underline{w}_i$ der Bildpunkte.

$$\underline{w}_1 = \begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$$

$$\underline{w}_2 = \begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$\underline{w}_3 = \begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$$



What's inside: Assignments

PDF/A Report, instructions, submissions, feedback, and annotated PDFs per submission

Testassignment (Submission #7)

User	DU Demo User 3 (#6)
Email address	demouser3@invalid.localhost
ID number	1337004242
Course	Archiving Development (#28)
Opening date	Friday, 20 March 2020, 12:00 AM
Due date	Thursday, 1 April 2032, 12:00 AM
Cut-off date	Friday, 30 April 2032, 4:20 AM
Grading due date	*Disabled*
Description	This is a test assignment that assigns assignments to assigned assignment students to take their assigned assignments.
Archiving date	Sunday, 13 September 2026, 1:41 PM

Assignment

Activity instructions

Just pass the test!

Take these on your way:

A Rogers-Ramanujan Identity

$$1+\frac{q^2}{(1-q)}+\frac{q^6}{(1-q)(1-q^2)}+\cdots=\prod_{j=0}^{\infty}\frac{1}{(1-q^{5j+2})(1-q^{5j+3})},\qquad \text{for } |q|<1.$$

Maxwell's Equations

$$\nabla\times\vec{\mathbf{B}}-\frac{1}{c}\frac{\partial\vec{\mathbf{E}}}{\partial t}=\frac{4\pi}{c}\vec{\mathbf{j}}$$
$$\nabla\cdot\vec{\mathbf{E}}=4\pi\rho$$
$$\nabla\times\vec{\mathbf{E}}+\frac{1}{c}\frac{\partial\vec{\mathbf{B}}}{\partial t}=\vec{\mathbf{0}}$$
$$\nabla\cdot\vec{\mathbf{B}}=0$$

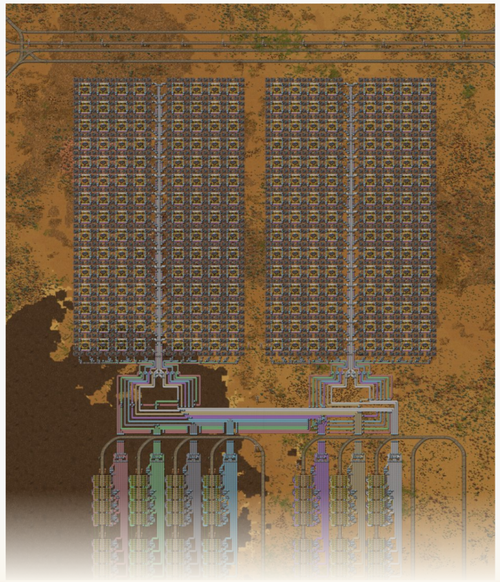
Submission status

Attempt number	This is attempt 1 (3 attempts allowed).
Submission status	Submitted for grading
Grading status	Graded
Time remaining	Assignment was submitted 5 years 201 days early
Last modified	Sunday, 13 September 2026, 1:39 PM

Submission

Online text

I did the thing and solved it!



Feedback

Grade	95.00 / 100.00	
Graded on	Sunday, 13 September 2026, 1:41 PM	
Graded by	AU Admin User	
Feedback comments	That's huge! Nice job :)	
Annotate PDF	Demo User 3_4_0.pdf	13 September 2026, 1:41 PM
Feedback files	The solution_graded.zip	13 September 2026, 1:41 PM

File attachments

- Provided intro files
- Submitted student files
- Feedback files
- Annotated PDF files

Archive structure

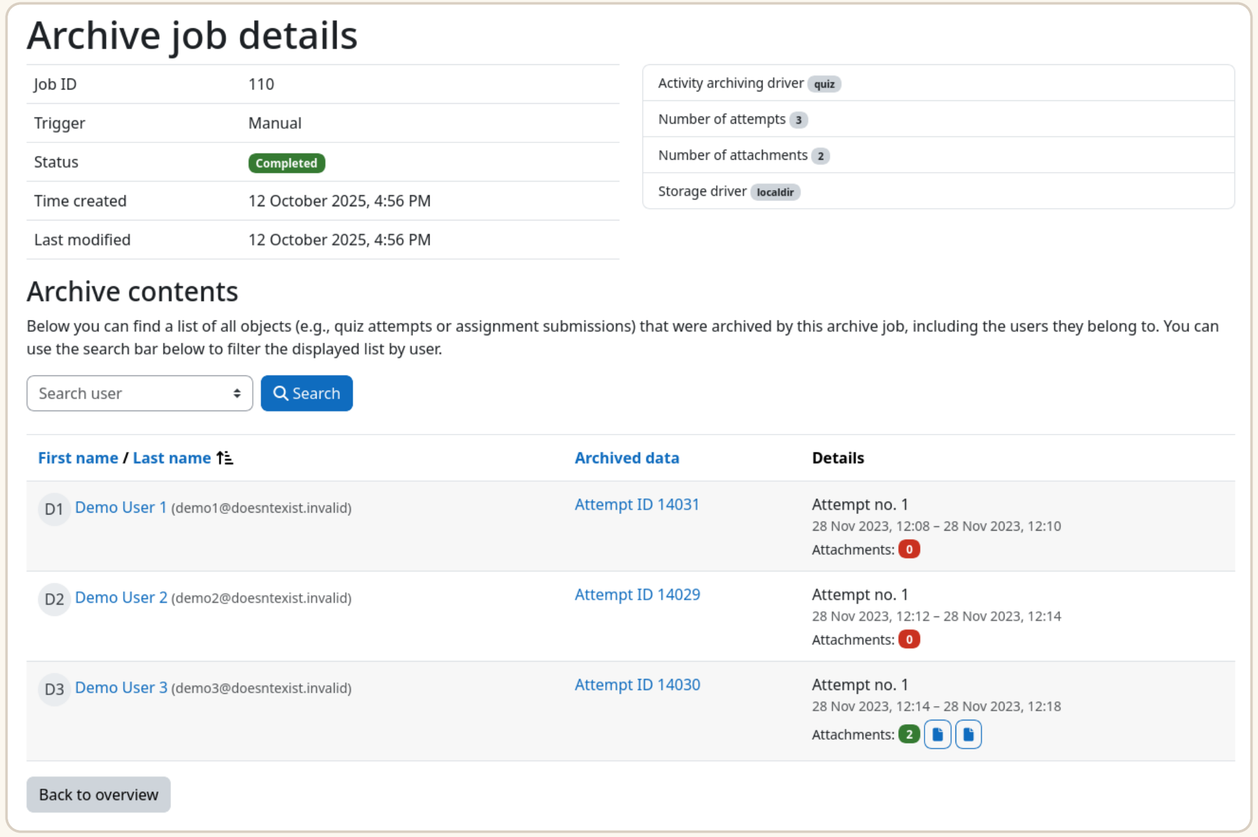
Example: Hierarchical archive of an assignment

```
assignment-archive.zip
├── submissions/
│   └── jdoe-17/
│       ├── annotation/
│       │   ├── John Doe_17_0.pdf
│       │   └── John Doe_17_0.pdf.sha256
│       ├── assignment/
│       │   ├── template.zip
│       │   └── template.zip.sha256
│       ├── feedback/
│       │   ├── unit_test_log.txt
│       │   └── unit_test_log.txt.sha256
│       ├── submission/
│       │   ├── solution.zip
│       │   └── solution.zip.sha256
│       ├── submission-17-jdoe.pdf
│       └── submission-17-jdoe.pdf.sha256
├── submissions_metadata.csv
└── submissions_metadata.csv.sha256
```

- PDF/A-3b for long-term archiving
- All file attachments
- Optional HTML sources
- Optional Moodle backups (`.mbz`)
- CSV metadata for all objects
- SHA256 checksum for every file
- Hierarchical or flat layout
- File and folder names configurable

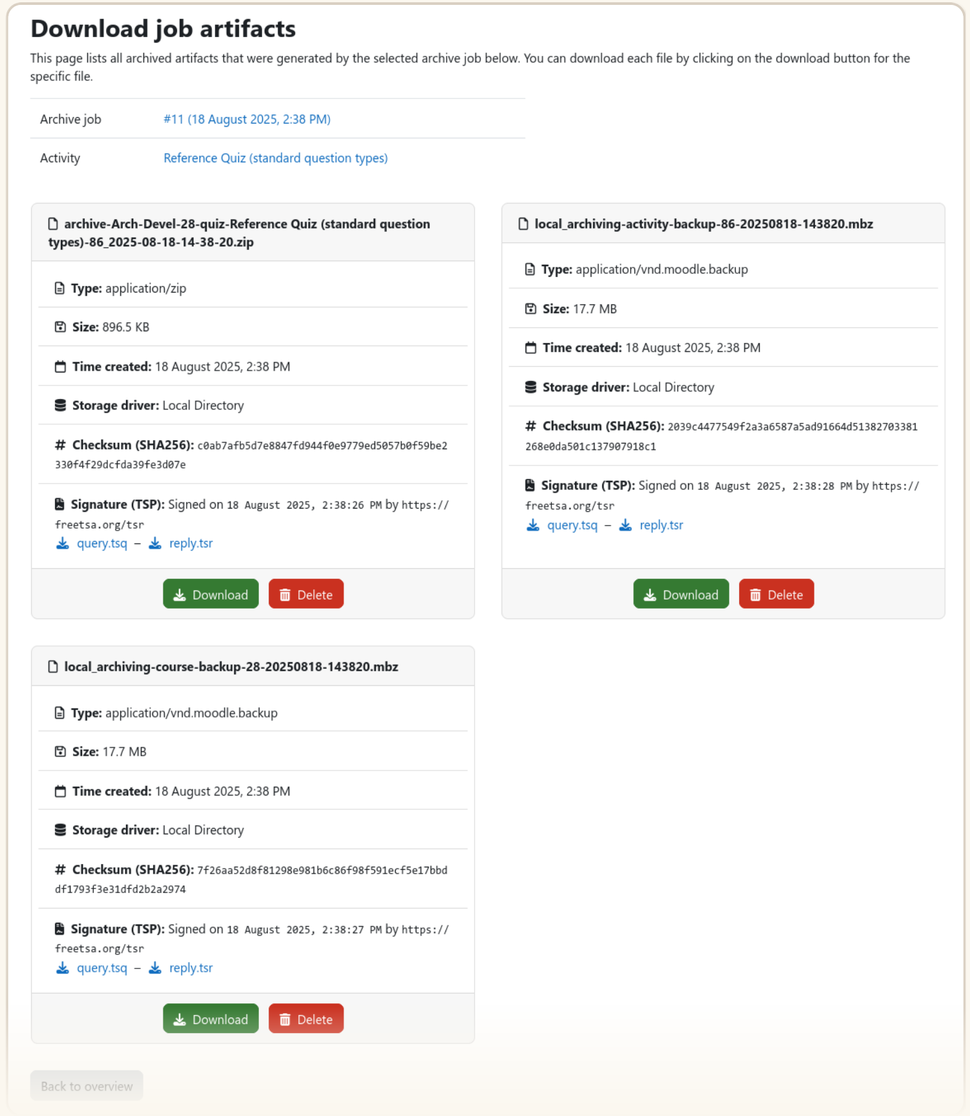
Archive job details

Inspect archive job metadata and see what's inside



All users with data inside this archive are searchable

File download & integrity



Easy access via Moodle

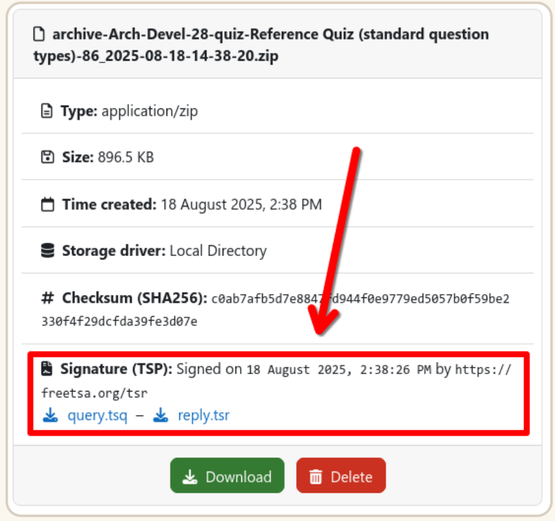
- Transparent file retrieval for all storage types

SHA256 checksums of every archive

- Verifies integrity of archived data
- Re-validated on every retrieval

Cryptographic signature (TSP / RFC 3161)

- Signed by a trusted Time-Stamp Authority
- Legally proves the archive existed unaltered at that time



Job logs

Every step of every job is logged for full traceability

Archive job logs

Job ID	12
Status	Completed
Time created	18 August 2025, 2:40 PM
Last modified	18 August 2025, 2:40 PM

Logs

Archive jobs log certain events and actions during execution. Below you can find a list of all logged events for this archive job. If you need more information, please ask your Moodle administrator to increase the log level on the admin settings page of this plugin.

```
2025-08-18 14:40:12 [ INFO] Job status: Queued (10)
2025-08-18 14:40:13 [ INFO] Job status: Pre-Processing (20)
2025-08-18 14:40:13 [ INFO] Created activity archiving task (driver: quiz)
2025-08-18 14:40:14 [ INFO] Requested a Moodle course backup (#c4a7e447cc4229e604075de0a11c48d6): local_archiving-course-backup-28-20250818-144014.mbz
2025-08-18 14:40:14 [ INFO] Requested a Moodle activity backup (#54564f2357349d970b64dad87fbb6b79): local_archiving-activity-backup-86-20250818-144014.mb
2025-08-18 14:40:14 [ INFO] Stored 1 task content metadata entries.
2025-08-18 14:40:14 [ INFO] Job status: Archiving (30)
2025-08-18 14:40:14 [ INFO]  -> Activity archiving task status: CREATED (20)
2025-08-18 14:40:14 [ INFO]  -> Enqueued new worker job with UUID 7cc605d2-7c30-11f0-af41-2adbc49dbb63
2025-08-18 14:40:14 [ INFO]  -> Activity archiving task status: AWAITING_PROCESSING (40)
2025-08-18 14:40:14 [ INFO]  -> Activity archiving task status: RUNNING (100)
2025-08-18 14:40:14 [ INFO]  -> Activity archiving task 10 progress updated: 0%
2025-08-18 14:40:17 [ INFO]  -> Activity archiving task status: FINALIZING (200)
2025-08-18 14:40:17 [ INFO]  -> Activity archiving task status: FINISHED (220)
2025-08-18 14:40:20 [ INFO] Job status: Backup Collection (40)
2025-08-18 14:40:20 [ INFO] Job status: Post-Processing (50)
2025-08-18 14:40:20 [ INFO] Got 1 artifact(s) from the activity.
2025-08-18 14:40:20 [ INFO] Job status: Storing (60)
2025-08-18 14:40:20 [ INFO] Stored activity artifact: archive-Arch-Devel-28-quiz-Reference Quiz (standard question types)-86_2025-08-18-14-40-14.zip (siz
2025-08-18 14:40:20 [ INFO] Stored backup: local_archiving-course-backup-28-20250818-144014.mbz (size: 17.7 MB) (id: 20)
2025-08-18 14:40:20 [ INFO] Stored backup: local_archiving-activity-backup-86-20250818-144014.mbz (size: 17.7 MB) (id: 21)
2025-08-18 14:40:20 [ INFO] Job status: Signing (70)
2025-08-18 14:40:20 [ INFO] Created TSP signature for file: archive-Arch-Devel-28-quiz-Reference Quiz (standard question types)-86_2025-08-18-14-40-14.zi
2025-08-18 14:40:21 [ INFO] Created TSP signature for file: local_archiving-course-backup-28-20250818-144014.mbz (id: 20)
2025-08-18 14:40:22 [ INFO] Created TSP signature for file: local_archiving-activity-backup-86-20250818-144014.mbz (id: 21)
2025-08-18 14:40:22 [ INFO] Job status: Cleanup (90)
2025-08-18 14:40:22 [ INFO] Job status: Completed (100)
```

Back to overview

Automatic deletion

- Automatic cleanup of old archives is supported out of the box
- Each archive can have a **retention time** set
  - Expired archives are deleted automatically by a scheduled task
- Admins can **enforce** retention policies via locked job presets
- Batch deletion is supported
  - Example: Delete all expired archives on the first of January and July
- Archive files with PII are deleted, job metadata and logs remain for traceability

Automation

Because nobody wants to click the "archive" button a thousand times

Archiving triggers

Archive jobs can be created in one of the following ways ...



Manual

- On demand by teachers / admins
- Creates a single archive job
- Full control over settings per job
- Can also be disabled



Scheduled

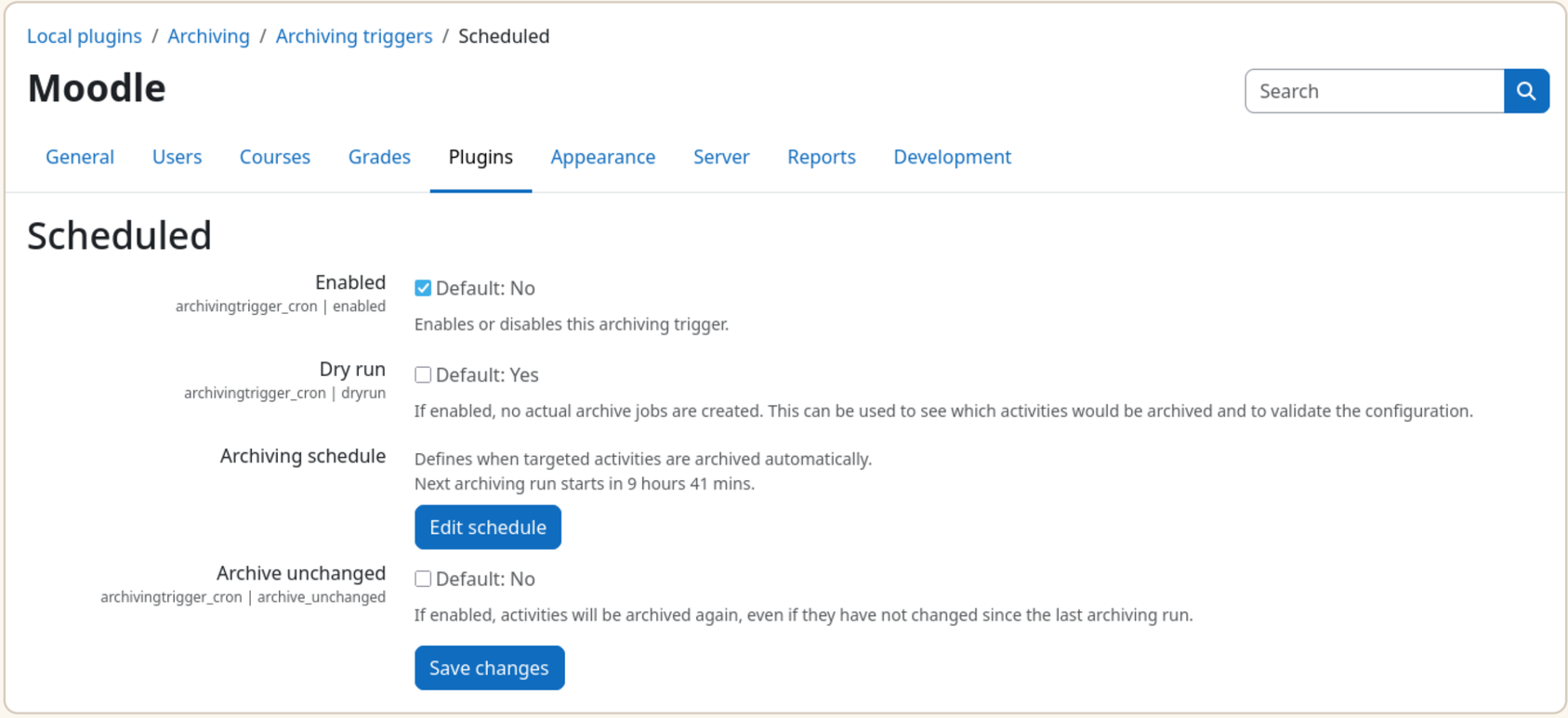
- Periodic, e.g. every night
- Archives all activities with new unarchived changes
- Dry-run mode for testing



Event-based

- Listens to Moodle events
- Archives only the affected attempt / submission
- Right when it happens

Scheduled archiving



- Activity fingerprints detect changes since the last archive
- Dry-run mode allows you to see what would be archived before going live

Event-based archiving

Admins select which Moodle events create archive jobs

Activity	Event	Archives
Quiz	`\mod_quiz\event\attempt_submitted`	The affected attempt
	`\mod_quiz\event\attempt_graded` (Moodle 5.0+)	
	`\mod_quiz\event\attempt_regraded`	
	`\mod_quiz\event\attempt_manual_grading_completed`	
Assignment	`\mod_assign\event\assessable_submitted`	The affected submission
	`\mod_assign\event\submission_graded`	
	`\mod_assign\event\submission_locked`	

Under the hood

Partial archiving

- Jobs can be scoped to specific attempts / submissions instead of the whole activity

Job fingerprints

- Identical jobs (same course, activity, settings, objects) are not queued twice

Combine triggers

- Archive each attempt individually on submission and full activities on a schedule / manually

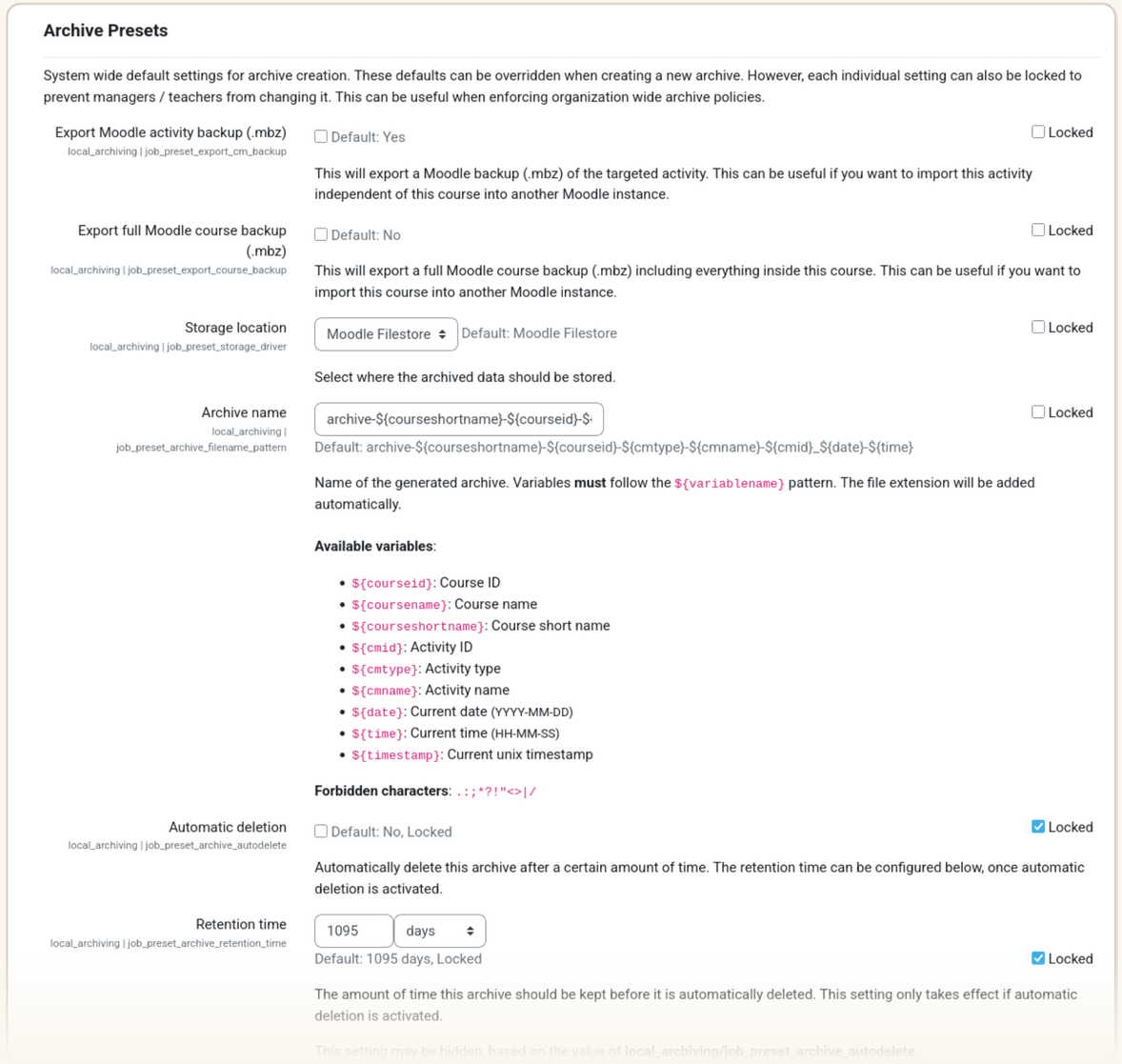
Traceability

- Trigger, source event, and targeted objects are recorded with each job

Administration & Policies

Ensure archives meet your institutional requirements

Job presets and archiving scope



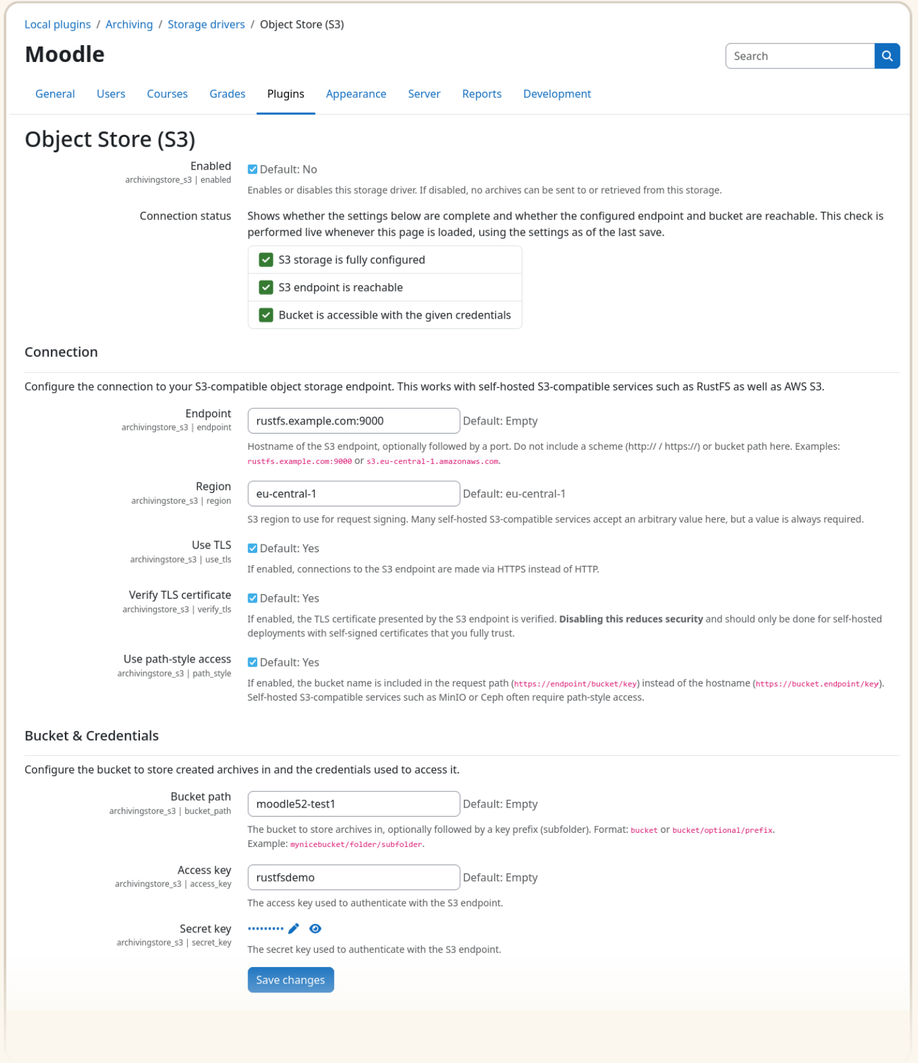
- Global configuration of all job parameters
- Configurable defaults for all jobs
- Lock settings to enforce institution-wide policies
- Activity-specific presets per activity type
- Automatic triggers always use presets
- Archiving can be limited to some course categories

Storage

Various storage solutions are supported out of the box

Driver	Tier	Use case
Moodle filestore	Local	Default, zero configuration
Local directory	Hybrid	Specific folder, NFS / SMB mounts, ...
S3-compatible	Remote	DMS, Ceph, RustFS, AWS, ...

- Local files are directly accessible
- Remote files are fetched asynchronously and cached
- Allows connection of WORM storage



Permissions

Custom capabilities let you control who can work with archives and how

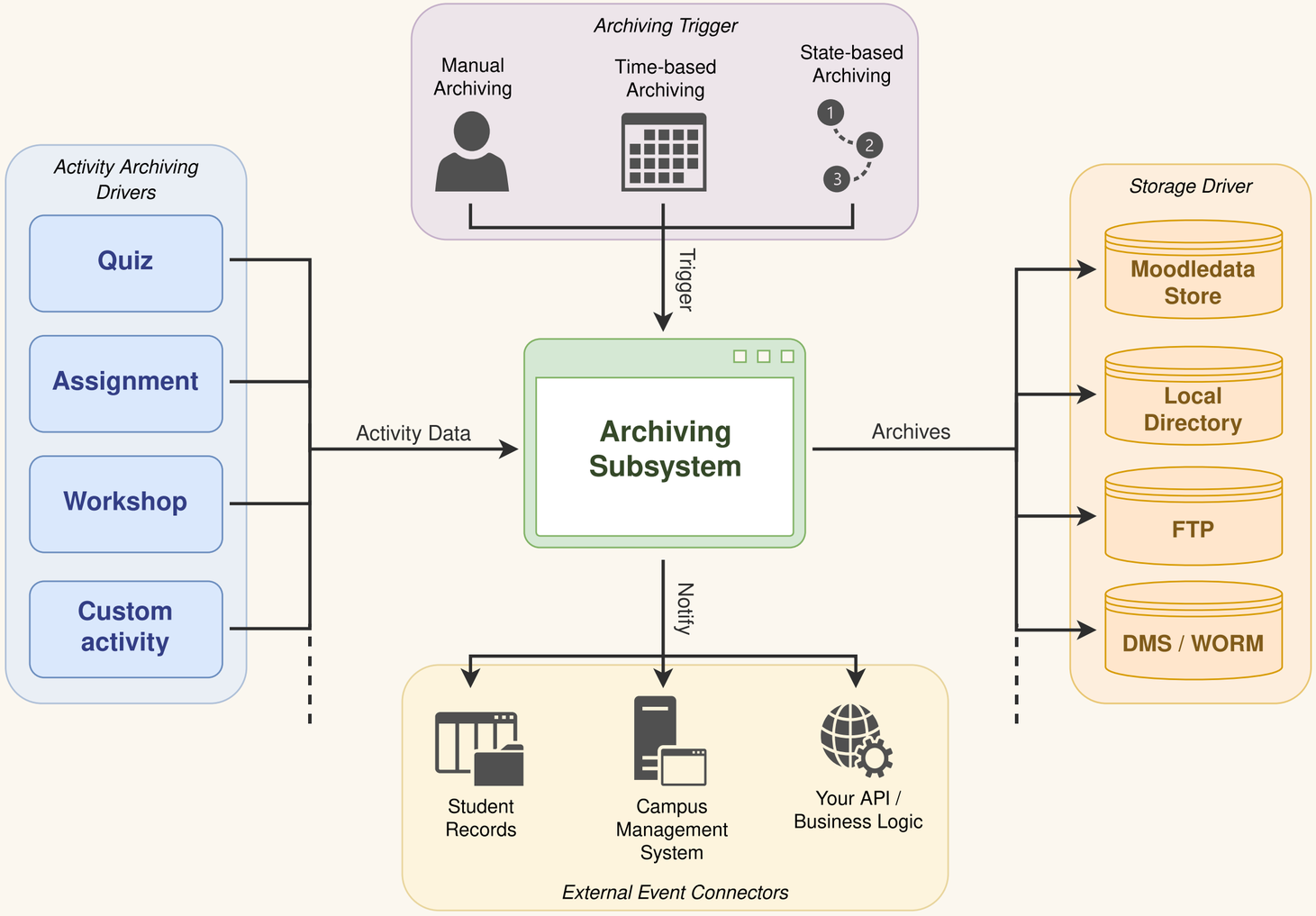
Capability	Allows you to …	Default roles
`local/archiving:view`	View and download archives	Teacher, Editing teacher, Manager
`local/archiving:create`	Create archive jobs	Editing teacher, Manager
`local/archiving:delete`	Delete archives	**Nobody** (Admins only)
`local/archiving:bypasscourserestrictions`	Archive outside of allowed categories	**Nobody** (Admins only)

Archives must not disappear accidentally – deletion is denied by default

Archiving Subsystem Architecture

One core, many pluggable components

The Archiving Subsystem



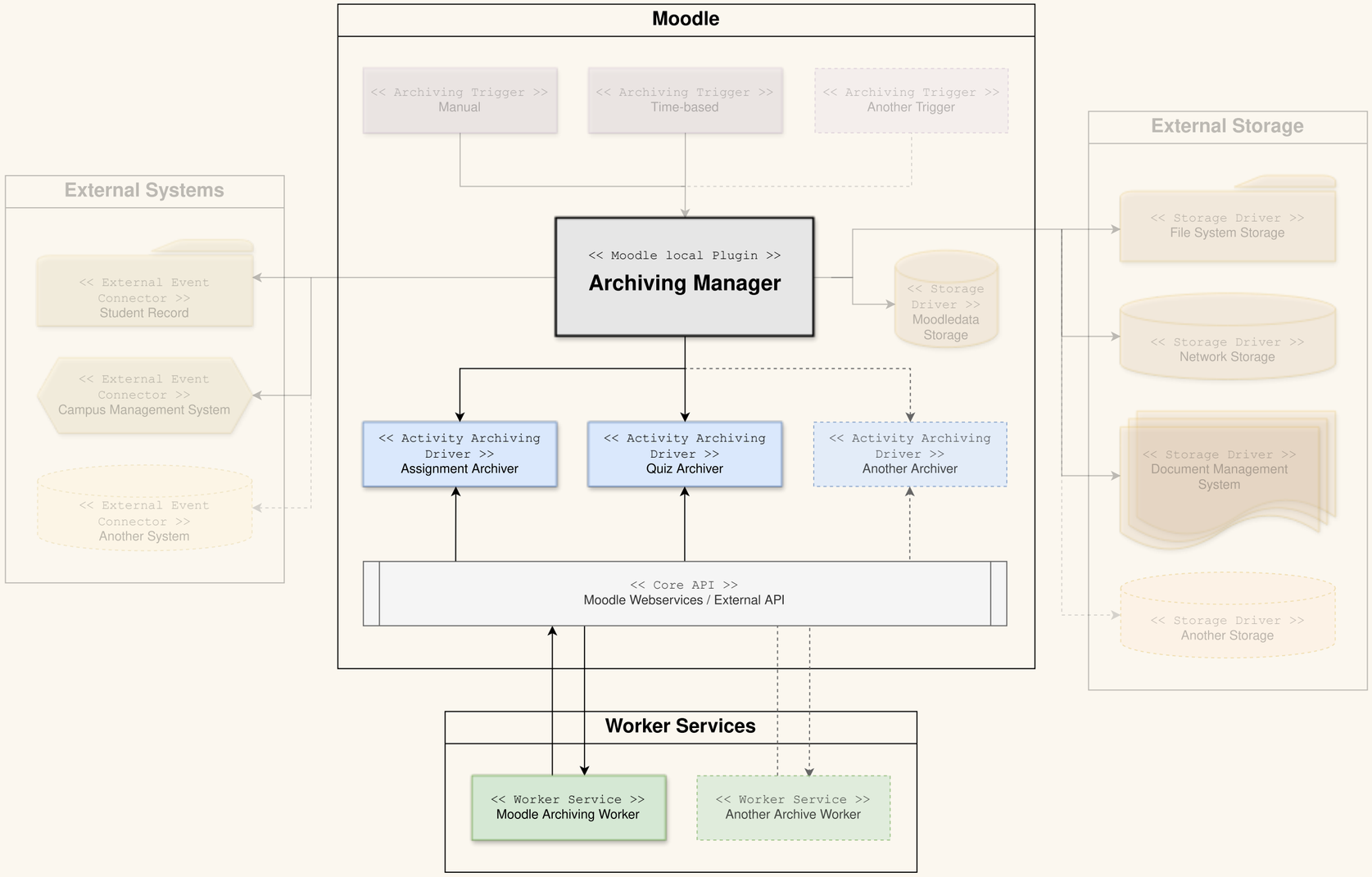
Sub-plugin types

Every component is a sub-plugin, allowing for easy extension!

Type	Purpose	Shipped implementations
`archivingmod`	Activity archiving drivers: Extract and render activity data	Quiz, Assignment
`archivingstore`	Storage drivers: Store, retrieve, and delete archives	Moodle, Local directory, S3 object store
`archivingtrigger`	Archiving triggers: Decide when to create archive jobs	Manual, Scheduled, Event-based
`archivingevent`	External event connectors: Notify third-party systems	Flexible API

External services

A variety of external systems can interact with the Archiving Subsystem



The Moodle Archiving Worker

Handles the heavy lifting for both quizzes and assignments

- Archived **exactly as seen** in the browser
  - Headless browser renders exactly what users saw (MathJax, STACK, GeoGebra, JSXGraph, …)
- Rendering happens **outside of Moodle**
  - No stress on Moodle, no blocked web requests, no PHP timeouts
- Asynchronous and parallel
  - Archives are created in parallel and in the background
- Security by design / Least privilege
  - Short-lived web service tokens, scoped to a single task
- Ready-to-use Docker image
  - Docker Hub: `ngandrass/moodle-archiving-worker`

Back to 2029 ...

... but now with the Archiving Subsystem

Course reset twice?

Archives live in an **independent storage**, not inside the course

Questions edited?

Questions and grades were **snapshotted at archiving time**

Teacher left?

Archives are kept by the **institution**, not by a single person

Plugin uninstalled?

Everything was **rendered to PDF/A** exactly as seen

Moodle upgraded?

The archive opens **without Moodle** or custom plugins at all

Lawsuit ongoing?

SHA256 & TSP signature prove the data is unaltered

Yes, you can prove exactly what was answered and how it was graded

Getting Started

Interested? Here's how to try it yourself!

Quickstart

① Install the plugin `local_archiving`

- Supports Moodle 4.5 – 5.3, PHP 8.1 – 8.4
- All sub-plugins are bundled

② Spin up an archive worker

- `docker run ngandrass/moodle-archiving-worker`
- Or use the public demo worker for testing

③ Archive!



Full documentation:
https://archiving.gandrass.de

Open source & community driven

Test and give feedback

Found a bug or have an idea? Let us know!

Build sub-plugins

New activities, storage systems, triggers, ...

Join the discussion

Matrix: `#archiving:gandrass.de`

ngandrass/moodle-local_archiving

GPLv3 – free and open source

What's next?

- Final release in the Moodle Marketplace
- Gathering your requirements and wishes
- Support for more activities?
- Additional storage systems?
- Standardized event connectors for CMS?
- Ensuring long-term maintenance

Q&A Session

Now it's time for your questions!



You can find all slides of this talk at
https://gandrass.de