



OpenCloud

Stable basis for growth

Stability

<https://opencloud.eu>



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OpenCloud - Stable basis for growth

Stability is not a ‘nice-to-have’ but a basic requirement for any IT infrastructure. When 5,000 users grow to 50,000 within a few years, many cloud storage systems start to falter: databases become bottlenecks, interpreters consume unnecessary resources, administrative costs rise – and ultimately, the user experience suffers.

This is exactly where OpenCloud comes in. The platform is designed from the ground up to remain stable even under heavy loads. No databases, no interpreters – just compiled code that runs directly on the machine. This reduces complexity, lowers energy consumption and ensures predictable performance. For users, this means smooth operation without waiting times; for administrators, it means less effort and greater stability. OpenCloud makes stability an architectural principle – making it the future-proof choice for organisations with growing requirements.

OpenCloud combines open standards with a comprehensive security concept. Multi-tenancy, differentiated access control and comprehensive audit functions ensure secure and traceable operation – even in highly sensitive or federal environments.

OpenCloud is based on a fork of the open source software ‘ownCloud Infinite Scale’ (OCIS), whose components were co-developed by developers from the science organisation CERN and other active contributors. OpenCloud is now being further developed by the Heinlein Group with new ideas and a clear focus on data protection, interoperability and sustainable digitalisation.

Why conventional platforms are reaching their limits

Growing user numbers and increasing data volumes quickly push traditional file management systems to the limits of their capacity. What still works with a few thousand users proves to be less resilient in larger rollouts. Typical problems are:

- **Complex dependencies:** Many platforms rely on a complex technology stack with PHP, MySQL, Redis and Apache. Each additional component increases maintenance costs and opens up new sources of error.
- **Database as a bottleneck:** Metadata must be permanently managed in SQL databases. Backups are time-consuming, and queries slow down performance – especially when files and versions grow exponentially.
- **Interpreter overhead:** PHP-based systems interpret code at runtime. Under load, this leads to unstable response times and high resource consumption.
- **High administrative overhead:** To keep the systems stable, ongoing optimisation and manual tuning are required – time that many IT departments lack.

Stable systems are indispensable, especially in the public sector, in education and research, and in companies. But with thousands of users or millions of files, instability quickly becomes a permanent problem: the user experience suffers, and energy and personnel requirements increase disproportionately.

Stability begins with architecture

Stability is not achieved through targeted optimisations in individual areas, but through an architecture that is designed from the ground up for efficiency and reliability.

OpenCloud follows three clear principles:

- 1. Less complexity:**
OpenCloud can be installed without traditional databases and interpreters. All metadata is stored directly in the file system. This reduces dependencies, lowers maintenance costs and makes backups as easy as copy & paste or snapshots.
- 2. Maximum performance:**
Instead of using dynamically interpreted code, OpenCloud works with compiled machine code. Applications run without detours – quickly, resource-efficiently and predictably, even under high loads.
- 3. Improved user experience:**
Every access is fully traceable, and data sovereignty remains entirely with the operating organisation.

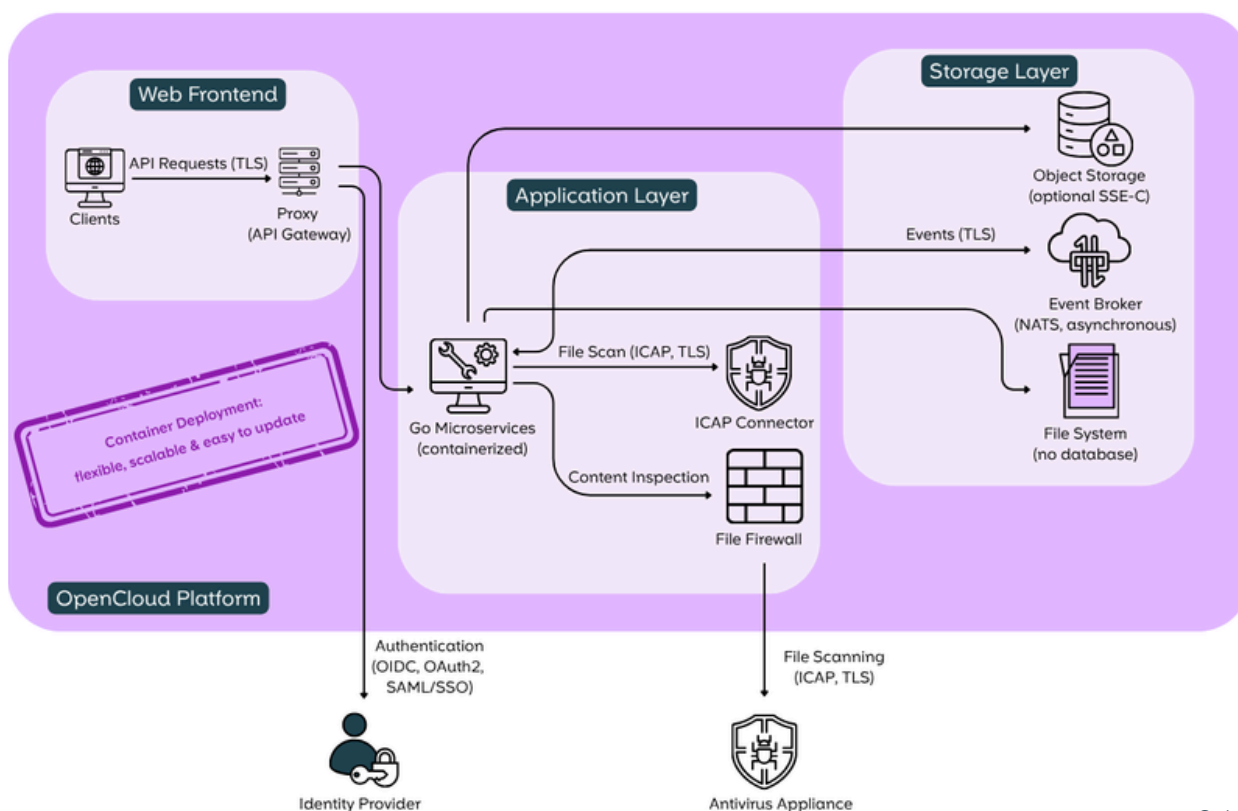
OpenCloud consistently implements these stability principles. This means that the platform not only works stably today, but will also remain reliable tomorrow as demands increase.

Stability begins with architecture

Stability requires a solid basis. OpenCloud therefore relies on a streamlined, scalable architecture that remains reliable as it grows.

The key components of this architecture are:

- Containerised microservices: Each service runs in isolation in its own container. This simplifies updates and enables flexible adaptation to peak loads.
- No database: Metadata is stored in the file system. This reduces complexity and enables backups with snapshots.
- TLS-encrypted communication: All connections between the front end, application and storage are secured. This keeps data protected and processes stable.
- Event broker for reliable data exchange: The internal messaging service ensures that all components work together efficiently and without delay – even under high load.



Stability in the field

Theory is great – but solid data is even better. To realistically benchmark OpenCloud's performance, we ran some serious load tests using K6. K6 is an open-source tool that simulates real-world access scenarios with virtual users (VUs) and measures response times, error rates, and resource utilisation.

The tests covered various hardware setups – from a single to eight CPU cores, with 2 to 32 GB of RAM and up to 630 simultaneously simulated users. The aim was to identify the optimal hardware for different workloads and to test how OpenCloud behaves under increasing load.

Compiled code instead of dynamic execution

The tests covered a broad spectrum: different hardware configurations were run through, from a single CPU core to eight CPU cores and with memory sizes between 2 and 32 GB.

At the same time, K6 simulated up to 630 simultaneously active users who made typical requests to the system. Both the response times in milliseconds and the error rates in percent were measured – precisely the factors that determine stability and user satisfaction in practical operation.

The calculations based on these measurements paint a clear picture: OpenCloud scales linearly. Although additional users require more resources, the typical crashes of classic systems – caused by database overhead or interpreter limits, for example – do not occur.

Stability in the field

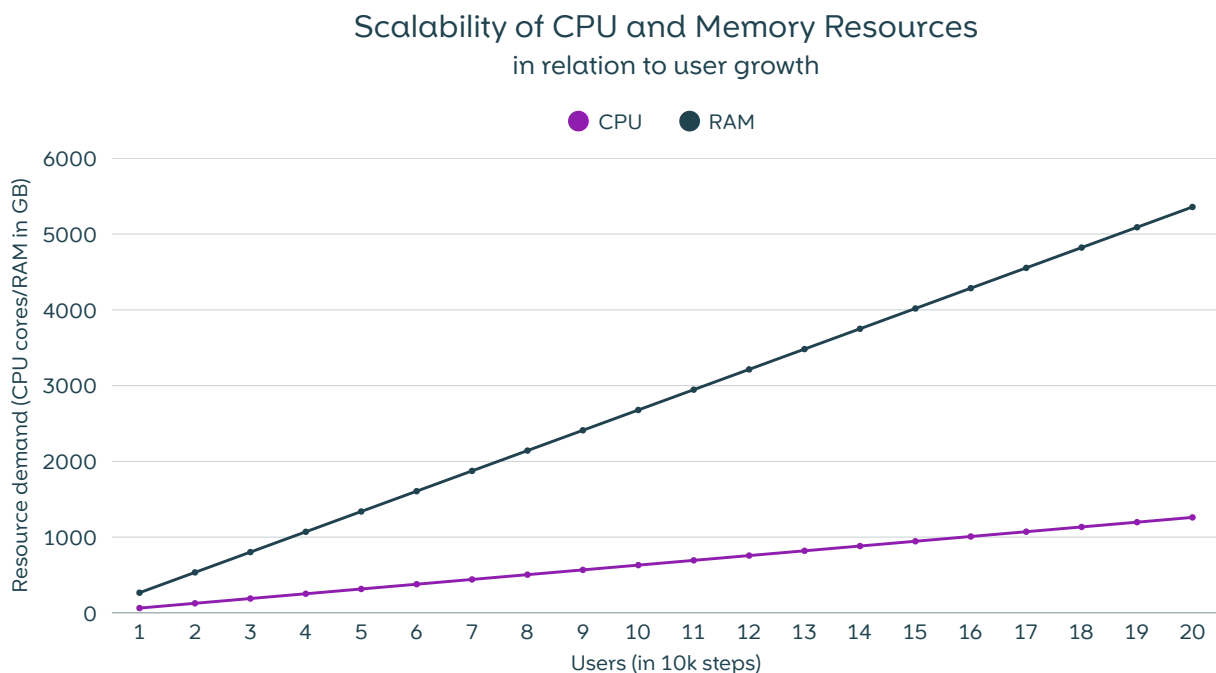


Diagram 1: Scaling of user numbers and resource requirements: While CPU values remain low, RAM requirements increase more sharply – however, both values grow linearly with the number of users.

Long-term stable memory consumption

In addition to the load tests, we examined how memory requirements develop during typical use. This was based on a practical scenario involving office workers, students and private individuals who regularly work with common Office files.

The file sizes range from kilobytes to low megabytes, with peak values for presentations or scanned documents. Each user generates approximately 1.1 GB of new files per year. Versioning increases the requirement to up to 20 versions per file in the case of intensive use.

The upload frequency was also taken into account: each user generates around 500–700 new files per year, with peaks after meetings or during project phases. Under these conditions, storage consumption grows to just under 3 GB per year.

Stability in the field

Storage development

The measurements show that even with intensive use and many file versions, the storage requirements per user remain manageable and reliably calculable. Organisations can therefore plan their infrastructure for the long term – a key factor for stability in ongoing operations.

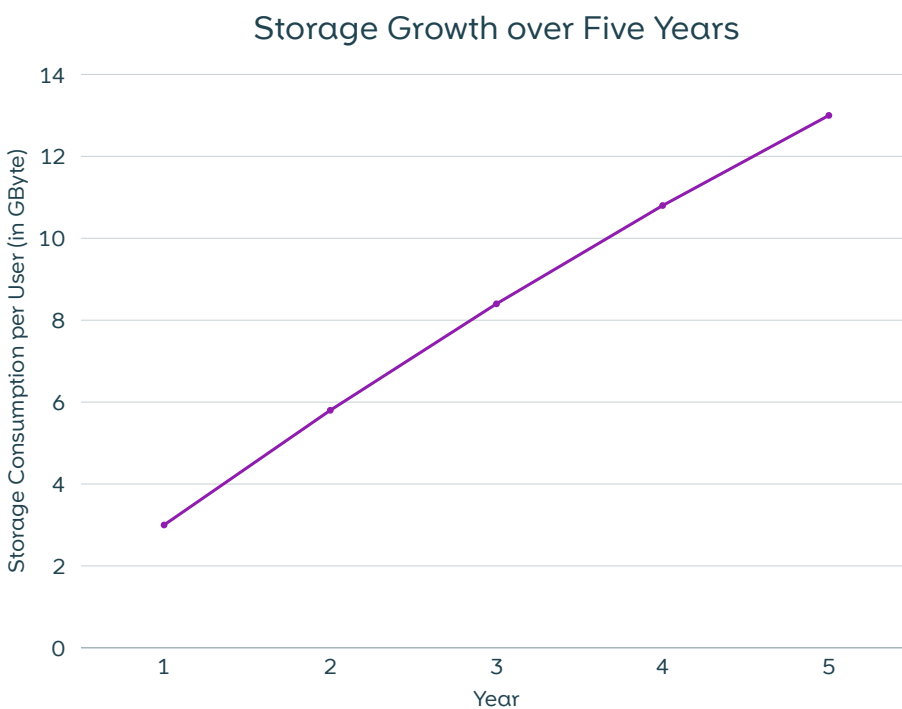


Diagram 2: Storage development per user over five years: Storage requirements are growing continuously, but remain predictable and calculable – an important factor for long-term stability.



Overview:

How OpenCloud ensures stability

Function	Description
Single source of truth	Metadata are stored directly in the file system; backups are as simple as taking a snapshot.
High Performance via GO	Maximum efficiency through a modern tech stack in GO.
Container-Deployment	Modular services, flexibly scalable and updatable without interruptions. It enables the use of computing resources according to demand. The environment automatically scales up when there is a load and reduces to the minimum required level during periods of low activity.
Event-driven architecture (NATS)	Reliable processing even with high parallelism thanks to asynchronous communication.
Automatic versioning	Files remain consistent and recoverable even after many editing cycles.
Scattered storage	Support for S3, NFS, CephFS, GPFS and local file systems – freely combinable.
Linear scaling	CPU and RAM requirements grow predictably with the number of users, no database overhead.
Predictable storage requirements	Storage consumption per user increases steadily and remains predictable in the long term.

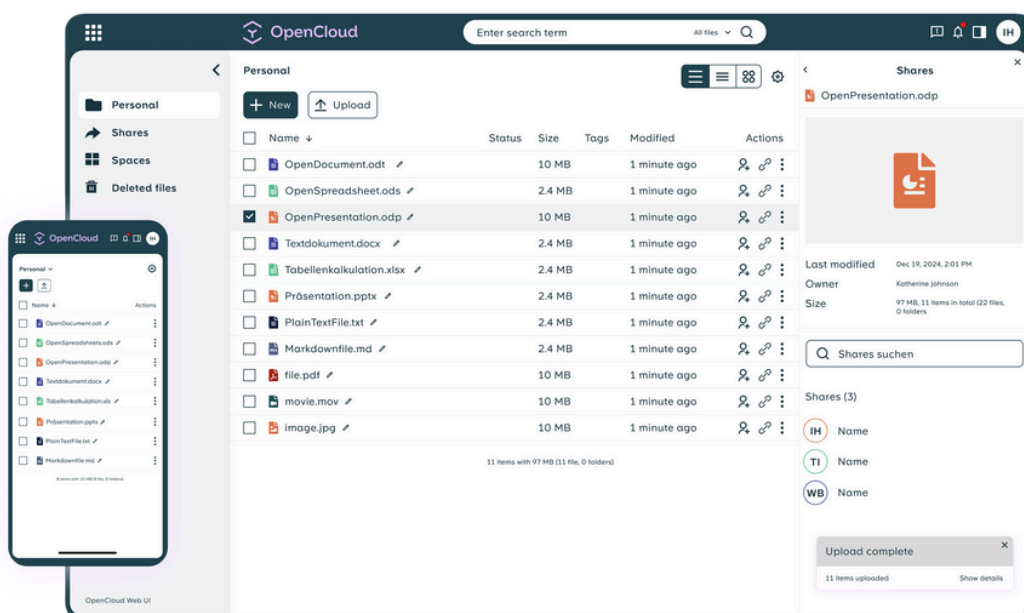
Your choice for stable infrastructure.

Stability is no coincidence, but rather the result of an architecture designed for reliability from the outset. OpenCloud offers a platform for file management and digital collaboration that remains reliable even as user numbers and data volumes grow – developed for organisations that value availability, efficiency and sustainability.

The combination of lean architecture without a database, compiled microservices, container-based operation and linear scalability makes OpenCloud a future-proof choice. Stress tests and practical scenarios prove that OpenCloud meets the requirements for a stable and long-term predictable IT infrastructure.

Rely on open source, open standards and reliable performance – and choose a platform that grows with your requirements. Talk to us about your scalability and stability requirements.

Get in contact with us at sales@opencloud.eu. We look forward to hearing from you.





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