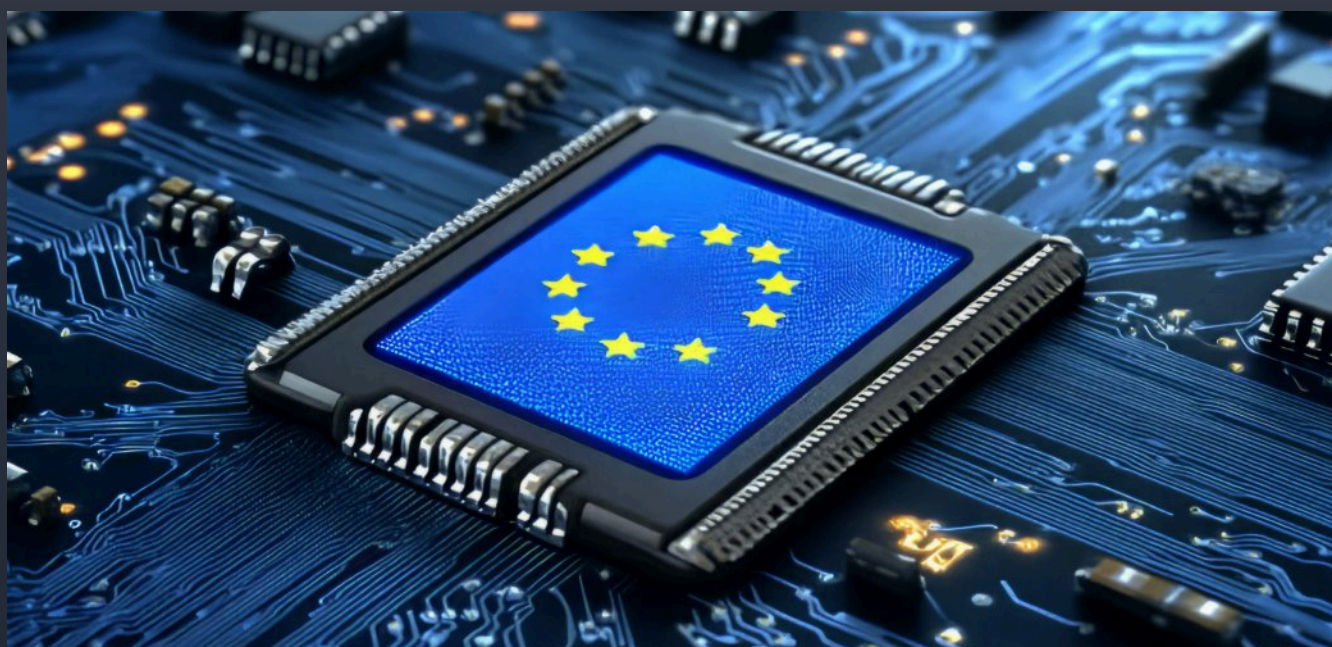


CLYSO — Building the Foundation of Digital Sovereignty

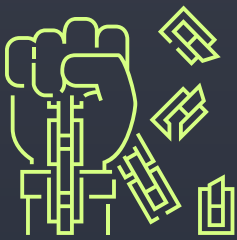


Executive Summary

The debate over digital sovereignty is no longer theoretical. Rising licensing costs from proprietary vendors, combined with growing geopolitical uncertainty, are actively constraining the public sector's ability to operate freely and make strategic technology decisions on its own terms. At its core lies the question of control over data and platforms; those who only swap out the application layer are building on quicksand. This whitepaper reveals why true autonomy must fundamentally begin at the data storage level (Layer 0/1) and how CES (CLYSO Enterprise Storage) puts an end to risky vendor lock-in.

01. The New Dimension of Digital Sovereignty

1.1 FROM COST OPTIMIZATION TO STRATEGIC RESILIENCE



Open source has evolved from a simple cost-saving strategy into a structural prerequisite for technological independence and sustainability. The increasing consolidation of proprietary platform ecosystems, alongside shifting regulatory and geopolitical landscapes, necessitates a shift in thinking: today, IT architectures are evaluated primarily by their strategic controllability. Choosing an infrastructure is no longer a purely technical decision, but a matter of an organization's long-term operational viability.

1.2 THE ILLUSION OF SOVEREIGNTY: WHY SOFTWARE UPDATES ALONE ARE NOT ENOUGH

Current discussions regarding digital sovereignty focus strikingly on the visible application layer - such as replacing end-user software, groupware, or collaboration tools. While modern standardization efforts at the infrastructure level demand openness for compute resources and networks, the critical layer of data storage is often treated as an afterthought in practical implementation.

Sovereignty cannot be achieved through the user interface alone. A strategy that merely replaces applications while neglecting the underlying persistence layer is nothing more than treating the symptoms. It simply pushes technological dependencies deeper into the stack, where they remain invisible to decision-makers but fatal for operations.

True technological self-determination must therefore be thought of consistently "bottom-up." Without full control over the data layer, the strategic freedom of the entire organization is compromised. Resilient digital transformation requires a foundation based on open standards (Layer 0/1) as a mandatory prerequisite for the sovereignty of the entire IT stack.

02. Ceph: The Technological Standard for Open Infrastructure

2.1 DEFINITION AND FUNCTIONALITY

Ceph is a distributed, software-defined storage (SDS) system designed for high availability, scalability, and hardware independence. Unlike proprietary or traditional storage solutions, Ceph completely decouples data storage logic from physical hardware.

The system's intelligence is organized decentrally: component failures are compensated for automatically, while capacity expansions occur during live operation without interruption. Ceph thus follows the design principles of modern cloud-native infrastructures, where scaling and resilience are integral parts of the architecture. Consequently, Ceph functions not as an isolated product, but as a vendor-independent infrastructure standard.

2.2 THE RELEVANCE OF UNIFIED STORAGE



Legacy IT environments are often characterized by fragmented data silos - consisting of separate systems for virtual instances (block), file services (file), and cloud-native applications (object). This infrastructure fragmentation increases operational complexity, complicates unified security concepts, and incurs significant migration costs.

Ceph dissolves these isolated structures by consolidating all storage requirements into a single, multi-protocol platform. The ability to provide block, file, and object storage natively via a shared cluster enables consistent data governance without media breaks. In this context, unified storage is not an optional feature, but an operational necessity to sustainably reduce complexity and ensure infrastructure scalability.

03. Strategic Application Scenarios and Exit Strategies

3.1 THE LIBERATION: BREAKING FREE FROM PROPRIETARY VIRTUALIZATION PRISONS (VMWARE EXIT)



Recent market consolidation (e.g., Broadcom/VMware) demonstrates the risks associated with dependence on a single IT vendor. Organizations without an independent, open data layer are often left defenseless against price hikes and vendor-imposed product mandates. left defenseless against price hikes and product mandates.

Ceph serves here as a vendor-independent abstraction layer. On this basis, various platforms - from OpenStack and Proxmox to Kubernetes with KubeVirt - can be operated in parallel or transitioned over time or transitioned gradually or adopted in time or migrated in stages. The data layer remains a constant resource; switching the technologies above it is thus possible without arduous data migrations.

Beyond pure virtualization, CES serves as the foundation for the entire data lifecycle management. Through native support for S3 and file interfaces, backup and archiving solutions can be seamlessly integrated. CES also enables Hierarchical Storage Management (HSM): data can be managed across different hardware classes (e.g., NVMe for performance, HDD for long-term archiving) within one cluster based on access frequency. This reduces the need for expensive specialized systems and creates a scalable basis for audit compliance.

3.2 SECTOR-SPECIFIC REQUIREMENTS

The relevance of an open data layer is particularly evident in regulated industries:

3.2.1

Public Sector & Administration

The focus here is on full data sovereignty, source code auditability, and maintaining strict data protection standards. Ceph enables operation under full self-control (on-premises or in sovereign clouds).

3.2.2

Critical Infrastructure (KRITIS)

Resilience and the avoidance of vendor lock-in are business-critical. Ceph guarantees independence from hardware suppliers and offers transparent cost structures.

3.2.3

Research and Data-Intensive Industries

Ceph supports the processing of massive data volumes for analytics and AI workloads through native integration into container infrastructures.

04. Strategic Role and Governance Expertise

While conventional system integrators often function merely as an extended sales arm for proprietary manufacturers, CLYSO breaks these value chains.

4.1 ACTIVE SHAPING OF INTERNATIONAL STANDARDS

Credibility in the open-source world is measured by participation in central governance structures. CLYSO secures the future viability of the technologies used through its active engagement

Linux Foundation & Ceph Board



Through its direct presence on the Ceph Board, CLYSO influences the strategic roadmap. This ensures that public sector and regulated industry requirements - such as stability and enterprise readiness - are considered during development.

NeoNephos Foundation



CLYSO is committed to building a sovereign European cloud infrastructure with NeoNephos. The goal is a data infrastructure that operates according to European standards and reduces dependence on non-European platform ecosystems.

One of our contributions to NeoNephos

This involvement provides users with long-term planning security, ensuring that operational requirements are permanently reflected in Ceph's technological evolution.

4.2 LEADERSHIP WITH OPERATIONAL PRACTICALITY

Strategic direction is driven by a combination of management expertise and technical depth. CLYSO's leadership team views infrastructure decisions primarily as a governance task. The focus is on systems that don't just scale in theory, but remain performant under real-world loads and meet complex regulatory mandates (e.g., KRITIS requirements). This operational experience forms the basis for the validity of our solutions.

05. The Operational Challenge: From Community to Enterprise Operations

Implementing high-scaling open-source technologies in production environments presents organizations with significant challenges. While Ceph provides the technological prerequisites for digital sovereignty, operation in the petabyte range requires disciplined architecture and deep expertise.



OVERCOMING OPERATIONAL HURDLES

In the petabyte range, pure community projects carry unpredictable risks without professional protection. Confusing digital sovereignty with "experimental tinkering" jeopardizes service operations. CES closes this gap and makes open source truly enterprise-ready.

06. CES (CLYSO Enterprise Storage) – The Standardized Enterprise Platform

CES is the systematic transition of Ceph technology into mission-critical IT operations. It is not an isolated software distribution, but a holistic storage platform developed for long-term, predictable use in enterprise environments. By using CES, CLYSO bundles extensive project experience into a standardized framework that combines the flexibility of open source with the operational security of industrial IT infrastructures.



6.1 STRATEGIC KEY ADVANTAGES OF CES

6.1.1

Consolidation of Storage Silos

CES integrates object, block, and file storage into a unified management environment, significantly reducing operational complexity. This leads to standardized operational processes and a measurable reduction in Total Cost of Ownership (TCO).

6.1.2

True Interoperability instead of Golden Cages

The architecture of CES is based on radical openness. While competitors often bind customers through proprietary formats, CLYSO guarantees complete hardware freedom.

6.1.3

Guaranteed Data Sovereignty

Full control over data assets, access rights, and storage locations remains with the customer. CES is designed for high-security environments where technological sovereignty is an architectural prerequisite. CLYSO acts as an enabler without ever having access to the actual content.

6.1.4

Code Validation and Security

A key advantage of CES over pure community releases is the systematic vetting of source code. CLYSO validates new versions for stability, performance, and security vulnerabilities before production release. This minimizes the risks associated with direct community software implementation and guarantees a hardened infrastructure.

6.1.5

Enterprise-Grade Lifecycle Management

Data center stability results from reproducible processes. CES utilizes validated reference architectures and offers defined upgrade paths. This eliminates the risks of individual "black-box" constructions and enables linear scalability from terabytes to petabytes.

6.1.6

Transfer of Operational Responsibility

Organizations do not need to build their own highly specialized capacity for Ceph core development. CLYSO assumes operational co-responsibility for the entire system - from design governance and performance optimization to continuous support.



6.2 APPLICATION AREAS FOR CES

CES is optimized for data-intensive and scaling workloads, supporting the full spectrum of modern IT requirements: from legacy core systems to cloud-native infrastructures and demanding analytics/AI applications. Depending on compliance needs, CES can be operated on-premises, in hybrid models, or within sovereign cloud environments.

07.

Conclusion: Infrastructure as a Digital Common Good



The transformation of public IT increasingly follows the principle: Public Money = Public Code. When public funds flow into digitalization, the results must be available to the general public as auditable and independently usable resources. However, this claim cannot be fulfilled at the application layer alone if the underlying infrastructure continues to rely on proprietary technologies.

CLYSO occupies the decisive intersection between technological excellence and strategic responsibility. Digital sovereignty does not arise through symbolic individual measures or purely visual adjustments to the software landscape. It manifests where basic infrastructure is understood as a public good: open, auditable, and sustainably viable.

Anyone seriously striving for technological autonomy can no longer delegate control over their data to black-box providers. With CES, CLYSO offers more than just an alternative; it provides the necessary "infrastructure rebellion" to liberate the public sector from digital hostage-taking.



CLYSO

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