Anexa nr. 22 la Documentația standard aprobată prin Ordinul Ministrului Finanțelor nr. 115 din 15.09.2021

Specificații tehnice

[Acest tabel va fi completat de către ofertant în coloanele 2, 3, 4, 6, 7, iar de către autoritatea contractantă – încoloanele 1, 5,]

Numărul procedurii de achiziție: *ocds-b3wdp1-MD-1740577309675* Obiectul achiziției: *Servere și sisteme de stocare (perioada 2024-2025)*

Denumirea bunurilor/ serviciilor	Denumirea modelului bunului/ serviciului	Țara de origine	Produ- cătorul	Specificarea tehnică deplină solicitată de către autoritatea contractantă	Specificarea tehnică deplină propusă de către ofertant	Standarde de referință
1	2	3	4	5	6	7
Bunuri/serv icii						
Lotul nr. 1 Enterprise Server tip 1	UCSC- C220-M7S	SUA	CISCO	 Echipament nou şi nerecondiționat, produs minim trim. I anul 2024, corespunzător tipului de dispozitive de nivel Enterprise, produs de producători renumiți (Brand name internațional). Configurația echipamentului trebuie să fie compusă din componente reciproc compatibile şi să asigure funcționarea optimă a sistemului în ansamblu. Type: Enterprise Server; Form Factor: Rack mount EIA-310 compatibility, max 2U (rail-kit included); CPU Included: 2 x CPU; Min. 24 core per CPU with hyper- threading; Launch date not earlier than Q4'23; Min. 50MB Cache; min. 2.4 Ghz; Memory: Min. 24 ECC (error-correcting code) DDR5 slots; Memory installed: Min. 12 x 64GB ECC DDR5; Min. drive bays: Min. 8 bays 2.5 for data Support Hot-Swappable; 	 Echipament-ul este nou şi nerecondiționat, produs dupa trim. I anul 2024, este corespunzător tipului de dispozitive de nivel Enterprise. Configurația echipamentului este compusă din componente reciproc compatibile şi asigura funcționarea optimă a sistemului în ansamblu. Type: Enterprise Server; Form Factor: Rack mount EIA-310 compatibility, max 2U (rail-kit included); CPU Included: 2 x CPU; Min. 24 core per CPU with hyper-threading; Launch date not earlier than Q4'23; Min. 50MB Cache; min. 2.4 Ghz; Memory: Min. 24 ECC (error-correcting code) DDR5 slots; Memory installed: Min. 12 x 64GB ECC DDR5; Min. drive bays: 	SM, CE, ISO, EN

Storage installed:	Min. 8 bays 2.5 for data Support Hot-	
Min. 2 x min. 240Gb SSD SAS	Swappable;	
RAID Controller:	Swappaole; Storage installed:	
	0	
Support Pass-through mode; RAID 1,5,6,10,50,60;	Min. 2 x min. 240Gb SSD SAS	
Cache min. 4GB;	RAID Controller:	
NICs included:	Support Pass-through mode; RAID	
Min. 1 x 1GE management;	1,5,6,10,50,60; Cache min. 4GB;	
Min. 2 x 1GE;	NICs included:	
Min. 2 x 10G SFP+, with SFP+ SR MM modules	Min. 1 x 1GE management;	
included (Cisco Compatible);	Min. 2 x 1GE;	
Min. 2 x 32G FC SFP28 850nm, with	Min. 2 x 10G SFP+, with SFP+ SR MM	
SFP28 SR MM modules included (Cisco	modules included (Cisco Compatible);	
Compatible).	Min. 2 x 32G FC SFP28 850nm, with	
Supported operating environments:	SFP28 SR MM modules included (Cisco	
Microsoft Windows Server (Hyper V) min. 2019;	Compatible).	
Red Hat Enterprise Linux;	Supported operating environments:	
VMware (VMware ESXi) min. ver. 8.0.x;	Microsoft Windows Server (Hyper V) min.	
Interfaces:	2019;	
Min. 2 port USB;	Red Hat Enterprise Linux;	
Power supplies included:	VMware (VMware ESXi) min. ver. 8.0.x;	
Min. 2 hot-plug PSU with support for 1+1	Interfaces:	
redundancy with power cables c13-c14(0.6 m);	Min. 2 port USB;	
Front Indicator Status:	Power supplies included:	
Power Status	Min. 2 hot-plug PSU with support for 1+1	
Health System Status	redundancy with power cables c13-c14(0.6 m);	
Drive Status	Front Indicator Status:	
NIC Status	Power Status	
UID Status	Health System Status	
Fan Modules:	Drive Status	
hot-swappable with N+1 redundancy;	NIC Status	
Management:	UID Status	
A web-based solution for KVM must be included	Fan Modules:	
with full functionality for manage and monitoring,	hot-swappable with N+1 redundancy;	
including at least following features:	Management:	
- View information about the state of the managed	A web-based solution for KVM is included	
server:	with full functionality for manage and	
- Inventory and monitoring of network adapters and	monitoring, including at least following	
data storage subsystems without software agents in	features:	
the OS;	- View information about the state of the	
- View inventory information (CPU, RAM,	managed server;	
Storages);	- Inventory and monitoring of network	
- View information from sensors;	adapters and data storage subsystems without	
- Monitoring and control of electricity consumption;	software agents in the OS;	
- Turn on/off the server;	- View inventory information (CPU, RAM,	
- 1 uni on/on uie server;		
	Storages);	

	1					1
				- Remote update of BIOS, firmware of network and	- View information from sensors;	
				RAID controllers;	- Monitoring and control of electricity	
				- Working with RAID controllers without shutting	consumption;	
				down and restarting the servers;	- Turn on/off the server;	
				- Virtual console, virtual media devices;	- Remote update of BIOS, firmware of network	
				- Perform OS installations using virtual media	and RAID controllers;	
				interfaces and network-shared directories, with	- Working with RAID controllers without	
				support for an integrated graphical user interface	shutting down and restarting the servers;	
				(GUI).	- Virtual console, virtual media devices;	
				- Support SNMP min.v2c	- Perform OS installations using virtual media	
				- Provision of the Management Information Base	interfaces and network-shared directories, with	
				(MIB) libraries, including detailed Object Identifier	support for an integrated graphical user	
				(OID) descriptions, either as a standalone document	interface (GUI).	
				from the manufacturer or through a link to the server	- Support SNMP min.v2c	
				manufacturer's official website.	- Provision of the Management Information	
					Base (MIB) libraries, including detailed Object	
				Operating system: no OS pre-installed;	Identifier (OID) descriptions, either as a	
				• F • • • • • • • • • • • • • • • • • •	standalone document from the manufacturer or	
				Toate licențele necesare (dacă se aplică conform	through a link to the server manufacturer's	
				termenilor și condițiilor producătorului) pentru	official website.	
				caracteristicile minime de management menționate		
				mai sus și software-ul/firmware-ul specific	Operating system: no OS pre-installed;	
				serverului, inclusiv actualizările/patch-urile	operating systems no os pre instantes,	
				periodice, trebuie să fie incluse în ofertă și furnizate	Toate licențele necesare sunt incluse pentru	
				pe o bază perpetuă - valabile obligatoriu pentru	caracteristicile minime de management	
				durata integrală de viață a serverului.	menționate mai sus și software-ul/firmware-ul	
				durata integrata de viaçã a serverarar.	specific serverului, inclusiv	
				Cerințe obligatorii pentru prestarea serviciilor de	actualizările/patch-urile periodice, sunt incluse	
				punere în funcțiune, a garanției și a serviciilor de	în ofertă și furnizate pe o bază perpetuă -	
				suport (deservire și mentenanță) a bunurilor -	valabile obligatoriu pentru durata integrală de	
				conform Anexei la Anunțul de participare.	viață a serverului.	
				conform Anexel la Anunjul de participare.		
				Termeni ei eendittie	Tooto covinto obligatorii nontuu	
				Termeni și condiții:	Toate cerințe obligatorii pentru prestarea	
				Toate cerințele sunt minime și obligatorii;	serviciilor de punere în funcțiune, a	
				O cerință nu trebuie să limiteze o altă cerință;	garanției și a serviciilor de suport (deservire	
				Toate componentele trebuie să fie actuale și să nu fie	<u>și mentenanță) a bunurilor – vor fi efectuate</u>	
				promovate ca EOS (sfârșitul vânzării/suportului) /	conform Anexei la Anunțul de participare.	
				EOL (sfârșitul duratei de viață);		
				Extinderea memoriei (ram) și a capacității de stocare		
				nu trebuie să includă limitări hardware sau software.		
Lotul nr. 2	UCSC-			Echipament nou și nerecondiționat, produs minim	Echipament-ul este nou și nerecondiționat,	
		OTTA	araco	trim. I anul 2024, corespunzător tipului de	produs dupa trim. I anul 2024, este	SM, CE, ISO
Enterprise	C240-	SUA	CISCO	dispozitive de nivel Enterprise, produs de	corespunzător tipului de dispozitive de nivel	, ,
Server tip 2	M7SX			producători renumiți (Brand name internațional).	Enterprise. Configurația echipamentului este	
L				Configurația echipamentului trebuie să fie compusă	compusă din componente reciproc compatibile	

1:	-: -::
din componente reciproc compatibile și să asigure	și asigură funcționarea optimă a sistemului în
funcționarea optimă a sistemului în ansamblu.	ansamblu.
Type:	Type:
Enterprise Server;	Enterprise Server;
Form Factor:	Form Factor:
Rack mount EIA-310 compatibility, max. 2U (rail-	Rack mount EIA-310 compatibility, max. 2U
kit included);	(rail-kit included);
CPU Included:	CPU Included:
2 x CPU; Min. 24 core per CPU with hyper-	2 x CPU; Min. 24 core per CPU with hyper-
threading; Launch date not earlier than Q4'23; min.	threading; Launch date not earlier than Q4'23;
50MB Cache; min. 2.4 Ghz;	min. 50MB Cache; min. 2.4 Ghz;
Memory:	Memory:
Min. 24 ECC (error-correcting code) DDR5 slots;	Min. 24 ECC (error-correcting code) DDR5
Memory installed:	slots;
Min. 8 x 64 GB ECC DDR5;	Memory installed:
Min drive bays:	Min. 8 x 64 GB ECC DDR5;
Min. 24 bays 2.5 for data Support Hot-Swappable	Min drive bays:
Storage installed:	Min. 24 bays 2.5 for data Support Hot-
Min. 18 x min.1,9 Tb SSD, SAS 12Gb/s	Swappable
Min. 2 x min.240Gb SSD SAS	Storage installed:
RAID Controller:	Min. 18 x min.1,9 Tb SSD, SAS 12Gb/s
Support Pass-through mode; RAID 1,5,6,10,50,60;	Min. 2 x min.240Gb SSD SAS
Cache min. 4GB	RAID Controller:
NICs included:	Support Pass-through mode; RAID
Min. 1 x 1GE management;	1,5,6,10,50,60; Cache min. 4GB
Min. 2 x 1GE;	NICs included:
Min. 2 x 10G SFP+, with	Min. 1 x 1GE management;
SFP+ SR MM modules included(Cisco compatible);	Min. 2 x 1GE;
Supported operating environments:	Min. 2 x 10G SFP+, with
Microsoft Windows Server (Hyper V) min. 2019;	SFP+ SR MM modules included(Cisco
Red Hat Enterprise Linux;	compatible);
VMware (VMware ESXi) min. ver. 8.0.x;	Supported operating environments:
Interfaces:	Microsoft Windows Server (Hyper V) min.
Min. 2 port USB;	2019;
Power supplies included:	Red Hat Enterprise Linux;
2 hot-plug PSU with support for 1+1 redundancy	VMware (VMware ESXi) min. ver. 8.0.x;
with power cables c13-c14(0.6 m);	Interfaces:
Front Indicator Status:	Min. 2 port USB;
Power Status	Power supplies included:
Health System Status	2 hot-plug PSU with support for 1+1
Drive Status	redundancy with power cables c13-c14(0.6 m);
NIC Status	Front Indicator Status:
UID Status	Power Status
Fan Modules:	Health System Status
hot-swappable with N+1 redundancy;	Drive Status

	NIC Status
Management:	UID Status
A web-based solution for KVM must be included	Fan Modules:
with full functionality for manage and monitoring,	hot-swappable with N+1 redundancy;
including minimum following features:	
- View information about the state of the managed	Management:
server;	A web-based solution for KVM is included
- Inventory and monitoring of network adapters and	with full functionality for manage and
data storage subsystems without software agents in	monitoring, including minimum following
the OS;	features:
- View inventory information (CPU, RAM.	- View information about the state of the
Storages);	managed server;
- View information from sensors;	- Inventory and monitoring of network
- Monitoring and control of electricity consumption;	adapters and data storage subsystems without
- Turn on/off the server;	software agents in the OS;
- Remote update of BIOS, firmware of network and	- View inventory information (CPU, RAM.
RAID controllers;	Storages);
- Working with RAID controllers without shutting	- View information from sensors;
down and restarting the servers;	- Monitoring and control of electricity
- Virtual console, virtual media devices;	consumption;
- Perform OS installations using virtual media	- Turn on/off the server;
interfaces and network-shared directories, with	- Remote update of BIOS, firmware of network
support for an integrated graphical user interface	and RAID controllers;
(GUI).	- Working with RAID controllers without
- Support SNMP min.v2c	shutting down and restarting the servers;
- Provision of the Management Information Base	- Virtual console, virtual media devices;
(MIB) libraries, including detailed Object Identifier	- Perform OS installations using virtual media
(OID) descriptions, either as a standalone document	interfaces and network-shared directories, with
from the manufacturer or through a link to the server	support for an integrated graphical user
manufacturer's official website.	interface (GUI).
	- Support SNMP min.v2c
	- Provision of the Management Information
Operating system: no OS pre-installed;	Base (MIB) libraries, including detailed Object
	Identifier (OID) descriptions, either as a
Toate licențele necesare (dacă se aplică conform	standalone document from the manufacturer or
termenilor și condițiilor producătorului) pentru	through a link to the server manufacturer's
caracteristicile minime de management menționate	official website.
mai sus și software-ul/firmware-ul specific	
serverului, inclusiv actualizările/patch-urile	
periodice, trebuie să fie incluse în ofertă și furnizate	Operating system: no OS pre-installed;
pe o bază perpetuă - valabile obligatoriu pentru	
durata integrală de viață a serverului.	Toate licențele necesare sunt icluse pentru
	caracteristicile minime de management
Cerințe obligatorii pentru prestarea serviciilor de	menționate mai sus și software-ul/firmware-ul
punere în funcțiune, a garanției și a serviciilor de	specific serverului, inclusiv
puncte in functiones a garantier st a set viellor ut	speeme serverului, melusiv

				 suport (deservire și mentenanță) a bunurilor - conform Anexei la Anunțul de participare. Termeni și condiții: Toate cerințele sunt minime și obligatorii; O cerință nu trebuie să limiteze o altă cerință; Toate componentele trebuie să fie actuale și să nu fie promovate ca EOS (sfârșitul vânzării/suportului) / EOL (sfârșitul duratei de viață); Extinderea memoriei (ram) și a capacității de stocare nu trebuie să includă limitări hardware sau software. 	actualizările/patch-urile periodice, sunt incluse în ofertă și furnizat pe o bază perpetuă - valabile obligatoriu pentru durata integrală de viață a serverului. <u>Toate cerințe obligatorii pentru prestarea</u> <u>serviciilor de punere în funcțiune, a</u> <u>garanției și a serviciilor de suport</u> (deservire și mentenanță) a bunurilor – vor fi efectuate conform Anexei la Anunțul de participare.	
Lotul nr. 3 Enterprise Storage (Sisteme de stocare) tip 1(SAS SSD)	OceanStor Dorado 8000 V6	CN	HUAWEI	 Echipament nou şi nerecondiţionat, produs minim trim. I anul 2024, corespunzător tipului de dispozitive de nivel Enterprise, produs de producători renumiţi (Brand name internaţional). Configuraţia echipamentului trebuie să fie compusă din componente reciproc compatibile şi să asigure funcţionarea optimă a sistemului în ansamblu. Type: Enterprise-grade Storage with SAS SSDs. Form Factor: min. 2U rack-mountable chassis, fully compatible with the EIA-310 standard for rack mounting. The solution must include all necessary components (e.g., rails, mounting brackets). Availability requirements: The equipment must be working in Symmetric Active-Active mode, which means that in the case of 100% utilization, ensures following: The storage system architecture must ensure that, in the event of a controller failure, the write cache of the surviving controller(s) remains fully operational and protected. The equipment must utilize mechanisms such as cache mirroring or equivalent protection to guarantee data integrity. Under no circumstances should the write cache be deactivated, operated without mirroring, or left without an alternative protection mechanism to prevent data loss or corruption. The system must ensure a high availability rate of at least 99.9999%, minimizing downtime and guaranteeing continuous operation, 	Echipament-ul este nou și nerecondiționat, produs dupa trim. I anul 2024, corespunde tipului de dispozitive de nivel Enterprise. Configurația echipamentului este compusă din componente reciproc compatibile și să asigură funcționarea optimă a sistemului în ansamblu. Type: Enterprise-grade Storage with SAS SSDs. Form Factor: 4U rack-mountable chassis, fully compatible with the EIA-310 standard for rack mounting. The solution includes all necessary components (e.g., rails, mounting brackets). Availability requirements: The equipment is working in Symmetric Active-Active mode, which means that in the case of 100% utilization, ensures following: - The storage system architecture ensures that, in the event of a controller failure, the write cache of the surviving controller(s) remains fully operational and protected. The equipment utilizes mechanisms such as cache mirroring or equivalent protection to guarantee data integrity. Under no circumstances the write cache will not be deactivated, operated without mirroring, or left without an alternative protection mechanism to prevent data loss or corruption.	SM, CE, ISO

- The system's efficiency must remain unaffected in - The system ensures a high availability rate of	
the event of a failure of up to 50% of the controllers, at least 99.9999%, minimizing downtime and	
maintaining consistent operational capability - alive guaranteeing continuous operation,	
with a single active controller, - The system's efficiency will remain	
- The system must sustain its required performance unaffected in the event of a failure of up to 50%	
levels without degradation in the event of a failure of the controllers, maintaining consistent	
affecting half of the controllers, operational capability - alive with a single	
- The system must include robust, built-in active controller,	
mechanisms for non-disruptive software updates, - The system will sustain its required	
ensuring no compromise in availability or loss of performance levels without degradation in the	
access to stored data during version upgrades. event of a failure affecting half of the	
controllers,	
The storage system must ensure uninterrupted data - The system includes robust, built-in	
availability and full operational continuity in the mechanisms for non-disruptive software	
following failure scenarios: updates, ensuring no compromise in	
- failure of a single power supply line, ensuring availability or loss of access to stored data	
redundancy in power management, failure of any individual controller with sutemptio	
- failure of any individual controller, with automatic	
failover mechanisms to maintain functionality - alive The storage system will ensure uninterrupted	
with a single active controller, data availability and full operational continuity	
- simultaneous failures of up to two user data storage in the following failure scenarios:	
drives, with no loss of data integrity or accessibility, - failure of a single power supply line,	
- failures of any Fibre Channel (FC) or iSCSI port, ensuring redundancy in power management,	
with seamless rerouting of traffic to alternate - failure of any individual controller, with	
pathways. automatic failover mechanisms to maintain	
The equipment must support hot-swappable functionality - alive with a single active	
replacement of critical components without controller,	
interrupting access to data or degrading system - simultaneous failures of up to two user data	
performance. These components include, but are not storage drives, with no loss of data integrity or	
limited to: controllers, power supplies, cooling fans, accessibility,	
front-end and back-end ports, and storage drives failures of any Fibre Channel (FC) or iSCSI	
The hot replacement process must ensure seamless port, with seamless rerouting of traffic to	
operation and maintain data availability throughout. alternate pathways.	
The system must be designed to withstand the The equipment supports hot-swappable	
simultaneous failure of at least two storage devices replacement of critical components without	
(e.g., drives, NVMe, or flash modules), regardless of interrupting access to data or degrading system	
the system's scale or configuration. In such performance. These components include, but	
scenarios, the equipment must ensure uninterrupted are not limited to: controllers, power supplies,	
data access and maintain full data integrity. cooling fans, front-end and back-end ports, and	
The system must include functionality to safely storage drives. The hot replacement process	
disable the storage drives without causing any loss or ensures seamless operation and maintain data	
corruption of user data, ensuring seamless availability throughout.	
operational continuity during maintenance or The system is designed to withstand the	
decommissioning. In antenance of the system is designed to withstand the simultaneous failure of at least two storage	
devices (e.g., drives, NVMe, or flash modules),	
uevices (c.g., unives, in vivie, of flash filodules),	

· · · ·	· · ·			
		Type Drives:	regardless of the system's scale or	
		Enterprise-grade SAS SSD s utilizing TLC (Triple- Level Cell) or eTLC (Enhanced Triple-Level Cell)	configuration. In such scenarios, the equipment will ensure uninterrupted data access and	
		technology, optimized for high-performance, high-	maintain full data integrity.	
		reliability applications in enterprise environments.	The system includes functionality to safely	
		renability applications in encerprise environments.	disable the storage drives without causing any	
		Capacity:	loss or corruption of user data, ensuring	
		The system must provide a marked usable storage	seamless operational continuity during	
		capacity (before data reduction) of minimum 200	maintenance or decommissioning.	
		TB , ensuring sufficient space for high-demand		
		enterprise applications.	Type Drives:	
			Enterprise-grade SAS SSDs utilizing TLC	
		Hot Spare Configuration(optional):	(Triple-Level Cell) or eTLC (Enhanced Triple-	
		The solution must optionally support Hot Spare	Level Cell) technology, optimized for high-	
		components, including spare controllers or disks, to	performance, high-reliability applications in	
		enhance system redundancy. These spare components must remain inactive during regular	enterprise environments.	
		operations but should automatically activate to	Capacity:	
		maintain full system functionality in case of	The system provides a marked usable storage	
		hardware failure.	capacity (before data reduction) of minimum	
			200 TB , ensuring sufficient space for high-	
		RAID (if the equipment involves the use of RAID):	demand enterprise applications.	
		- The system must support advanced RAID levels,		
		including minimum:	Hot Spare Configuration:	
		RAID 6: Ensuring double parity protection, allowing	The solution supports Hot Spare components,	
		the system to tolerate simultaneous failure of two	including spare controllers or disks, to enhance	
		drives without data loss.	system redundancy. These spare components	
			remain inactive during regular operations will automatically activate to maintain full system	
		Cache requirement (<i>if the equipment involves the</i>	functionality in case of hardware failure.	
		<i>use of memory cache for data</i>): If the storage system includes a cache mechanism,	renetionality in case of haluware failure.	
		the system must provide a minimum of 512 GB of	RAID:	
		dedicated cache memory per node, ensuring high-	- The system supports advanced RAID levels,	
		speed data processing and optimal system	including minimum:	
		performance.	RAID 6: Ensuring double parity protection,	
		The cache must support advanced features such as:	allowing the system to tolerate simultaneous	
		- Cache mirroring - to ensure data integrity and	failure of two drives without data loss.	
		protection in the event of a node failure.		
		- Dynamic allocation - enabling efficient use of	Cache:	
		cache resources based on real-time workload	The storage system includes a cache	
		demands. - Non-volatile cache - to prevent data loss during	mechanism, the system provides 1 TB of dedicated cache memory per node, ensuring	
		power failures or unexpected shutdowns, ensuring	high-speed data processing and optimal system	
		all cached data is retained.	performance.	
			The cache supports advanced features such as:	
LI			The eache supports advanced reatures such as.	

r			
	The cache must be optimized for handling high IOPS	- Cache mirroring - to ensure data integrity and	
	workloads and ensuring low-latency operations,	protection in the event of a node failure.	
	particularly for enterprise-grade applications.	- Dynamic allocation - enabling efficient use of	
		cache resources based on real-time workload	
	Controllers requirement:	demands.	
	The storage system must include minimum one node	- Non-volatile cache - to prevent data loss	
	equipped with a minimum of two fully redundant	during power failures or unexpected	
	controllers configured in High Availability (HA)	shutdowns, ensuring all cached data is	
	mode.	retained.	
		The cache is optimized for handling high IOPS	
	The controllers must:	workloads and ensuring low-latency	
	- Operate in an Active-Active configuration,	operations, particularly for enterprise-grade	
	ensuring balanced workload distribution and	applications.	
	seamless failover capabilities without performance		
	degradation.	Controllers:	
	- Support advanced fault-tolerant mechanisms to	The storage system includes one node	
	maintain uninterrupted access to data during	equipped with a minimum of two fully	
	hardware failures or maintenance.	redundant controllers configured in High	
	- Be hot-swappable, allowing replacement or	Availability (HA) mode.	
	upgrade without disrupting system operations or data		
	availability.	The controllers can:	
	- Include built-in synchronization mechanisms to	- Operate in an Active-Active configuration,	
	maintain consistency between controllers, including	ensuring balanced workload distribution and	
	mirroring of critical operational data such as cache	seamless failover capabilities without	
	contents and configuration settings.	performance degradation.	
	The system must ensure that the failure of one	- Support advanced fault-tolerant mechanisms	
	controller does not impact the performance,	to maintain uninterrupted access to data during	
	availability, or operational integrity of the other	hardware failures or maintenance.	
	controller.	- Hot-swappable, allowing replacement or	
		upgrade without disrupting system operations	
	Cluster and replication requirements:	or data availability.	
	1. Synchronous replication capability:	- Include built-in synchronization mechanisms	
	- The storage solution must support synchronous	to maintain consistency between controllers,	
	replication to enable the creation of an Active-Active	including mirroring of critical operational data	
	cluster between two physically separated server	such as cache contents and configuration	
	rooms (located in separate buildings).	settings.	
	- The system must ensure zero Recovery Point	The system ensures that the failure of one	
	Objective (RPO) by maintaining data consistency	controller does not impact the performance,	
	across the cluster in real time.	availability, or operational integrity of the	
	2. Comprehensive hardware inclusion:	other controller.	
	- The solution must include all necessary hardware		
	components to fully implement synchronous	Cluster and replication:	
	replication functionality, utilizing Fibre Channel	1. Synchronous replication capability:	
	(FC) protocols for high-speed, low-latency data	- The storage solution supports synchronous	
	transmission.	replication to enable the creation of an Active-	
		replication to enable the creation of an Active-	

3. Flexible volume replication:	Active cluster between two physically	
- The system must support synchronous replication	separated server rooms (located in separate	
for a minimum of one Logical Unit Number (LUN)	buildings).	
and scale seamlessly to replicate multiple LUNs	- The system ensures zero Recovery Point	
simultaneously.	Objective (RPO) by maintaining data	
- Changes to the number of replicated volumes must	consistency across the cluster in real time.	
not require modifications to the physical hardware	2. Comprehensive hardware inclusion:	
configuration of the storage system.	- The solution includes all necessary hardware	
4. Data consistency and synchronization:	components to fully implement synchronous	
- The contents of all cluster volumes must remain	replication functionality, utilizing Fibre	
identical across both systems in the cluster at all	Channel (FC) protocols for high-speed, low-	
times, ensuring data consistency and integrity.	latency data transmission.	
- The system must include mechanisms to handle		
data synchronization efficiently during recovery	- The system supports synchronous replication	
scenarios, ensuring minimal impact on performance	for a minimum of one Logical Unit Number	
and availability.	(LUN) and scale seamlessly to replicate	
5. Resiliency and high availability:	multiple LUNs simultaneously.	
- The cluster must provide continuous operation in	- Changes to the number of replicated volumes	
the event of a hardware failure, network disruption,	will not require modifications to the physical	
or planned maintenance at one site, without	hardware configuration of the storage system.	
	 Data consistency and synchronization: 	
compromising data integrity or availability.	- The contents of all cluster volumes remain	
- The system must be designed to support failover		
and failback between the two sites automatically and	identical across both systems in the cluster at	
transparently.	all times, ensuring data consistency and	
	integrity.	
Performance requirements:	- The system includes mechanisms to handle	
1. Minimum performance metrics:	data synchronization efficiently during	
- the storage solution must deliver a combined	recovery scenarios, ensuring minimal impact	
performance of minimum 300,000 Input/Output	on performance and availability.	
Operations Per Second (IOPS) with inline data	5. Resiliency and high availability:	
reduction (deduplication and compression).	- The cluster provides continuous operation in	
2. Performance calculation parameters:	the event of a hardware failure, network	
IOPS performance must be evaluated based on the	disruption, or planned maintenance at one site,	
following metrics:	without compromising data integrity or	
- read/write ratio: 70% read / 30% write.	availability.	
- block sizes: support for operations with block sizes	- The system is designed to support failover	
of 16 KB, 32 KB, and 64 KB to accommodate	and failback between the two sites	
varying workload requirements.	automatically and transparently.	
- I/O patterns: include both sequential and random		
I/O workloads.	Performance requirements:	
- latency: ensure a maximum delay of 1 millisecond	1. Minimum performance metrics:	
(0.001 s) under full load conditions.	- the storage solution deliveres a combined	
3. Consistency of performance:	performance of minimum 300,000	
	Input/Output Operations Per Second	

	(IODS) with inline data watertian	
- the system must maintain the required performance	(IOPS) with inline data reduction	
levels even under high concurrency and mixed	(deduplication and compression).	
workload conditions.	2. Performance calculation parameters:	
- performance must remain unaffected during	IOPS performance will be evaluated based on	
maintenance operations, including firmware	the following metrics:	
updates, drive rebuilds, or component failures.	- read/write ratio: 70% read / 30% write.	
4. Performance verification:	- block sizes: support for operations with block	
- vendors must provide detailed benchmark test	sizes of 16 KB, 32 KB, and 64 KB to	
results to validate the stated performance - for	accommodate varying workload requirements.	
operations with block sizes 16 KB(mandatory), 32	- I/O patterns: will include both sequential and	
KB and 64 KB(optionall), using industry-standard	random I/O workloads.	
tools such as IOmeter or FIO, under the specified	- latency: ensures a maximum delay of 1	
conditions.	millisecond (0.001 s) under full load	
- results must demonstrate compliance with all stated	conditions.	
parameters, including latency and I/O patterns.	3. Consistency of performance:	
5. Monitoring and optimization:	- the system will maintain the required	
- the system must include tools to monitor and	performance levels even under high	
optimize performance dynamically, offering real-	concurrency and mixed workload conditions.	
time insights into throughput, latency, and IOPS for	- performance will remain unaffected during	
proactive performance tuning.	maintenance operations, including firmware	
	updates, drive rebuilds, or component failures.	
Supported protocols:	4. Performance verification:	
- FC,	- vendor provides detailed benchmark test	
- iSCSI,	results to validate the stated performance – for	
	operations with block sizes 16	
Features:	KB(mandatory), 32 KB and 64	
Dedicated system management interfaces:	KB(optionall), using industry-standard tools	
1. The system must include dedicated physical	such as IOmeter or FIO, under the specified	
and/or virtual interfaces specifically for system	conditions.	
management.	- results will demonstrate compliance with all	
2. These interfaces should allow out-of-band	stated parameters, including latency and I/O	
management, ensuring that administrative tasks can	patterns.	
be performed without impacting data traffic.	5. Monitoring and optimization:	
3. Management interfaces must support the	- the system includes tools to monitor and	
following functionalities:	optimize performance dynamically, offering	
- Web-based GUI for ease of access.	real-time insights into throughput, latency, and	
- Command-line interface (CLI) for advanced	IOPS for proactive performance tuning.	
configuration.		
- Support for industry-standard protocols such as	Supported protocols:	
SSH, SNMP, and REST API for integration with	- FC,	
monitoring and orchestration tools.	- iSCSI,	
- Role-based access control (RBAC) to ensure secure		
system administration.	Features:	
4. Redundancy for management interfaces:	Dedicated system management interfaces:	
T. Redundancy for management metraces.	Dealeated system management metraces.	

- to ensure availability, the management interfaces	1. The system includes dedicated physical	
must support redundancy, allowing continuous	and/or virtual interfaces specifically for system	
system management even in the event of a single	management.	
interface failure.	2. These interfaces allow out-of-band	
5. Protocol optimization:	management, ensuring that administrative	
The system must include protocol-specific	tasks can be performed without impacting data	
optimizations such as:	traffic.	
- Multipath I/O (MPIO) for FC and iSCSI to ensure	3. Management interfaces supports the	
high availability and load balancing.	following functionalities:	
- Support for jumbo frames in iSCSI for improved	- Web-based GUI for ease of access.	
performance in high-throughput environments.	- Command-line interface (CLI) for advanced	
6. Compliance and Interoperability:	configuration.	
The system must be compliant with industry	- Support for industry-standard protocols such	
standards for both FC and iSCSI protocols. It must	as SSH, SNMP, and REST API for integration	
ensure interoperability with third-party devices,	with monitoring and orchestration tools.	
including servers, switches, and network adapters.	- Role-based access control (RBAC) to ensure	
meruaning servers, switches, and network adapters.	secure system administration.	
Dedunition and companying requirements	4. Redundancy for management interfaces:	
Deduplication and compression requirements:	- to ensure availability, the management	
1. Functional capabilities:	interfaces support redundancy, allowing	
The storage system must provide deduplication	continuous system management even in the	
functionality for data stored at the block level		
(iSCSI/FC LUN) and file level, with the following	event of a single interface failure.	
specifics:	5. Protocol optimization:	
- Deduplication must operate both at the volume	The system includes protocol-specific	
level and globally across the system, ensuring	optimizations such as:	
optimal storage efficiency.	- Multipath I/O (MPIO) for FC and iSCSI to	
The system must also include compression	ensure high availability and load balancing.	
functionality for:	- Support for jumbo frames in iSCSI for	
- Block-level volumes (iSCSI/FC LUN).	improved performance in high-throughput	
2. Interoperability and unrestricted functionality:	environments.	
Deduplication and compression features must	6. Compliance and Interoperability:	
operate seamlessly without introducing limitations	The system is compliant with industry	
or restrictions on simultaneous use of other critical	standards for both FC and iSCSI protocols. It	
functionalities, including but not limited to:	ensures interoperability with third-party	
- Data replication.	devices, including servers, switches, and	
- Thin provisioning.	network adapters.	
- Backups.		
- Volume cloning.	Deduplication and compression	
3. Inline deduplication and compression:	requirements:	
- Both deduplication and compression mechanisms	1. Functional capabilities:	
must function in in-line mode, ensuring real-time	The storage system provides deduplication	
data optimization without requiring post-processing.	functionality for data stored at the block level	
- Deduplication must remain continuously active and	(iSCSI/FC LUN) and file level, with the	
cannot be disabled or bypassed by system	following specifics:	
cannot be disabled of bypassed by system	tonowing specifics.	

1 * *		
administrators or any other means, ensuring	- Deduplication operates both at the volume	
consistent storage efficiency and data integrity.	level and globally across the system, ensuring	
- Storage solutions that rely on scheduled or job-	optimal storage efficiency.	
based data reduction processes are not	The system will also include compression	
acceptable.	functionality for:	
4. Licensing and support:	- Block-level volumes (iSCSI/FC LUN).	
All features related to deduplication and	2. Interoperability and unrestricted	
compression must be:	functionality:	
- Fully licensed (if required by vendor provisions)	Deduplication and compression features	
and included in the offer, eliminating additional	operate seamlessly without introducing	
licensing costs for essential functionality.	limitations or restrictions on simultaneous use	
- Supported by the storage system in its maximum	of other critical functionalities, including but	
configuration, ensuring scalability and compatibility	not limited to:	
across all deployment scenarios.	- Data replication.	
5. Performance and reliability considerations:	- Thin provisioning.	
- The deduplication and compression mechanisms	- Backups.	
must not introduce significant latency or impact the	- Volume cloning.	
system's performance metrics, such as IOPS or	3. Inline deduplication and compression:	
throughput.	- Both deduplication and compression	
- Mechanisms should include built-in error detection	mechanisms function in in-line mode, ensuring	
and correction to maintain data integrity during	real-time data optimization without requiring	
deduplication and compression processes.	post-processing.	
6. Management and monitoring:	- Deduplication will remain continuously	
The system must provide a dedicated interface or	active and cannot be disabled or bypassed by	
tools for monitoring deduplication and compression	system administrators or any other means,	
efficiency, including:	ensuring consistent storage efficiency and data	
- Space savings metrics.	integrity.	
- Real-time and historical performance impacts.	4. Licensing and support:	
- Detailed logs of deduplication and compression	All features related to deduplication and	
activities.	compression will be:	
	- Fully licensed and included in the offer,	
Snapshot requirements:	eliminating additional licensing costs for	
1. General functionality:	essential functionality.	
- The system must support snapshot functionality at	- Supported by the storage system in its	
a minimum for block-level volumes (LUNs),	maximum configuration, ensuring scalability	
ensuring operational flexibility.	and compatibility across all deployment	
- The snapshot functionality must be applicable to	scenarios.	
both LUNs and other supported volumes without	5. Performance and reliability considerations:	
imposing restrictions on the simultaneous use of	- The deduplication and compression	
other critical system functions, including replication,	mechanisms will not introduce significant	
backups, and cloning.	latency or impact the system's performance	
2. Snapshot quantity and retention:	metrics, such as IOPS or throughput.	
- The system must provide the ability to create and	- Mechanisms include built-in error detection	
manage a minimum of 365 snapshots per shared	and correction to maintain data integrity during	
	deduplication and compression processes.	
	dedupiteation and compression processes.	

volume, supporting long-term operational and	
recovery needs.	The system provides a dedicated interface or
- Snapshots must be configurable with retention	
policies to optimize storage space and align with data	
governance requirements.	- Space savings metrics.
3. Performance efficiency:	- Real-time and historical performance
- The implementation of snapshots must not degrade	
overall system performance, regardless of the	
number of active snapshots or system workload.	compression activities.
- The system must include optimization mechanisms,	
such as metadata indexing and intelligent snapshot	
scheduling, to minimize latency and maintain high	
performance.	- The system supports snapshot functionality at
4. Space efficiency:	a minimum for block-level volumes (LUNs),
- Snapshot functionality must employ a cost-	
effective approach by storing only the delta	
(changes) from the original data. This ensures	
minimal storage consumption while preserving full	
data access and recovery capabilities.	simultaneous use of other critical system
5. Integration with storage QoS:	functions, including replication, backups, and
- The system must support performance monitoring	
and prioritization mechanisms for snapshots,	
enabling administrators to enforce Storage QoS	
(Quality of Service) policies at both the volume and	
LUN levels.	shared volume, supporting long-term
- These QoS policies should dynamically allocate	
resources to prioritize performance-critical	
snapshots, ensuring minimal impact on other	policies to optimize storage space and align with data governance requirements.
operations. 6. Advanced features:	č
	3. Performance efficiency:The implementation of snapshots will not
Snapshots must support: - Application-consistent snapshots, ensuring data	
integrity for workloads such as databases and	
virtualized environments.	system workload.
- Writable snapshots, allowing clones to be created	
for development, testing, or analytics without	mechanisms, such as metadata indexing and
affecting the production environment.	intelligent snapshot scheduling, to minimize
Snapshots must be compatible with data replication	
workflows, ensuring consistent replication of both	
primary data and snapshot states across systems.	- Snapshot functionality will employ a cost-
7. Monitoring and reporting:	effective approach by storing only the delta
- The system must include a dedicated interface or	
tools for managing, monitoring, and reporting on	
snapshot performance, space utilization, and	
recovery operations.	5. Integration with storage QoS:
recovery operations.	5. megration with storage Qob.

- Real-time alerts and historical logs must be		
available for visibility into snapshot performance		
and potential bottlenecks.	snapshots, enabling administrators to enforce	
	Storage QoS (Quality of Service) policies at	
Encryption requirements:	both the volume and LUN levels.	
1. Encryption standard:	- These QoS policies will dynamically allocate	
- The solution must support encryption of all stored	resources to prioritize performance-critical	
data using a minimum of the AES-256 algorithm or		
a stronger industry-standard encryption algorithm.		
ensuring compliance with modern security and		
regulatory standards.	Snapshots support:	
2. Scope of encryption:	- Application-consistent snapshots, ensuring	
- Encryption must be applied to all drives, NVMe,	data integrity for workloads such as databases	
and flash storage within the device, covering the	.	
entire data storage ecosystem.	- Writable snapshots, allowing clones to be	
- Encryption must extend to data at rest across all	created for development, testing, or analytics	
volumes, snapshots, backups, and metadata	without affecting the production environment.	
associated with the system.	Snapshots must be compatible with data	
3. Performance integrity:	replication workflows, ensuring consistent	
- Encryption functionality must operate with no		
measurable impact on system performance, ensuring		
IOPS, throughput, and latency metrics remain		
consistent with non-encrypted operations.	- The system includes a dedicated interface or	
- The system must leverage hardware-accelerated	tools for managing, monitoring, and reporting	
encryption or equivalent technologies to maintain		
optimal performance during data encryption and		
decryption processes.	- Real-time alerts and historical logs must be	
4. Key management:	available for visibility into snapshot	
- The solution must generate encryption keys using a	performance and potential bottlenecks.	
secure hardware-based random number generator.		
ensuring keys are robust and resistant to attacks.	Encryption requirements:	
- Encryption keys must be securely stored on the		
equipment, leveraging a dedicated hardware security		
module (HSM) or equivalent secure enclave to		
isolate keys from unauthorized access.	algorithm or a stronger industry-standard	
- The system must ensure that data stored on		
drives/NVMe/flash cannot be accessed if the storage		
media is removed from the device or if the device		
itself is compromised.	- Encryption will be applied to all drives,	
5. Key backup and recovery:	NVMe, and flash storage within the device,	
- The system must include mechanisms for secure		
backup and recovery of encryption keys, supporting		
integration with external key management systems		
(KMS) compliant with KMIP (Key Management		
Interoperability Protocol) standards.	3. Performance integrity:	
interoperating riotocory standards.		

- Key rotation and lifecycle management should be	- Encryption functionality operates with no	
automated and configurable to align with	measurable impact on system performance,	
organizational policies and compliance	ensuring IOPS, throughput, and latency	
requirements.	metrics remain consistent with non-encrypted	
6. Encryption for replication and snapshots:	operations.	
- The encryption functionality must extend to	- The system leverage hardware-accelerated	
replicated data and snapshots, ensuring consistency	encryption or equivalent technologies to	
in encryption across all replicated sites or volumes.	maintain optimal performance during data	
- Encryption must not disrupt or degrade replication	encryption and decryption processes.	
workflows, including synchronous and	4. Key management:	
asynchronous modes.	- The solution will generate encryption keys	
	using a secure hardware-based random number	
Monitoring requirements:	generator, ensuring keys are robust and	
1. Analytical platform or portal:	resistant to attacks.	
- The system must include a robust analytical	- Encryption keys are securely stored on the	
platform or virtual machine (VM) accessible via a	equipment, leveraging a dedicated hardware	
	security module (HSM) or equivalent secure	
web browser-based portal.	enclave to isolate keys from unauthorized	
- The platform must provide an intuitive, user-	access.	
friendly interface with interactive dashboards for	- The system ensures that data stored on	
data visualization and management.		
2. Log collection and reporting:	drives/NVMe/flash cannot be accessed if the	
The platform must automatically collect and analyze	storage media is removed from the device or if	
logs from the device and present them as	the device itself is compromised.	
customizable graphs, reports, and alerts, covering the	5. Key backup and recovery:	
following:	- The system includes mechanisms for secure	
2.1. Storage utilization:	backup and recovery of encryption keys,	
- Real-time and historical monitoring of used space.	supporting integration with external key	
- Display of the data reduction indicator, accounting	management systems (KMS) compliant with	
for deduplication and compression (excluding thin	KMIP (Key Management Interoperability	
provisioning, if applicable).	Protocol) standards.	
- Granular visibility at both the global device level	- Key rotation and lifecycle management will	
and the local LUN level.	be automated and configurable to align with	
2.2. Space growth prediction:	organizational policies and compliance	
- Advanced forecasting tools for predicting space	requirements.	
growth, factoring in deduplication, compression, and	6. Encryption for replication and snapshots:	
provisioning trends.	- The encryption functionality will extend to	
- Tools for future expansion analysis, including	replicated data and snapshots, ensuring	
recommendations for scaling.	consistency in encryption across all replicated	
3. Component monitoring:	sites or volumes.	
The system must include an application or hardware-	- Encryption will not disrupt or degrade	
based monitoring solution to oversee and report	replication workflows, including synchronous	
detailed events for the following physical and logical	and asynchronous modes.	
components:		
- Physical components: controllers, drives, ports,	Monitoring requirements:	
power supplies, and network interfaces.	1. Analytical platform or portal:	
power supplies, and network interfaces.		

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	- Logical components: volumes, LUNs, replication		
	processes, deduplication, and compression	platform or virtual machine (VM) accessible	
	algorithms.	via a web browser-based portal.	
	4. Performance monitoring:	- The platform will provide an intuitive, user-	
	The portal must provide minimum:	friendly interface with interactive dashboards	
	- Real-time and historical performance metrics for	for data visualization and management.	
	individual resources.	2. Log collection and reporting:	
	- Key parameters to monitor: Latency, Read and	The platform will automatically collect and	
	Write IOPS, Bandwidth.	analyze logs from the device and present them	
	Performance data must be available at both the	as customizable graphs, reports, and alerts,	
	global system level and the LUN level.	covering the following:	
	5. Storage QoS and prioritization:	2.1. Storage utilization:	
	- The system must include a performance monitoring	- Real-time and historical monitoring of used	
	and prioritization mechanism for Storage QoS,	space.	
	configurable at both the volume and LUN levels.	- Display of the data reduction indicator,	
	- QoS metrics should be adjustable in real-time to	accounting for deduplication and compression	
	meet dynamic workload demands.	(excluding thin provisioning, if applicable).	
	6. Reporting and alerting:	- Granular visibility at both the global device	
	The portal must provide comprehensive reporting	level and the local LUN level.	
	capabilities, including at least:	2.2. Space growth prediction:	
	- Capacity reports: current usage, available space,	- Advanced forecasting tools for predicting	
	and forecasted capacity needs.	space growth, factoring in deduplication,	
	- Performance reports: historical trends and real-time	compression, and provisioning trends.	
	analytics of system performance.	- Tools for future expansion analysis, including	
	- Future space predictions: automated simulations for	recommendations for scaling.	
	capacity increases based on application type and	3. Component monitoring:	
	workload.	The system includes an application or	
	- Event logs: authorization attempts, executed	hardware-based monitoring solution to oversee	
	commands, and system alerts for security and	and report detailed events for the following	
	operational events.	physical and logical components:	
	- Technical support logs: level of support received,	- Physical components: controllers, drives,	
	resolution times, and incident history.	ports, power supplies, and network interfaces.	
	7. Operational monitoring:	- Logical components: volumes, LUNs,	
	- Snapshot and replication status: display the real-	replication processes, deduplication, and	
	time status of operations such as snapshots,	compression algorithms.	
	synchronous/asynchronous replication, and recovery	4. Performance monitoring:	
	tasks.	The portal provides minimum:	
	- Threat alerts: warnings related to system integrity,	- Real-time and historical performance metrics	
	user activity, or misconfigurations.	for individual resources.	
	- Optimization insights: recommendations for	- Key parameters to monitor: Latency, Read	
	system performance improvement, resource	and Write IOPS, Bandwidth.	
	reallocation, or energy efficiency.	Performance data will be available at both the	
	8. Configuration verification and upgrades:	global system level and the LUN level.	
	- The platform must include an algorithm for	5. Storage QoS and prioritization:	
	verifying configuration correctness and		
	i j g timeg times and		

compatibility with potential device or cluster	- The system includes a performance	
upgrades.	monitoring and prioritization mechanism for	
9. Simulation and optimization:	Storage QoS, configurable at both the volume	
- The platform must enable capacity simulation tools	and LUN levels.	
to project storage needs based on application types	- QoS metrics are adjustable in real-time to	
and expected workloads.	meet dynamic workload demands.	
- Display real-time system consumption metrics with	6. Reporting and alerting:	
actionable optimization guidelines for improving	The portal provides comprehensive reporting	
performance and efficiency.	capabilities, including at least:	
	- Capacity reports: current usage, available	
NICs included per controller:	space, and forecasted capacity needs.	
Min. 1 x 1GE for management;	- Performance reports: historical trends and	
Min 2 x 32G FC SFP28(850nm SFP+ SR MM		
module included) for data transfer;	real-time analytics of system performance.	
	- Future space predictions: automated	
Min. 2 x 32G FC dedicated for replication (metro	simulations for capacity increases based on	
cluster).	application type and workload.	
	- Event logs: authorization attempts, executed	
Supported operating environments:	commands, and system alerts for security and	
Microsoft Windows Server;	operational events.	
Red Hat Enterprise Linux;	- Technical support logs: level of support	
VMware (VMware ESXi);	received, resolution times, and incident	
Power supplies included:	history.	
The system must include a minimum of two (2) hot-	7. Operational monitoring:	
swappable (hot-plug) Power Supply Units (PSUs).	- Snapshot and replication status: display the	
The PSUs must support at least 1+1 redundancy,	real-time status of operations such as	
ensuring continuous operation in case of failure of	snapshots, synchronous/asynchronous	
one PSU.	replication, and recovery tasks.	
	- Threat alerts: warnings related to system	
Power cables included must meet the following	integrity, user activity, or misconfigurations.	
specifications:		
- Type: IEC C13 to C14.	- Optimization insights: recommendations for	
- Minimum length: 0.6 meters (24 inches).	system performance improvement, resource	
	reallocation, or energy efficiency.	
	8. Configuration verification and upgrades:	
Cerințe obligatorii pentru prestarea serviciilor de	- The platform includes an algorithm for	
punere în funcțiune, a garanției și a serviciilor de	verifying configuration correctness and	
suport (deservire și mentenanță) a bunurilor -	compatibility with potential device or cluster	
conform Anexei la Anunțul de participare.	upgrades.	
contorni i monor la i manjur de participare.		
Testa lisentela massara (1 × 1' × C	9. Simulation and optimization:	
Toate licențele necesare (dacă se aplică conform	- The platform enables capacity simulation	
termenilor și condițiilor producătorului) pentru	tools to project storage needs based on	
caracteristicile platformei/portalului de monitorizare	application types and expected workloads.	
(analitică) și software-ului/firmware-ului specific	- Display real-time system consumption	
sistemului de stocare, inclusiv actualizările/patch-	metrics with actionable optimization	
urile periodice, trebuie să fie incluse în ofertă și	guidelines for improving performance and	
furnizate pe o bază perpetuă - valabile obligatoriu	efficiency.	
	enterency.	

Lotul nr. 4	OceanStor			pentru durata integrală de viață a sistemului de stocare. Termeni și condiții: Toate cerințele sunt minime și obligatorii; O cerință nu trebuie să limiteze o altă cerință; Toate componentele trebuie să fie actuale și să nu fie promovate ca EOS (sfârșitul vânzării/suportului) / EOL (sfârșitul duratei de viață); Extinderea memoriei (ram) și a capacității de stocare nu trebuie să includă limitări hardware sau software.	 NICs included per controller: x 1GE for management; x 32G FC SFP28(850nm SFP+ SR MM module included) for data transfer; x 32G FC dedicated for replication (metro cluster). Supported operating environments: Microsoft Windows Server; Red Hat Enterprise Linux; VMware (VMware ESXi); Power supplies included: The system includes a minimum of two (2) hotswappable (hot-plug) Power Supply Units (PSUs). The PSUs supports at least 1+1 redundancy, ensuring continuous operation in case of failure of one PSU. Power cables included meet the following specifications: Type: IEC C13 to C14. Minimum length: 0.6 meters (24 inches). Toate cerinte obligatorii pentru prestarea serviciilor de punere în functiune, a garantiei și a serviciilor de suport (deservire și mentenanță) a bunurilor – vor fi efectuate conform Anexei la Anunțul de participare. Toate licențele necesare pentru caracteristicile platformei/portalului de monitorizare (analitică) și software-ului/firmware-ului specific sistemului de stocare, inclusiv actualizările/patch-urile periodice, sunt în ofertă și furnizate pe o bază perpetuă - valabile obligatoriu pentru durata integrală de viață a sistemului de stocare. 	
Enterprise Storage	Dorado 8000 V6	CN	HUAWEI	trim. I anul 2024, corespunzător tipului de dispozitive de nivel Enterprise, produs de producători renumiți (Brand name internațional).	produs dupa trim. I anul 2024, corespunde tipului de dispozitive de nivel Enterprise. Configurația echipamentului este compusă din	SM, CE, ISO

	Configurația echipamentului trebuie să fie compusă	componente reciproc compatibile și să asigură	
(Sisteme de	din componente reciproc compatibile și să asigure	funcționarea optimă a sistemului în ansamblu.	
stocare) tip 2	funcționarea optimă a sistemului în ansamblu.	funcționarea optima a sistemului în ansamolu.	
(Full flash)	funcționarea optima a sistemului în ansamolu.		
(I dil fidsif)	Trans of Endermaine and de Stears of suith Early Electr	Tomos Entennics and Stances with Fall	
	Type: Enterprise-grade Storage with Full Flash	Type: Enterprise-grade Storage with Full	
		Flash	
	Form Factor: min. 2U rack-mountable chassis, fully		
	compatible with the EIA-310 standard for rack	Form Factor: min. 4U rack-mountable	
	mounting. The solution must include all necessary	chassis, fully compatible with the EIA-310	
	components (e.g., rails, mounting brackets).	standard for rack mounting. The solution must	
	A	include all necessary components (e.g., rails,	
	Availability requirements:	mounting brackets).	
	The equipment must be working in Symmetric		
	Active-Active mode, which means that in the case of	Availability requirements:	
	100% utilization, ensures following:	The equipment is working in Symmetric Active-Active mode, which means that in the	
	- The storage system architecture must ensure that,		
	in the event of a controller failure, the write cache of	case of 100% utilization, ensures following:	
	the surviving controller(s) remains fully operational	- The storage system architecture ensures that,	
	and protected. The equipment must utilize mechanisms such as cache mirroring or equivalent	in the event of a controller failure, the write cache of the surviving controller(s) remains	
	protection to guarantee data integrity. Under no	fully operational and protected. The equipment	
	circumstances should the write cache be deactivated,	utilizes mechanisms such as cache mirroring or	
	operated without mirroring, or left without an	equivalent protection to guarantee data	
	alternative protection mechanism to prevent data loss	integrity. Under no circumstances should the	
	or corruption.	write cache be deactivated, operated without	
	- The system must ensure a high availability rate of	mirroring, or left without an alternative	
	at least 99.9999%, minimizing downtime and	protection mechanism to prevent data loss or	
	guaranteeing continuous operation;	corruption.	
	- The system's efficiency must remain unaffected in	- The system ensures a high availability rate of	
	the event of a failure of up to 50% of the controllers,	at least 99.9999%, minimizing downtime and	
	maintaining consistent operational capability - alive	guaranteeing continuous operation;	
	with a single active controller;	- The system's efficiency will remain	
	- The system must sustain its required performance	unaffected in the event of a failure of up to 50%	
	levels without degradation in the event of a failure	of the controllers, maintaining consistent	
	affecting half of the controllers;	operational capability - alive with a single	
	- The system must include robust, built-in	active controller;	
	mechanisms for non-disruptive software updates,	- The system will sustain its required	
	ensuring no compromise in availability or loss of	performance levels without degradation in the	
	access to stored data during version upgrades.	event of a failure affecting half of the	
		controllers;	
	The storage system must ensure uninterrupted data	- The system includes robust, built-in	
	availability and full operational continuity in the	mechanisms for non-disruptive software	
	following failure scenarios:	updates, ensuring no compromise in	
	- failure of a single power supply line, ensuring	availability or loss of access to stored data	
	redundancy in power management,	during version upgrades.	

 failure of any individual controller, with automatic failover mechanisms to maintain functionality - alive with a single active controller, failures simultaneous failures of up to two user data storage drives, with no loss of data integrity or accessibility, failures of any Fibre Channel (FC) or iSCSI port, 	The storage system ensures uninterrupted data availability and full operational continuity in the following failure scenarios: - failure of a single power supply line, ensuring redundancy in power management,
with seamless rerouting of traffic to alternate pathways. The equipment must support hot-swappable replacement of critical components without interrupting access to data or degrading system performance. These components include, but are not limited to: controllers, power supplies, cooling fans, front-end and back-end ports, and storage drives.	functionality - alive with a single active controller, - failures simultaneous failures of up to two user data storage drives, with no loss of data integrity or accessibility, - failures of any Fibre Channel (FC) or iSCSI port, with seamless rerouting of traffic to
The hot replacement process must ensure seamless operation and maintain data availability throughout. The system must be designed to withstand the simultaneous failure of at least two storage devices (e.g., drives, NVMe, or flash modules), regardless of the system's scale or configuration. In such scenarios, the equipment must ensure uninterrupted data access and maintain full data integrity.	The equipment supports hot-swappable replacement of critical components without interrupting access to data or degrading system performance. These components include, but are not limited to: controllers, power supplies, cooling fans, front-end and back-end ports, and storage drives. The hot replacement process
The system must include functionality to safely disable the storage drives without causing any loss or corruption of user data, during maintenance or relocation of the device Type Drives: Enterprise-grade NVMe/Flash utilizing TLC (Triple Level Cell) or eTLC (Enhanced Triple Level	availability throughout. The system is designed to withstand the simultaneous failure of at least two storage devices (e.g., drives, NVMe, or flash modules), regardless of the system's scale or configuration. In such scenarios, the equipment
(Triple-Level Cell) or eTLC (Enhanced Triple-Level Cell) technology, optimized for high-performance, high-reliability applications in enterprise environments. Capacity: The system must provide a marked usable storage constitut (before data reduction) of minimum 600	full data integrity. The system includes functionality to safely disable the storage drives without causing any loss or corruption of user data, during maintenance or relocation of the device
capacity (before data reduction) of minimum 600 TB , ensuring sufficient space and maximum performance for high-demand enterprise applications. Hot Spare Configuration (<i>optional</i>):	Enterprise-grade NVMe/Flash utilizing TLC

 The solution must optionally support Hot Spare components, including spare controllers or disks, to enhance system redundancy. These spare components must remain inactive during regular operations but should automatically activate to maintain full system functionality in case of hardware failure. RAID (<i>if the equipment involves the use of RAID</i>): The system must support advanced RAID levels, including minimum: RAID 6: Ensuring double parity protection, allowing the system to tolerate simultaneous failure of two drives without data loss. 	Capacity: The system provides a marked usable storage capacity (before data reduction) of minimum 600 TB, ensuring sufficient space and maximum performance for high-demand enterprise applications.Hot Spare Configuration: The solution supports Hot Spare components, including spare controllers or disks, to enhance system redundancy. These spare components will remain inactive during regular operations but should automatically activate to maintain full system functionality in case of hardware failure.RAID:
 use of memory cache for data): The storage must provide a minimum of 512 GB of dedicated cache memory per node, ensuring high-speed data processing and optimal system performance. The cache must support advanced features such as: Cache mirroring - to ensure data integrity and protection in the event of a node failure. Dynamic allocation - enabling efficient use of cache resources based on real-time workload demands. Non-volatile cache - to prevent data loss during power failures or unexpected shutdowns, ensuring all cached data is preserved and immediately available after hardware recovery from power failures or unexpected shutdowns. The cache must be optimized for handling high IOPS workloads and ensuring low-latency operations, particularly for enterprise-grade applications. Controllers requirements: The storage system must include minimum one node equipped with a minimum of two fully redundant controllers configured in High Availability (HA) 	 The system supports advanced RAID levels, including: RAID 6: Ensuring double parity protection, allowing the system to tolerate simultaneous failure of two drives without data loss. Cache: The storage provides a 1 TB of dedicated cache memory per node, ensuring high-speed data processing and optimal system performance. The cache supports advanced features such as: Cache mirroring - to ensure data integrity and protection in the event of a node failure. Dynamic allocation - enabling efficient use of cache resources based on real-time workload demands. Non-volatile cache - to prevent data loss during power failures or unexpected shutdowns, ensuring all cached data is preserved and immediately available after hardware recovery from power failures or unexpected shutdowns. The cache will be optimized for handling high
mode. The controllers must: - Operate in an Active-Active configuration, ensuring balanced workload distribution and	IOPS workloads and ensuring low-latency operations, particularly for enterprise-grade applications.

1 0 1 1 1 1 4 6	Control Incontrol Control	
seamless failover capabilities without performance	Controllers requirements:	
degradation and data loss.	The storage system includes minimum one	
- Support advanced fault-tolerant mechanisms to	node equipped with a minimum of two fully	
maintain uninterrupted access to data during	redundant controllers configured in High	
hardware failures or maintenance (until the technical	Availability (HA) mode.	
interventions are provided).	The controllers can:	
- Be hot-swappable, allowing replacement or	- Operate in an Active-Active configuration,	
upgrade without disrupting system operations,	ensuring balanced workload distribution and	
performance or data availability.	seamless failover capabilities without	
- Include built-in synchronization mechanisms to	performance degradation and data loss.	
maintain consistency between controllers, including	- Support advanced fault-tolerant mechanisms	
mirroring of critical operational data such as cache	to maintain uninterrupted access to data during	
contents and configuration settings.	hardware failures or maintenance (until the	
The system must ensure that the failure of one	technical interventions are provided).	
controller does not impact the performance,	- Be hot-swappable, allowing replacement or	
availability, or operational integrity of the other	upgrade without disrupting system operations,	
controller.	performance or data availability.	
	- Include built-in synchronization mechanisms	
Cluster and replication	to maintain consistency between controllers,	
Cluster and replication requirements:	including mirroring of critical operational data	
1. Synchronous replication capability:	such as cache contents and configuration	
- The storage solution must support synchronous	settings.	
replication to enable the creation of an Active-Active	The system ensures that the failure of one	
cluster between two physically separated server	controller does not impact the performance,	
rooms (located in separate buildings).	availability, or operational integrity of the	
- The system must ensure zero Recovery Point	other controller.	
Objective (RPO=0) by maintaining data consistency		
across the cluster in real time.		
2. Comprehensive hardware inclusion:	Cluster and replication requirements:	
- The solution must include all necessary hardware	1. Synchronous replication capability:	
components to fully implement synchronous	- The storage solution supports synchronous	
replication functionality, utilizing Fibre Channel	replication to enable the creation of an Active-	
(FC) protocols for high-speed, low-latency data	Active cluster between two physically	
transmission.	separated server rooms (located in separate	
3. Flexible volume replication:	buildings).	
- The system must support synchronous replication	- The system ensures zero Recovery Point	
for a minimum of one Logical Unit Number (LUN)	Objective (RPO=0) by maintaining data	
and scale seamlessly to replicate multiple LUNs	consistency across the cluster in real time.	
simultaneously.	2. Comprehensive hardware inclusion:	
- Changes to the number of replicated volumes must	- The solution includes all necessary hardware	
not require modifications to the physical hardware	components to fully implement synchronous	
configuration of the storage system.	replication functionality, utilizing Fibre	
4. Data consistency and synchronization:	Channel (FC) protocols for high-speed, low-	
- The contents of all cluster volumes must remain	latency data transmission.	
identical across both systems in the cluster at all	3. Flexible volume replication:	
times, ensuring data consistency and integrity.		
	L I	

- The system must include mechanisms to handle	- The system supports synchronous replication	
data synchronization efficiently during recovery	for a minimum of one Logical Unit Number	
scenarios, ensuring minimal impact on performance,	(LUN) and scale seamlessly to replicate	
availability and corrupted/degraded data.	multiple LUNs simultaneously.	
5. Resiliency and high availability:	- Changes to the number of replicated volumes	
- The cluster must provide continuous operation in	must not require modifications to the physical	
the event of a hardware failure, network disruption,	hardware configuration of the storage system.	
or planned maintenance at one site, without	4. Data consistency and synchronization:	
compromising data integrity or availability.	- The contents of all cluster volumes will	
- The system must be designed to support failover	remain identical across both systems in the	
and failback between the two sites automatically and	cluster at all times, ensuring data consistency	
transparently.	and integrity.	
uansparentiy.		
Performance requirements:	- The system includes mechanisms to handle	
1. Minimum performance metrics:	data synchronization efficiently during	
- the storage solution must deliver a combined	recovery scenarios, ensuring minimal impact	
performance of minimum 500,000 Input/Output	on performance, availability and	
	corrupted/degraded data.	
Operations Per Second (IOPS) with inline data	5. Resiliency and high availability:	
reduction (deduplication and compression).	- The cluster provides continuous operation in	
2. Performance calculation parameters:	the event of a hardware failure, network	
IOPS performance must be evaluated based on the	disruption, or planned maintenance at one site,	
following metrics:	without compromising data integrity or	
- read/write ratio: 70% read / 30% write.	availability.	
- block sizes: support for operations with block sizes	- The system is designed to support failover	
of 16 KB, 32 KB, and 64 KB to accommodate	and failback between the two sites	
varying workload requirements.	automatically and transparently.	
- I/O patterns: include both sequential and random		
I/O workloads.	Performance requirements:	
- latency: ensure a maximum delay of 1 millisecond	1. Minimum performance metrics:	
(0.001 s) under full load conditions.	- the storage solution delivers a combined	
3. Consistency of performance:	performance of minimum 500,000	
- the system must maintain the required performance	Input/Output Operations Per Second	
levels even under high concurrency and mixed	(IOPS) with inline data reduction	
workload conditions.	(deduplication and compression).	
- performance must remain unaffected during	2. Performance calculation parameters:	
maintenance operations, including firmware	IOPS performance will be evaluated based on	
updates, drive rebuilds, or component failures.	the following metrics:	
<u>4. Performance verification:</u>	- read/write ratio: 70% read / 30% write.	
- vendors must provide detailed benchmark test	- block sizes: support for operations with block	
results to validate the stated performance – for	sizes of 16 KB, 32 KB, and 64 KB to	
operations with block sizes 16 KB(mandatory), 32	accommodate varying workload requirements.	
KB and 64 KB(optionall), using industry-standard	- I/O patterns: include both sequential and	
tools such as IOmeter or FIO, under the specified	random I/O workloads.	
conditions.		

- results must demonstrate compliance with all stated	- latency: ensure a maximum delay of 1	
parameters, including latency and I/O patterns.	millisecond (0.001 s) under full load	
5. Monitoring and optimization:	conditions.	
- the system must include tools to monitor and	3. Consistency of performance:	
optimize performance dynamically, offering real-	- the system will maintain the required	
time insights into throughput, latency, and IOPS for	performance levels even under high	
proactive performance tuning.	concurrency and mixed workload conditions.	
	- performance will remain unaffected during	
Supported protocols:	maintenance operations, including firmware	
- FC,	updates, drive rebuilds, or component failures.	
- iSCSI;	4. Performance verification:	
10001,	- vendor provides detailed benchmark test	
Features:	results to validate the stated performance – for	
Dedicated system management interfaces:	operations with block sizes 16	
1. The system must include dedicated physical	KB(mandatory) , 32 KB and 64	
and/or virtual interfaces specifically for system	KB(optionall), using industry-standard tools	
management.	such as IOmeter or FIO, under the specified	
2. These interfaces should allow out-of-band	conditions.	
2. These interfaces should allow out-of-band management, ensuring that administrative tasks can		
	- results will demonstrate compliance with all	
be performed without impacting data traffic.	stated parameters, including latency and I/O	
3. Management interfaces must support the	patterns.	
following functionalities:	5. Monitoring and optimization:	
- Web-based GUI for ease of access.	- the system includes tools to monitor and	
- Command-line interface (CLI) for advanced	optimize performance dynamically, offering	
configuration.	real-time insights into throughput, latency, and	
- Support for industry-standard protocols such as	IOPS for proactive performance tuning.	
SNMP and REST API for integration with		
monitoring and orchestration tools.	Supported protocols:	
- Role-based access control (RBAC) to ensure secure	- FC,	
system administration.	- iSCSI;	
4. Redundancy for management interfaces:		
- to ensure availability, the management interfaces	Features:	
must support redundancy, allowing continuous	Dedicated system management interfaces:	
system management even in the event of a single	1. The system includes dedicated physical	
interface failure.	and/or virtual interfaces specifically for system	
5. Protocol optimization:	management.	
The system must include protocol-specific	2. These interfaces allow out-of-band	
optimizations such as:	management, ensuring that administrative	
- Multipath I/O (MPIO) for FC and iSCSI to ensure	tasks can be performed without impacting data	
high availability and load balancing.	traffic.	
- Support for jumbo frames in iSCSI for improved	3. Management interfaces support the	
performance in high-throughput environments.	following functionalities:	
6. Compliance and Interoperability:	- Web-based GUI for ease of access.	
The system must be compliant with industry	- Command-line interface (CLI) for advanced	
standards for both FC and iSCSI protocols. It must		
standards for bour FC and ISCSI protocols. It must	configuration.	

e and a set of the set		
ensure interoperability with third-party devices,	- Support for industry-standard protocols such	
including servers, switches, and network adapters.	as SNMP and REST API for integration with	
	monitoring and orchestration tools.	
Deduplication and compression requirements:	- Role-based access control (RBAC) to ensure	
1. Functional capabilities:	secure system administration.	
The storage system must provide deduplication	4. Redundancy for management interfaces:	
functionality for data stored at the block level	- to ensure availability, the management	
(iSCSI/FC LUN) and file level, with the following	interfaces support redundancy, allowing	
specifics:	continuous system management even in the	
- Deduplication must operate both at the volume	event of a single interface failure.	
level and globally across the system, ensuring	5. Protocol optimization:	
optimal storage efficiency.	The system includes protocol-specific	
The system must also include compression	optimizations such as:	
functionality for:	- Multipath I/O (MPIO) for FC and iSCSI to	
- Block-level volumes (iSCSI/FC LUN).	· · · ·	
	ensure high availability and load balancing.	
2. Interoperability and unrestricted functionality:	- Support for jumbo frames in iSCSI for	
Deduplication and compression features must	improved performance in high-throughput	
operate seamlessly without introducing limitations	environments.	
or restrictions on simultaneous use of other critical	6. Compliance and Interoperability:	
functionalities, including but not limited to:	The system is compliant with industry	
- Data replication.	standards for both FC and iSCSI protocols. It	
- Thin provisioning.	must ensure interoperability with third-party	
- Backups.	devices, including servers, switches, and	
- Volume cloning.	network adapters.	
3. Inline deduplication and compression:		
- Both deduplication and compression mechanisms	Deduplication and compression	
must function in in-line mode, ensuring real-time	requirements:	
data optimization without requiring post-processing.	1. Functional capabilities:	
- Deduplication must remain continuously active and	The storage system provides deduplication	
cannot be disabled or bypassed by system	functionality for data stored at the block level	
administrators or any other means, ensuring	(iSCSI/FC LUN) and file level, with the	
consistent storage efficiency and data integrity.	following specifics:	
- Storage solutions that rely on scheduled or job-	- Deduplication operates both at the volume	
based data reduction processes are not	level and globally across the system, ensuring	
acceptable.	optimal storage efficiency.	
4. Licensing and support:	The system also includes compression	
All features related to deduplication and	functionality for:	
compression must be:	- Block-level volumes (iSCSI/FC LUN).	
- Fully licensed (if required by vendor provisions)	2. Interoperability and unrestricted	
and included in the offer, eliminating additional	functionality:	
licensing costs for essential functionality.	Deduplication and compression features	
- Supported by the storage system in its maximum	operate seamlessly without introducing	
configuration, ensuring scalability and compatibility	limitations or restrictions on simultaneous use	
across all deployment scenarios.	of other critical functionalities, including but	
5. Performance and reliability considerations:	not limited to:	
5. renormance and renability considerations:		

 The ideuplication and compression mechanism, shoch as how for the system's performance metrics, such as IOES And replication, and the providence of improvisioning, Backups, B	I I			
 system's performance metrics, such as IOPS or Volume cloning. - Nockamisms should include hult-in error detection and compression processes. - Management and monitoring: - The system must provide a dedicated interface or tools for monitoring detaplication and compression processing. - Declupfication remain continuously active and cannot be disabled or bypassed by system administrators or any other means, ensuring consistent storage efficiency and data integrity. - Destable lay of declaplication and compression activities. - Real-time and historical performance impacts. - Real-time and historical performance impacts. - Destable lay of declaplication and compression activities. - Suppostor functionality: - The system must support snaphot functionality: - The system functions, including replication and compression of the subject or containt duals and geolyment sectors. - Supposted coloning. - Supposted volumes (LUNS), ensuring operational flexibility. - The system must provide a debity to create and nactor enginemation. - Supposted coloning. - Supposted coloning. - Supposted volumes (LUNS), ensuring operational debitility considerations: - Dereformance efficiency: - The system must provide the ability to create and nactore significant latency or impact the system's performance indicional include generation and compression and correpression and correpression matcher end monitoring detable dual integrity during detablication and compression indication and compression processes. - Performance efficiency: - The system must provide the ability to create and nactore corre on annitian data integrity during detablication and compression processes. - Preformance efficiency: - The isystem performance impactements - Speer system with the intribule optimization mediation indition and compression processes				
 - Volume coning. - None debuplication and compression: - Both debuplication remain continously active and cannot be disabled or bypsets by system administrators or any other means, ensuring consistent stores and alia integrity. - Hally iterational incensing costs for essent conting scalability across all deployment sectarios. - Supported functionality: - The styption functionality must be applicable both LINNs and other supports long-term operational an econversion and compression functionality. - Starysbot quantity and retention: - The styption profile or performance may envice the ability coreate any manage a minimum of 365 snapholis prof				
 - Mechanisms should include built-in error detection and correction to maintain data integrity during debuplication and compression processes. - Management and monitoring: The system must provide a dedicated interface or tools for mountain and historical performance impacts. - Dedupfication reruin a continuously active and cannot be disabled or bypassed by system administrators or any other means, ensuring consistent strapes efficiency and data integrity. - Dedupfication reruin a continuously active and cannot be disabled or bypassed by system administrators or any other means, ensuring consistent strapes efficiency and data integrity. - Dedupfication and compression rescharms must support snapehot functionality a minimum for block-level volumes (LNss), ensuring orgenizational flexibility. - The system must support snapehot functionality a minimum for block-level volumes without both LUSs and other supported volumes without boths uptos must be configurable volumes without imposing restrictions on the simultaneous use of other critical system functions, including replication backups, and cloning. - Snapshot supporting long-term operational necovery necks. - Paystem must provide the ability considerations: - The system must supporting long-term operational necovery necks. - Snapshot supporting long-term operational necovery necks. - Snapshot support space and aling with policies to optimize storage space and aling with policies to optimize storage space and aling with policies to optimize storage space and aling with policies to signaphots must not depending active sanghato storage system workload, - The system must include optimization mechanism, such as metaduta indexing and intelligent snapshots - Dereliad long of deduplication and compression activities. - Dereliad long of deduplication and compression activities. - Dereliad long of deduplication and compression activities. -			•	
and correction to maintain data integrity during deduplication and compression mechanisms function in in-line mode, ensuring real-time data optimization without requiring post-processing. - Deduplication remain continuously active and cannot be disabled or bypassed by system and cannot be disabled or bypassed by system and cannot be disabled or bypassed by system and cannot browge efficiency and data integrity - Deduplication and compression mechanisms function in in-line mode, ensuring consistent storage efficiency and data integrity - Deduplication and compression and cannot be disabled or bypassed by system and cannot to deduplication and compression must be: - Publy licensed and included in the offer, eliminating additional licensing costs for essential functionality. - The system must provide relations without imposing persitorions of the simultaneous wefor other critical system functions; including replication byh LUNs and cloning. 2. Snapshot quantity and retention: - The system must provide the ability to create and manage a minimum of 365 snapshots persterion outcer crequiements. 3. Performance enguiements. 3. Performance e				
 deduplication and compression processes. 6. Management and monitoring: The system must provide a dedicated interface or tools for monitoring deduplication and compression efficiency, including: Space savings metrics. Detailed logs of deduplication and compression activities. Stapshot requirements: 1. General functionality: The system must support snapshot functionality at a minimum for block-level volumes (LUNs), ensuring operational Resultive. The system must support snapshot functionality at a minimum for block-level volumes (LUNs), ensuring operational Resultive. 2. Snapshot quarity and retention: The system must support snapshot functionality at a minimum for block-level volumes (LUNs), ensuring operational Resultive. 2. Snapshot quarity and retention: The system must provide the ability. The system must provide the ability or crate an amage a minimum of 365 snapshots prepriation and compression mechanisms include significant a must provide the ability to create an amage a minimum of 365 snapshots previation and compression mechanisms include duriti. The system must provide the ability to create an amage a minimum of 365 snapshots previation and compression mechanisms include duriti. The system must provide the ability to create an and agreement erquirements. Snephot quarity and retention: The system must provide the ability to create an and agreement erquirements. Snephot sports of snapshots must not degrade overall system performance requirements. The system performance requirements. Real-time and historical performance increasing and including: Space saving metrics. The system must include optimization mechanisms, such as metadata indecision and compression and compression adviction. The system must include optimization mechanisms, such as metadata indecision and compression and compression				
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such as metadata indexing and intelligent snapshot compression activities.				
scheduling, to minimize latency and maintain high			compression activities.	
performance. Snapshot requirements:		1		
4. Space efficiency: 1. General functionality:			1. General functionality:	
- Snapshot functionality must employ a cost-				
effective approach by storing only the delta		effective approach by storing only the delta		

(changes) from the original data. This ensures	- The system supports snapshot functionality at	
minimal storage consumption while preserving full	a minimum for block-level volumes (LUNs),	
data access and recovery capabilities.	ensuring operational flexibility.	
5. Integration with storage QoS:	- The snapshot functionality can be applicable	
- The system must support performance monitoring	to both LUNs and other supported volumes	
and prioritization mechanisms for snapshots,	without imposing restrictions on the	
enabling administrators to enforce Storage QoS	simultaneous use of other critical system	
(Quality of Service) policies at both the volume and	functions, including replication, backups, and	
LUN levels.	cloning.	
- These QoS policies should dynamically allocate	2. Snapshot quantity and retention:	
resources to prioritize performance-critical	- The system provides the ability to create and	
snapshots, ensuring minimal impact on other	manage a minimum of 365 snapshots per	
operations.	shared volume, supporting long-term	
6. Advanced features:	operational and recovery needs.	
Snapshots must support:	- Snapshots can be configurable with retention	
- Application-consistent snapshots, ensuring data	policies to optimize storage space and align	
integrity for workloads such as databases and	with data governance requirements.	
virtualized environments.	3. Performance efficiency:	
- Writable snapshots, allowing clones to be created	- The implementation of snapshots will not	
for development, testing, or analytics without	degrade overall system performance,	
affecting the production environment.	regardless of the number of active snapshots or	
Snapshots must be compatible with data replication	system workload.	
workflows, ensuring consistent replication of both	- The system includes optimization	
primary data and snapshot states across systems.	mechanisms, such as metadata indexing and	
	intelligent snapshot scheduling, to minimize	
Encryption requirements:	latency and maintain high performance.	
1. Encryption standard:	4. Space efficiency:	
- The solution must support encryption of all stored	- Snapshot functionality can employ a cost-	
data using a minimum of the AES-256 algorithm or	effective approach by storing only the delta	
a stronger industry-standard encryption algorithm,	(changes) from the original data. This ensures	
ensuring compliance with modern security and	minimal storage consumption while preserving	
regulatory standards.	full data access and recovery capabilities.	
2. Scope of encryption:	5. Integration with storage QoS:	
- Encryption must be applied to all drives, NVMe,	- The system supports performance monitoring	
and flash storage within the device, covering the	and prioritization mechanisms for snapshots,	
entire data storage ecosystem.	enabling administrators to enforce Storage	
- Encryption must extend to data at rest across all	QoS (Quality of Service) policies at both the	
volumes, snapshots, backups, and metadata	volume and LUN levels.	
associated with the system.	- These QoS policies can dynamically allocate	
3. Performance integrity:	resources to prioritize performance-critical	
- Encryption functionality must operate with no	snapshots, ensuring minimal impact on other	
measurable impact on system performance, ensuring	operations.	
IOPS, throughput, and latency metrics remain	6. Advanced features:	
consistent with non-encrypted operations.	6. Advanced features: Snapshots support:	

		- The system must leverage hardware-accelerated	- Application-consistent snapshots, ensuring	
		encryption or equivalent technologies to maintain	data integrity for workloads such as databases	
		optimal performance during data encryption and	and virtualized environments.	
		decryption processes.	- Writable snapshots, allowing clones to be	
		4. Key management:	created for development, testing, or analytics	
		- The solution must generate encryption keys using a	without affecting the production environment.	
		secure hardware-based random number generator,	Snapshots are compatible with data replication	
		ensuring keys are robust and resistant to attacks.	workflows, ensuring consistent replication of	
		- Encryption keys must be securely stored on the	both primary data and snapshot states across	
		equipment, leveraging a dedicated hardware security	systems.	
		module (HSM) or equivalent secure enclave to		
	i	isolate keys from unauthorized access.	Encryption:	
		- The system must ensure that data stored on	1. Encryption standard:	
		drives/NVMe/flash cannot be accessed if the storage	- The solution supports encryption of all stored	
		media is removed from the device or if the device	data using a minimum of the AES-256	
		itself is compromised.	algorithm or a stronger industry-standard	
		5. Key backup and recovery:	encryption algorithm, ensuring compliance	
		- The system must include mechanisms for secure	with modern security and regulatory standards.	
		backup and recovery of encryption keys, supporting	2. Scope of encryption:	
		integration with external key management systems	- Encryption can be applied to all drives,	
		(KMS) compliant with KMIP (Key Management		
		Interoperability Protocol) standards.	covering the entire data storage ecosystem.	
		- Key rotation and lifecycle management should be	- Encryption could be extended to data at rest	
		automated and configurable to align with		
		organizational policies and compliance	metadata associated with the system.	
		requirements.	3. Performance integrity:	
		6. Encryption for replication and snapshots:	- Encryption functionality can operate with no	
		- The encryption functionality must extend to	measurable impact on system performance,	
		replicated data and snapshots, ensuring consistency	ensuring IOPS, throughput, and latency	
		in encryption across all replicated sites or volumes.	metrics remain consistent with non-encrypted	
		- Encryption must not disrupt or degrade replication	operations.	
		workflows, including synchronous and	- The system can leverage hardware-	
		asynchronous modes.	accelerated encryption or equivalent	
		7. Audit and compliance:	technologies to maintain optimal performance	
		- The system must provide audit logs and reports	during data encryption and decryption	
		detailing encryption operations, key management	processes.	
		activities, and access attempts, ensuring	4. Key management:	
		transparency and regulatory compliance.	- The solution can generate encryption keys	
		- Logs should be exportable and compatible with	using a secure hardware-based random number	
		industry-standard security information and event	generator, ensuring keys are robust and	
	1	management (SIEM) systems.	resistant to attacks.	
			- Encryption keys are securely stored on the	
		Monitoring requirements:	equipment, leveraging a dedicated hardware	
		1. Analytical platform or portal:	security module (HSM) or equivalent secure	

- The system must include a robust analytical	enclave to isolate keys from unauthorized	
platform or virtual machine (VM) accessible via a	access.	
web browser-based portal.	- The system can ensure that data stored on	
- The platform must provide an intuitive, user-	drives/NVMe/flash cannot be accessed if the	
friendly interface with interactive dashboards for	storage media is removed from the device or if	
data visualization and management.	the device itself is compromised.	
2. Log collection and reporting:	5. Key backup and recovery:	
The platform must automatically collect and analyze	- The system includes mechanisms for secure	
logs from the device and present them as	backup and recovery of encryption keys,	
customizable graphs, reports, and alerts, covering the	supporting integration with external key	
following:	management systems (KMS) compliant with	
2.1. Storage utilization:	KMIP (Key Management Interoperability	
- Real-time and historical monitoring of used space.	Protocol) standards.	
- Display of the data reduction indicator, accounting	- Key rotation and lifecycle management	
for deduplication and compression (excluding thin	should be automated and configurable to align	
provisioning, if applicable).	with organizational policies and compliance	
- Granular visibility at both the global device level	requirements.	
and the local LUN level.	6. Encryption for replication and snapshots:	
2.2. Space growth prediction:	- The encryption functionality can extend to	
- Advanced forecasting tools for predicting space	replicated data and snapshots, ensuring	
growth, factoring in deduplication, compression, and	consistency in encryption across all replicated	
provisioning trends.	sites or volumes.	
- Tools for future expansion analysis, including	- Encryption will not disrupt or degrade	
recommendations for scaling.	replication workflows, including synchronous	
3. Component monitoring:	and asynchronous modes.	
The system must include an application or hardware-	7. Audit and compliance:	
based monitoring solution to oversee and report	- The system can provide audit logs and reports	
detailed events for the following physical and logical	detailing encryption operations, key	
components:	management activities, and access attempts,	
- Physical components: controllers, drives, ports,	ensuring transparency and regulatory	
power supplies, and network interfaces.	compliance.	
- Logical components: volumes, LUNs, replication	- Logs are exportable and compatible with	
processes, deduplication, and compression	industry-standard security information and	
algorithms.	event management (SIEM) systems.	
4. Performance monitoring:		
The portal must provide minimum:	Monitoring:	
- Real-time and historical performance metrics for	1. Analytical platform or portal:	
individual resources.	- The system includes a robust analytical	
- Key parameters to monitor: Latency, Read and	platform or virtual machine (VM) accessible	
Write IOPS, Bandwidth.	via a web browser-based portal.	
Performance data must be available at both the	- The platform provides an intuitive, user-	
global system level and the LUN level.	friendly interface with interactive dashboards	
5. Storage QoS and prioritization:	for data visualization and management.	
	2. Log collection and reporting:	
	2. Log concerton and reporting.	

- The system must include a performance monitoring	The platform can automatically collect and	
and prioritization mechanism for Storage QoS,	analyze logs from the device and present them	
configurable at both the volume and LUN levels.	as customizable graphs, reports, and alerts,	
- QoS metrics should be adjustable in real-time to	covering the following:	
meet dynamic workload demands.	2.1. Storage utilization:	
6. Reporting and alerting:	- Real-time and historical monitoring of used	
The portal must provide comprehensive reporting	space.	
capabilities, including at least:	- Display of the data reduction indicator,	
- Capacity reports: current usage, available space,	accounting for deduplication and compression	
and forecasted capacity needs.	(excluding thin provisioning, if applicable).	
- Performance reports: historical trends and real-time	- Granular visibility at both the global device	
analytics of system performance.	level and the local LUN level.	
- Future space predictions: automated simulations for	2.2. Space growth prediction:	
capacity increases based on application type and	- Advanced forecasting tools for predicting	
workload.	space growth, factoring in deduplication,	
- Event logs: authorization attempts, executed	compression, and provisioning trends.	
commands, and system alerts for security and	- Tools for future expansion analysis, including	
operational events.	recommendations for scaling.	
- Technical support logs: level of support received,	3. Component monitoring:	
resolution times, and incident history.	The system includes an application or	
7. Operational monitoring:	hardware-based monitoring solution to oversee	
- Snapshot and replication status: display the real-	and report detailed events for the following	
time status of operations such as snapshots,	physical and logical components:	
synchronous/asynchronous replication, and recovery	- Physical components: controllers, drives,	
tasks.	ports, power supplies, and network interfaces.	
- Threat alerts: warnings related to system integrity,	- Logical components: volumes, LUNs,	
user activity, or misconfigurations.	replication processes, deduplication, and	
- Optimization insights: recommendations for	compression algorithms.	
system performance improvement, resource	4. Performance monitoring:	
reallocation, or energy efficiency.	The portal provides:	
8. Configuration verification and upgrades:	- Real-time and historical performance metrics	
- The platform must include an algorithm for	for individual resources.	
verifying configuration correctness and	- Key parameters to monitor: Latency, Read	
compatibility with potential device or cluster	and Write IOPS, Bandwidth.	
upgrades.	Performance data must be available at both the	
9. Simulation and optimization:	global system level and the LUN level.	
- The platform must enable capacity simulation tools	5. Storage QoS and prioritization:	
to project storage needs based on application types	- The system includes a performance	
and expected workloads.	monitoring and prioritization mechanism for	
- Display real-time system consumption metrics with	Storage QoS, configurable at both the volume	
	and LUN levels.	
actionable optimization guidelines for improving		
performance and efficiency.	- QoS metrics should be adjustable in real-time	
NIC: to de la la companya P	to meet dynamic workload demands.	
NICs included per controller:	6. Reporting and alerting:	
Min. x 1GE for management;		

Min 2 - 22C EC CED29/950- CED CD MAA	The nextel provides comprehensive and exting
Min. 2 x 32G FC SFP28(850nm SFP+ SR MM	The portal provides comprehensive reporting
module included) for data transfer;	capabilities, including at least:
Min. 2 x 32G FC dedicated for replication (metro	- Capacity reports: current usage, available
cluster).	space, and forecasted capacity needs.
	- Performance reports: historical trends and
Supported operating environments:	real-time analytics of system performance.
Microsoft Windows Server;	- Future space predictions: automated
Red Hat Enterprise Linux;	simulations for capacity increases based on
VMware (VMware ESXi);	application type and workload.
	- Event logs: authorization attempts, executed
Power supplies included:	commands, and system alerts for security and
The system must include a minimum of two (2) hot-	operational events.
swappable (hot-plug) power supply units (PSUs).	- Technical support logs: level of support
The PSUs must support at least 1+1 redundancy,	received, resolution times, and incident
ensuring continuous operation in case of failure of	history.
one PSU.	7. Operational monitoring:
Power cables included must meet the following	- Snapshot and replication status: display the
specifications:	real-time status of operations such as
- Type: IEC C13 - C14.	snapshots, synchronous/asynchronous
- Minimum length: 0.6 meters (24 inches).	replication, and recovery tasks.
- minimum lengui. 0.0 meters (24 menes).	- Threat alerts: warnings related to system
<u>Cerințe obligatorii pentru prestarea serviciilor de</u>	integrity, user activity, or misconfigurations.
<u>punere în funcțiune, a garanției și a serviciilor de</u>	- Optimization insights: recommendations for
suport (deservire și mentenanță) a bunurilor -	system performance improvement, resource
	reallocation, or energy efficiency.
conform Anexei la Anunțul de participare.	8. Configuration verification and upgrades:
	- The platform includes an algorithm for
Toate licențele necesare (dacă se aplică conform	
termenilor și condițiilor producătorului) pentru	verifying configuration correctness and
caracteristicile platformei/portalului de monitorizare	compatibility with potential device or cluster
(analitică) și software-ului/firmware-ului specific	upgrades.
sistemului de stocare, inclusiv actualizările/patch-	9. Simulation and optimization:
urile periodice, trebuie să fie incluse în ofertă și	- The platform enables capacity simulation
furnizate pe o bază perpetuă - valabile obligatoriu	tools to project storage needs based on
pentru durata integrală de viață a sistemului de	application types and expected workloads.
stocare.	- Display real-time system consumption
	metrics with actionable optimization
Termeni și condiții:	guidelines for improving performance and
Toate cerințele sunt minime și obligatorii;	efficiency.
O cerință nu trebuie să limiteze o altă cerință;	
Toate componentele trebuie să fie actuale și să nu fie	NICs included per controller:
promovate ca EOS (sfârșitul vânzării/suportului) /	Min. x 1GE for management;
EOL (sfârșitul duratei de viață);	Min. 2 x 32G FC SFP28(850nm SFP+ SR MM
Extinderea memoriei (ram) și a capacității de stocare	module included) for data transfer;
nu trebuie să includă limitări hardware sau software.	Min. 2 x 32G FC dedicated for replication
	(metro cluster).

	Supported operating environments: Microsoft Windows Server; Red Hat Enterprise Linux; VMware (VMware ESXi);
	Power supplies included: The system includes a minimum of two (2) hot- swappable (hot-plug) power supply units (PSUs). The PSUs supports at least 1+1 redundancy, ensuring continuous operation in case of failure of one PSU. Power cables included meet the following specifications: - Type: IEC C13 - C14.
	 Minimum length: 0.6 meters (24 inches). <u>Toate cerințe obligatorii pentru prestarea</u> serviciilor de punere în funcțiune, a garanției și a serviciilor de suport (deservire și mentenanță) a bunurilor – vor fi efectuate conform Anexei la Anunțul de participare.
	Toate licențele necesare pentru caracteristicile platformei/portalului de monitorizare (analitică) și software-ului/firmware-ului specific sistemului de stocare, inclusiv actualizările/patch-urile periodice, sunt incluse în ofertă și furnizate pe o bază perpetuă - valabile obligatoriu pentru durata integrală de viață a sistemului de stocare.

Semnat:______ Numele, Prenumele:<u>Alexei LEU</u> În calitate de: <u>Director</u>

Ofertantul: <u>PRIDE SYSTEM S.R.L.</u> Adresa: <u>str. Columna 170 lit"Ş"</u>