Abstracting the DNA storage media from the IT world

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Revolutionizing Data Storage with DNA

BUILDING DNA STORAGE SERVERS FOR DATA CENTERS

For various Data Centers:
- Enterprise / Private
- Institutions / Private or Public
- Cloud Service Providers / Public
- Biomemory's

For various use-cases:
- Preservation (regulatory or not)
- Archive
- Back-up / Cloning
- Progressively evolving towards "warmer-storage"

For various scale:
- From KBs (NFTs, keys) to Exabyte-scale (CSP, national archives, etc.)
- Stand-alone or bare-metal (single unit or redundant)
- On-premise cluster
- Distributed and Hybrid Cloud
- Hyperscale

DNA in Data Centers: a demanding environment

Rackable Units
(upgradable functional modules)

Consumables
(in Cartridges or continuous supply)

DNA Cards
(Storage containers gathered in a rackable library)

Storage Server
(rack of enclosure units)

➢ Dimensions	19''-21''-wide rackable cabinet
➢ Environment	5-45 °C and 8%-90% RH
➢ Flexibility	Modular architecture
➢ Evolution	Upgrades (HW, SW, consumables)
➢ Scalability	From single unit to clusters
➢ Automation	Human-less continuous operation
➢ Multi-tenant	Virtualization & resource sharing
➢ System Meta-Data	Life-time tracking
➢ Content Meta-data	Efficient search & retrieval
➢ Remote Management	External configuration & control
➢ Interoperability	Validated open interfaces
➢ Data Integrity	End-to-end very low error rate
➢ Reliability	Validated degradation models
➢ Resilience	Efficient fault management
➢ Security	Protection & rights management, biosecurity
➢ Safety	Biosafe, no-hazardous components
➢ Compliance	Tests and Certifications
➢ Opex	Low-cost consumables
➢ Capex	Cheaper than alternatives

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DNA in Data Centers….Leverage the Industry

Rackable Units
(upgradable functional modules)

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➤ Dimensions	IT industry, OCP
➤ Environment	ASRHAE, OCP, SNIA
➤ Flexibility	Biomemory System Architecture
➤ Evolution	Biomemory System Architecture
➤ Scalability	SNIA, S3
➤ Automation	Biomemory System Architecture
➤ Multi-tenant	CEPH / S3
➤ System Meta-Data	Biomemory System Architecture
➤ Content Meta-data	OAIS, MODS, ISO,…
➤ Remote Management	Swordfish/Redfish
➤ Interoperability	S3, SNIA / DMTF plug-fests
➤ Data Integrity	EDAC/ECC, indexing techniques
➤ Reliability	SNIA/DDSA
➤ Resilience	Storage industry techniques
➤ Security	SNIA, ISO/IEC 270001, DDSA
➤ Safety	ISO, EU & US Biosafety task forces
➤ Compliance	So many….
➤ Opex	Biomemory's biosourcing of consumables
➤ Capex	Biomemory System Architecture

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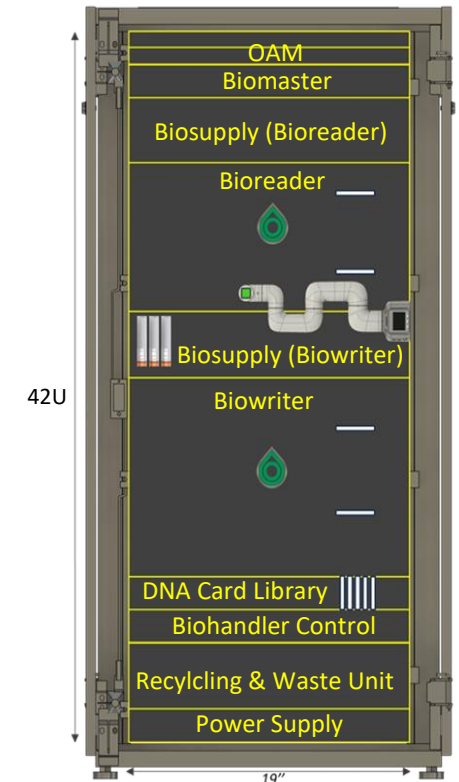
Biomemory Modular & Open System
Seamless integration into data centers

The Biomemory DNA storage server works just like any other storage unit (SSD, HDD, tape), with its own features and SLA
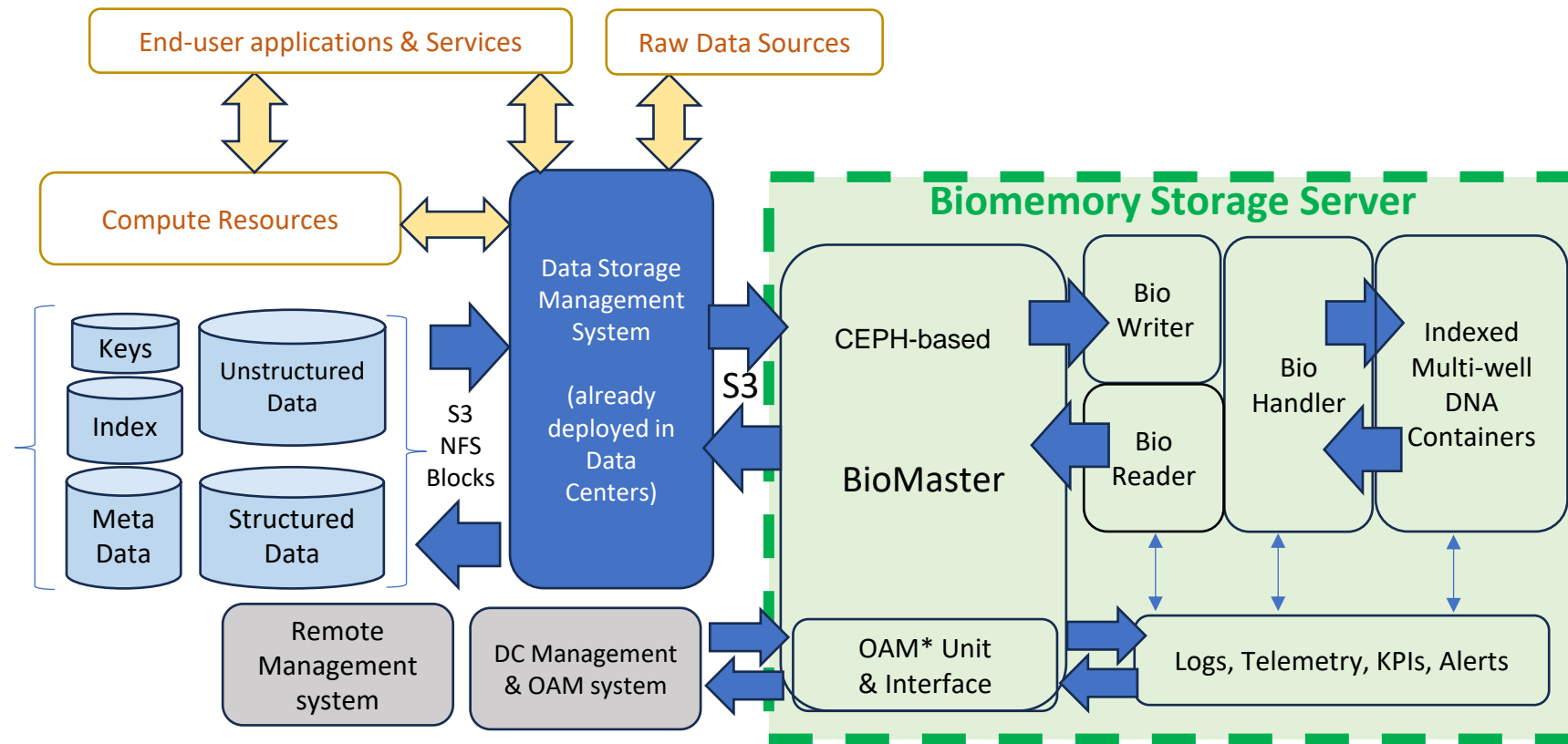
*OAM = Operation Administration & Maintenance

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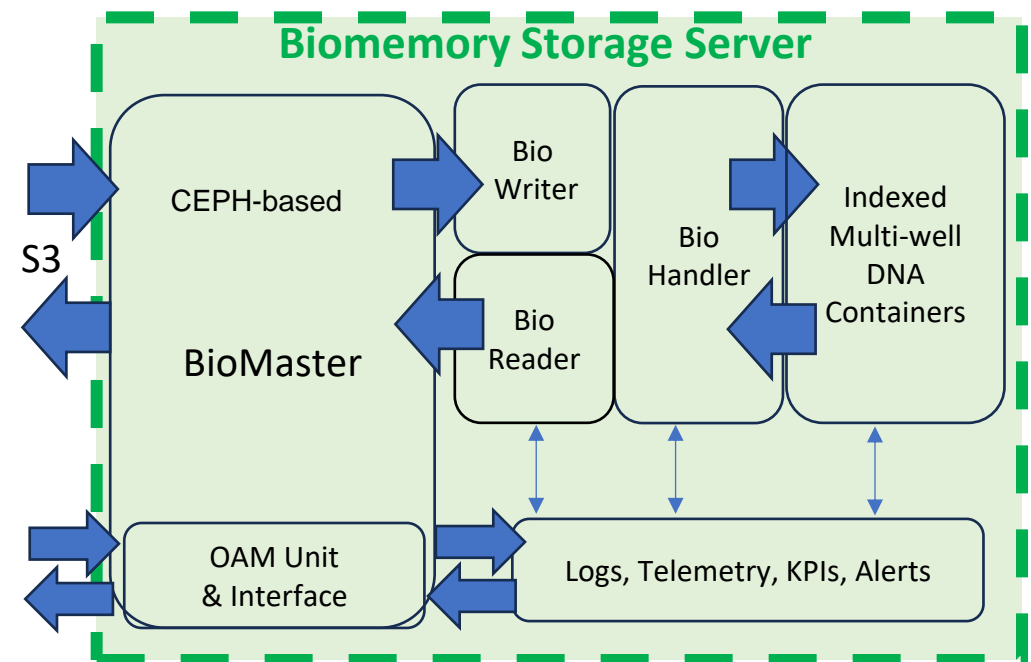
Key Technology Enablers

Biomemory DNA storage server is seen and accessed like any other data storage unit (SSD, HDD, Tape), with its specific attributes and SLA

System Architecture

- Scalability to reach PB/day write & read operations (2030)
- Endorse the Data Center constraints
- Software-defined system
- Biomaster controls all modules using APIs
- Leveraging S3 for interoperability
- Leveraging CEPH for multi-tenant policy-based scalability
- Life-time tracking, storage & retrieval of system meta-data
- Map to the SNIA Swordfish models for remote management
- Metadata & multi-level indexing for search and management

Advanced algorithms & development tools

- AI-assisted algorithms and signal processing
- End-to-End Digital Twin simulator
- Multi-stage Error Detection & Correction
- Strategy for "cloud-free" processing

Biomemory Storage Server

S3

CEPH-based

BioMaster

Bio Writer

Bio Reader

Bio Handler

Indexed Multi-well DNA Containers

OAM Unit & Interface

Logs, Telemetry, KPIs, Alerts

What's next ?

Towards easier deployment in Data Centers

➢ Interoperability with S3-compatible multi-tier platforms

➢ Finalize the Swordfish model for DNA Data Storage and test for interoperability

➢ Open Biomemory's system to 3rd party components / modules (SW or HW)

Thank You !

Your questions are welcome

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This slide set is a subset of the full presentation.
To get the full presentation, please send a request to :
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