

SWISS VAULT

# AI's Data Tsunami: Innovative data management storage solutions and SMR drives

Simplified • Efficient • Sustainable

Joe Suppers  
President, Swiss Vault Global Sales  
[info@swissvault.io](mailto:info@swissvault.io)

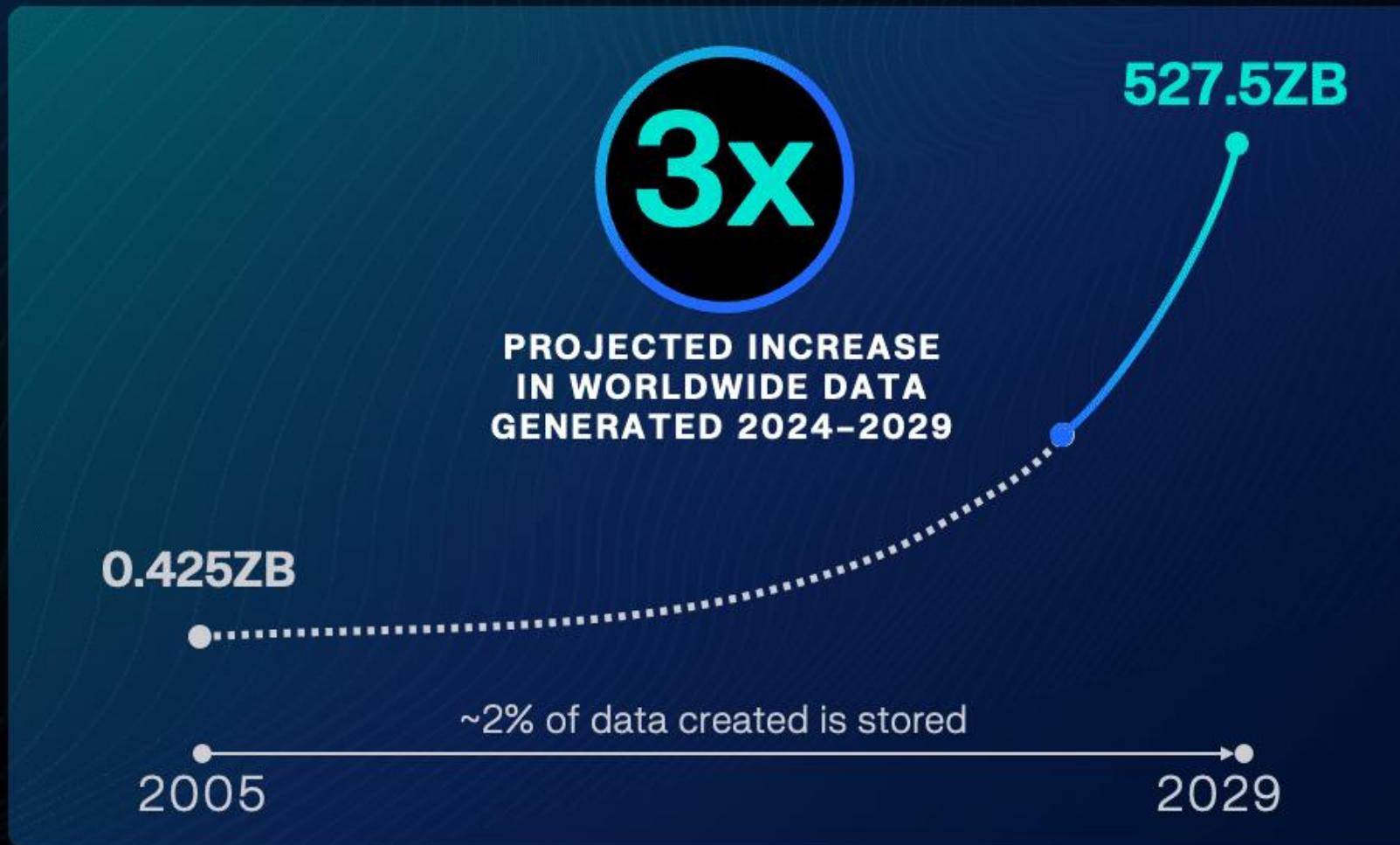
Member of  
**WORLD ALLIANCE**  
for EFFICIENT SOLUTIONS  
by SOLARIMPULSE  
FOUNDATION

**HOUSTON**



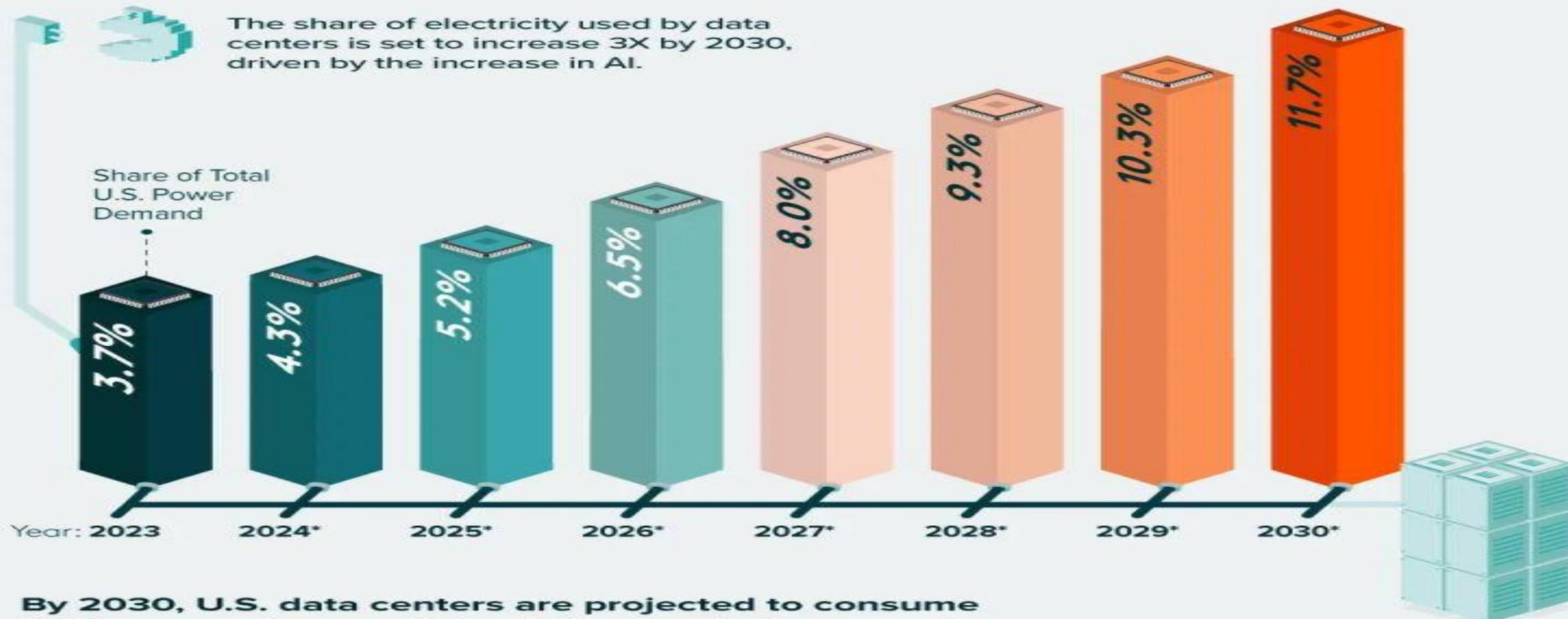
**WE  
HAVE  
A PROBLEM**

# Data Generated Will See Massive Growth



Source: Worldwide IDC Global DataSphere Forecast, 2025–2029, doc #US53363625, May 2025

# THE RISING SHARE OF U.S. POWER CONSUMED BY DATA CENTERS, 2023–2030



# Data has an Environmental Footprint

**We contribute to it EVERYDAY**

“...sending 1 email with an attachment produces the same Carbon emissions as 1 small plastic bag...”

- BBC News report, 2020

“...a single AI query uses up a bottle of water for cooling ...”

# REMEMBER THIS MESSAGE?

**“Time is running out for millions of Microsoft Windows 10 users — here's what you must do before the deadline.”**

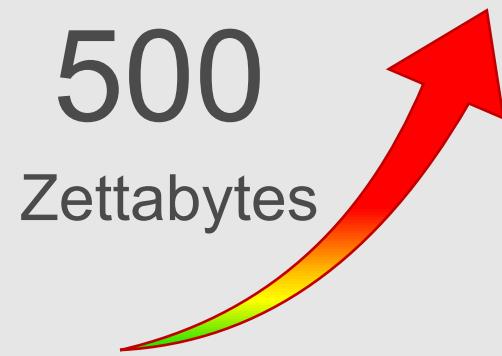
Omdia estimates there are **550 million machines** in corporations that still use Windows 10, and half of these can't upgrade to Windows 11

**THE RESULT: MORE CAPEX & E-WASTE**

# Data Explosion Overwhelming Storage

Today's data infrastructure is bloated & costly, with massive e-waste and OPEX from inefficient systems.

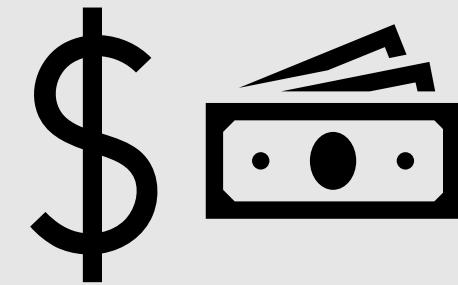
Exploding Data Volumes



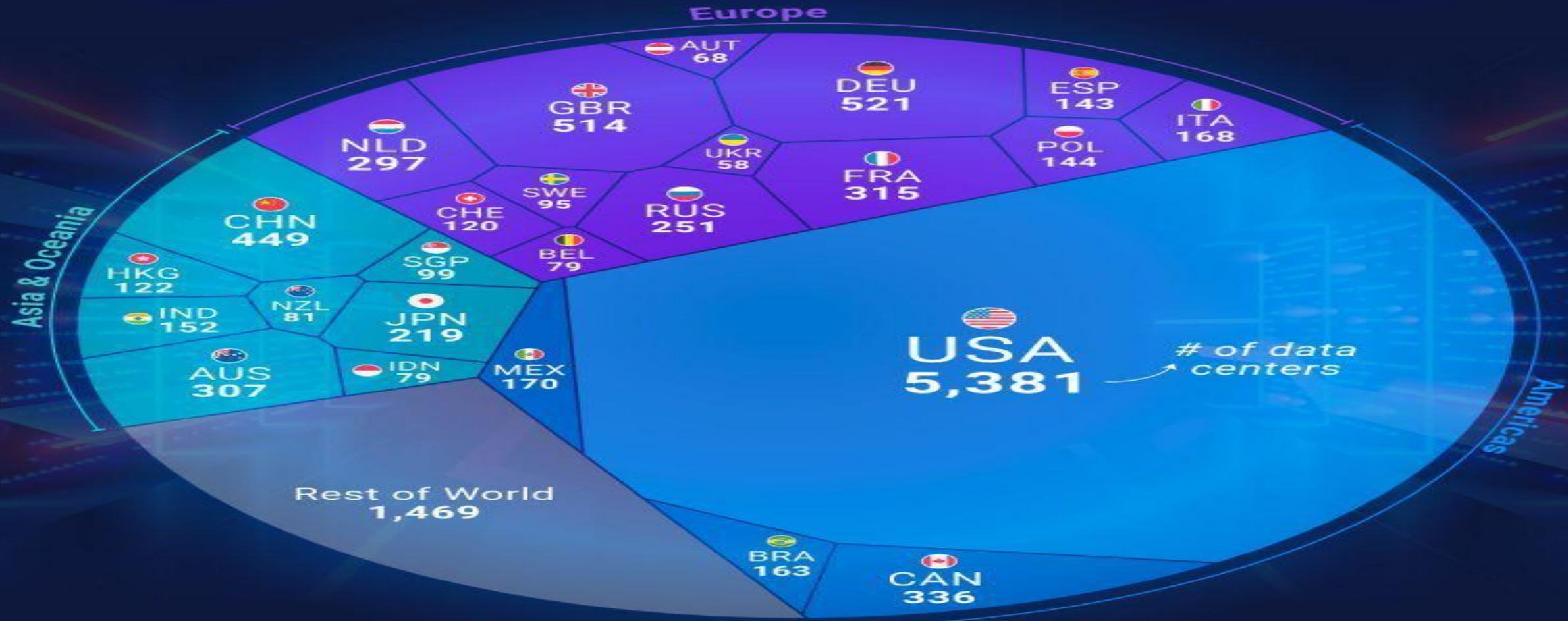
Skyrocketing Energy & E-Waste



High OPEX & CAPEX



# THE WORLD HAS 11,800 DATA CENTERS



Rest of World may also include countries from these regions. Cutoff is at rank 25 (Ukraine). As of March 2024. Source: Cloudscene, Statista

# DATA CENTER PROJECTS

## RECENT ANNOUNCEMENTS



Microsoft \$110B Expansion Plan



OpenAI Launches \$10B Texas Stargate Campus



Oracle to Build over 100 Data Centers



NVIDIA®



NVIDIA-Deutsche Plan \$1B Germany Data Center

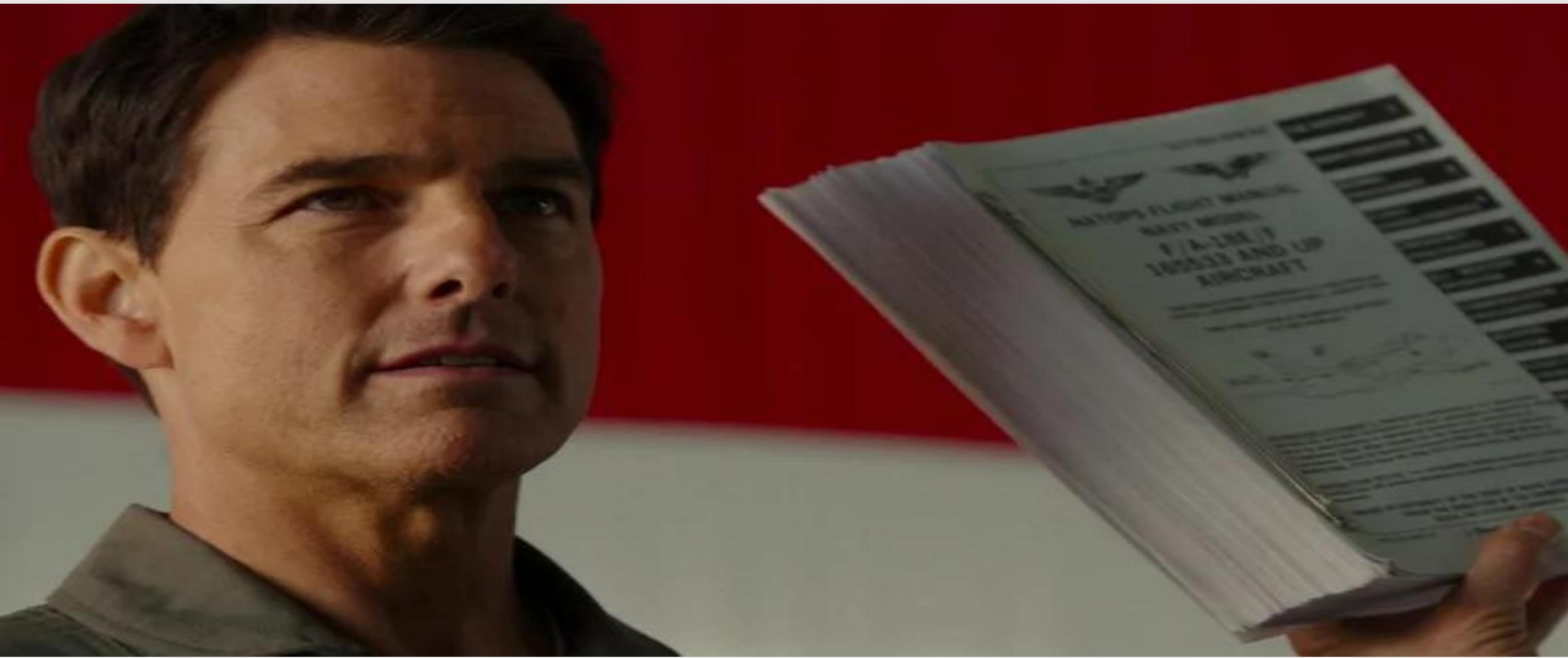
Meta selects Louisiana for \$10B Data Center

Just this week...

# AI boom could ‘break’ global power grid Buffet, Musk and Zuckerberg warn



# The Data Center Manual is Being Rewritten



# THE NEW DATA CENTER MANUAL

META spent \$70 Million  
Tore down for AI workloads

- Outdated design after 2-3 yrs.
- Adopting the “miners” concepts
- Future Proof design
- Needed higher density
- Liquid cooling
- Massive Power Needs
- Retrofitting facilities for AI
- Seeking greater efficiency



# IT Requires Innovative Solutions...NOW!

## Hardware:

- higher densities for AI - greater data volumes
- uses more and more energy
- racks over 100kw requiring water cooled systems
- sever refresh every 3-4 years – generates e-waste

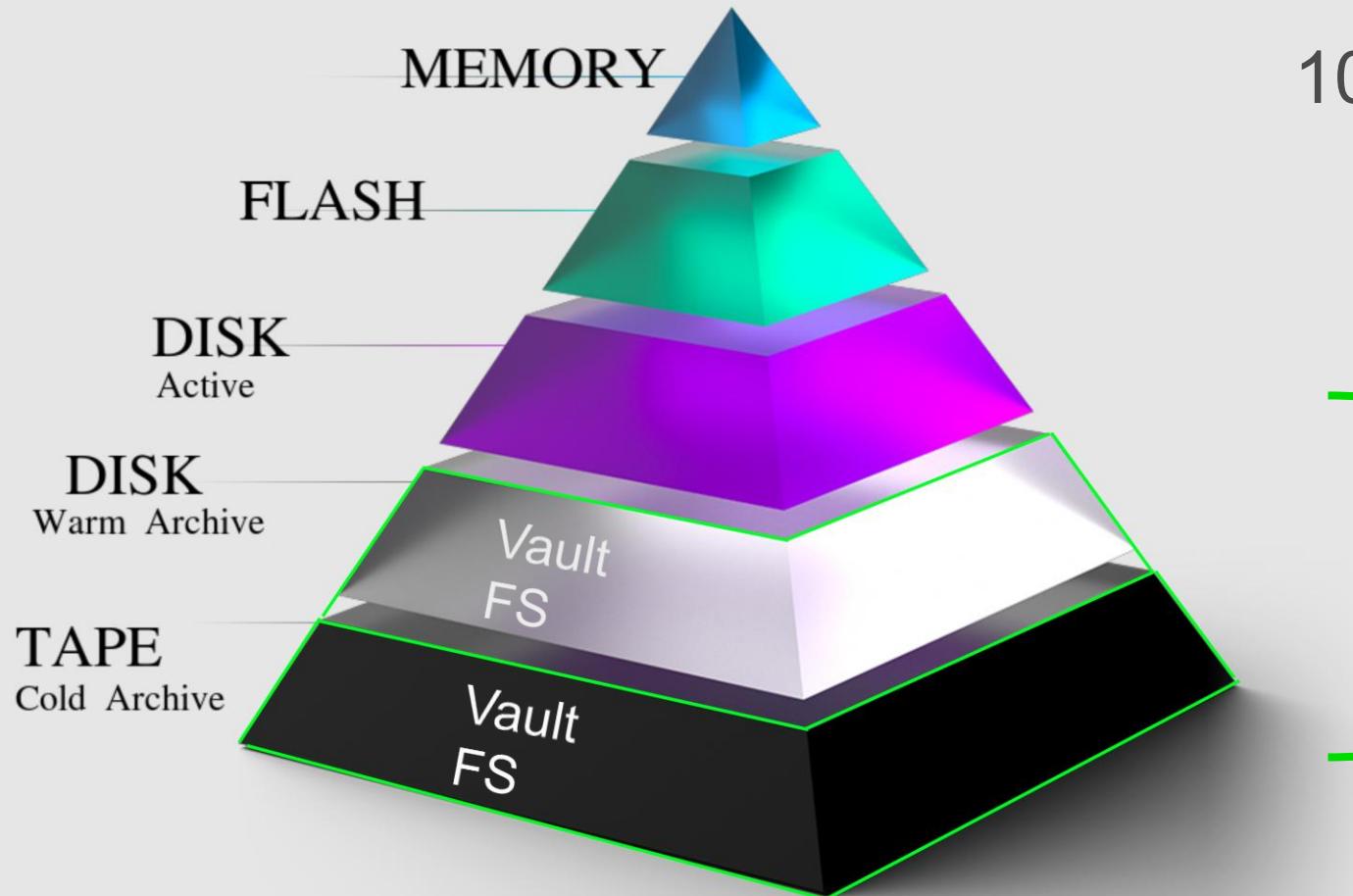


## Software:

- reduce hardware need – extend hardware life
- self healing and automated data backups
- resilient data across distributed systems (high availability)
- reduce overhead costs and DR for managing data

# Vault File System for Active Archive Data

On-Prem • Edge Data • Cloud



## 100 Year Active Archive Data Storage

- AI & LLM Training
- Healthcare
- Government
- Aerospace
- Banking / Finance
- Research
- Media

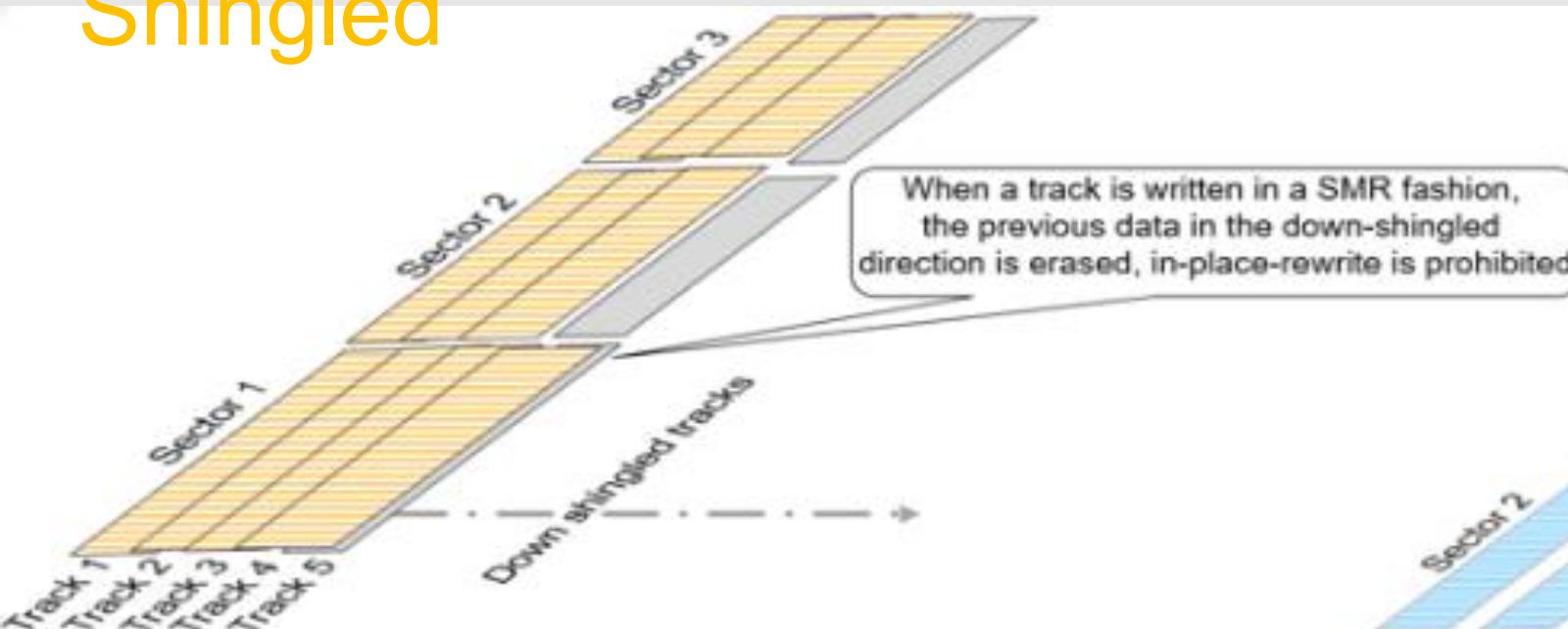
# **HARDWARE**

## **SMR & CMR DRIVES**

**Requires Proprietary Software and Firmware**

# The Hyperscale Company SECRET... Shingled Magnetic Recording Hi-Capacity Drives (SMR vs CMR)

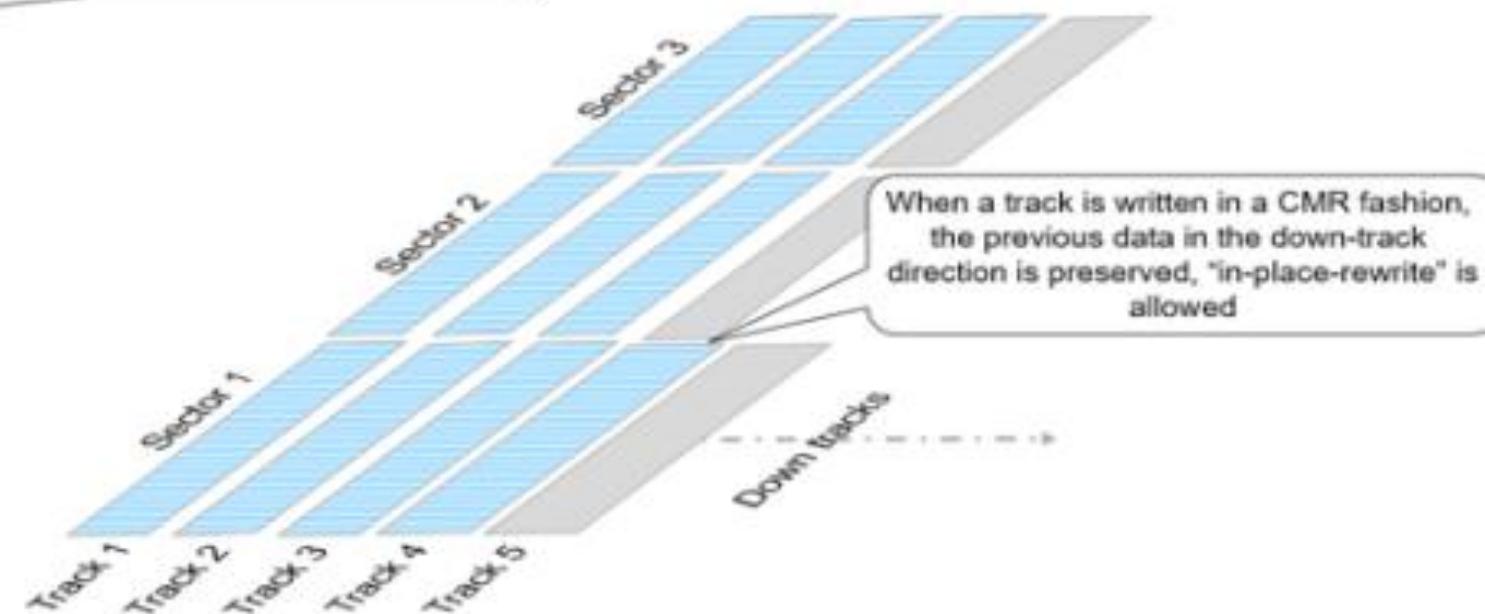
Shingled



SMR Architecture

Conventional

CMR Architecture



# CMR vs SMR\* Comparison

FEATURE	CMR	SMR
COST PER TB	HIGHER	LOWER (saves space & energy)
WRITE SPEEDS	FASTER	SLOWER
READ SPEEDS	SLOWER	FASTER (with parallelization)
IDEAL USAGE	MULTI-TASKING	ARCHIVAL – ACTIVE ACCESS
DENSITY	LOWER	HIGHER (20-30% more - same space)

\* ONLY AVAILABLE TO HYPERSCALE COMPANIES

# **SOFTWARE**

**Swiss Vault's VaultFS**

**“Is a GAME CHANGER”**

**Unlocks SMR's for Everyone**

# File Systems

## TYPE 1: Traditional File Replication Management

RAID 1P or 2P Limited!

1 PB

Backup #1

1 PB

Backup #2

1 PB

Total

**3.0 PB**

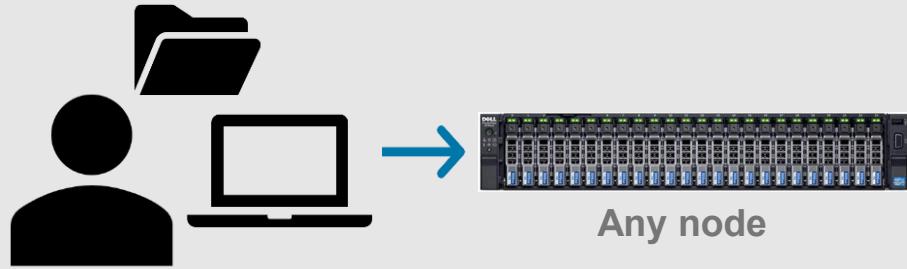
200% Hardware  
Overhead

## TYPE 2 – Network Based

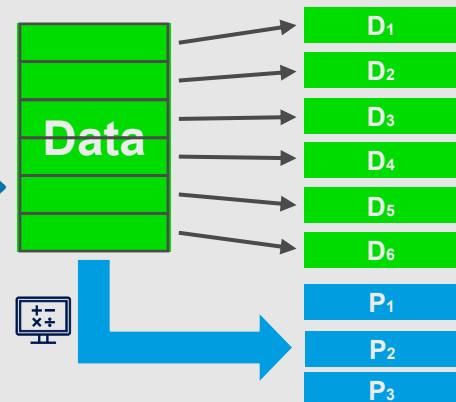
### Erasure Coding: Parallel & Distributed

#### Swiss Vault File System- VaultFS (VFS) Ex.6D+3P

Data is transferred from  
client to  
**Vault File System (VFS)**



Data is fragmented  
into 6 slices



3 Erasure-Coded chunks of equal size  
are calculated.

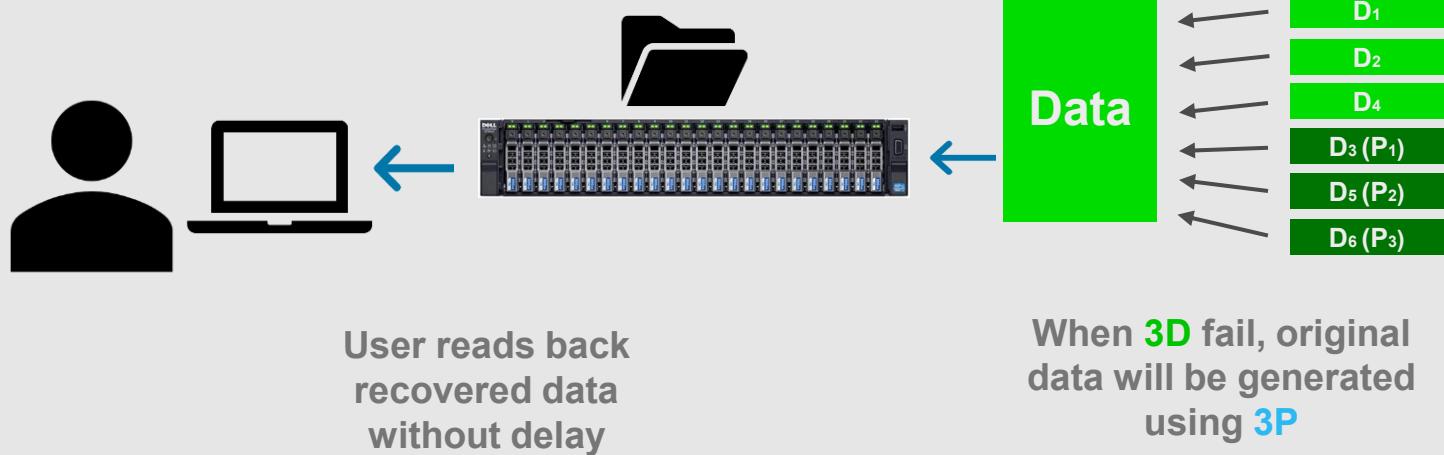
Parity chunks are generated quickly  
after a series of complex algorithms

**No replication required!**

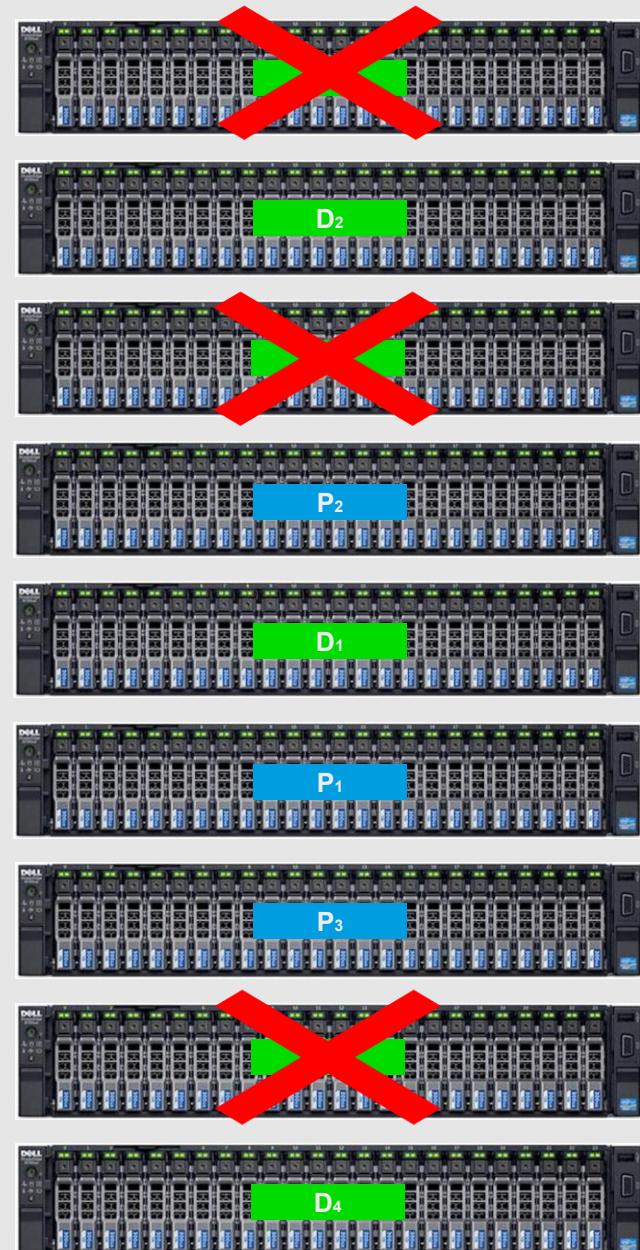


# Erasure Coding: Parallel & Distributed

## Swiss Vault File System- VaultFS (VFS) Ex.6D+3P



No replication required!



# VaultFS = Optimized Space, Less Volume Higher Resiliency

RAID 1P or 2P Limited!



Backup #1



Backup #2



Total

**3.0 PB**

200% Hardware Overhead

VFS 120D + 6P

Data Chunks

0.008 PB	0.008 PB

Parity Chunks

0.008 PB	0.008 PB

...120 D

**1.05 PB**

5% Hardware Overhead

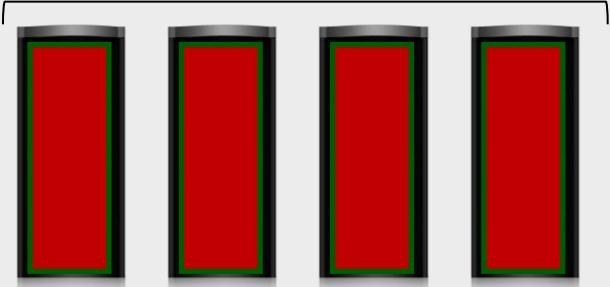
Higher levels of data robustness – but using only half of the additional data storage space.

# Genomic Use Case

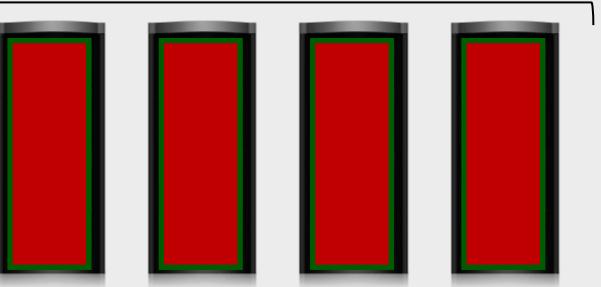
## Free-up Space & Increase Resiliency

Storage of 10 PetaBytes data using RAID on hyperconverged racks,  = 2.5 PB/rack

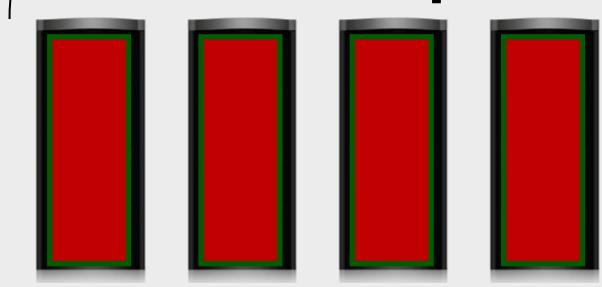
10 PB Raw Data



10 PB Backup #1



10 PB Backup #2



30

PetaBytes used

0 Free

PetaBytes

Install **VaultFS** on above servers with  $8 D + 4 P$ , data will migrate to this result:



15

PetaBytes used

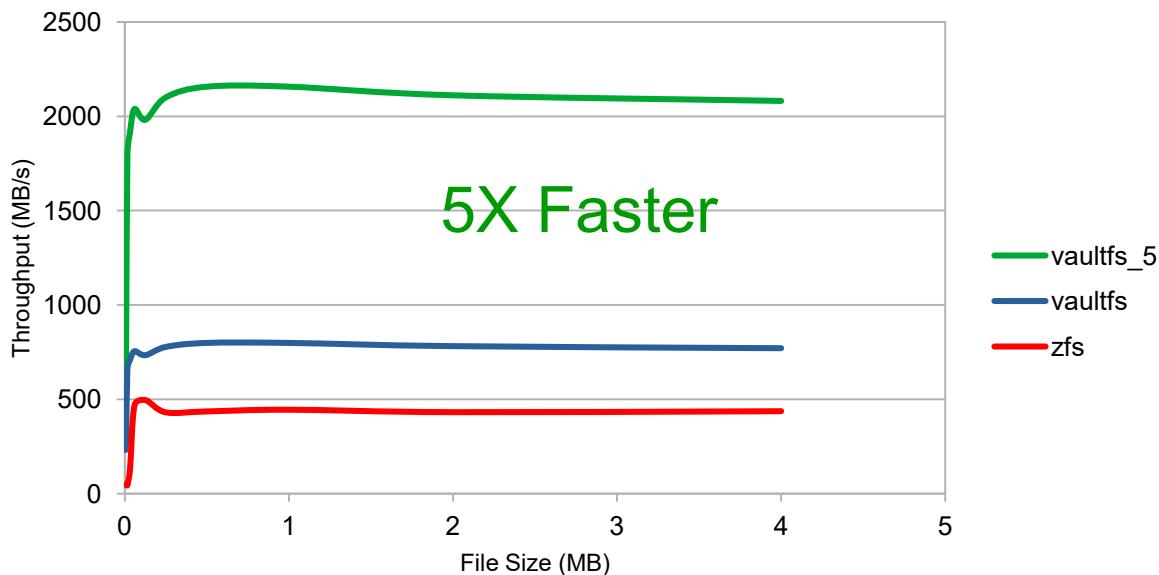
15 Free

PetaBytes

- 50% hardware savings • 2X increase in resiliency • Energy savings

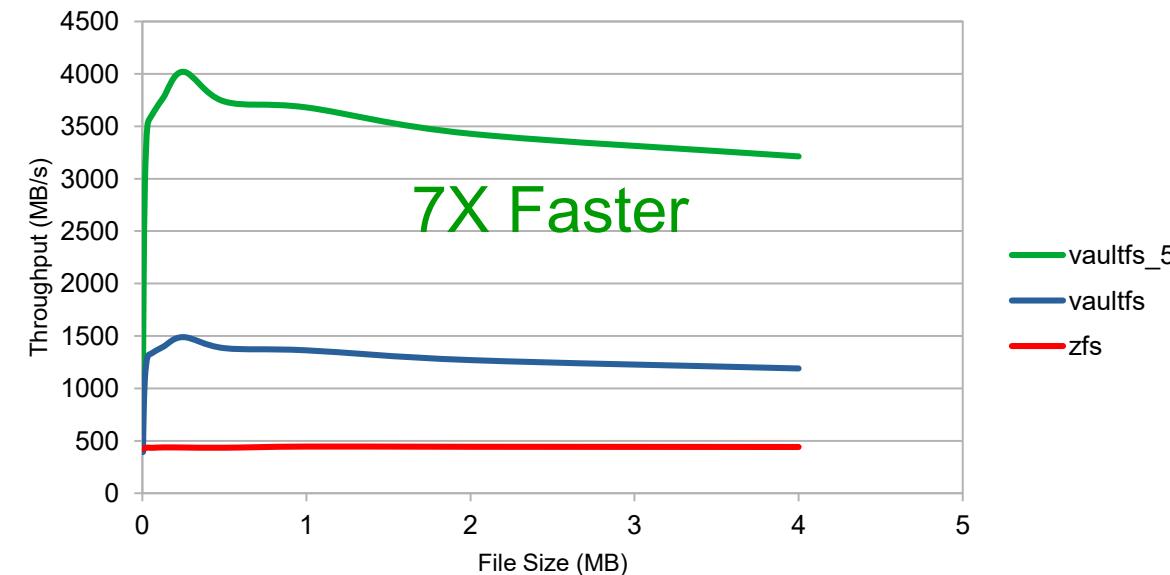
# VFS Offers Faster Data Speeds

Single & Multi Node Write Throughput



5X Faster

Single & Multi Node Read Throughput



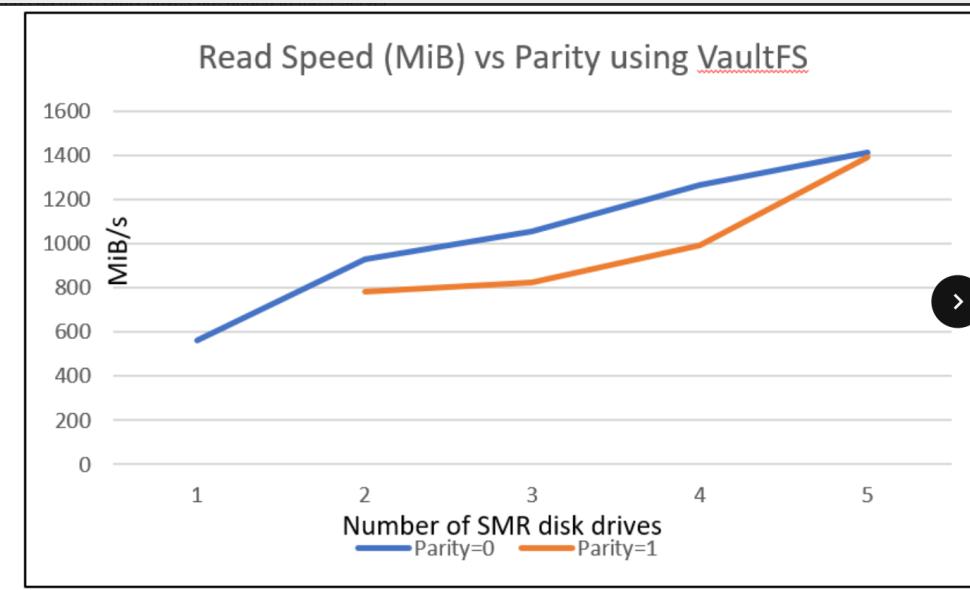
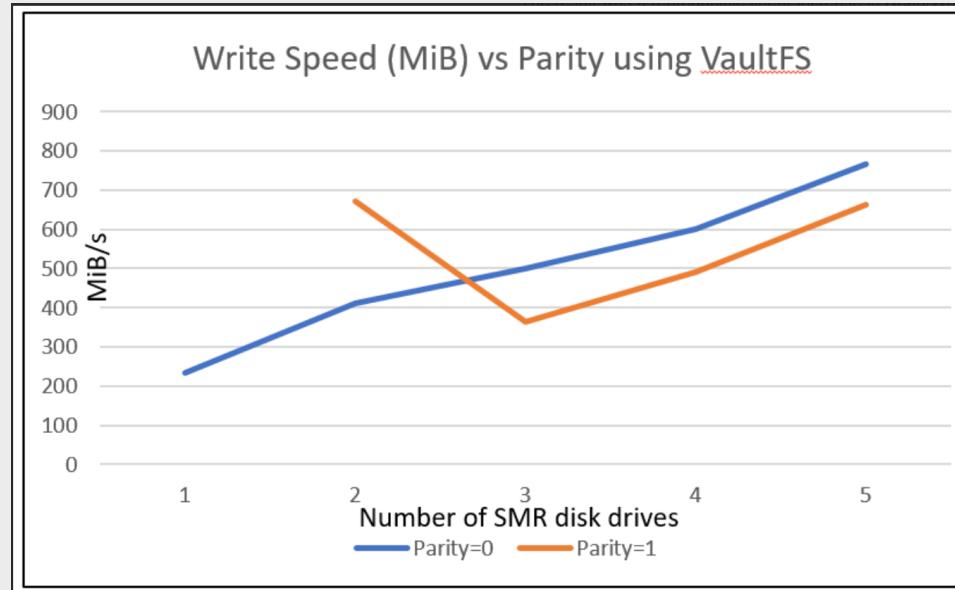
7X Faster

ZFS vs VaultFS (DELL PowerEdge R730xd)

Number of disks	12*5
DISK	5TB Seagate ST5000LM000-2AN170 HDD NMRR:5526
RAM	4x 16GB 2400MT/s DDR4
CPU	56x Intel(R) Xeon(R) CPU E5-2680 v4 @ 2.40GHz

# Shingled Magnetic Recording Drives

VaultFS works out of the box with high density SMR drives with few errors



- 30 TB data density (50TB/disk in development)
- VaultFS linear increase of Write / Read speeds (adding more drives or more Nodes)
- Few errors (6 extents errors with VaultFS vs. 152,354 with ZFS)

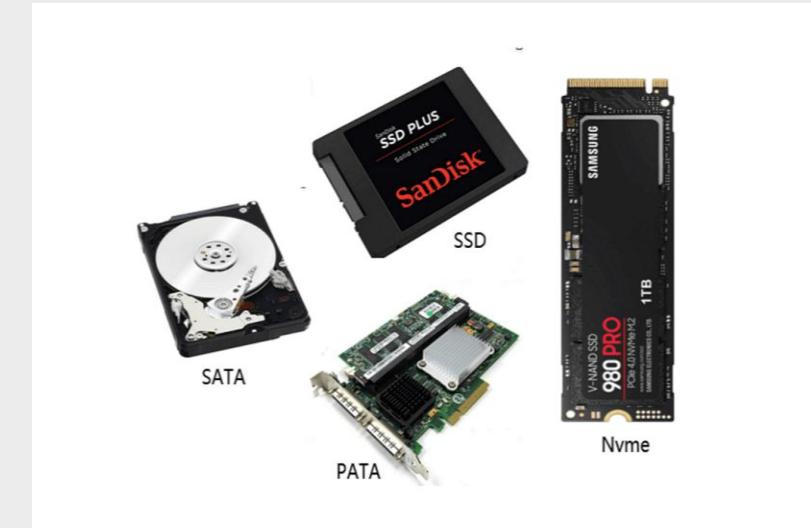
# Media Flexibility is a MUST

## Vendor Lock-in is a Problem

VaultFS  
is the Key

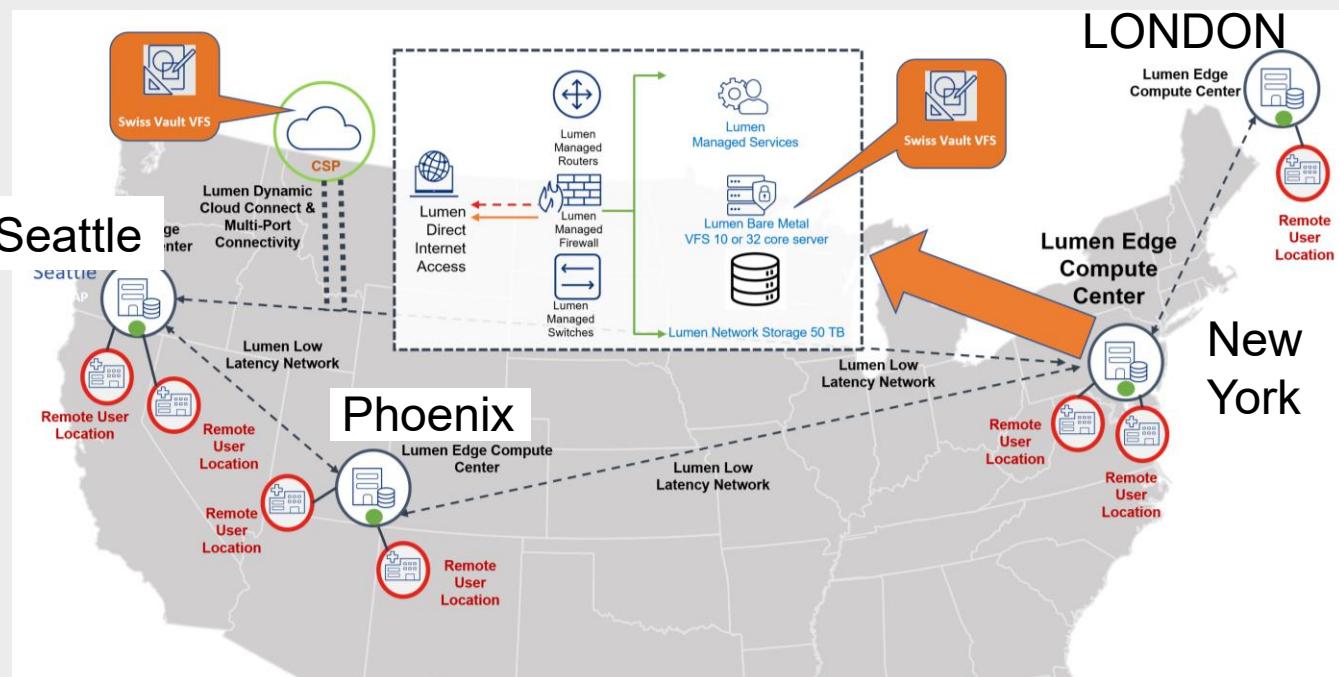
- Any type of server
- No hardware accelerators required
- Use to end of life

- Any SMR or CMR data media
- Any volume or size
- Use to end of life



# Growing IT Requirements Distributed Terrestrial Data

File Sharing for DR and risk management, global data availability



## File transfer rate

Latency	70 milliseconds
Default TCP window size in bytes	1'048'576 bytes (~1 MB)
Expected data transmission rate	15 Megabytes/sec
Measured data transmission rate	150 Megabytes/sec
10X speed up with Vault FS	10X speed up

- Connected 4 data centers on 2 continents
- Set-up time 10 minutes

- Achieved 10X data transmission speed-up

# Most Sustainable Modular Data Center

- Partnership with Kais-AIR / Bladeroom
- Sustainable Data at Edge



BUILT, SHIPPED AND INSTALLED IN 24 WEEKS

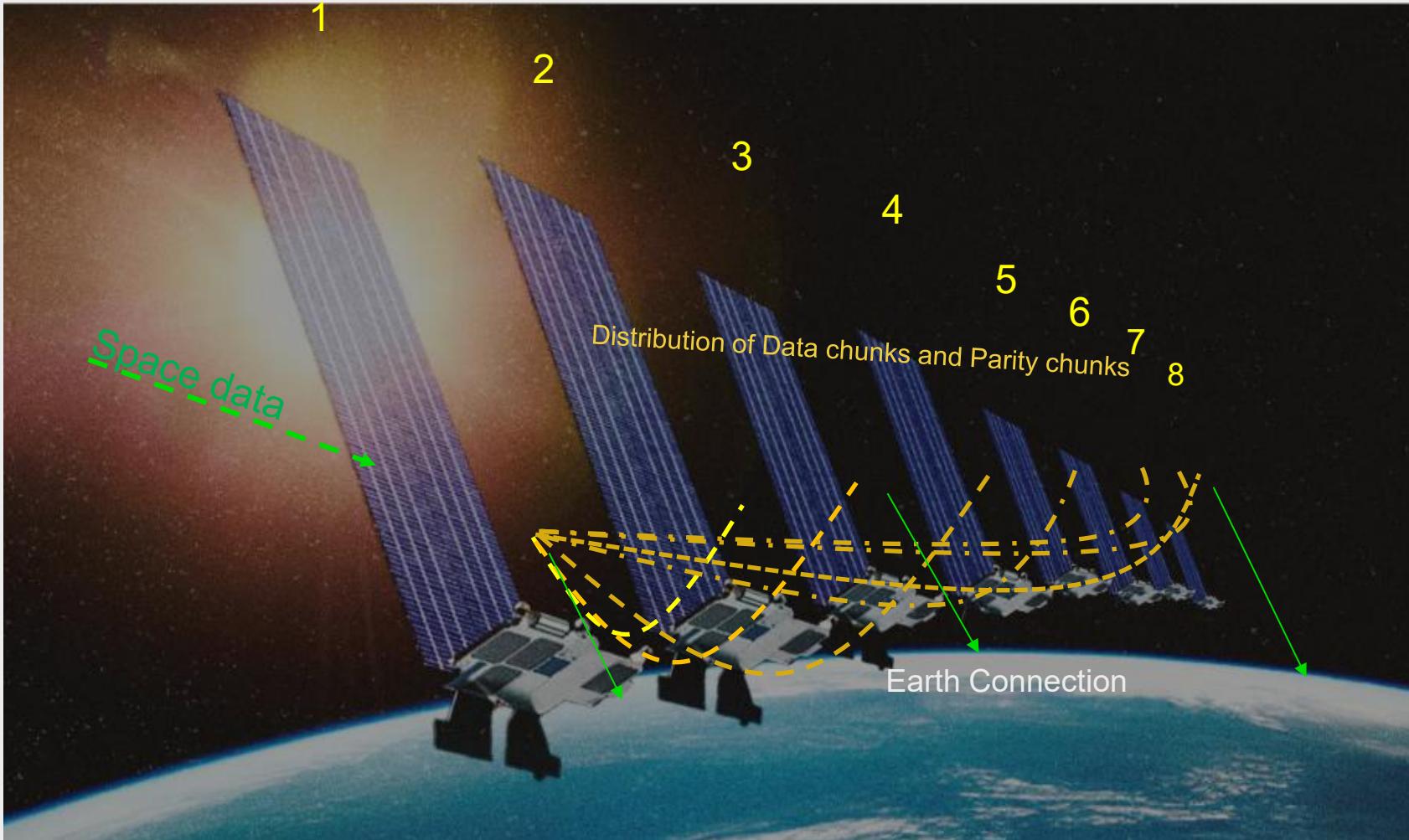


# SPACE Data Storage The Next Frontier



# TERRESTRIAL to CELESTIAL NETWORKS

## Resilient Data in Space



### Vault File System Distributed Data

Each Satellite acts as a Node

- Can lose satellites, but data is always available
- Fast data transfer in parallel processing

# **FINAL MESSAGE**

## **As Top Gun Maverick Said...**

**“IT’S NOT THE PLANE IT’S THE PILOT”**

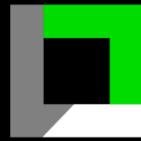
### **1. Change Requires New THINKING – address massive impacts of IT, AI & DATA**

- Financial & Construction
- Utility & Water Resources
- Land & Environmental Costs

### **2. Innovative Designs - Manuals & Tools needed to:**

- Reduce Energy, Carbon & Resources`
- Do more with LESS
- Extend life of equipment
- Reduce Farm Land Development

**SWISS VAULT can help “PILOT”  
Your HPC Future With VFS/SMR Technology**



SWISS VAULT

Thank you

Maximizing Data Efficiency with VFS & SMR's

**CONTACT:**

Website: [SwissVault.global](http://SwissVault.global)  
Email: [j.suppers@swissvault.io](mailto:j.suppers@swissvault.io)  
Phone: 609-462-2230

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