my history with Samba 😊
1998 - worked on AFS and leveraged Samba for SMB exports to windows
2000 - contracted Volker to fully support Samba on AIX on top of AFS
2001 - started working on GPFS
2005 - convinced Volker and Tridge that you can cluster SMB 😊
2006 - the first commit of CTDB landed
2007 – launch of Service Offering - SOFS
2010 – launch of Scale Out NAS - SONAS
2016 – DDN Media Scaler 2.0
2019 - added scale out SMB Support to EXAScaler
Who is DDN?
DDN is the World’s Largest Privately held Storage Company

At Scale | Enterprise

- GPU
- CPU
- VM
- Container
- AI, Big Data & HPC
- DB, Analytics
- Objects

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DDN’s mission is to change the way data moves and is managed for the AI-powered era to bring simplicity and hyper efficiency to our customers. No more slow applications and inefficient Flash implementations. No more inhibitors to scale. No more failed AI projects with immature and unproven Software and Hardware.

- >1000 Employees
- 10 Technology Centers
- >10,000 Customers
- 150+ Patents
Our Customers
AI and Analytics Solutions

• Security at the scale you need to accelerate cancer research and personalized medicine
• The world’s largest autonomous car solutions
• Fast, in-place analysis of all your financial data
• Low latency systems designed for real time image processing
NVIDIA SuperPOD

Optimized for DGX, Installed and record-breaking in ½ day

40 AI400X Appliances (15 PB ALL NVME, 1.6TB/sec)
First 10 appliances deployed onsite in 4 hours
Filesystem delivered > 400GB/s read throughput out of the box
Fastest production system on IO500 10 node challenge at SC19
US Autonomous Driving

HyperScale R&D made practical with EXAScaler

Hyperscale Autonomous Driving solution across the US with EXAScaler

Performance at Web Scale – over 1.6TB/s Aggregate Performance.

Cost Effective approach to very large capacities and flat namespace performance for each Region.

DDN provided complete at scale management environment for provisioning and monitoring.
European Autonomous Driving

Modular and Scalable AI Storage for Leading Vehicle Manufacturer

Multiple Installations, each of
200 GB/s throughput
27 PB net per EXA5 filesystem

DDN Insight Scalable Monitoring Solution allows fine grained visibility into user and workload as well as system performance and health
DDN @ Scale  Products
COMPREHENSIVE DATA PLATFORMS FOR SCALE

DDN®
AI • BIG DATA • HPC

- All-Flash Cache
  - Acceleration for all workflows, file systems and applications

- EXA5
  - Fast parallel file storage for every workload and data type

- SFA®
  - Fastest time to insight with limitless scaling and best efficiency

- A³I™
  - Turnkey acceleration for artificial intelligence and deep learning

- DataFlow
  - Synchronize, Backup, Archive at any Scale

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<table>
<thead>
<tr>
<th>DS200NVX</th>
<th>ES400NVX</th>
<th>ES7990X</th>
<th>ES18KX</th>
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<tr>
<td>24GB/s</td>
<td>48GB/s</td>
<td>24GB/s</td>
<td>76GB/s</td>
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<tr>
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<td>3M IOP/s</td>
<td>800K IOP/s</td>
<td>3M IOP/s</td>
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<tr>
<td>24 NVME Slots</td>
<td>24 NVME Slots</td>
<td>Up to 450 SAS Slots</td>
<td>48 NVMe Slots</td>
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<tr>
<td>Up to 360 SAS Slots</td>
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<td>Up to 450 SAS Slots</td>
<td>Up to 1872 SAS Slots</td>
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<td>EDR/HDR100 IB (4)</td>
<td>EDR/HDR100 IB (16)</td>
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</table>
A³I APPLIANCES REDUCE COST AND COMPLEXITY

SIMPLIFIED STACK WITH DDN A³I APPLIANCES

SIMPLE TO DEPLOY, MANAGE AND SCALE!
The Intelligent, Optimized Environment for AI and HPC

- Deep Optimizations for both AI and HPC delivers for the highest efficiencies and the right capabilities
- Your data in the right place at the right time
DDN Enterprise Products
IntelliFlash Portfolio

N Series
NVMe All-Flash Arrays
200 μsec latency

HD Series
High-Density All-Flash Arrays
< 1ms latency

T Series
Hybrid SAS Flash Arrays
1ms – 2ms latency

ONE Operating Environment | ONE Feature Set | ONE User Experience
- IntelliFlash brings unified all-flash and hybrid appliances for high performance enterprise workloads
  - Unified access for block, file and object
  - Performance – high IOPs and low latency
  - S3 cloud migration for backup and DR
  - Cloud-based storage analytics
- Target workloads
  - Mission critical applications demanding performance
  - OLTP, OLAP and databases
  - Enterprise AI and Analytics

* 3.11 brings Openstack support based on NFS
N-Series Advantages

- **60% Savings**
- **2.5x Data Reduction**
- **~300us latency/response time**
- **4X Faster**
- **>800K IOPs per system**
Tintri VMstore

Simplicity – Single Datastore for all VMs - Mgmt & Desktops

VAAI & VCAI Offloading (Full Clones)

Improve Deployment speeds for Citrix and VMware View

Automation - PowerShell Toolkit & REST API support

Tintri Global Center – Per-VM Analytics & Mgmt at Scale

Latency Visualization (Host/Network/Storage + Mirror)

QoS

Dynamic QoS (Noisy Neighbor Isolation)

Per-VM Granularity (Logical Live Size – i.e. PVS write cache)

Long-term Trending & Modeling (Tintri Analytics)

Mix and Match Workloads (VDI, Infrastructure, Server Apps, etc.)
Two challenges
Challenges for the community

• Samba is lacking behind on some key workloads e.g. single threaded seq read/write
  o High Speed collect of sensory data
  o DNA sequencer
  o Autonomous vehicle

• Target single file writes at ~2-3 GB/sec from a windows 10 client to a distributed storage system, today we see 100’s of MB/sec
Challenges for the community

What would it take to build an optimized SMB Server for a KV Storage Backend?

- Assume super fast low latency (10’s of usec) KV Client library in userspace
- Highly resilience and scalable to quadrillions of keys and 100’s of PB in size
- Completely elastic and resilient backend with zero end-user touch

What would an ideal interface for SMB to KV Store look like?