(Cyber)szkolenia dla podmiotów krajowego systemu cyberbezpieczeństwa

Czego możemy oczekiwać od systemu backupu?

Warszawa 11.10.2022

Kancelaria Prezesa
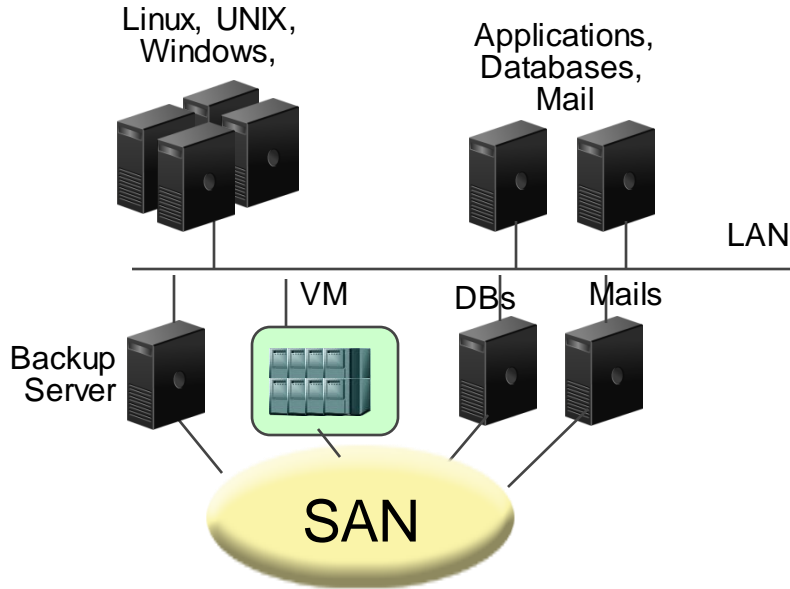Rady Ministrów

DELLTechnologies

(CYBER)SZKOLENIA
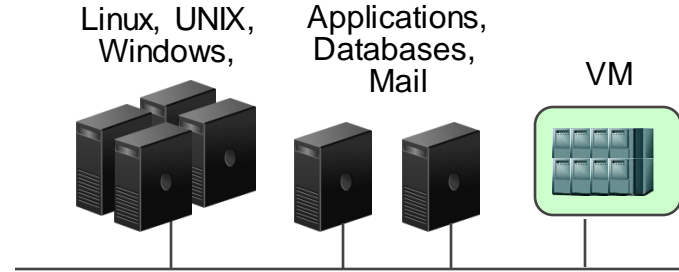KRAJOWY SYSTEM
CYBERBEZPIECZEŃSTWA

PWCyber

Why do we perform backups?

Data Domain in my environment

Site A

Linux, UNIX, Windows,

Applications, Databases, Mail

LAN

VM

DBs

Mails

Backup Server

SAN

Site B

Linux, UNIX, Windows,

Applications, Databases, Mail

VM

Why do we perform backups?

- Restore

- Disaster Recovery

- Hacker / Ransomware attack

- Tests

What can we expect from backups?

Backup / recovery expectations

- Speed

- Immediate restore

- Security

- No data loss

- Easy

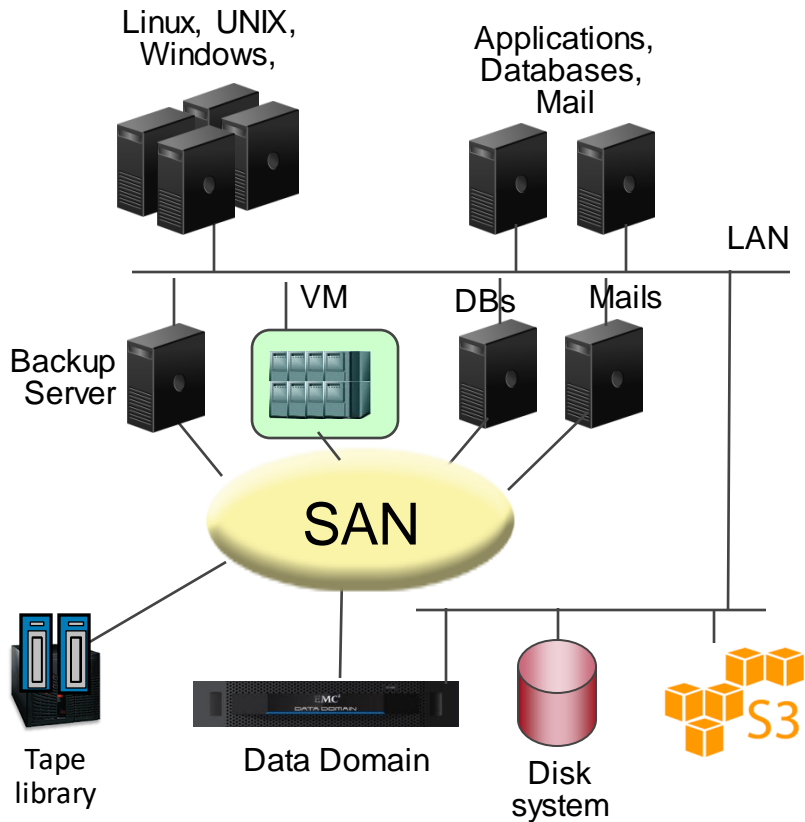- Self-backup infrastructure

- SLA

- Minimal cost

Backup / recovery expectations

- No load of production

- Elastic / Scalable

- Covering the whole environment

- Full backups

- Application owner backup
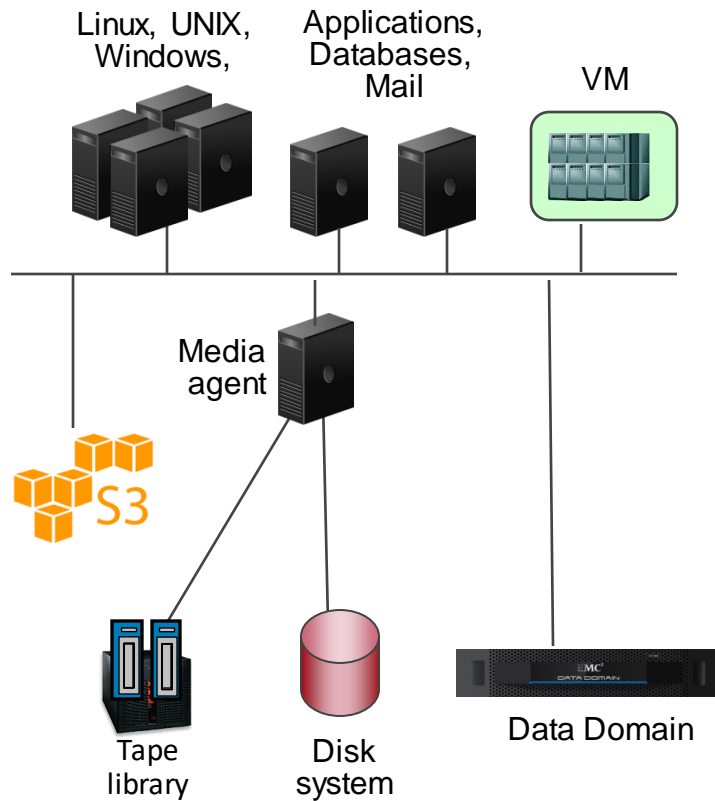
- Appliance

- Hardware agnostic

- S3

What are the components of backup solution?

Data Domain in my environment

Data Domain in my environment

Site A

Site B

Linux, UNIX, Windows,

Applications, Databases, Mail

VM

Backup software

LAN

Backup Server

VM

DBs

Mails

Media agent

SAN

S3

Backup media

S3

Tape library

Data Domain

Disk system

Tape library

Disk system

Data Domain
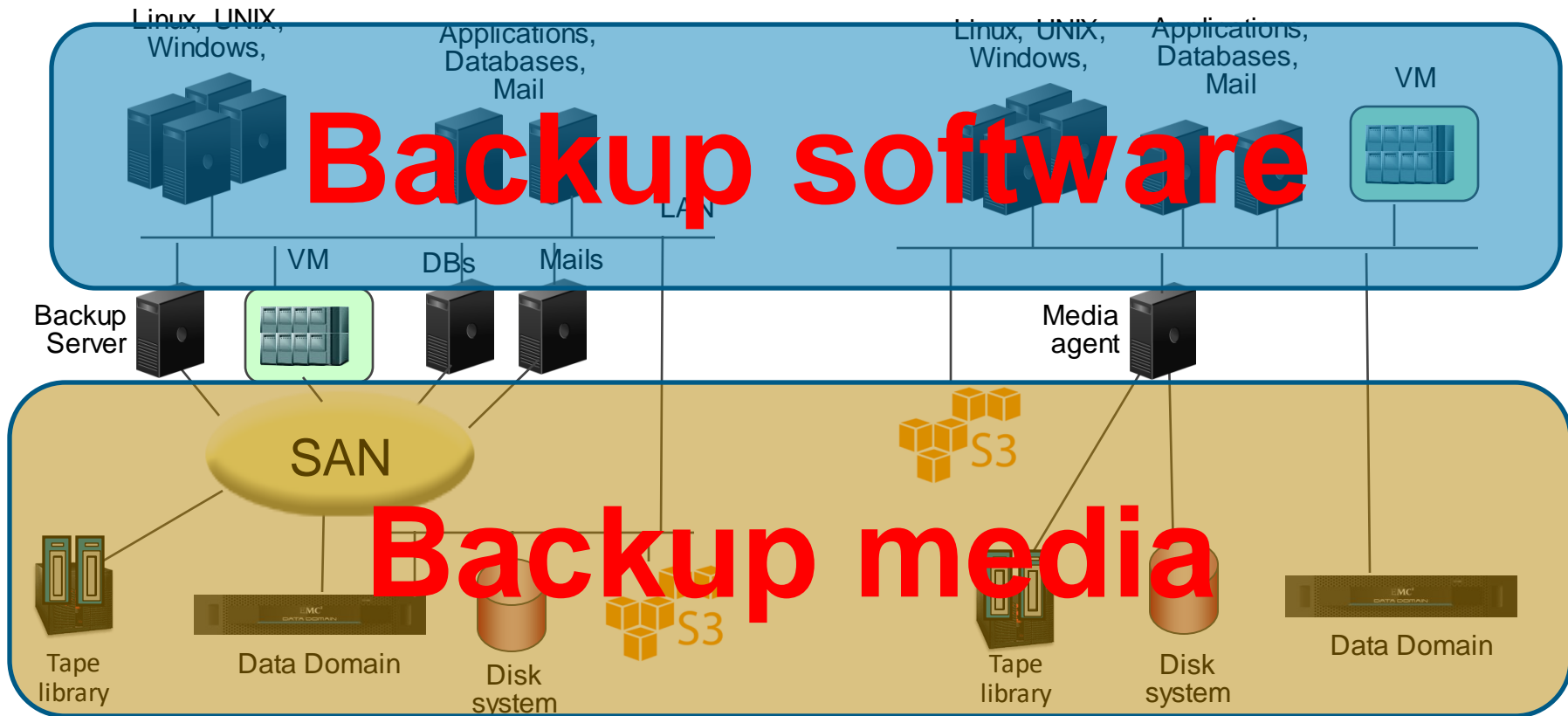
Speed, only speed…

Speed

Frequent backups

Speed

Frequent backups

No data loss

No load

Speed

Frequent backups
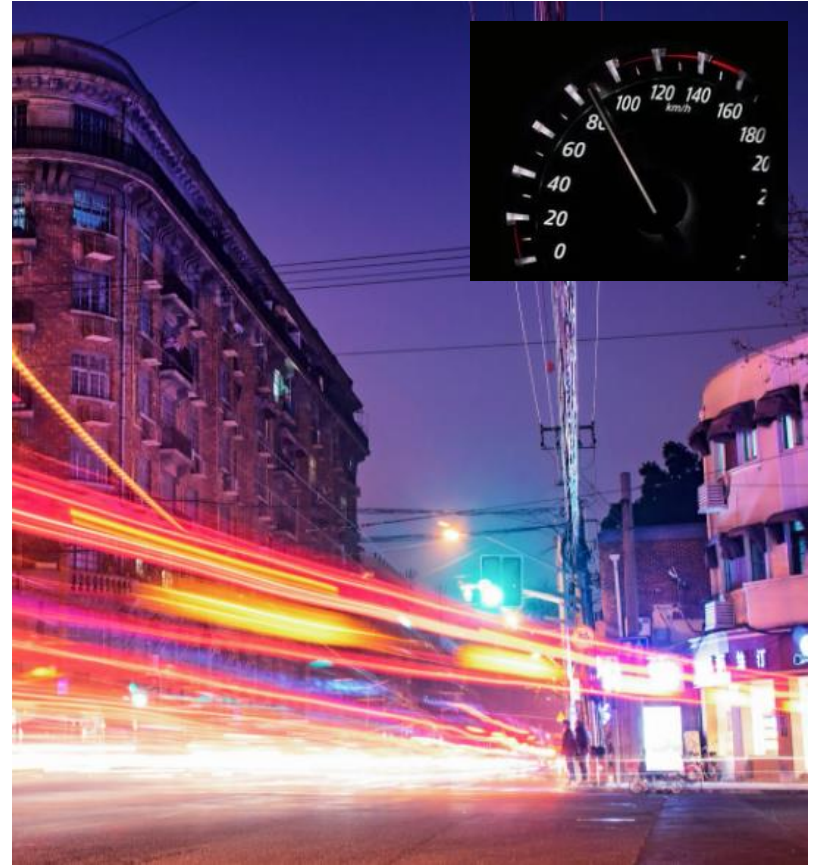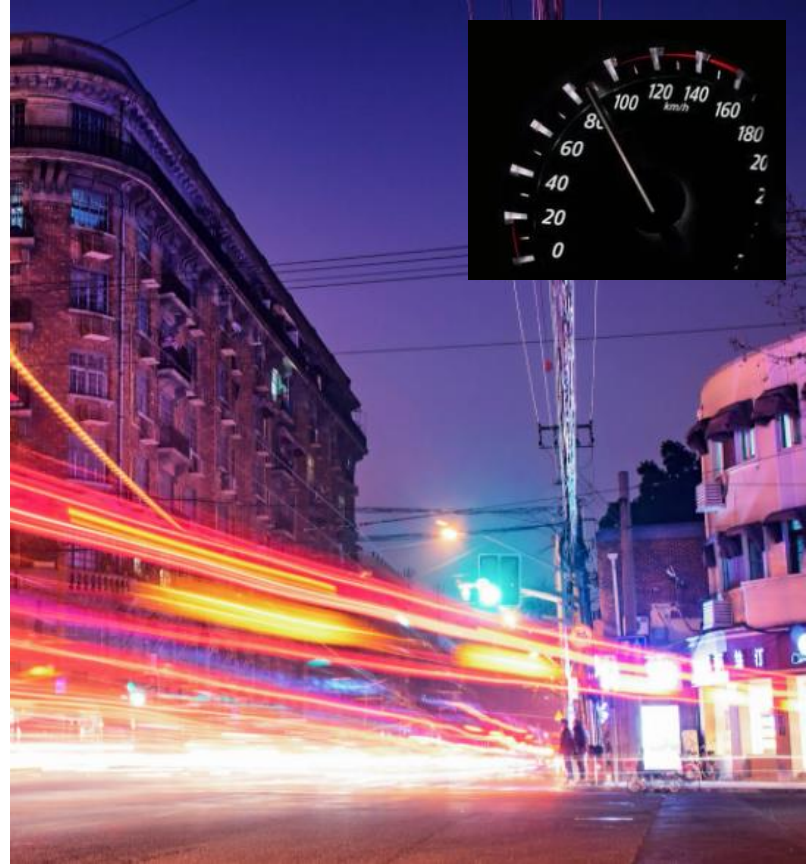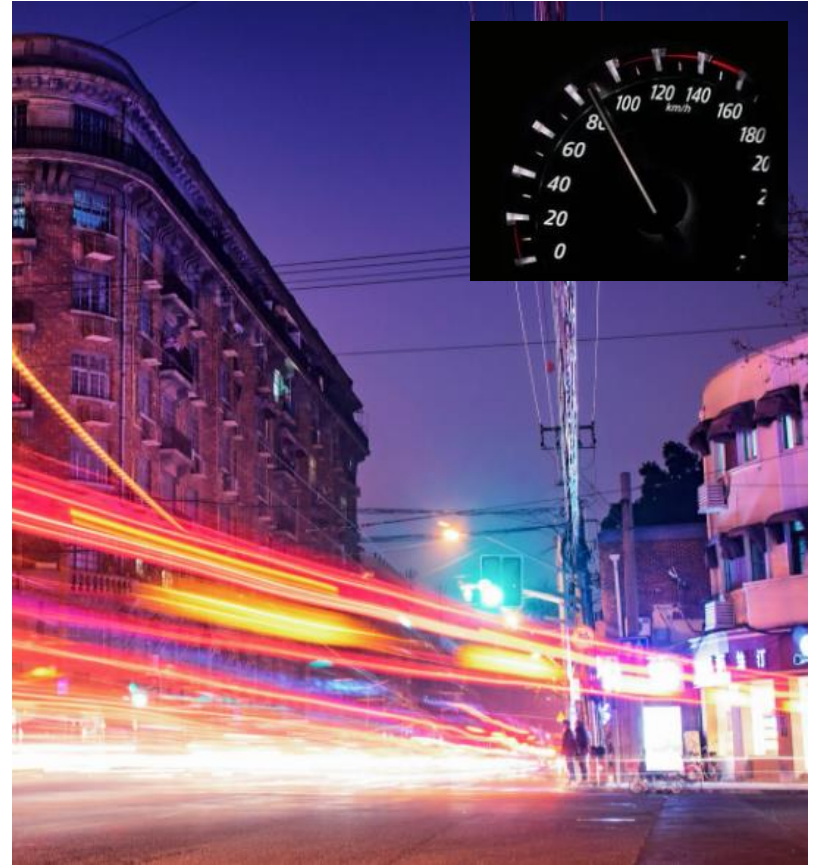
No data loss

No load

Immediate recovery
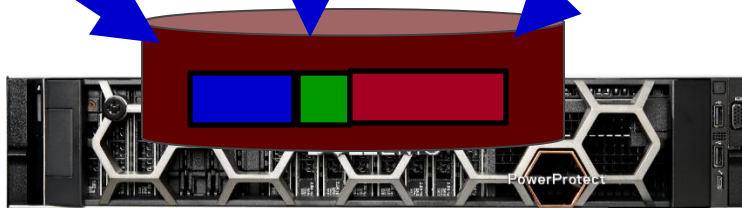
Virtual Machine   Virtual Machine   Virtual Machine

VM   VM   VM
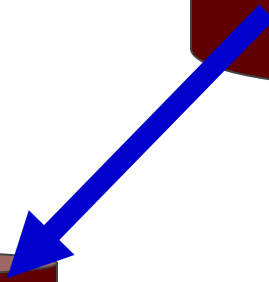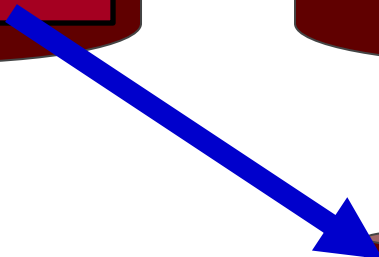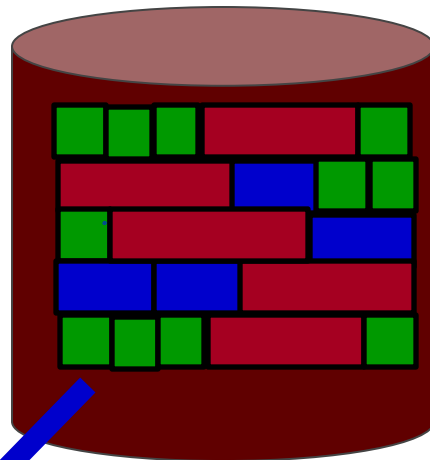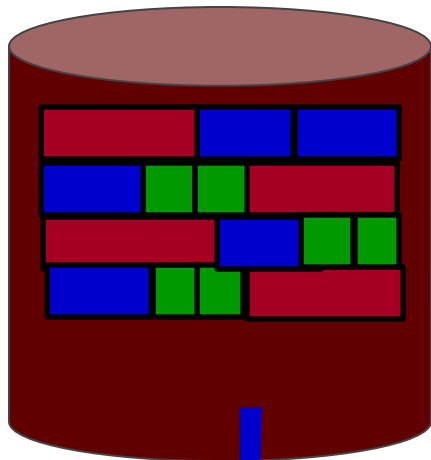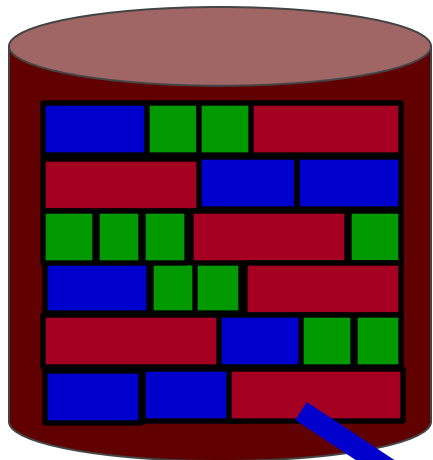
PowerProtect

Virtual Machine

Virtual Machine

Virtual

Small block
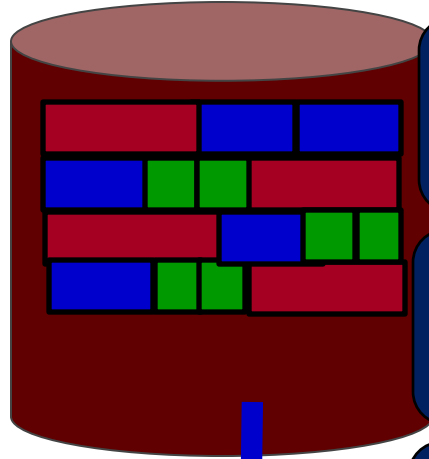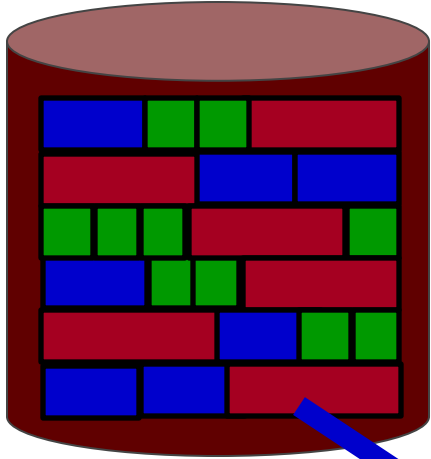
Variable block

Soruce de-duplication

Virtual Synthetic

PowerProtect
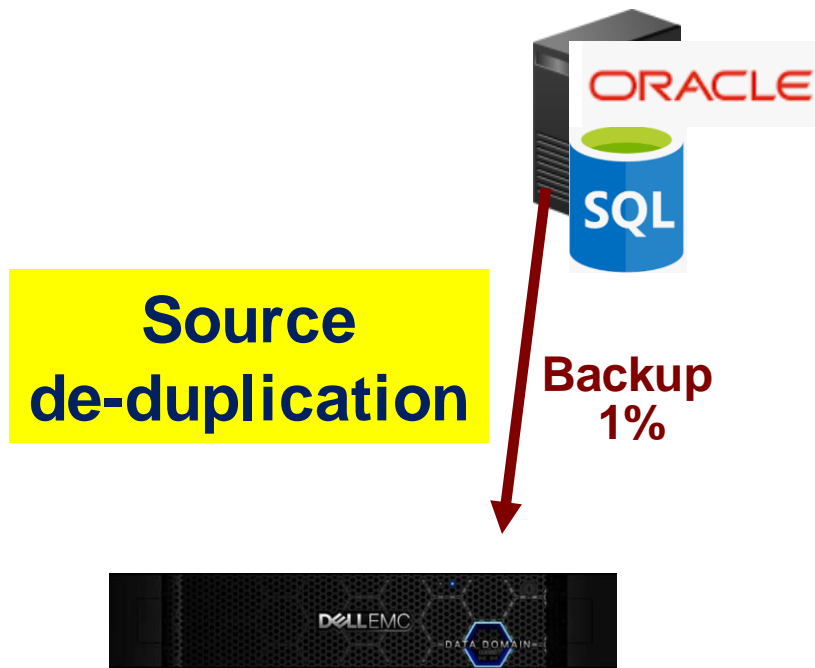
Production results

Backup speed: 5TB/h
from single Oracle server

Speed limited by production storage (1.5GB/s max read)

Implementation by
Jakub Kłoda

Linux Oracle — 14 TB
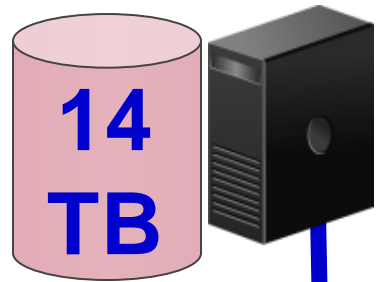
Backup Serwer NetWorker

Data Domain DD6300
with just 7 disk

Policies								
Name	Status	Group	Start Time	Duration	Next Run	Save Set N...	Rate	Size
Rman	✓		12/8/20 8:40:50 PM					
WF_ORA_RMAN	✓	RMAN	12/8/20 8:40:50 PM	02:45:21		disabled		
backup	✓	RMAN	12/8/20 8:40:50 PM			disabled		
RMAN	✓	RMAN					1383 MB/S	14 TB

POC backup results achieved yesterday for MS SQL @ Partners Healthcare

Microsoft for Apps (SQL) – 1st Full,   *14 TB's /Hr*

Environment
- Database on SSD, 128 core system
- DD9800, DDOS 7.0, (4-10GigE ports) across 2-10GigE cards, 32 stripes
- SQL Server 2017

We haven't observed performance like this on a single node SQL Server – Ever!
And this isn't even on our fastest device or DDOS!

Speed, only speed…

Oracle Backup – DD Boost Customer

CKM00171002086 (bckddgbz9801)

68TB/h !

Read (MBs)   Write (MBs)   Read+Write (MBs)

New Results with DD9900 (Sep'2019)

- Same customer (Beta tests)
- Exadata **411TB**, 14-nodes
- Backup performance **90TB/h**
- Restore performance **28TB/h**

DELLEMC | **PowerProtect Data Manager**

- ⌂ Dashboard
- ⅗ Infrastructure
- ⛨ Protection
- ⟳ Restore
- △ Alerts
- ⅗ Administration
- ⅲ Reports
- ⊘ Jobs
  - Protection Jobs
  - System Jobs

Protection Jobs > Job ID: FNS658IT

Job Metrics ⓘ

1 Total Assets   **180.2** KB Data Transferred

00:01:22 Duration hh:mm:ss

Job Details ⓘ

Start Time:	May 5, 2022, 5:00:00 AM	End Time:	May 5, 2022, 5:01:22 AM
Storage Target:	ddve-02.demo.local	Next Scheduled:	May 5, 2022, 8:00:00 PM
Asset Size:	17.2 GB	Data Compressed:	205.2 KB

✖ **0** Failed	⚠ **0** Completed with Exceptions	✔ **1** Success	▶ **0** In Progress

Restart   Export Log   Cancel   🔍 Search   Group by   None ▾

	Details	Ass... ▽	Status ▽	Err... ▽	Ho... ▽	Size
○	🔍	LINUX-01	✔ Success	--		17.2 GB

Action	Duration
✔ Verifying resource availability	00:00:05
✔ Verifying connectivity	00:00:01
✔ Disabling storage vMotion	308 ms
✔ Creating LWD snapshot	00:00:01

1 Item

DELL EMC | PowerProtect Data Manager

Dashboard

Infrastructure

Protection Jobs > Job ID: FNS658IT

Job Metrics ℹ

Job Details ℹ

Action	Duration
✅ Verifying resource availability	00:00:05
✅ Verifying connectivity	00:00:01
✅ Disabling storage vMotion	308 ms
✅ Creating LWD snapshot	00:00:01
✅ Performing LWD sync (delta)	00:00:12
✅ Retiring LWD snapshot	00:00:01
✅ Finalizing backup	258 ms
✅ Enabling storage vMotion	337 ms
✅ Creating copy	00:00:01

2 KB Data Transferred

uration
n:mm:ss

Start Time:	May 5, 2022, 5:00:00 AM	End Time:	May 5, 2022, 5:01:22 AM
Storage Target:	ddve-02.demo.local	Next Scheduled:	May 5, 2022, 8:00:00 PM
Asset Size:	17.2 GB	Data Compressed:	205.2 KB

⚠ 0 Completed with Exceptions   ✅ 1 Success   ▶ 0 In Progress

Cancel   🔍 Search   Group by   None

Status ▽   Err... ▽   Ho... ▽   Size

✅ Success   --   17.2 GB

1 Item

Action	Duration
✅ Verifying resource availability	00:00:05
✅ Verifying connectivity	00:00:01
✅ Disabling storage vMotion	308 ms
✅ Creating LWD snapshot	00:00:01

ESX / Virtual Machines

PowerProtect Data Manager
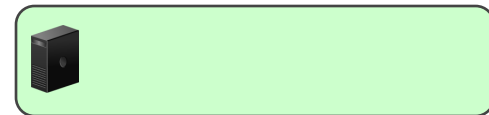
VMDE - VM Direct Engine

Datastore

Datastore
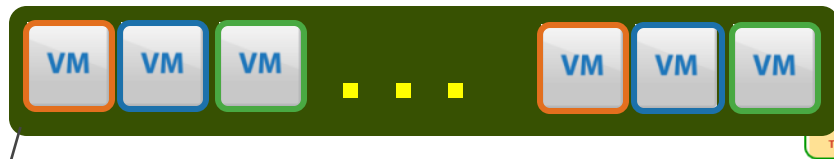
1% data transferred
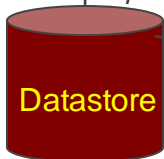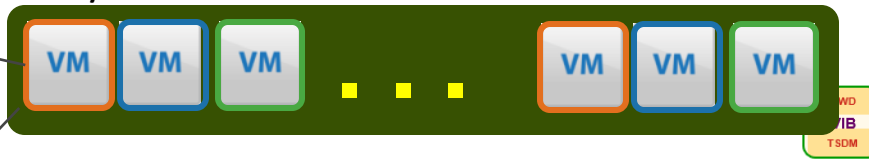
PowerProtect Data Manager is single point of control and management

Full resource usage

Scale? Just backup next VM

Easy! Policy can have 1 or 1000 VMS

Reduce infrastrcuture cost – no proxy

No backup limitations

Speed

Almost zero production latency

Eliminates backup windows

Hardware independent

Performance / easy for any platform

No issues with VMware / snapshots

VADP Performance impact on VM

READ Latency (ms) - (FIO 4 Threads) - VADP

Gen 0

WRITE Latency (ms) - (FIO 4 Threads) - VADP
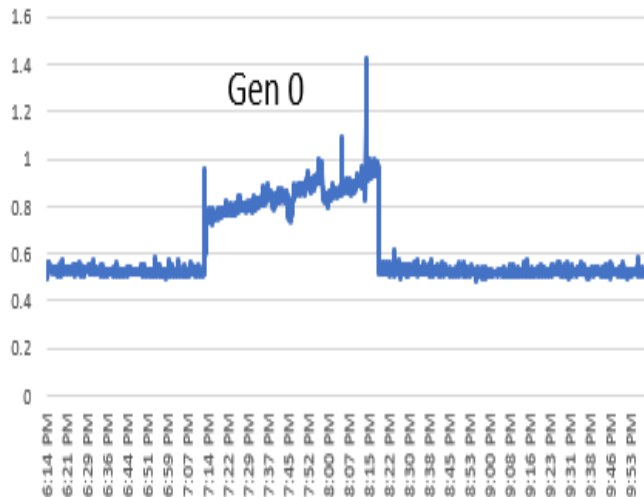
Gen 0

READ Overhead seen (VADP):

Steady state response time (95th percentile) – 0.5 ms

Gen0 state response time (95th percentile) – **0.95 ms**
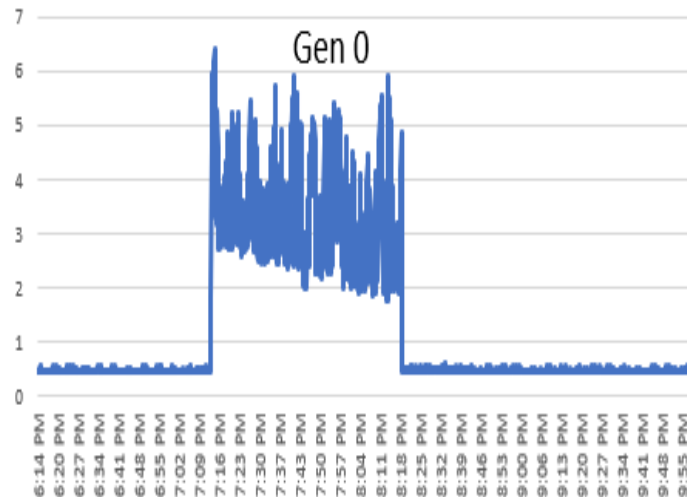
WRITE Overhead seen (VADP) :

Steady state response time (95th percentile) – 0.45 ms

Gen0 state response time (95th percentile) – **5 ms**

DELLTechnologies

Transparent Snapshot – Results

READ Latency (ms) - (FIO 4 Threads) - LWD

GEN 0

LWD Filter attach

WRITE Latency (ms) - (FIO 4 Threads) - LWD

GEN 0

LWD Filter attach
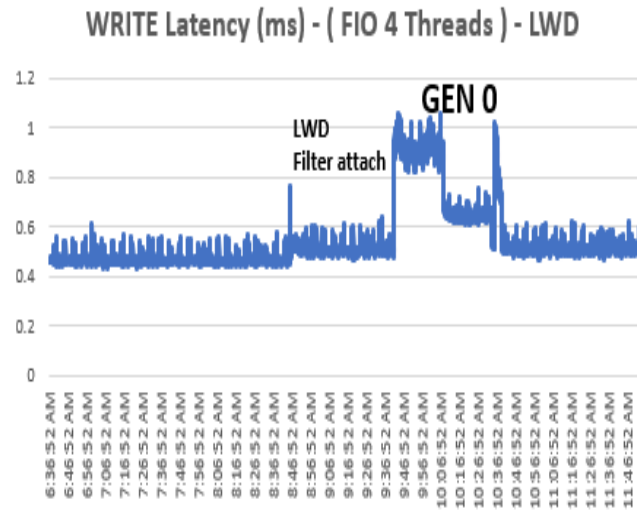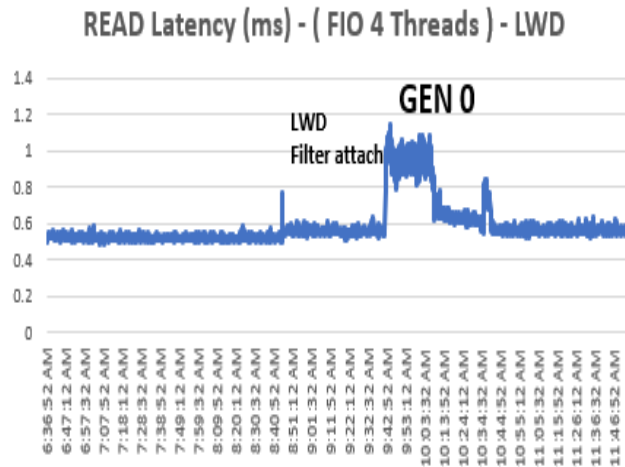
READ Overhead seen (LWD):

Steady state response time (95th percentile) – 0.5 ms

LWD enabled response time (95th percentile) – 0.58 ms

Gen0 state response time (95th percentile) – 1 ms

WRITE Overhead seen (LWD) :

Steady state response time (95th percentile) – 0.45 ms

LWD enabled response time (95th percentile) – 0.54 ms

Gen0 state response time (95th percentile) – 0.97 ms

D&LL Technologies

Actions   Tools   VMware   Navigation   Help

avamar.labd.local Avamar Administrator - Activity (/)

Activity Monitor | Activity Summary | Activity Report | Data Movement Report

Time of Full backups of that large Virtual Machines

Status			Elapsed			Server	Progress Bytes	New Bytes	Client		Domain
☑ Completed			00h:01m:54s			DD - dda.labd.local	300.0 GB	<0.05%	adProduction		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:43s			DD - dda.labd.local	400.0 GB	<0.05%	ProductionOracle		/vc1.labd.local/ProductionVMs
☑ Completed			00h:01m:53s			DD - dda.labd.local	300.0 GB	<0.05%	adProduction		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:48s			DD - dda.labd.local	400.0 GB	0.1%	ProductionOracle		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:13s			DD - dda.labd.local	300.0 GB	<0.05%	adProduction		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:51s			DD - dda.labd.local	400.0 GB	<0.05%	ProductionOracle		/vc1.labd.local/ProductionVMs
☑ Completed			00h:03m:28s			DD - dda.labd.local	450.0 GB	0.2%	IMSSQLProduction1		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:13s			DD - dda.labd.local	300.0 GB	<0.05%	adProduction		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:12s			DD - dda.labd.local	450.0 GB	<0.05%	IMSSQLProduction1		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:47s			DD - dda.labd.local	400.0 GB	<0.05%	ProductionOracle		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:26s			DD - dda.labd.local	450.0 GB	<0.05%	IMSSQLProduction1		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:02s			DD - dda.labd.local	300.0 GB	<0.05%	adProduction		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:51s			DD - dda.labd.local	400.0 GB	<0.05%	ProductionOracle		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:33s			DD - dda.labd.local	450.0 GB	<0.05%	IMSSQLProduction1		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:55s			DD - dda.labd.local	400.0 GB	<0.05%	ProductionOracle		/vc1.labd.local/ProductionVMs
☑ Completed			00h:02m:00s			DD - dda.labd.local	300.0 GB	<0.05%	adProduction		/vc1.labd.local/ProductionVMs

avamar.labd.local Avamar Administrator - Activity (/)

Actions Tools VMware Navigation Help

Activity Monitor | Activity Summary | Activity Report | Data Movement Report

Time of Full backups of that large Virtual Machines

One of many customers:
1200 VMs every 45 minutes
as **FULL** backup

Status	Elapsed			Server	Progress Bytes	New Bytes	Client	Domain
✓ Completed	00h:02m:12s	...	...	DD - dda.labd.local	450.0 GB	<0.05%	IMSSQLProduction1	/vc1.labd.local/ProductionVMs
✓ Completed	00h:02m:47s	...	...	DD - dda.labd.local	400.0 GB	<0.05%	ProductionOracle	/vc1.labd.local/ProductionVMs
✓ Completed	00h:02m:26s	...	...	DD - dda.labd.local	450.0 GB	<0.05%	IMSSQLProduction1	/vc1.labd.local/ProductionVMs
✓ Completed	00h:02m:02s	...	...	DD - dda.labd.local	300.0 GB	<0.05%	adProduction	/vc1.labd.local/ProductionVMs
✓ Completed	00h:02m:51s	...	...	DD - dda.labd.local	400.0 GB	<0.05%	ProductionOracle	/vc1.labd.local/ProductionVMs
✓ Completed	00h:02m:33s	...	...	DD - dda.labd.local	450.0 GB	<0.05%	IMSSQLProduction1	/vc1.labd.local/ProductionVMs
✓ Completed	00h:02m:55s	...	...	DD - dda.labd.local	400.0 GB	<0.05%	ProductionOracle	/vc1.labd.local/ProductionVMs
✓ Completed	00h:02m:00s	...	...	DD - dda.labd.local	300.0 GB	<0.05%	adProduction	/vc1.labd.local/ProductionVMs

Restore speed

Starting Virtual environment without recovery! SSD disks speed!

Starting Virtual environment without recovery! SSD disks speed!

PEAK 100% READ - IA ONLY : (Block Size = 8KB | IO Depth = 32)												
	DD9900			DD9400			DD9800			DD6900		
VMs	Total IOPS	Throughput (MB/s)	Total Latency (msec)	Total IOPS	Throughput (MB/s)	Total Latency (msec)	Total IOPS	Throughput (MB/s)	Total Latency (msec)	Total IOPS	Throughput (MB/s)	Total Latency (msec)
1	16856.00	138.09	1.80	18115.00	148.41	1.70	9722.00	79.65	3.20	15309.00	125.42	2.01
4	51330.00	420.50	2.50	43554.00	356.80	2.80	31830.00	260.76	3.90	30885.00	253.02	4.50
8	47891.00	392.33	5.30	45111.00	369.56	5.60	31396.00	257.20	8.10	34412.00	281.90	7.40
12	66736.00	546.72	5.55	67322.00	551.51	5.60	48232.50	395.13	7.70	50596.00	414.49	8.20
16	85581.00	701.10	5.80	89533.00	733.46	5.60	65069.00	533.06	7.30	46069.50	377.43	11.65
20	88155.50	722.19	7.10	91526.00	749.78	6.85	63484.00	520.08	10.20	41543.00	340.36	15.09
24	90730.00	743.28	8.40	93519.00	766.10	8.10	61899.00	507.09	13.10			
32	86833.00	711.38	11.40	89372.00	732.18	11.01	59265.00	485.55	16.30			
48	90394.00	740.57	16.50				61371.00	502.82	24.80			
64	87862.00	719.85	22.70									

For about 12h customer has run from Data Domain the whole VM environment after disk array crash

											900	
VMs	Total IOPS										ughput s)	Total Latency (msec)
1	1685										125.42	2.01
4	5133										253.02	4.50
8	47891										281.90	7.40
12	66736.00	546.72	5.55	67322.00	551.51	5.60	48232.50	395.13	7.70	50596.00	414.49	8.20
16	85581.00	701.10	5.80	89533.00	733.46	5.60	65069.00	533.06	7.30	46069.50	377.43	11.65
20	88155.50	722.19	7.10	91526.00	749.78	6.85	63484.00	520.08	10.20	41543.00	340.36	15.09
24	90730.00	743.28	8.40	93519.00	766.10	8.10	61899.00	507.09	13.10			
32	86833.00	711.38	11.40	89372.00	732.18	11.01	59265.00	485.55	16.30			
48	90394.00	740.57	16.50				61371.00	502.82	24.80			
64	87862.00	719.85	22.70									

PEAK 100%

Immediate Disaster Recovery!

Site A

Site B

Site A fails
How quickly can we starts VMs (critical VMs especially) in Site B?

Backup Restore

Backup Restore

Data Domain

Data Domain

Disaster Recovery
Transfer 1%
Recovery 100% of data
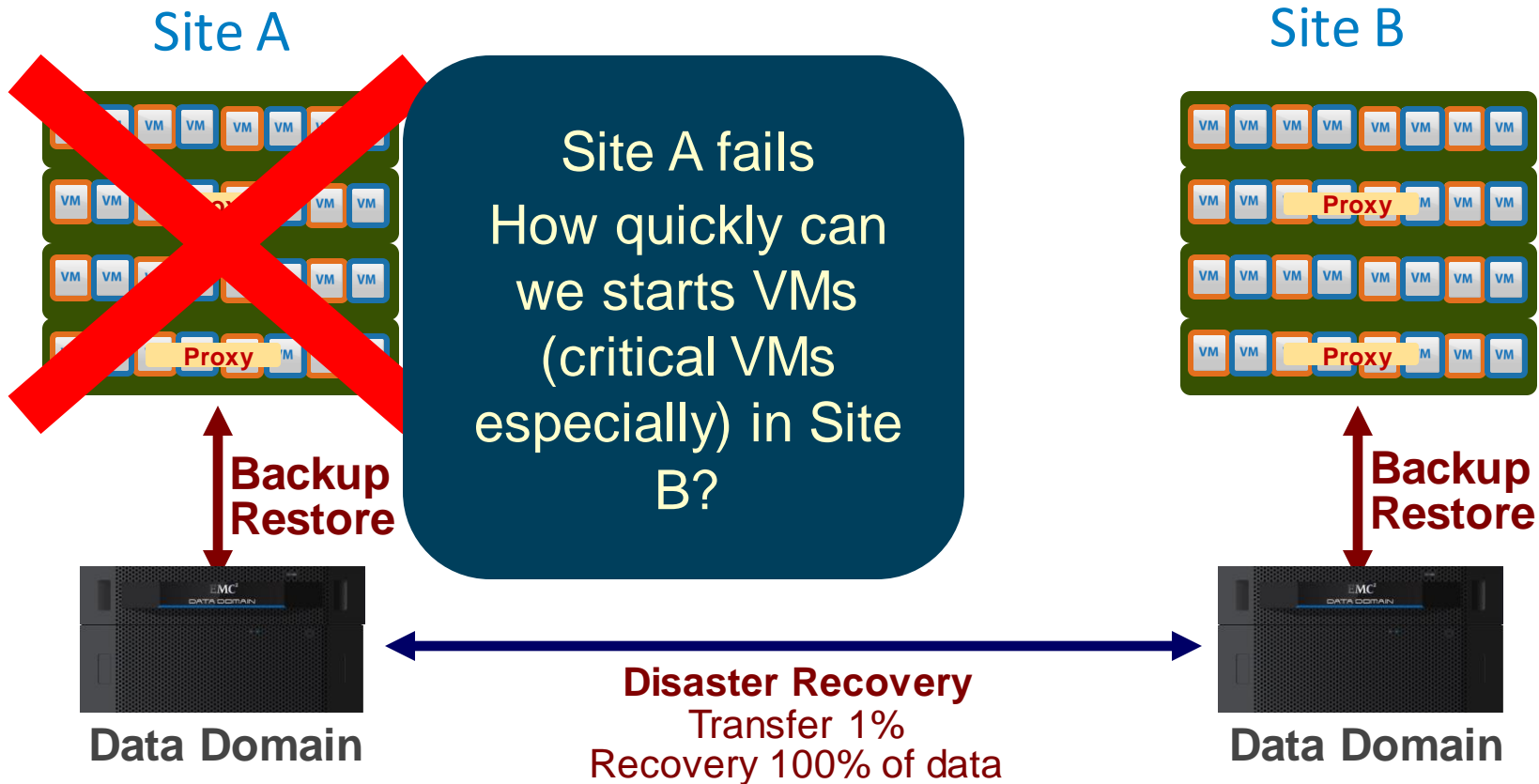
Simple

Self managed backup solution

PowerProtect / Architecture

Site A

Linux, UNIX, Windows,

Applications, Databases, Mail

LAN

Backup Server

VM

VM

DBs

Mails

SAN

Data Domain
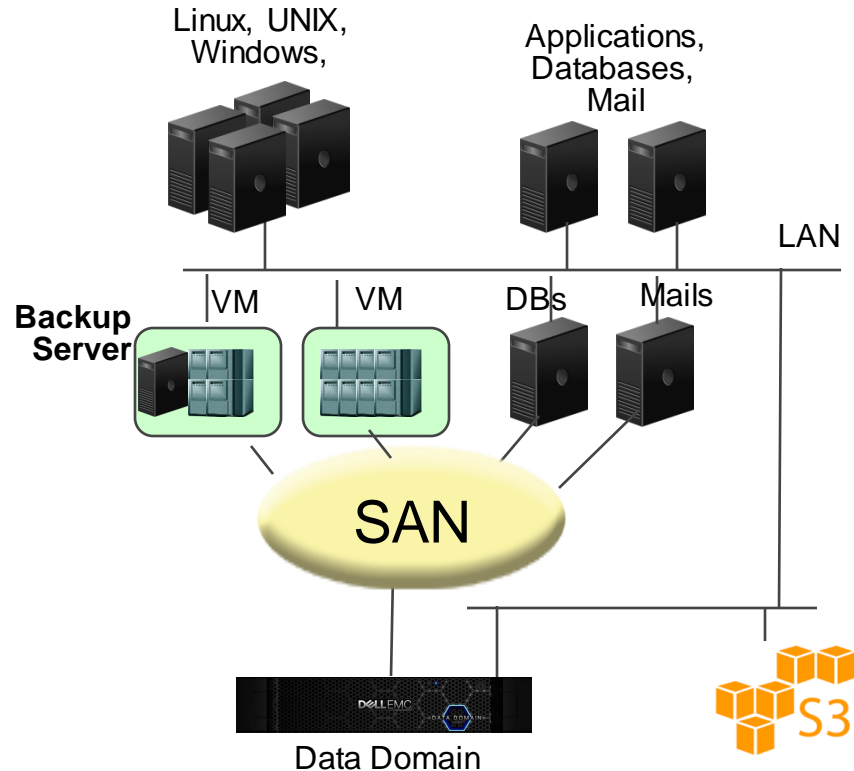
S3

Self-backup infrastructure
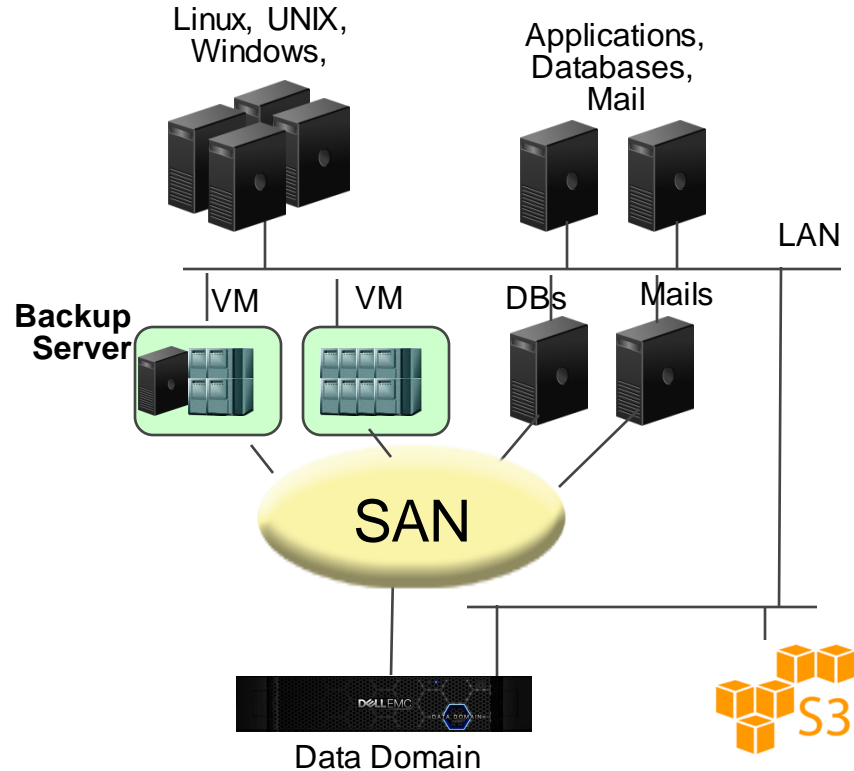
Simple solution

- Self-backup infrastructure
  - Easy
  - Guaranteed SLA – all VMs are backed-up

- Eliminating mechanical/manual elements (tapes)

- Simple interface
  - Complicated policies as simple process with several clicks

PowerProtect / Architecture

Site A

Linux, UNIX, Windows,

Applications, Databases, Mail

LAN

Backup Server

VM   VM   DBs   Mails

SAN

DELLEMC

Data Domain

S3

Self-backup infrastructure

Centralized or Application based

SLA

Focus on business

PowerProtect / Architecture

SLA

Site A

Linux, UNIX, Windows,

Applications, Databases, Mail

LAN

VM   VM   DBs   Mails

Backup Server

SAN

DELLEMC DATA DOMAIN

S3

Data Domain

(Cyber)szkolenia dla podmiotów krajowego systemu cyberbezpieczeństwa

Czego możemy oczekiwać od systemu backupu?

Warszawa 11.10.2022

Kancelaria Prezesa
Rady Ministrów

DELLTechnologies

(CYBER)SZKOLENIA
KRAJOWY SYSTEM
CYBERBEZPIECZEŃSTWA

PWCyber