Automating
MongoDB
Deployments on
Mainframes
Plus
SNA

Special Thanks Too:

- Elton de Souza -IBM
- Neale Ferguson – SNA
- The IBM Garage Team
- The IBM Redbook Team
- The z/VM Lab
- MongoDB w/Aaron Balaster
- [Sine Nomine Associates](#) (SNA) [Direct Systems Support](#) (DSS)

The Challenge from IBM to SNA

- Using the tools currently available, can MongoDB be deployed in an automated fashion to IBM's LinuxONE mainframes in 30 days?

- Can the instances be deployed in a geographically dispersed fashion?

- Does this solution help with 2025 decarbonization mandates?

- How does this solution help control and manage server sprawl?

- And at the same time, can the data be backed up in a fashion that protects it from corruption along with ransomware attacks (in order to meet Appendix J banking requirements)?

MongoDB World 2022 – Week of 6/6/2022

Building a Sustainable Enterprise with MongoDB-as-a-Service on IBM LinuxONE

- Pressure from consumers and regulatory bodies has enterprises laser-focused on achieving sustainability goals and standards. At this session, learn about how IBM LinuxONE hosting MongoDB has helped a large bank in the U.S. drive its sustainability, security, and hybrid cloud roadmap. At this bank, the IBM LinuxONE platform has produced several firsts: the highest density per core (at a ratio of 33:1) the bank has ever seen, 2-3x higher throughput per core for MongoDB, and compliance with Appendix J standards. You'll also learn more about how the IBM LinuxONE solution enabled the bank to reduce its server footprint and energy consumption by almost 80%!

MongoDB World is this week and looking forward to Aaron Balaster's topic on Ultra-High Resilience with MongoDB - Building for the Most Critical Workloads (https://lnkd.in/exNeWrRq)

- Join me for the Customer innovation feature by myself which will be aired onstage during keynote as well as a panel between <Citi, IBM and MongoDB> on the topic of building a secure and sustainable enterprise.
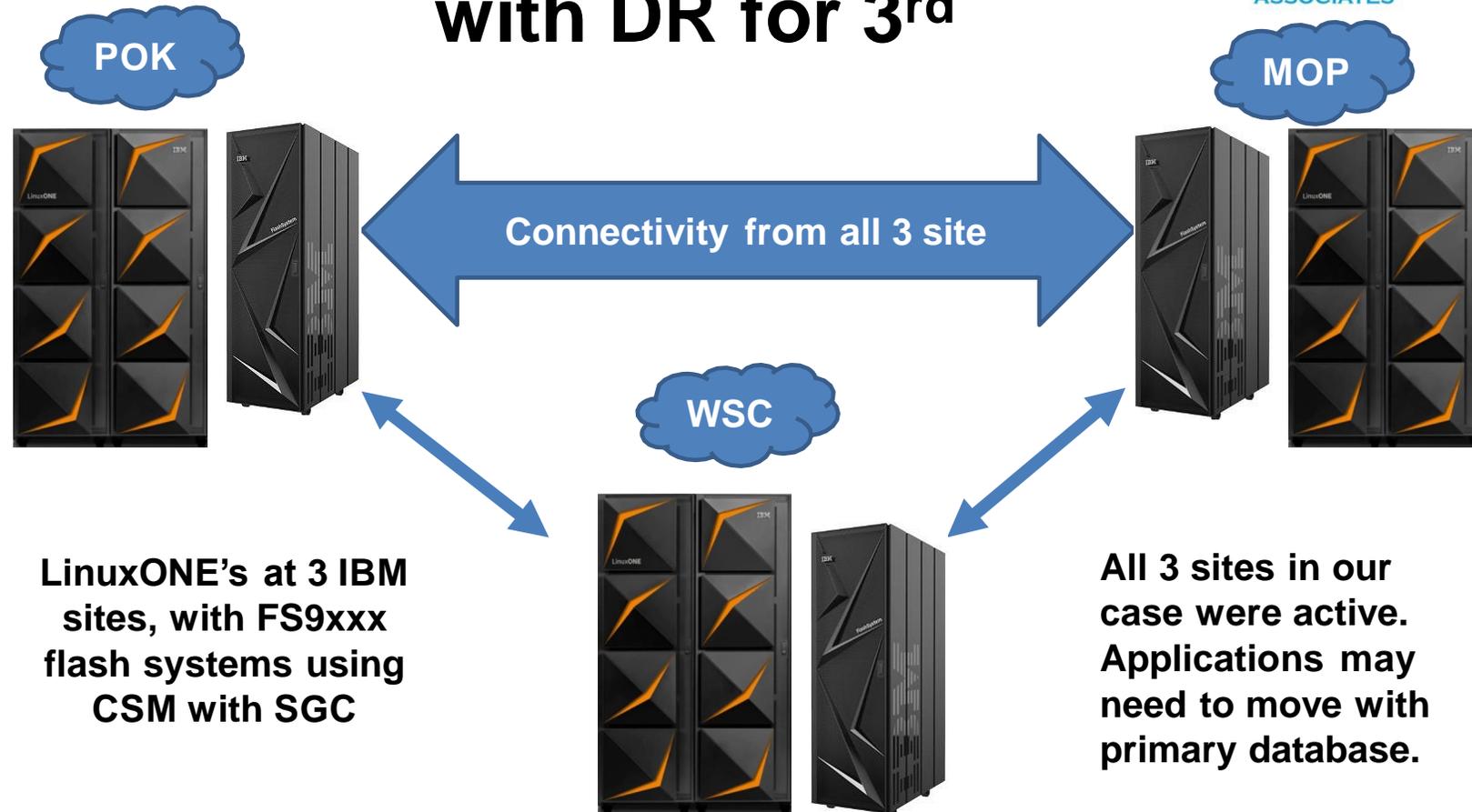
The Environment
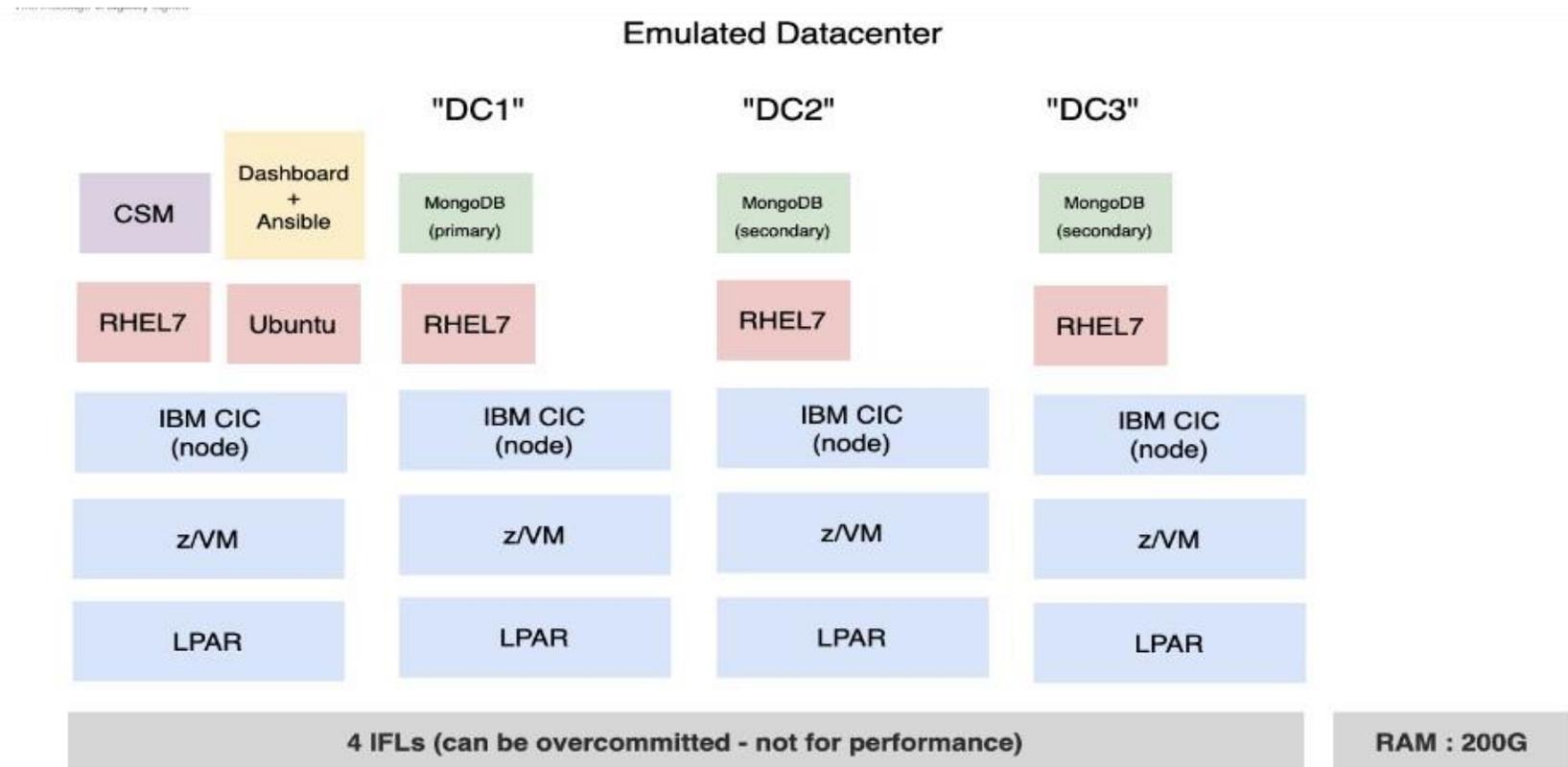
Emulated Datacenter

Geographically Dispersed Deployments

Consider 2 active systems with DR for 3rd

POK

MOP

Connectivity from all 3 site

WSC

LinuxONE's at 3 IBM sites, with FS9xxx flash systems using CSM with SGC

All 3 sites in our case were active. Applications may need to move with primary database.

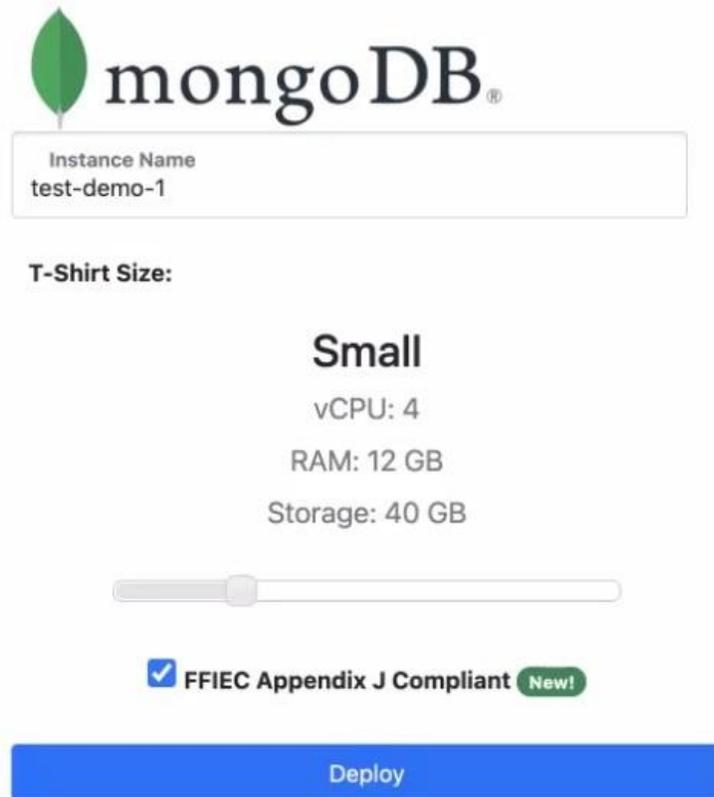# Incredible application availability with z/VM's Single System Image (SSI)
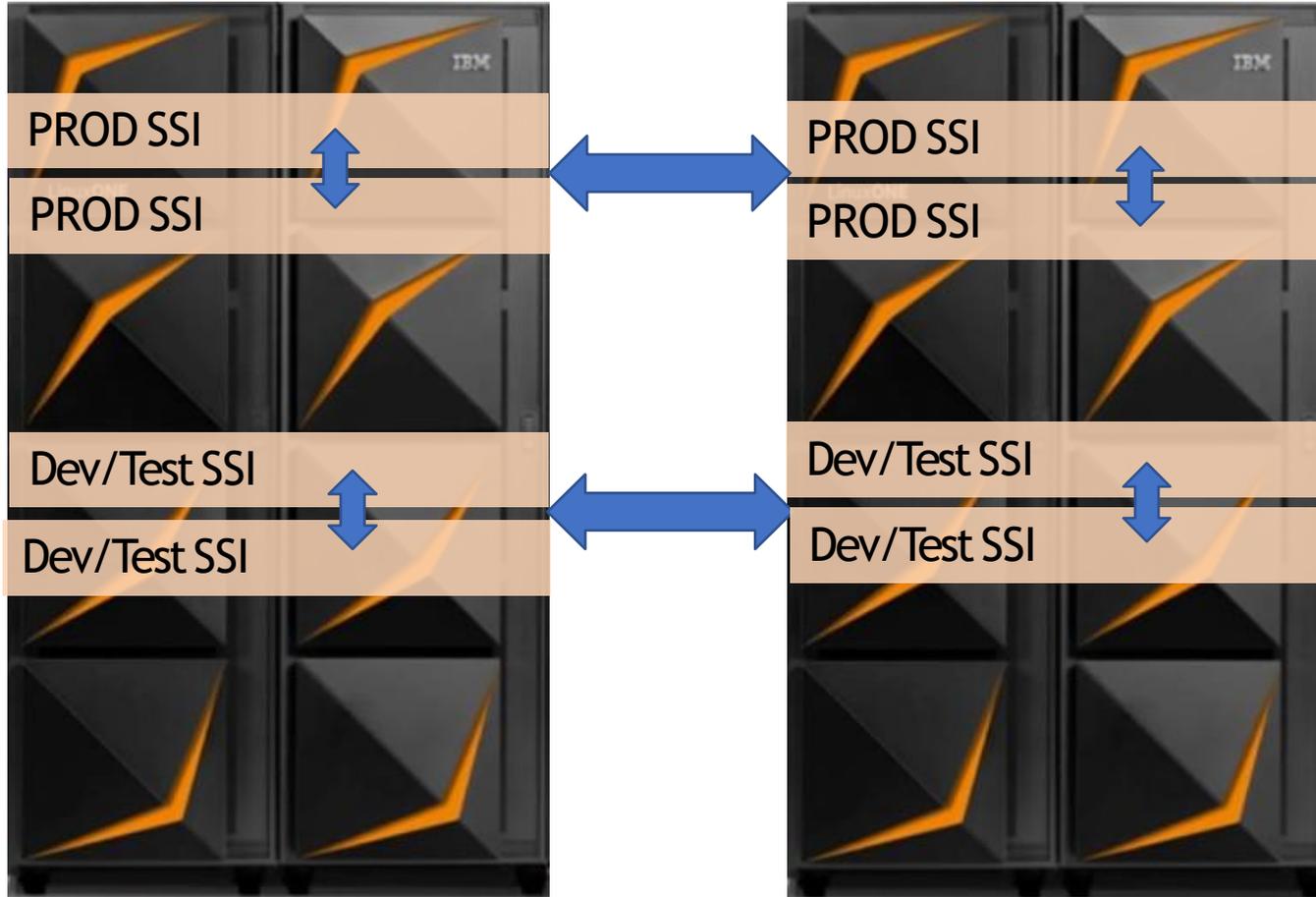
- SSI clusters can be created on a single box using LPAR's.
- When 2 systems are used, failover capacity on each CEC creates extreme HA, with no downtime for system upgrades.
- Application clustering within an SSI creates extreme availability.
- Up to 8 z/VM systems available with z/VM 730.
- SSI enables Live Guest Relocation between systems.
- z/VM must be on traditional DASD.
- Works on both traditional zSystems and LinuxONE machines.

Find your own high-level cost savings:
https://www.ibm.com/it-infrastructure/resources/tools/linuxone-tco-calculator/

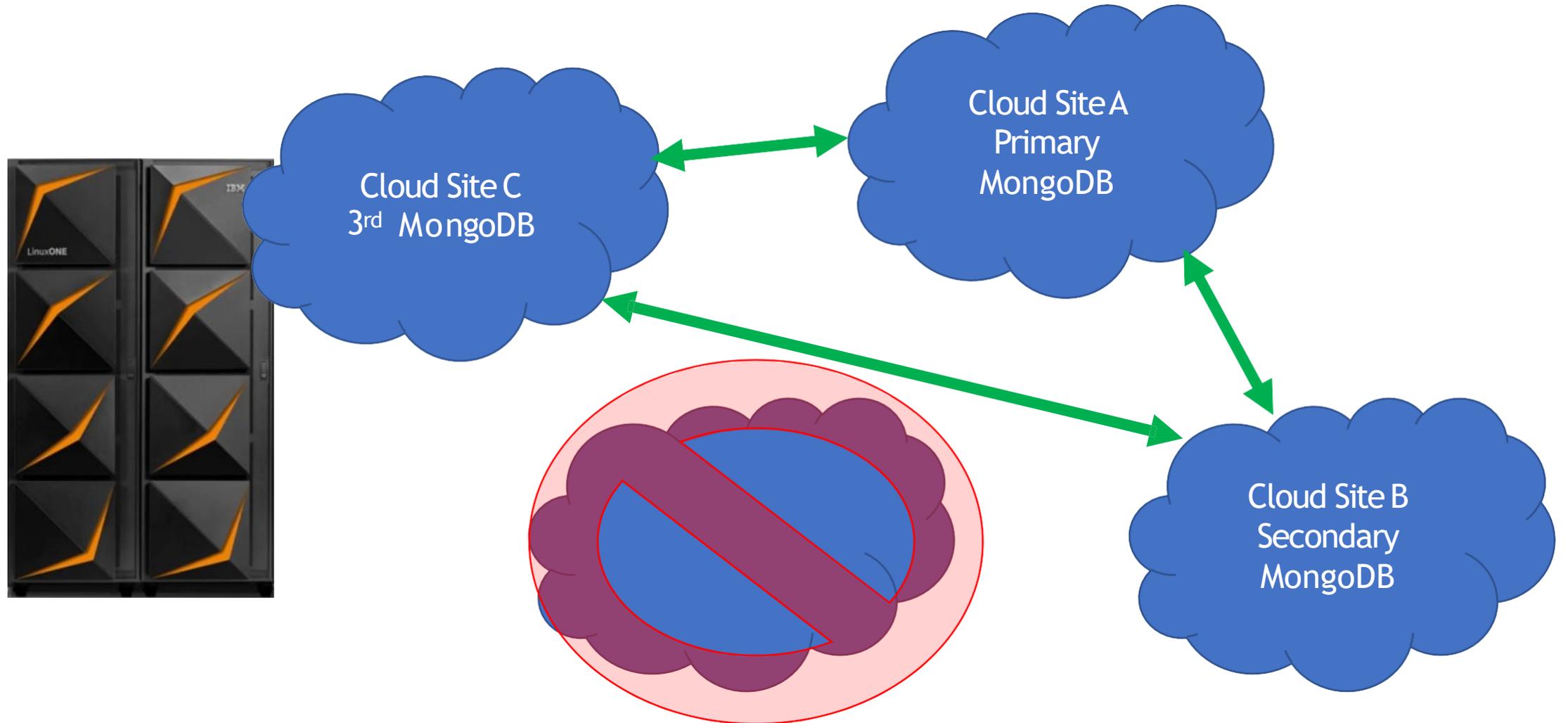# The work

IBM Cloud InfrastructureCenter

IBM Redbook: Leveraging LinuxONE to Maximize Your Data Serving Capabilities

Migrate existing deployments to IBM z Systems
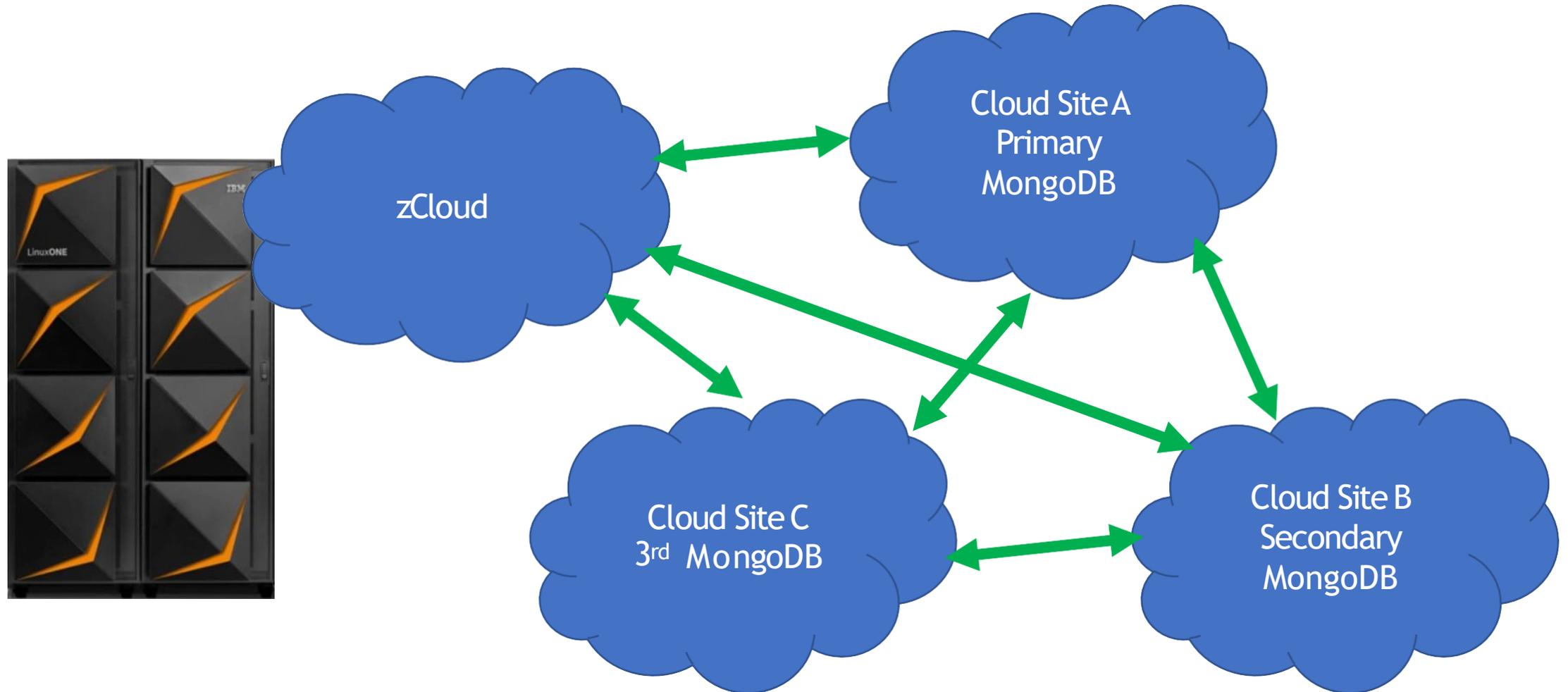
Migrate existing deployments to IBM z Systems
Let MongoDB do the migration for you!

Migrate existing deployments to IBM z Systems
Move backup servers to the same or different systems, in and out of geo's as required.
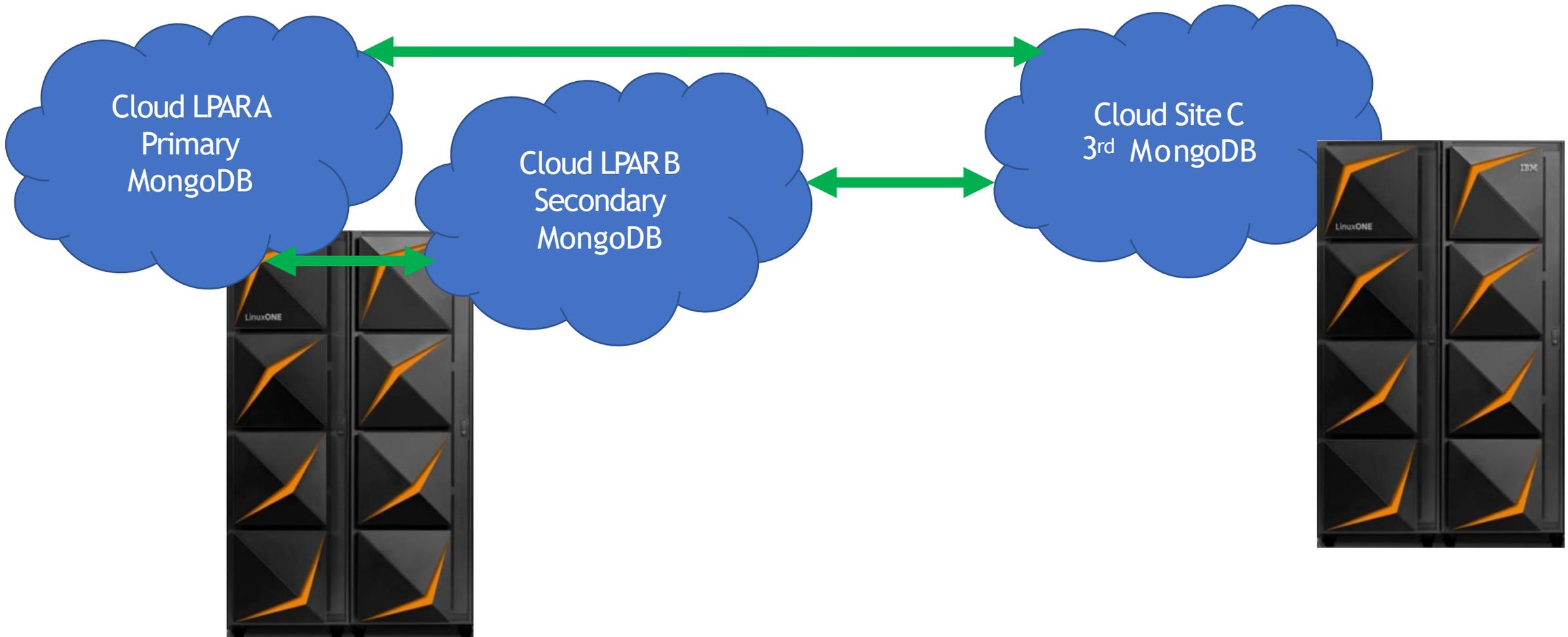
Attack and Recovery

A simulated attack

Social Engineering/Phishing

- Knowledge of username/password/keys

- Encrypt/Corrupt fields in the database at the application layer

- From app/DB layer so filesystem encryption isn't useful

Platform/Infrastructure

- Access to OS/filesystem

- Encrypt/corrupt the data at the filesystem layer

- From filesystem layer, so even encrypted volumes can get re-encrypted.

Recovery

Using Safeguarded Copy

- Access and identify a non-corrupt copy

- Create a new Mongo Instance (or use offline shadow copies of original t-shirt sizes)

- Connect restored volume to new instance

The case for cyber resiliency

As the prevalence, cost, and impact of cyberthreats continues to grow, today's businesses must recognize these risks and fortify against them

Prevalence	Cost	Impact
The occurrence of cyberthreats is growing at an alarming rate	The cost of cyberthreats and associated downtime is immense	Cyberthreats come in many different shapes and sizes

Prevalence

1 in 4
Odds of experiencing a data breach in the next two years[1]

The threat is growing fast
Ransomware attacks are **up 67% year-over-year**, while operational technology attacks have surged **2,000%**[2]

External actors aren't the only threat. Misconfigured servers accounted for **86% of compromised records in 2019**[2]

Cost

The costs are high ...
The average cost of a **data breach is $3.86 million,** while the average cost of a mega data breach is **$350 million**[3]

86% of businesses say that one hour of downtime costs them $300,000 or more[4]

... and only getting higher
78% of organizations say cybersecurity costs have increased in the past 2 years, and **85%** expect those costs to increase in the next 2-3 years[3]

Impact

Service disruption
Outages due to cyber attacks were up **15% from in 2018**[5]

Reputation loss
37% of organizations report brand reputation loss due to a cyber attack, and one in four of those organizations reported lost customers[5]

(1) IBM Institute for Business Value
(2) ITIC
(3) The Trust Factor: Cybersecurity's Role in Sustaining Business Momentum
(4) Consumer Intelligence Series: Protect.me

Safe Guarded Copy

Re-Deploy Net New Linux Virtual Machines Or:

Mechanism	Pros	Cons
Reuse virtual machines	• Single set of virtual machines • No networking changes required	• If virtual machine has been compromised or corrupted then recovery may not be possible or advisable
Shadowing	• Operating system and non-mongo data is pristine	• Networking addresses or names need changing to match what the mongo data expects

Data Center Sustainability

- **Modular and scalable:** available in one to four 19" frames depending on capacity needs

- **Flexible footprint:** A z15 single frame systems requires **75% less floor space** than compared x86 2U servers running the same workloads and throughput[1]

- **Energy management:** a rich set of capabilities for monitoring and managing the system's power consumption. The IBM Z Energy Optimization Advisor provides insights and recommendations to reduce the overall system power

- **50% less energy consumption compared to x86[2]**

- System redesign reduces energy consumption versus the equivalent x86 configuration for similar workload

- Replacing 10,000 compared x86 servers with IBM z15 T01 systems running the same workloads with the same throughputs could **save an estimated 15.7 million-kilowatt hours** and **emit 11,000 fewer metric tons of CO_2 each year[3]**

- Combining all z13 and z14 customers who have already upgraded to z15T01, they will **save an estimated 62 million-kilowatt hours** and **emit 43,904 fewer metric tons of CO_2 each year** – the equivalent of removing over 9,500 passenger cars from the road annually[4]

- **IBM 's z16 drives even more, for less!**

Physical schematic - IBM LinuxONE versus X86

Using LinuxONE versus X86 could save 72.5% per year on electrical costs

Using LinuxONE versus X86 could save 55.6% per year on space (sqft)

LinuxONE - Four Racks
104 sqft / 40.5 kwatts

Primary Site

X86 - Nine Racks
234 sqft / 148 kwatts

LinuxONE - Four Racks
104 sqft / 40.5 kwatts

Disaster Recovery Site

X86 - Nine Racks
234 sqft / 148 kwatts

This information came from a consolidation effort for a telco company.
Work with IBM's IT Economics team to create a study using your real cost so true savings can be tracked.

Power/Cooling/Space impact Analysis

Using LinuxONE versus X86 could save 72.5% per year on electrical costs

Using LinuxONE versus X86 could save 55.6% per year on space (sqft)

kWhr per year

LinuxONE 72.5% lower than X86

Legend: ■ LinuxONE(kWhr) ■ x86(kWhr)
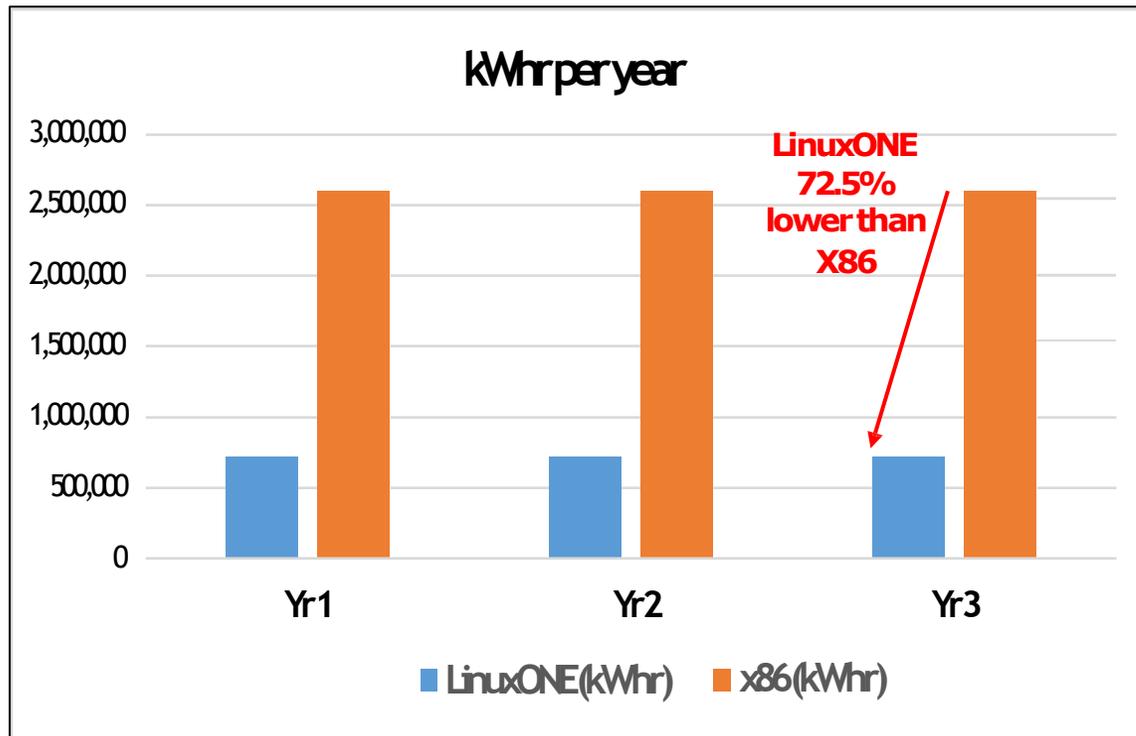
LinuxONE LT2	Yr 1	Yr 2	Yr 3	LinuxONE % Savings
LinuxONE Servers	8	8	8	
LinuxONE Space (sq ft)	208	208	208	**55.56%**
LinuxONE (kwatts)	81	81	81	
LinuxONE (kWhr)	713,905	713,905	713,905	**72.50%**
x86 2U Rackmount	**Yr 1**	**Yr 2**	**Yr 3**	
x86 Servers	210	210	210	
x86 Space (sq ft)	468	468	468	
x86 (kwatts)	296	296	296	
x86 (kWhr)	2,595,952	2,595,952	2,595,952	

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Cost Avoidance from increased uptime

LinuxONE cost avoidance of **$ 11.4 Million** over 3 years from increased uptime

- LinuxONE provides 99.999% availability versus X86 which provides 99.9% availability

  Going from 99.9% to 99.999% uptime **eliminates 526 minutes** a year of unplanned downtime

  At $ 7,300 * per minute of unplanned downtime, this equates to **$ 3,798,511 of avoided cost**

  Over 3 years this represents a total potential **cost avoidance of $ 11,395,533**

Platform	Availability	Downtime (minutes)	Cost of Downtime	Annual Savings
X86	99.900%	525.6	$3,836,880	
LinuxONE	99.999%	5.3	$38,369	**$3,798,511**

*Ponemon institute https://www.ponemon.org/

Annual Cost of Downtime
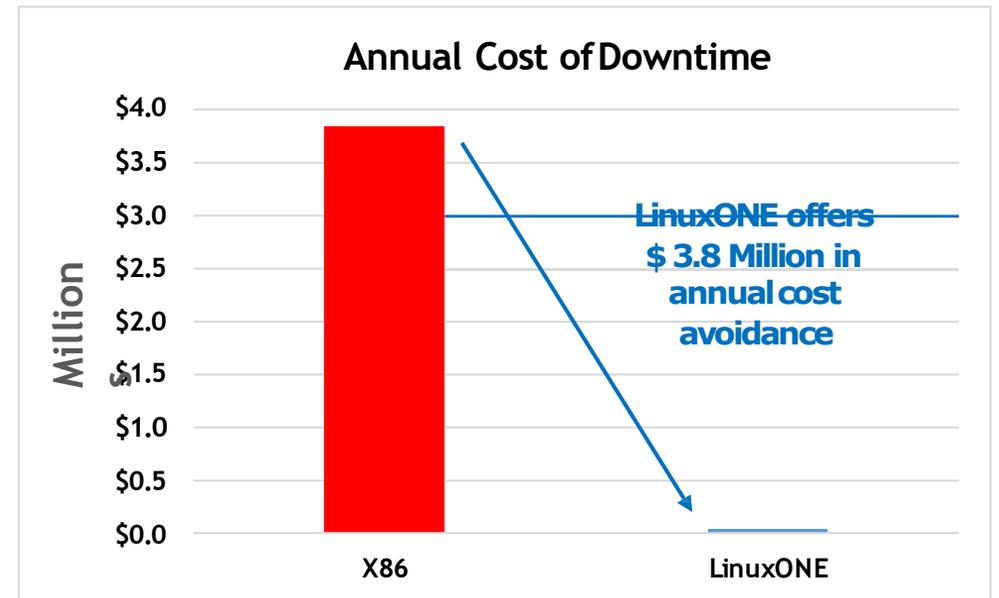


LinuxONE offers **$ 3.8 Million in annual cost avoidance**

**This information came from a consolidation effort for a telco company.
Work with IBM's IT Economics team to create a study using your real cost so true savings can be tracked.**

Tools for Instant Clouds on IBM z Systems

Manage any platform with IBM Cloud Infrastructure Center

Manage IBM's z/VM and Linux on z with integrated performance using Log-On WAVE

Manage IBM's z/VM and Linux, z/VSE, z/OS, Oracle and MongoDB with integrated performance using:
Velocity Software's zPRO Suite

IBM Timeline: Linux on Z, LinuxONE, and Red Hat OpenShift

20 Years of Linux on Z

5 Years of LinuxONE

1 Year of Red Hat OpenShift for IBM Z and LinuxONE

SNA is formed, helps bring Linux to IBM z Systems along with OpenAFS

SNA helps bring OpenShift technology to IBM z and zCX

SNA helps Marriott win innovator of the year at MongoDB world in 2019 and automates deployments in 2021

In the 2000's, SNA brings NJE/IP, CMS SSH, SCP and sFTP to z/VM

SNA wrote the locking code to enable Postgresql on IBM z Systems

SNA works with IBM and Microsoft bringing .NET v6 to IBM z System

Timeline (years)

1999 · 2000 · 2001 · 2002 · 2003 · 2004 · 2005 · 2006 · 2007 · 2008 · 2009 · 2010 · 2011 · 2012 · 2013 · 2014 · **2015** · 2016 · 2017 · 2018 · **2019** · 2020 · 2021

Above timeline events

- Late night port of Linux to S/390® at Boeblingen
- IBM publishes collection of patches and additions to enable Linux® for System/390®
- Red Hat® to deliver Linux Solutions for IBM's S/390 Mainframe Computer
- Linux 3 becomes available
- ... now runs on IBM ... z Series® client now runs more than 290 cores
- IBM Big Green Consolidation of 3900 x86 servers to 30 Linux on Z
- ... Server, based on IBM Z®
- IBM celebrates 100 years of innovation – including support for Linux
- The Ideas that Shaped a Century
- 1,000 ISV applications available for Linux on Z
- IBM Unveils LinuxONE
- Open Mainframe Project launched by ...
- MongoDB announces support for IBM z Systems®
- IBM and Red Hat join forces to advance hybrid cloud
- IBM and Red Hat commit to bring OpenShift® to Z & LinuxONE
- ... launches new ... z™ and LinuxONE III servers
- IBM Blockchain for Linux on Z and LinuxONE
- IBM Cloud™ Hyper Protect Services launched, built on LinuxONE
- IBM Hyper Protect Accelerator startup program launched

Below timeline events

- IBM Unveils Linux Software and Services for S/390 Server
- Major ISVs available for Linux on Z including SAP and Oracle 9i
- Linux on Z is used for mission-critical applications by clients
- IBM announces plan to invest $1B in developing and marketing Linux
- SUSE Linux S/390 Released
- IBM Z: An Open Platform
- 1,000 ISV applications available for Linux on Z
- Security and performance improvements with ...
- 400 IBM software products now available for ...
- IBM Systems™ Magazine special edition about Linux on Z
- KVM available for Linux on Z
- OpenStack available for Linux on Z
- Ubuntu 16.04 LTS for IBM LinuxONE and IBM z Systems is now available
- IBM Cloud Private brings containers and Kubernetes to Linux on Z and LinuxONE
- Red Hat OpenShift available on Linux on Z and on LinuxONE
- Red Hat Runtimes and IBM Cloud Pak for Applications 4.2 available on Linux on Z and LinuxONE
- Biggest Linux on Z client now runs more than 3,000 cores
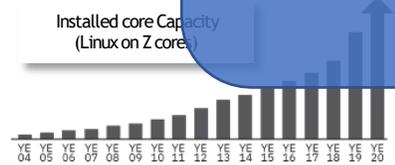- IBM advances IBM Cloud for Financial Services

Bottom chart

Installed core Capacity (Linux on Z cores)

YE 04, YE 05, YE 06, YE 07, YE 08, YE 09, YE 10, YE 11, YE 12, YE 13, YE 14, YE 15, YE 16, YE 17, YE 18, YE 19, YE 20

52% of IBM Z enterprises have Linux

20 Years of Linux on Z
5 Years of LinuxONE
1 Year of Red Hat OpenShift for IBM Z and LinuxONE

IBM

- IBM Launches LinuxONE

IBM and Red Hat join forces to advance hybrid cloud

- IBM Big Green Consolidation of 3900 x86 servers to 30 Linux on Z

IBM celebrates 100 years of innovation – including support for Linux

- IBM and Red Hat commit to bring OpenShift® to Z & LinuxONE

- Biggest Linux on IBM eServer® zSeries® client now runs more than 290 cores

- IBM Enterprise Linux Server, based on IBM Z®

- Open Mainframe Project launched by Linux Foundation

- IBM launches new IBM z15™ and LinuxONE III servers

- Late night port of Linux to S/390® at Boeblingen
- IBM publishes collection of patches and additions to enable Linux® for System/390®

- Red Hat® to deliver Linux Solutions for IBM's S/390 Mainframe Computer

- Red Hat Enterprise Linux 3 becomes available

- 3,000 ISV applications available for Linux on Z

- MongoDB announces support for IBM z Systems®

- IBM Blockchain for Linux on Z and LinuxONE

- IBM Cloud™ Hyper Protect Services launched, built on LinuxONE

Red Hat

- IBM Hyper Protect Accelerator startup program launched

And in 2022, AlmaLinux became available for IBM z systems with an SNA partnership too

| 1999 | **20** 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | **5** 2015 | 2016 | 2017 | 2018 | **1** 2019 | 2020 | 2021 |

- IBM Unveils Linux Software and Services for S/390 Server

- Major ISVs available for Linux on Z including SAP and Oracle 9i

SAP
Oracle

- Linux on Z is used for mission-critical applications by clients

- Ubuntu 16.04 LTS for IBM LinuxONE and IBM z Systems is now available

- IBM Cloud Private brings containers and Kubernetes to Linux on Z and LinuxONE

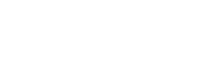- Red Hat OpenShift available on Linux on Z and on LinuxONE

- KVM available for Linux on Z

KVM

ubuntu

IBM Cloud

- Red Hat Runtimes and IBM Cloud Pak for Applications 4.2 available on Linux on Z and on LinuxONE

- OpenStack available for Linux on Z

openstack.

- Biggest Linux on Z client now runs more than 3,000 cores

- IBM announces plan to invest $1B in developing and marketing Linux

- IBM advances IBM Cloud for Financial Services

- SUSE Linux S/390 Released

SUSE

IBM Z: An Open Platform

20 Years of Linux on Z
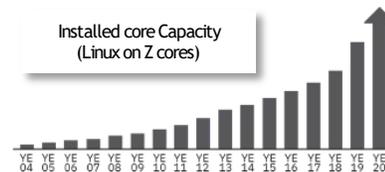**5** Years of LinuxONE
1 Year of Red Hat OpenShift for IBM Z and LinuxONE

Installed core Capacity (Linux on Z cores)

YE 04 YE 05 YE 06 YE 07 YE 08 YE 09 YE 10 YE 11 YE 12 YE 13 YE 14 YE 15 YE 16 YE 17 YE 18 YE 19 YE 20

52% of IBM Z enterprises have Linux

Global ArchViz Project

3D Modelling and Rendering
IBM Natural Resources Showcase Center
Singapore

SINE NOMINE ASSOCIATES
20 Years Customer Success

AlmaLinux

**AlmaLinux
v8 and 9 for s390x**

SNA continues turning research into reality

Contact us

- Recognized Design to Production Leadership
- Implementation with full Support Services
- Integration Experts

LinuxONE™ Services

**Creative 3D
Interactive Services**

CMS, SSH, SCP and SFTP

**High Availability Option (HAO) for Red Hat
Enterprise Linux on IBM Systemz**

**ClefOS royalty and license
free Linux on z Systems**

Training and Education Services

SNA: Your z/VM Partner

Full ClefOS Support

OpenShift Origin for Z Systems Support Services

**z/TPF to Linux
Modernization**

NJE/IP for Open Systems

Network Operations Center Services

Remote VPN

OpenAFS

Mono/.NET Development, Defect and Deployment Support

Products and Tools

Business Consulting Services

Mission-Critical Systems Support

Thank You

Questions?

Kurt Acker
Sir Kurt, Angler of New Technology
& IBM Champion 2
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Kurt@directsys.com