



# Automating MongoDB Deployments on Mainframes

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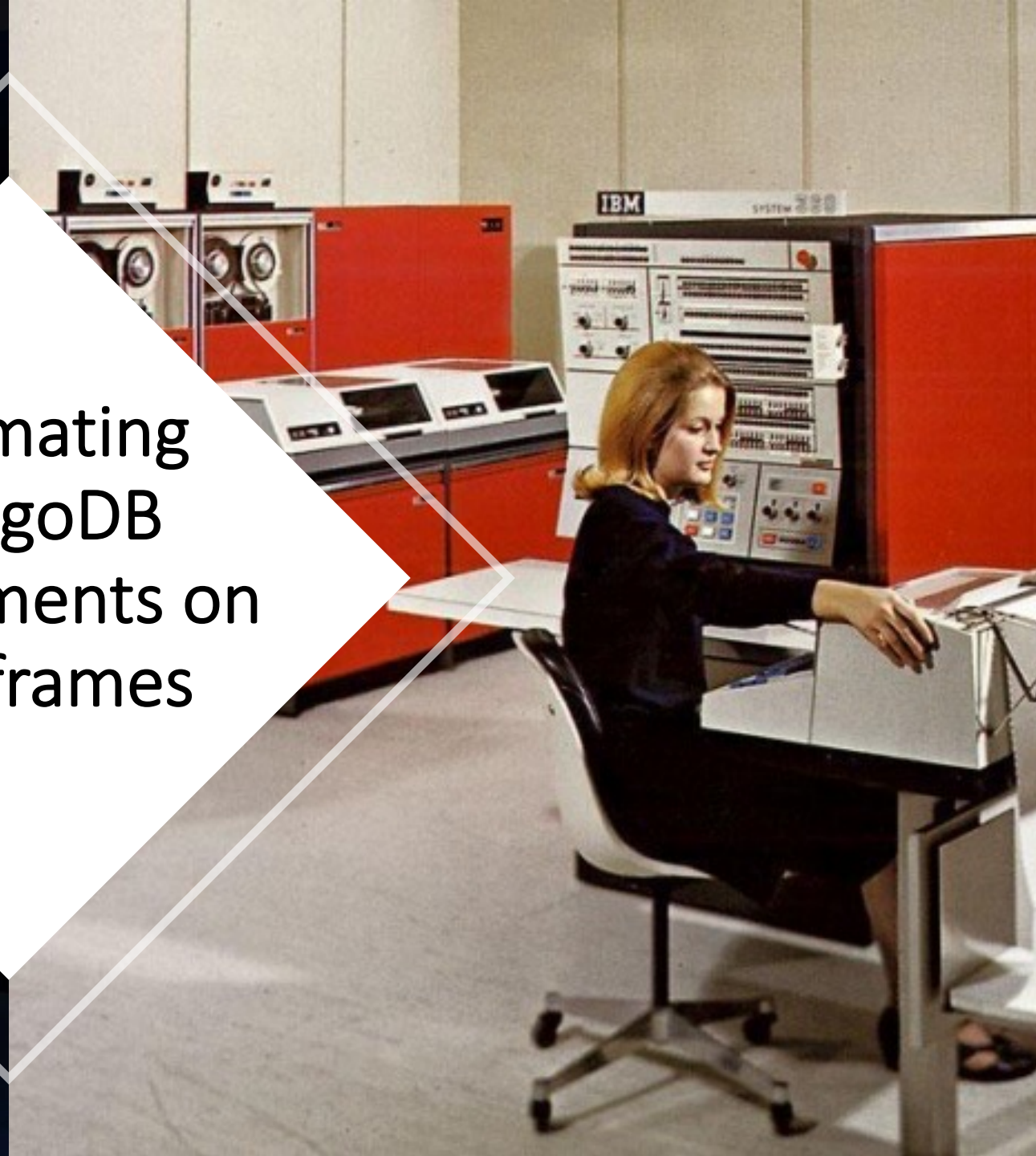


# Special Thanks Too:

- 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 server sprawl with control?**
- **And at the same time, can the data be backed up in a fashion that protects it from corruption along with ransomware attacks (Appendix J banking requirement)?**

# MongoDB World 2022 – Week of 6/6/2022

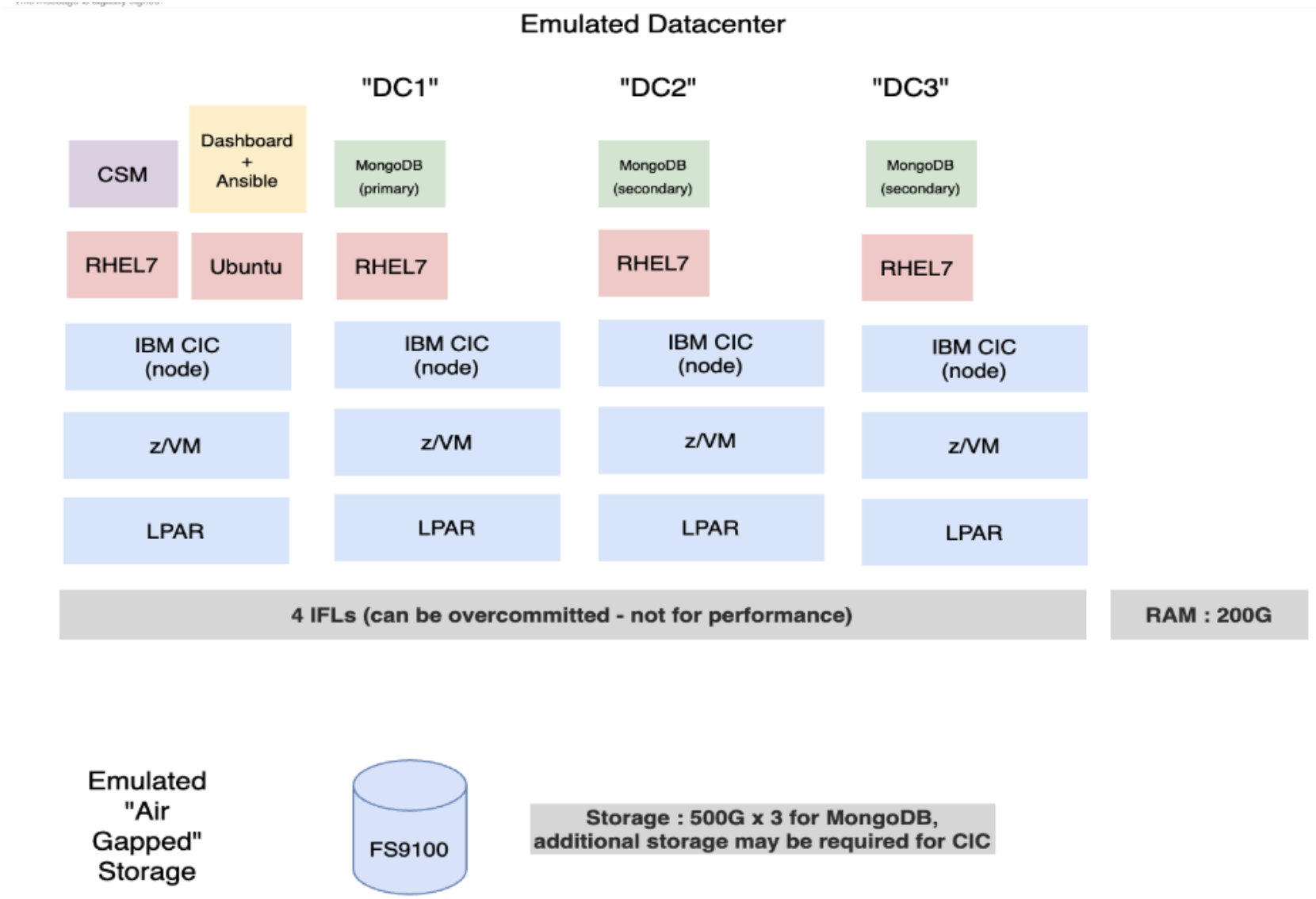
## Building a Sustainable Enterprise with MongoDB-as-a-Service on IBM LinuxONE

- **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)

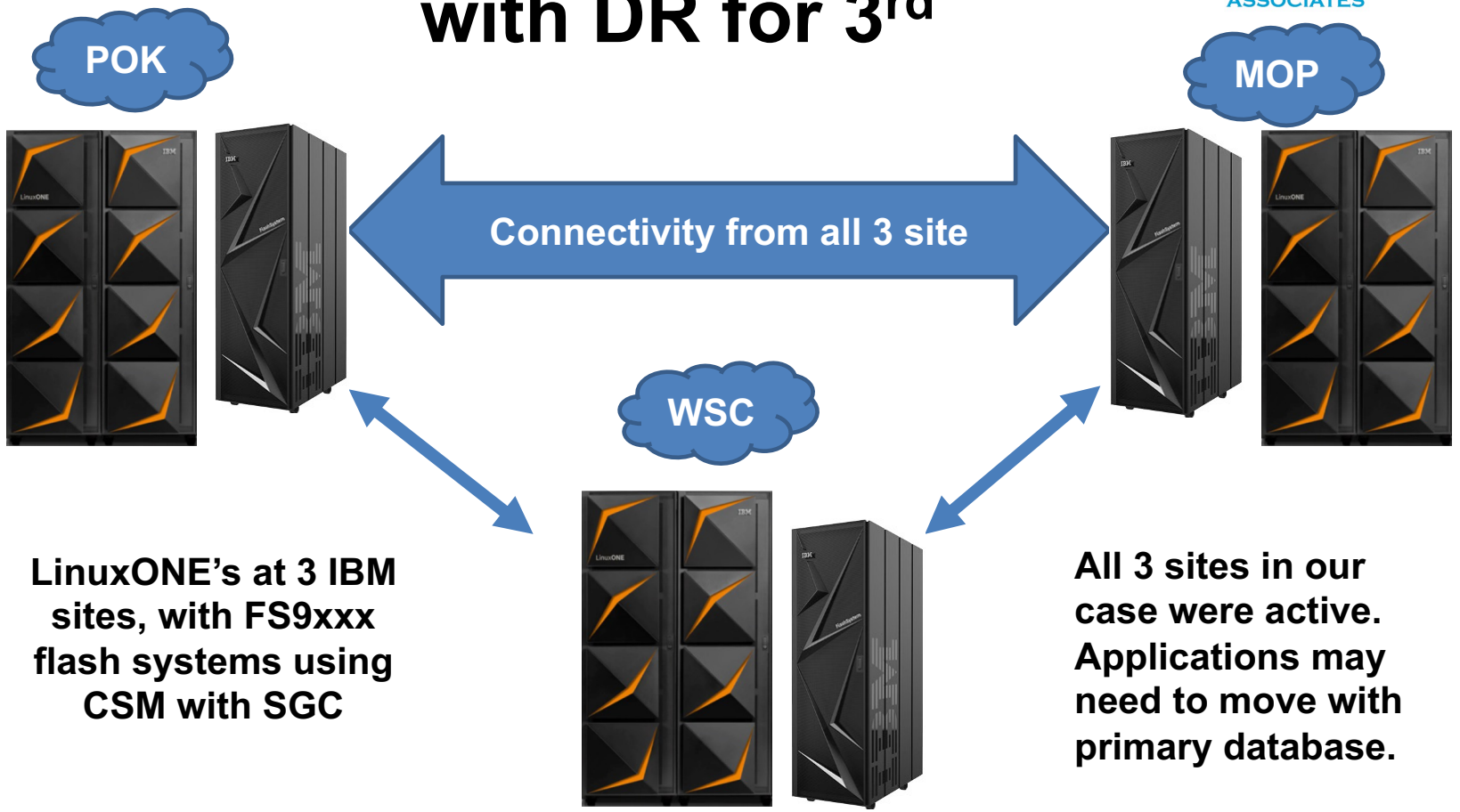
- **Join me for the Customer innovation feature by myself which will be aired onstage during keynote as well as a panel between <Citi, IBM and MongoDB> on the topic of building a secure and sustainable enterprise.**

# The Environment



# Geographically Dispersed Deployments

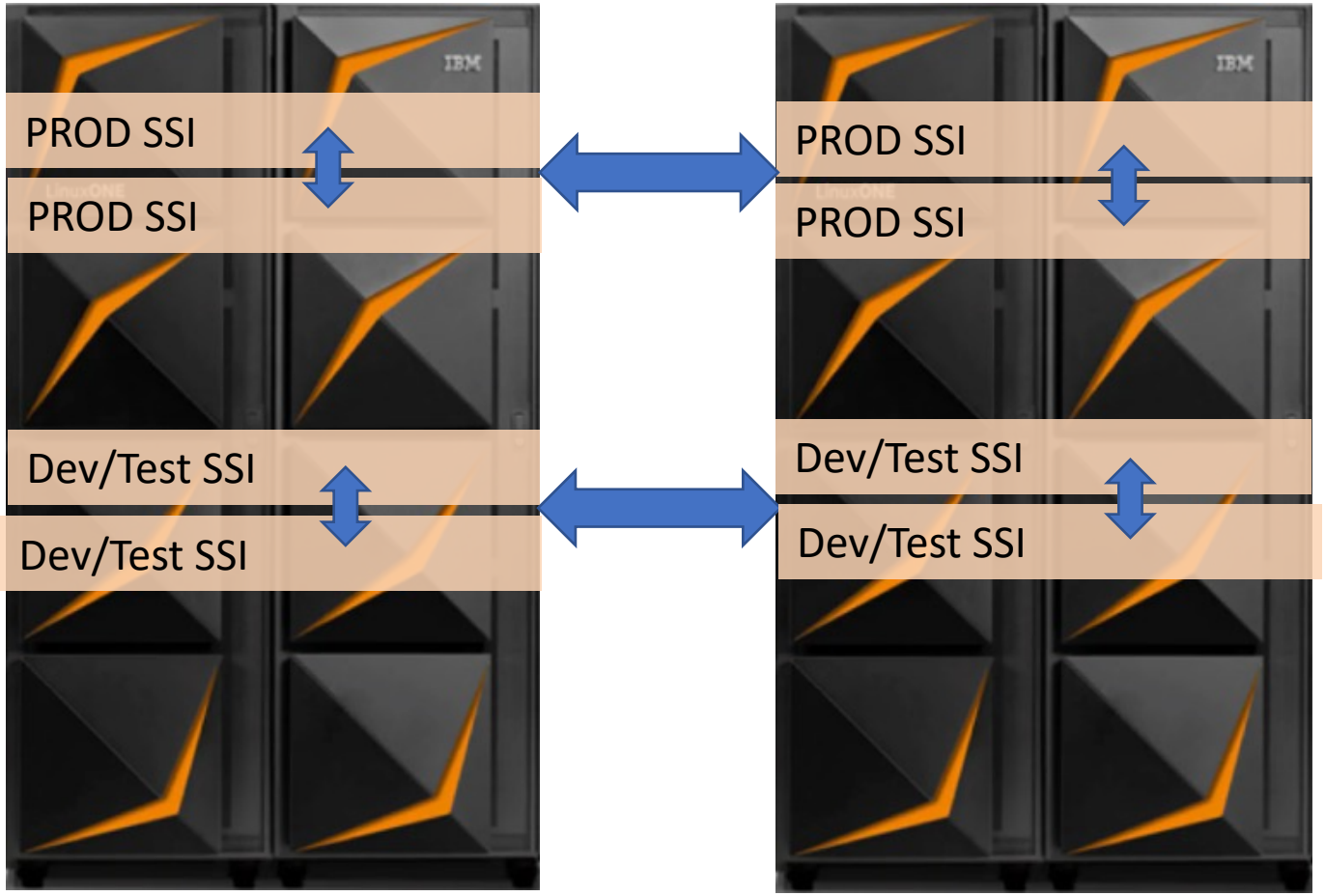
## Consider 2 active systems with DR for 3rd




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)

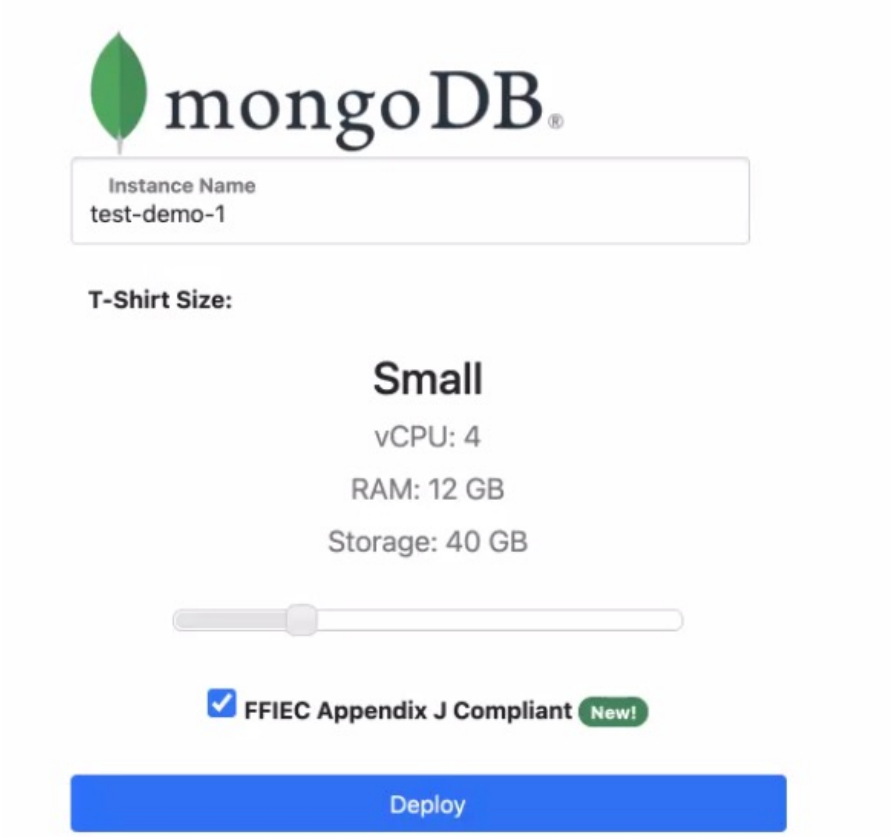



- **SSI clusters can be created on a single box using LPAR's.**
- **When 2 systems are used, failover capacity on each CEC creates extreme HA, with no downtime for system upgrades.**
- **Application clustering within an SSI creates extreme availability.**
- **Up to 8 z/VM systems available with z/VM 730.**
- **SSI enables Live Guest Relocation between systems.**
- **z/VM must be on traditional DASD.**
- **Works on both traditional z Systems 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 Infrastructure Center





**IBM Redbook:** Leveraging LinuxONE to Maximize Your Data Serving Capabilities

# 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

The occurrence of cyberthreats is growing at an alarming rate

### 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 cost of cyberthreats and associated downtime is immense

### 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

Cyberthreats come in many different shapes and sizes

### 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

Sessions > **mongoDB_SGC_LBSSVC6**

## mongoDB_SGC_LBSSVC6

Session Actions:

| | |
|---|---|
| **Status** | Normal |
| **State** | Protected |
| **Session Type** | Safeguarded Copy |
| **Active Host** | H1 |
| **Recoverable** | Yes |
| **Description** | Automatically created Safeguarded Copy session(modify) |
| **Copy Sets** | 4 (view) |
| **Group Name** | Automatically Generated Session |


| | |
|---|---|
| **Backup Schedule** | Every 5 mins |
| **Last Recoverable Backup** | 2021-09-13 20:06:39 MST |
| **Volume Group** | mongoDB_SGC |

Backup Info | Recover Backup Info

**Total Number Backups:** 40 **Total Recoverable Backups:** 40 **Total Unrecoverable Backups:** 0

| Backup Time | Backup ID | Recoverable | Copy Sets | Last Result | Expiration |
|---|---|---|---|---|---|
| 2021-09-13 16:56:34 MST | 1631577600 | Yes | 4 | IWNR2800I | 2021-09-20 16:56:34 ... |
| 2021-09-13 17:01:34 MST | 1631577900 | Yes | 4 | IWNR2800I | 2021-09-20 17:01:34 ... |
| 2021-09-13 17:03:09 MST | 1631577992 | Yes | 4 | IWNR2800I | 2021-09-14 17:03:09 ... |
| 2021-09-13 17:06:34 MST | 1631578200 | Yes | 4 | IWNR2800I | 2021-09-20 17:06:34 ... |
| 2021-09-13 17:11:34 MST | 1631578500 | Yes | 4 | IWNR2800I | 2021-09-20 17:11:34 ... |
| 2021-09-13 17:16:34 MST | 1631578800 | Yes | 4 | IWNR2800I | 2021-09-20 17:16:34 ... |
| 2021-09-13 17:21:34 MST | 1631579100 | Yes | 4 | IWNR2800I | 2021-09-20 17:21:34 ... |
| 2021-09-13 17:26:34 MST | 1631579400 | Yes | 4 | IWNR2800I | 2021-09-20 17:26:34 ... |
| 2021-09-13 17:31:34 MST | 1631579700 | Yes | 4 | IWNR2800I | 2021-09-20 17:31:34 ... |

# Re-Deploy Net New Linux Virtual Machines Or:

| Mechanism | Pros | Cons |
| --- | --- | --- |
| Reuse virtual machines | • Single set of virtual machines<br>• 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 CO2 each year[3]**
- Combining all z13 and z14 customers who have already upgraded to z15 T01, they will **save an estimated 62 million-kilowatt hours** and **emit 43,904 fewer metric tons of CO2 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)**

**Primary Site**

**LinuxONE** - Four Racks
104 sqft / 40.5 kwatts

**X86** - Nine Racks
234 sqft / 148 kwatts

**Disaster Recovery Site**

**LinuxONE** - Four Racks
104 sqft / 40.5 kwatts

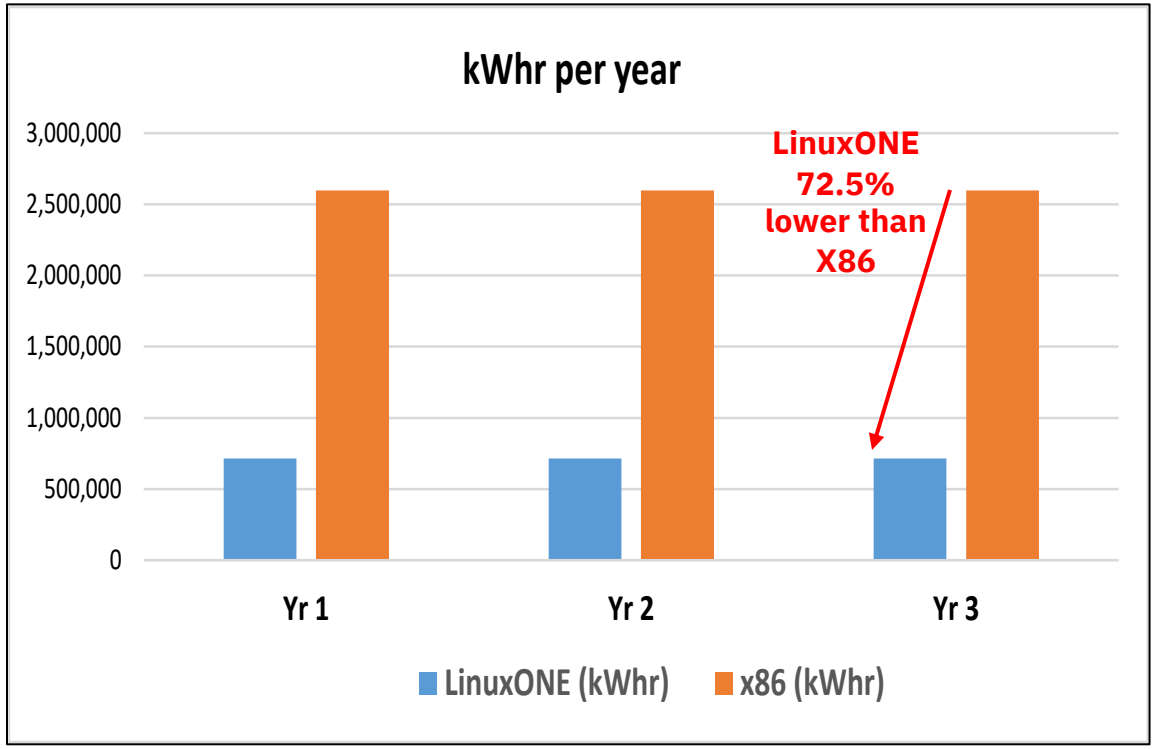
**X86** - Nine Racks
234 sqft / 148 kwatts

**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)**




| 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

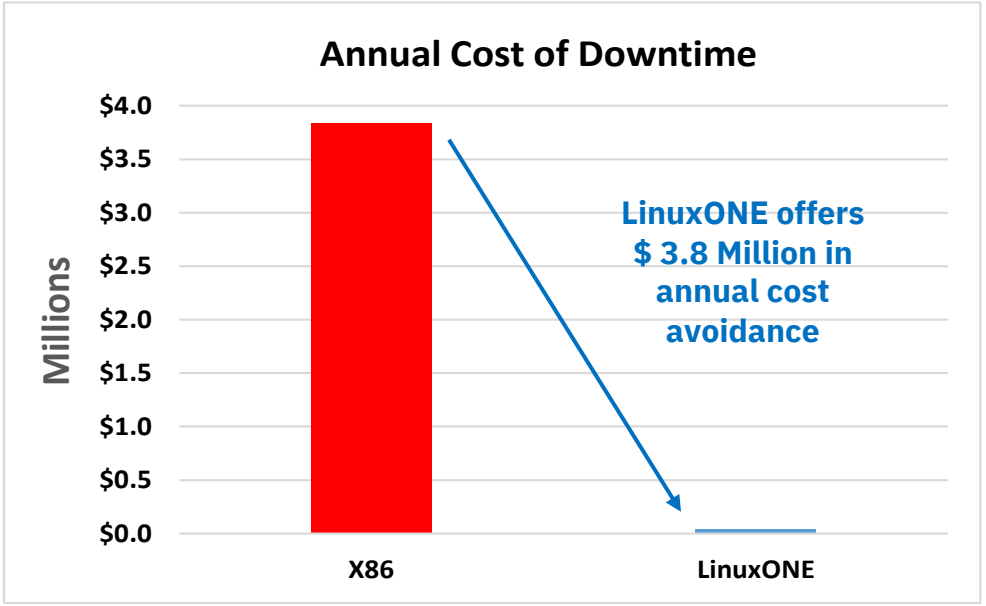
  Going from 99.9% to 99.999% uptime **eliminates 526 minutes** a year of unplanned downtime

  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/

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**20** Years of Linux on Z

**5** Years of LinuxONE

**1** Year of Red Hat OpenShift for IBM Z and LinuxONE

IBM

# And in 2022, Alma Linux became available for IBM z Systems too

- 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

- Red Hat Enterprise Linux 3 becomes available

- IBM Big Green

IBM celebrates 100

- IBM Launches LinuxONE

- IBM Blockchain for Linux on Z and LinuxONE

IBM and Red Hat join forces to advance hybrid cloud

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

RED HAT OPENSHIFT

- IBM launches new IBM z15™ and LinuxONE III servers
- IBM Cloud™ Hyper Protect Services launched, built on LinuxONE
- IBM Hyper Protect Accelerator startup program launched

IBM HYPER PROTECT ACCELERATOR

20

1999 | **2000** | 2001 | 2002 | 2018 | **2019** | 2020 | 2021

1

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


- IBM announces plan to invest $1B in developing and marketing Linux
- SUSE Linux S/390 Released

SUSE

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

SAP

Oracle

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

IBM Cloud

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

RED HAT OPENSHIFT

- Red Hat Runtimes and IBM Cloud Pak for Applications 4.2 available on Linux on Z and on LinuxONE
- Biggest Linux on Z client now runs more than 3,000 cores
- IBM advances IBM Cloud for Financial Services

IBM Z: An Ope

**20** Years of Linux on Z

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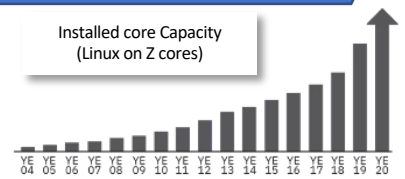


**52% of IBM Z enterprises have Linux**

# 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**

# Thank You

## Questions?

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