

# Holistic Management of z/VM and Linux on System z

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CA Technologies



# agenda

- Why Linux on System z?
- CA Management for Linux on System z
  - **CA VM:Manager™ Suite** to optimize z/VM virtual environment
  - **Velocity zVPS™ Performance Suite** to manage performance and capacity planning
  - **UPSTREAM for Linux on System z** to backup and restore data
  - **CA Mainframe Connector for Linux on System z** to centrally monitor and manage z/OS, z/VM, and Linux on System z
  - Other CA solutions for Linux on System z
- Q&A

# why Linux on System z?

- ❑ Linux on System z is energy efficient technology
  - ❑ Reduce energy consumption and save floor space
  - ❑ Increase utilization and operations efficiency
  - ❑ Reduce staffing resources required
  - ❑ STOP Server Sprawl
- ❑ Economics of IFLs and z/VM<sup>®</sup> help drive down cost of IT
  - ❑ Perpetual license, separate from MIPS calculation
  - ❑ Consolidate from distributed environments to Linux on System z to reduce server sprawl and simplify operations

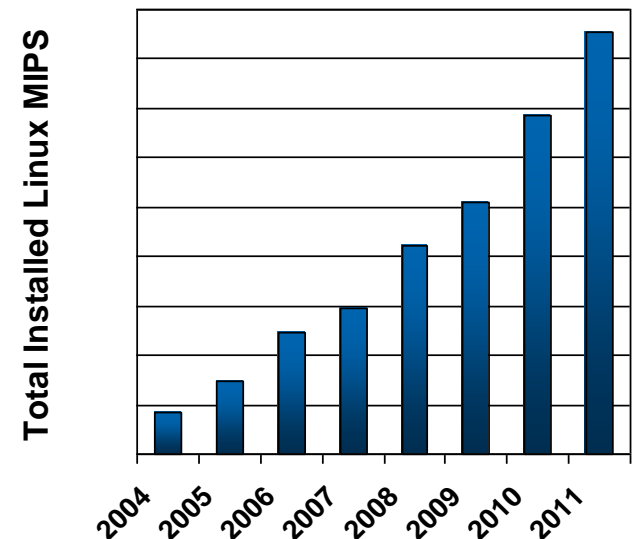


# Linux on System z

trends – showing significant growth!

- 35% of IBM System z customers run Linux on System z (includes 63 of top 100)
- IBM shipped approximately 2,000 Integrated Facility for Linux (IFL) specialty engines in 2010
- Installed IFL MIPS increased 24% in 2011
- 20% of System z MIPS are deployed to support Linux
- Over 3,000 applications are available for Linux on System z

**Installed Linux MIPS  
Growing at 39% CAGR\***



\* Based on YE 2004 to YE 2011

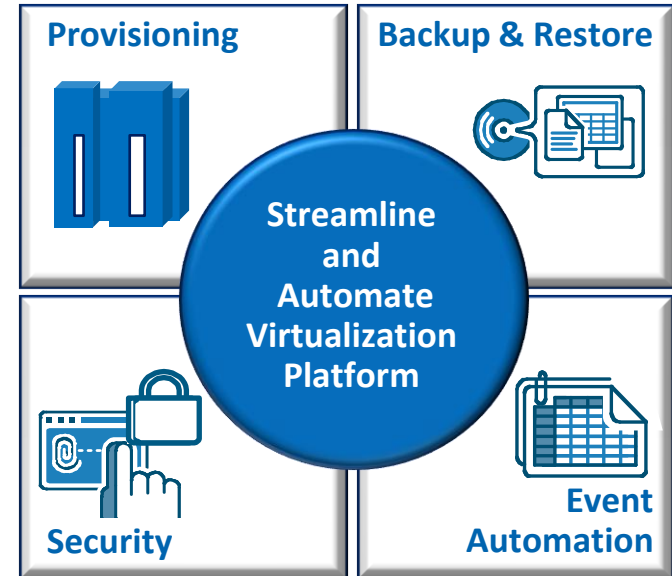
Source: IBM, April 2012

# managing and securing z/VM virtual environment

# automate z/VM management

## z/VM Challenges

- Growing Linux workload capacity
- Managing and securing z/VM and Linux environments
- Reducing time and cost of manual tasks
- Controlled, safe resource sharing
- z/VM performance monitoring
- Device sharing, media protection



## How CA Solutions Help You Address these Challenges

- Reduce human intervention and errors
- Remove complexity and lower costs for both z/VM and mainframe Linux environments by automating routine, labor-intensive tasks
- Scale to handle large Linux deployments with thousands of virtual Linux guests

# CA VM:Manager™ Suite for Linux on System z

## CA z/VM products simplify environment

### Security

CA Top Secret® for z/VM  
CA ACF2™ for z/VM  
CA VM:Secure

### Disk Storage Assets

CA VM:Account™  
CA VM:Director™

### Storage Backup/Recovery

CA VM:Backup™ (HiDRO)  
CA VM:Archiver

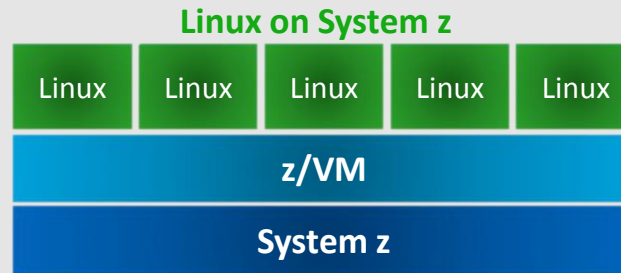
### Resource Chargeback

CA VM:Account™

### Performance Tuning

CA Explore® Performance  
Management for z/VM

CA VM:Operator™



### Operations Management

CA VM:Operator™  
CA VM:Schedule™  
CA VM:Spool™  
CA VM:Sort™  
CA VM:Batch™

### Provisioning

CA VM:Director™  
CA VM:Secure  
CA VM:Archiver™

### Tape Management

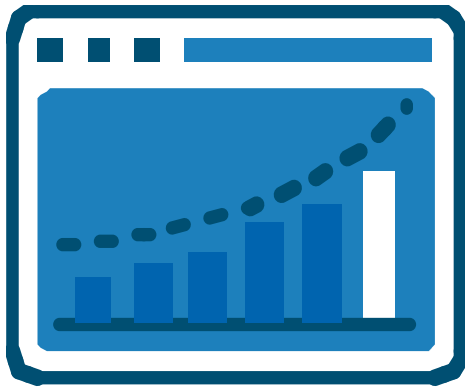
CA VM:Tape™  
CA Dynam/T for z/VM

# optimizing Linux on System z performance



# achieving Linux on System z cost saving benefits optimized utilization

Optimizing CPU utilization is how organizations are achieving significant cost savings benefits with Linux on System z



Key to high processor utilization is proper systems management



**Financial system** – 27 IFLs on one CEC running 85% utilization



**Insurance company** – 7 IFLs often running above 95% utilization



**Credit card company** – runs 12 IFLs consistently above 95% utilization

# Velocity zVPS™ Performance Suite

## optimize z/VM and Linux on System performance



Best in class  
performance management  
for Linux on System z

Combine  
multi-platform system  
management expertise  
from **CA Technologies**

...with the performance  
measurement expertise  
from **Velocity Software**

### Performance Analysis

- Collects real-time metrics on all facets of performance for all servers including z/VM, Linux on System z and distributed servers
- Enables immediate analysis of real-time problems

### Capacity Planning

- Provides trend data for projecting capacity requirements of future workloads
- Interfaces to popular enterprise capacity planning facilities console

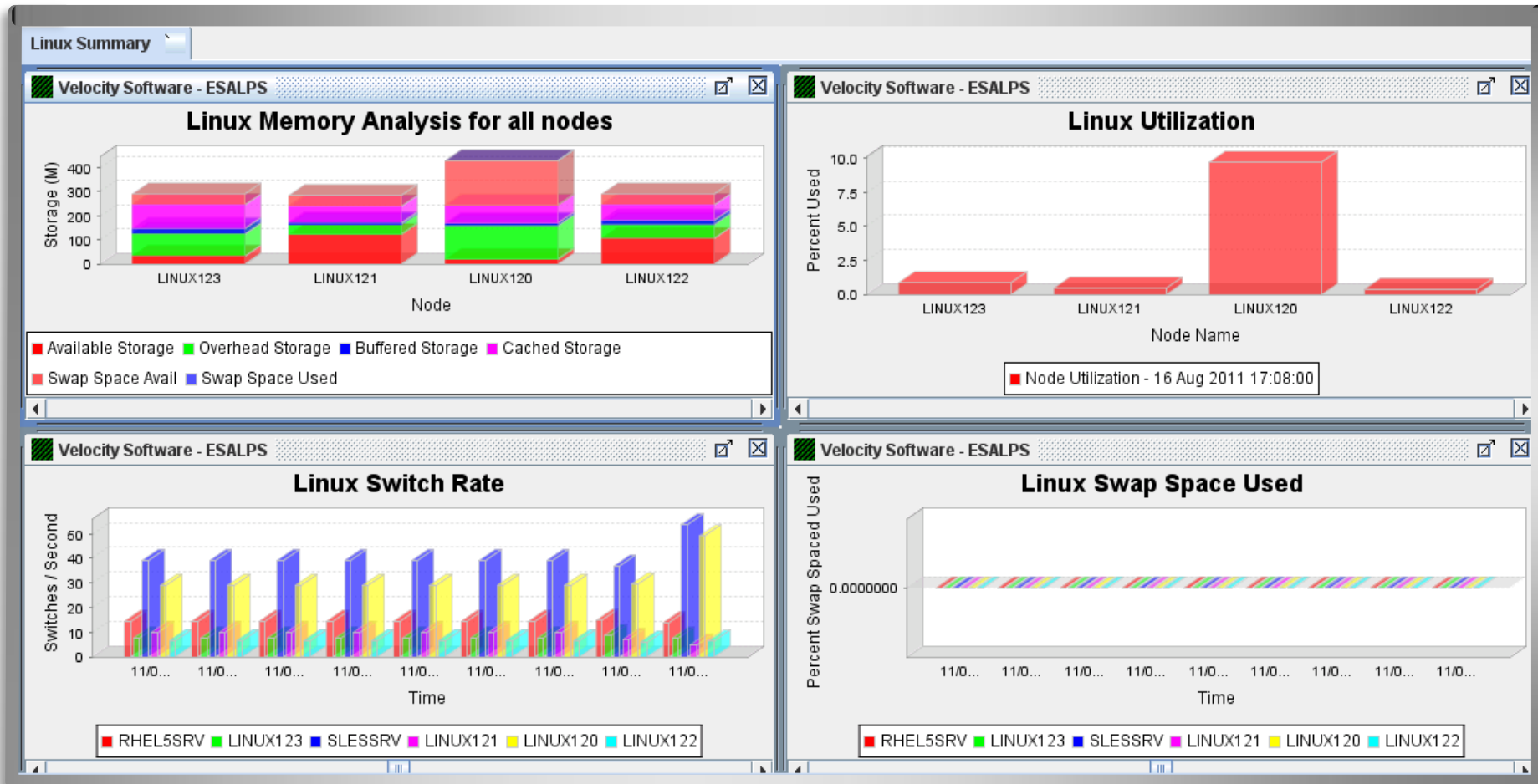
### Chargeback and Accounting

- Delivers data needed for chargeback and accounting, with complete and accurate data for both Linux on System z applications and z/VM virtual machines

### Operational Alerts

- Immediately detects and reports performance and capacity issues
- Provides alerts via a 3270 interface, web-based browser, and via SNMP alerts to integrate into your management console

# real-time display of performance information



Graphical display of up-to-the-minute Linux on System z performance data

# operational alerts

v1.0.2.9 Welcome

VELOCITY SOFTWARE zVIEW - CA TECHNOLOGIES - ZVM001 (ZVM001)  
ZVM001 - Exceptions Analysis Alerts - 11/10/22 at 17:07

Graphs	Code	Alert Description
	LNDX	usr area on LINUX121 is 84.66% full
ESAMGMT	VMID	User RSCS idle for 62 minutes
ESAHDR	VMID	User VMSCHEID idle for 41 minutes
ESAMAIN	VMID	User ZVPS idle for 62 minutes
SLA		
USER		
SFS		
PROCESSOR		
STORAGE		

zVIEW provides graphical display of performance data via a web browser, including zMON alerts

v1.1.2.0 Welcome ZVPS

VELOCITY SOFTWARE zVIEW - CA TECHNOLOGIES - ZVM001 (ZVM001)  
ESAUSLA - User Service Level Analysis

Graphs	Time	UserID /Class	Transaction Logged	Rate Actv /Min	Avg Resp	Pct of Total	<Target><Pct Missed	<SLO Trans	<Target><Pct Missed	<SLO Trans	<Pct of Transactions with><Resp Time (sec) less than>											
ESAMGMT	10:49:00	System:	32.0	15.0	103	0.142	69.90	0	0	100.0	0	0	96.8	1	90	91	93	94	94	99	99	
ESAHDR	10:49:00	*Servers:	11.0	2.0	38.0	0.026	94.74	0.2	95	100.0	0	1.50	95	100.0	0	97	97	97	100	100	100	100
ESAMAIN	10:49:00	*TheUsers:	12.0	6.0	44.0	0.203	52.27	0.2	90	100.0	0	2.00	90	95.2	1	89	91	93	93	93	98	98
SLA	10:49:00	KeyUser:	5.0	3.0	21.0	0.224	61.90	0.2	90	100.0	0	2.00	90	100.0	0	81	81	86	86	86	100	100
ESAUSLA	10:49:00	RELESSRV	2.0	2.0	0	.	.	0.2	90	.	0	2.00	90	.	0	.	.	.	.	.	.	.
ESAUSLA	10:49:00	SLESSRV	2.0	2.0	0	.	.	0.2	90	.	0	2.00	90	.	0	.	.	.	.	.	.	.
ESAEXCP	10:49:00	SLESSRV	2.0	2.0	0	.	.	0.2	90	.	0	2.00	90	.	0	.	.	.	.	.	.	.
ESARATE																						
ESASYSR																						
ESAXACT																						
USER																						
SFS																						
PROCESSOR																						
STORAGE																						

Define and analyze user service level objectives

v1.1.2.0 Welcome ZVPS

VELOCITY SOFTWARE zVIEW - CA TECHNOLOGIES - ZVM001 (ZVM001)  
ESAEXCP - Transaction Exception Log

Graphs	Time	Transaction	Rate	Avg Resp	Pct of Total	<Target><Pct Missed	<SLO Trans	<Target><Pct Missed	<SLO Trans	<Pct of Transactions with><Resp Time (sec) less than>
	00:00:05	LINUX123 response time (seconds):	778.6,	55 CPU seconds,	463 DASD I/O					
	00:58:58	LINUX122 response time (seconds):	729.2,	48 CPU seconds,	389 DASD I/O					
	00:59:43	LINUX123 response time (seconds):	770.5,	52 CPU seconds,	595 DASD I/O					
	01:58:02	LINUX122 response time (seconds):	671.6,	46 CPU seconds,	387 DASD I/O					
	01:59:57	LINUX123 response time (seconds):	769.7,	59 CPU seconds,	424 DASD I/O					
	02:55:03	LINUX121 response time (seconds):	62.0,	3.42 CPU seconds,	57 DASD I/O					
	02:58:40	LINUX122 response time (seconds):	713.6,	47 CPU seconds,	383 DASD I/O					
	02:59:55	LINUX123 response time (seconds):	767.2,	53 CPU seconds,	499 DASD I/O					
	03:03:32	LINUX123 response time (seconds):	60.5,	13 CPU seconds,	44 DASD I/O					
	03:23:49	LINUX123 response time (seconds):	87.9,	21 CPU seconds,	54 DASD I/O					
	03:44:15	LINUX123 response time (seconds):	81.6,	15 CPU seconds,	62 DASD I/O					

Report on SLA exceptions

# detail chargeback accounting

zVIEW - CA TECHNOLOGIES - ZVM001 (ZVM001)  
ESAACCT - User Accounting Analysis

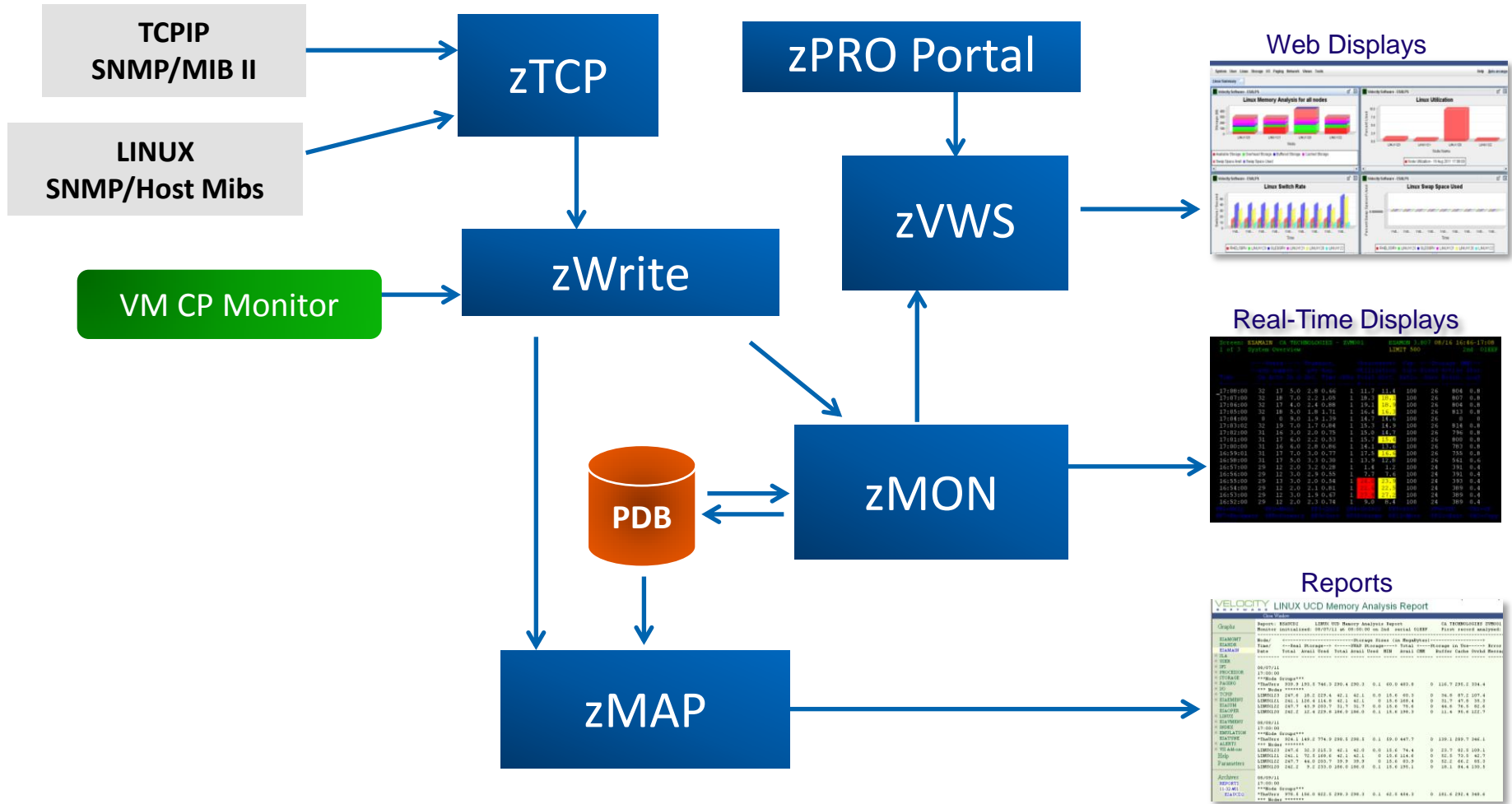
Graphs	Time	UserID /Class	Virt. CPU	Over. CPU	I/O	Stor.	Charge per Unit	<--Users--> Logged Actv	<Service Units> /Sec Total	Charges Total	<---Resources Used---	CPU	DASD	I/O	Pages
ESAMGMT	15:06:00	System:	10.0	0	0.8	0.5	0.00	32 16	1748.9 104928	10.49	19.94		167	209K	
ESAHDR	15:06:00	*Servers	10.0	0	0.8	0.5	0.00	11 2	4.9 297	0.03	0.02		0	593	
ESAMAIN	15:06:00	*TheUsers	10.0	0	0.8	0.5	0.00	12 7	10.9 654	0.07	0.87		26	1253	
SLA	15:06:00	KeyUser	10.0	0	0.8	0.5	0.00	5 3	9.0 540	0.05	1.32		0	1070	
USER	15:06:00	RHEL5SRV	10.0	0	0.8	0.5	0.00	2 2	886.6 53192	5.32	0.25		27	106K	
ESASRV1	15:07:00	LINUX122	10.0	0	0.8	0.5	0.00	1 1	447.9 26840	2.68	0.09		4	53671	
ESASRV1	15:07:00	LINUX123	10.0	0	0.8	0.5	0.00	1 1	439.6 26338	2.63	0.19		4	52665	
ESASRVC	15:06:00	SLESSRV	10.0	0	0.8	0.5	0.00	2 2	837.5 50244	5.02	17.48		114	99957	
ESAACT															
ESAACT															
ESAACT															

Transition IT  
from a  
cost center  
to a  
profit center

- Deliver detail data needed for chargeback and accounting, with complete and accurate data for both Linux on System z applications and z/VM virtual machines
- Data is captured at the process level
- Chargeback Linux on System z resource usage to applicable business, department or agency
- Data can also be processed in CA MICS® Resource Management



# zVPS Performance Suite architecture

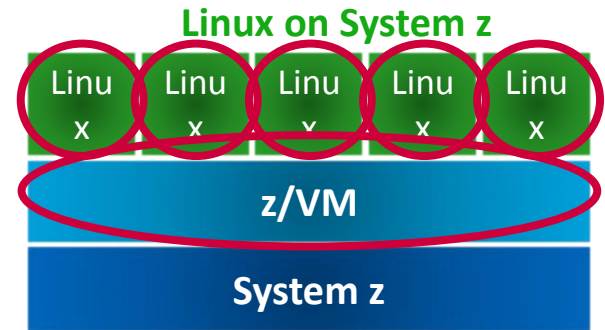


# zVPS Performance Suite

## the differentiators

### ***Comprehensive Data Collection***

- z/VM Subsystems (processor, storage, I/O, paging)
- z/VM Guest resources
- Linux on System z – disk, storage, processor
- Networked servers (Linux, Unix, Windows)
- Linux applications



### ***High Data Capture Ratio***

- Critical for accurate analysis, reporting, and accounting

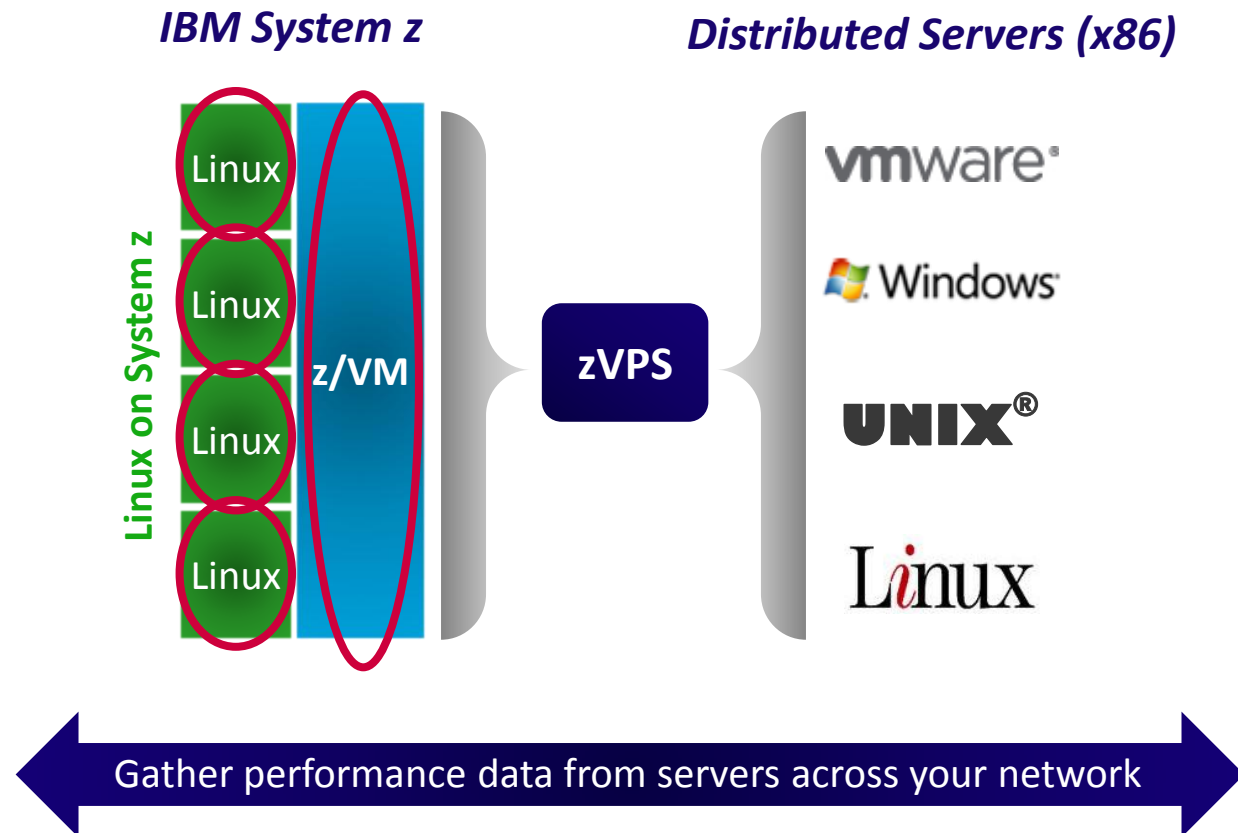
### ***Uses existing Linux on System z SNMPD process for data capture***

- Eliminates overhead and maintenance of new performance agent
- Adds additional VSI MIB set to capture process level data

# benchmark performance

comprehensive view of performance data

*When planning a consolidation project, gather accurate data across all platforms*





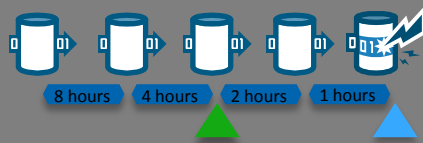
# protecting Linux on System z application and system data

# importance of file level backups

## Restore Time Objective



## Recovery Point Objective



## File Level Backups



## Service Level Agreements



## Regulatory Compliance



# why backup to the mainframe?

A black IBM zEnterprise server rack with multiple vertical modules. The IBM logo is visible at the top, and 'zEnterprise' is written vertically on the right side. The rack is centered in the image, flanked by two blue curved banners.

**Most Reliable**

**Most Efficient**

And provides the most **cost effective** way to protect your critical applications and data

# UPSTREAM for Linux on System z

best-in-class data protection

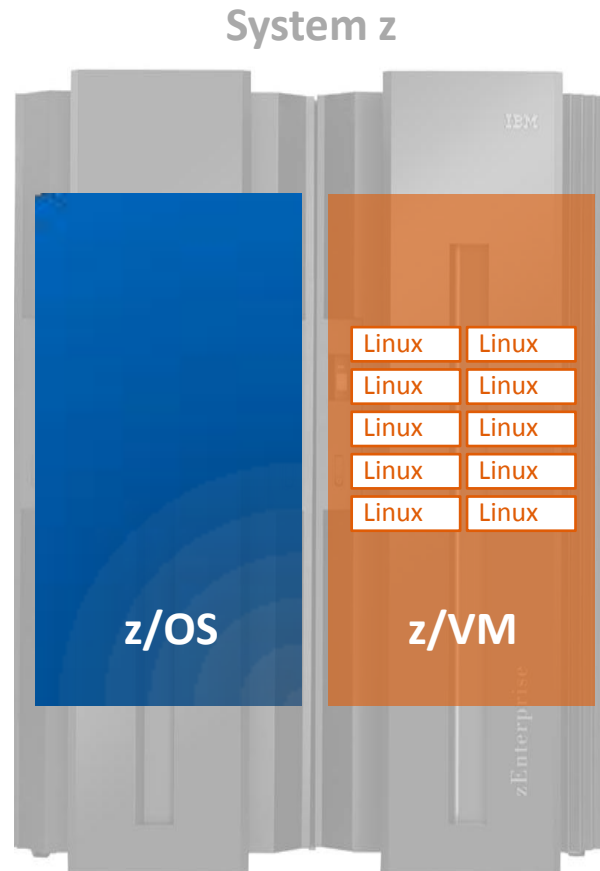


- **Fast, scalable** and highly **reliable** backup and recovery for Linux on System z
- **Only** solution that will **backup up to z/OS**
  - Leverage existing z/OS skills and infrastructure for operational efficiency
  - Rely on proven z/OS disaster recovery strengths

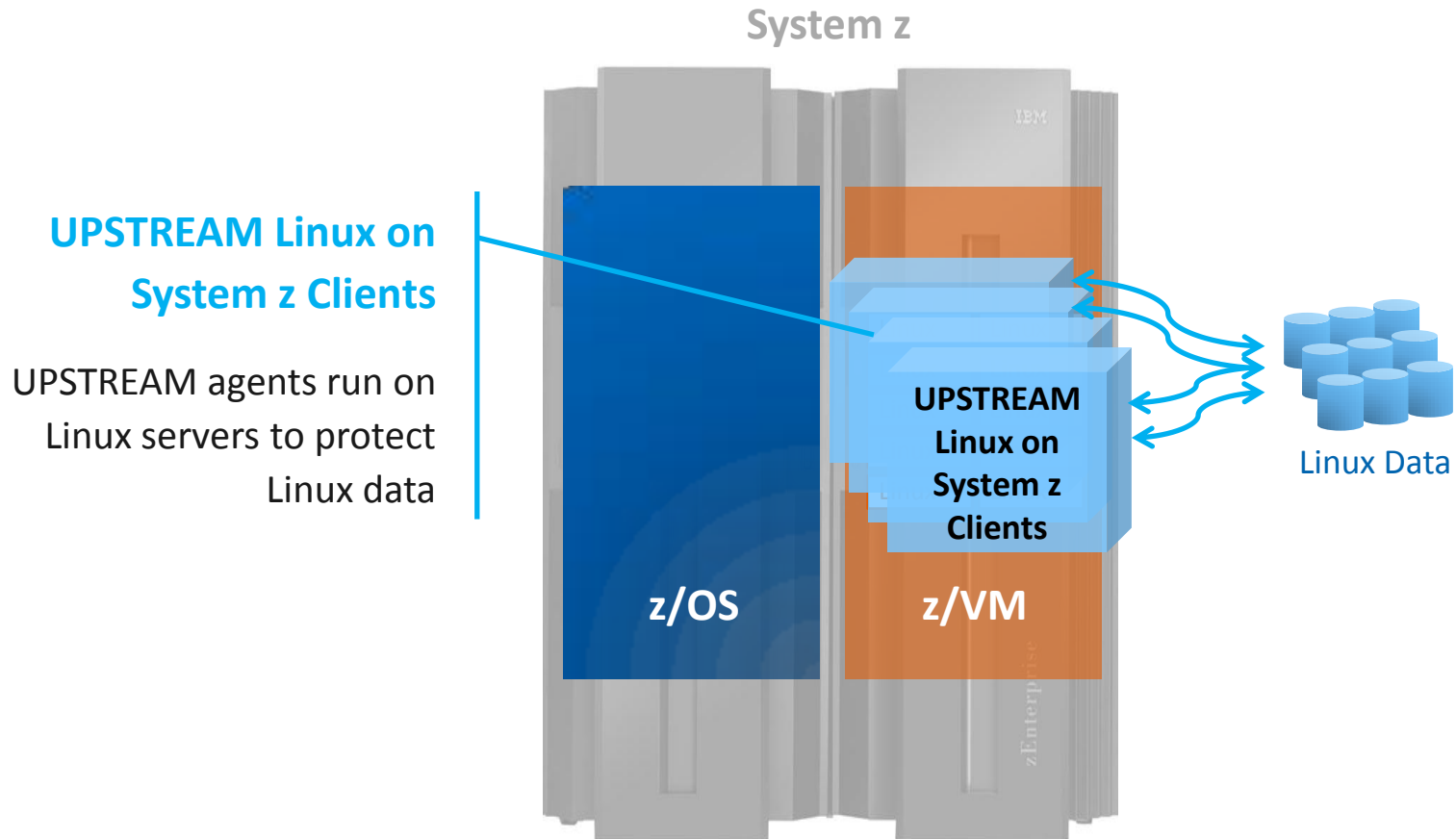
Business  
Continuity

Peace of  
Mind

# UPSTREAM for Linux on System z architecture



# UPSTREAM for Linux on System z architecture



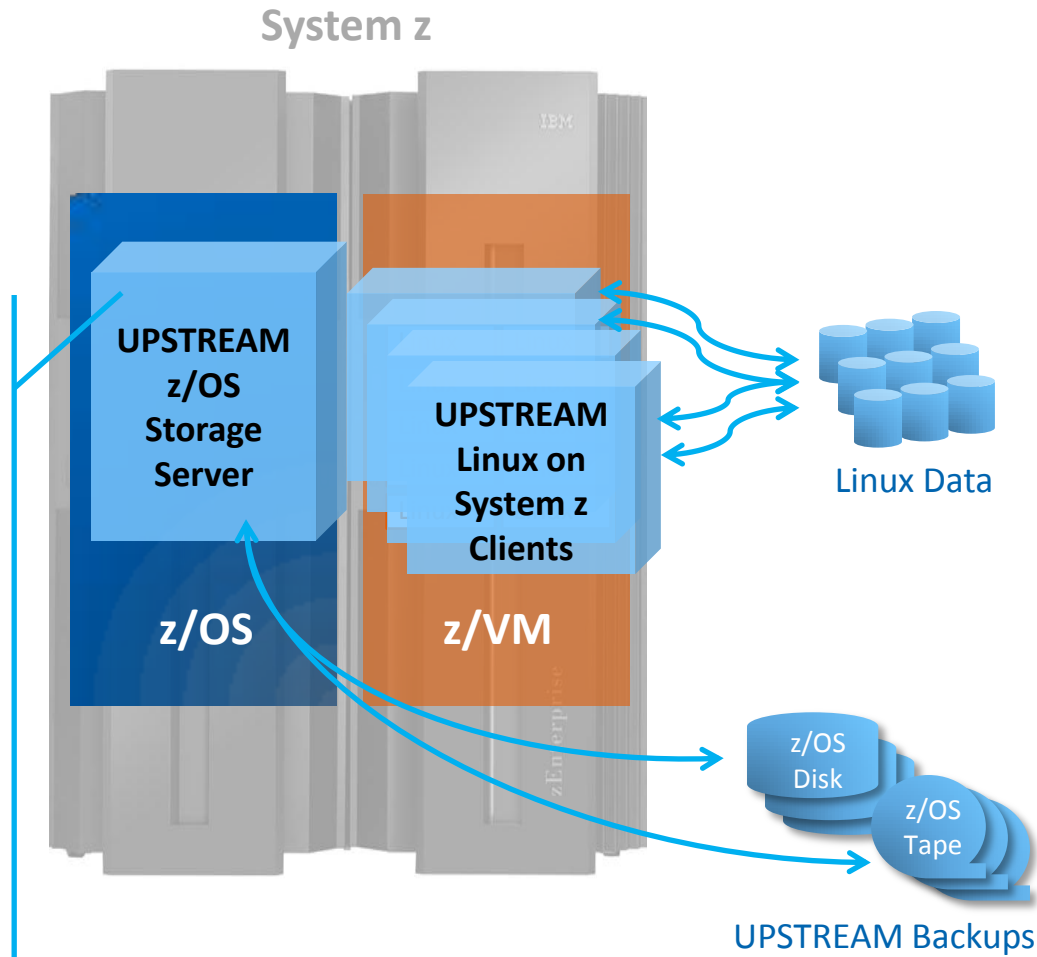
# UPSTREAM for Linux on System z architecture

## UPSTREAM z/OS Storage Server

UPSTREAM is only data protection solution that provides backup to z/OS storage server

Enabling backup to z/OS tape or disk

For increased reliability and compliance



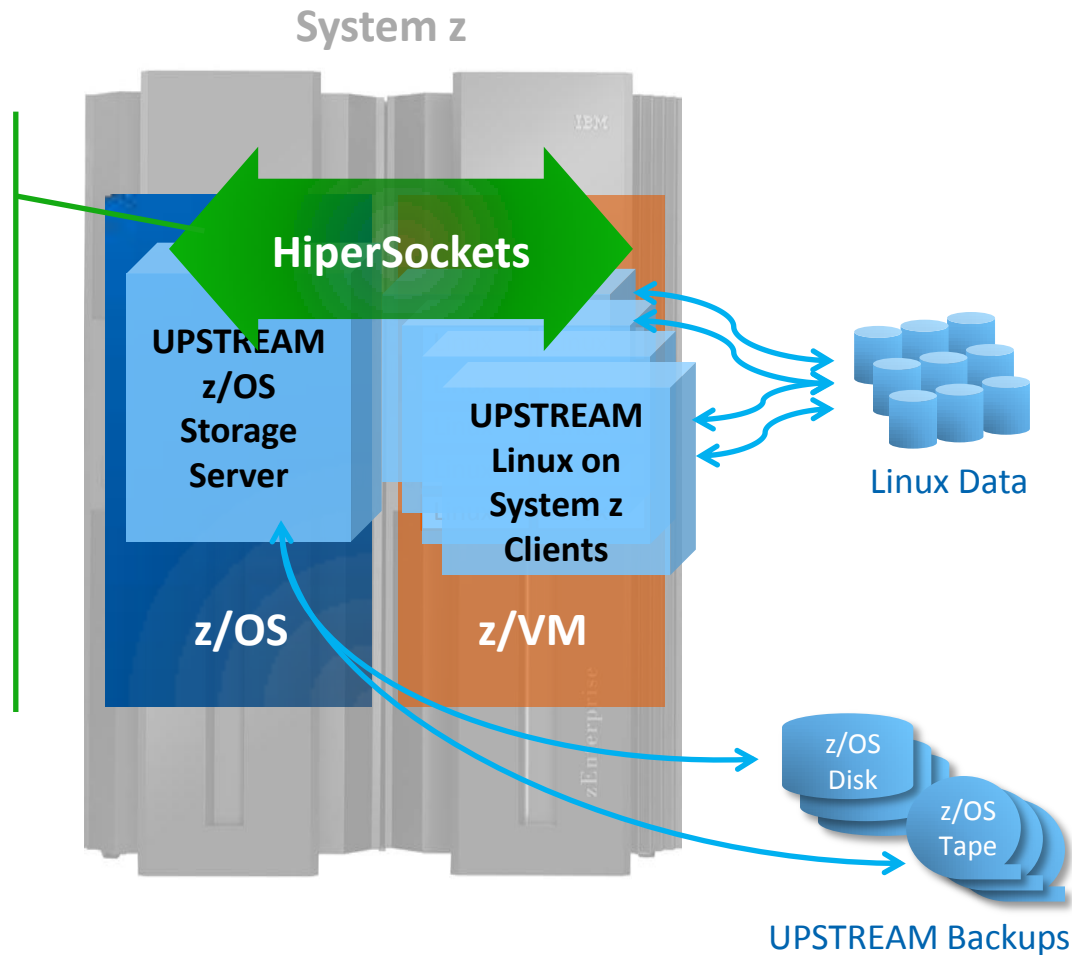
# UPSTREAM for Linux on System z

innovative high performance data protection

## UPSTREAM exploits HiperSocket Technology

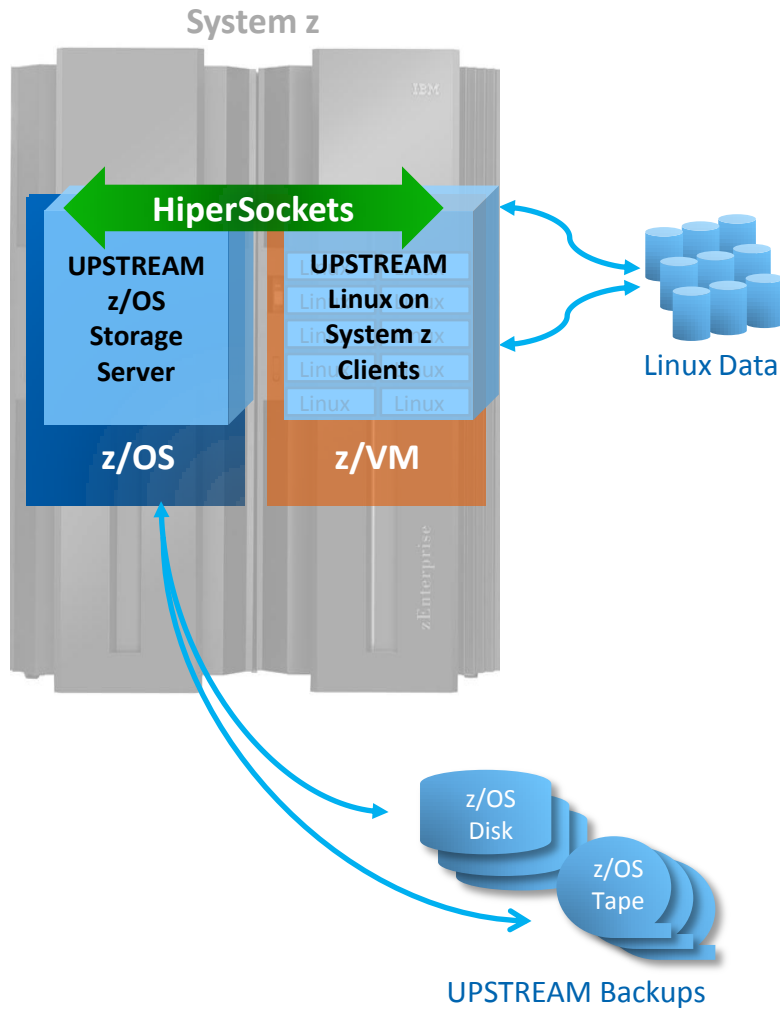
Takes backup and recovery off corporate network

Protect very large amounts of data without negatively impacting corporate communications or customer access

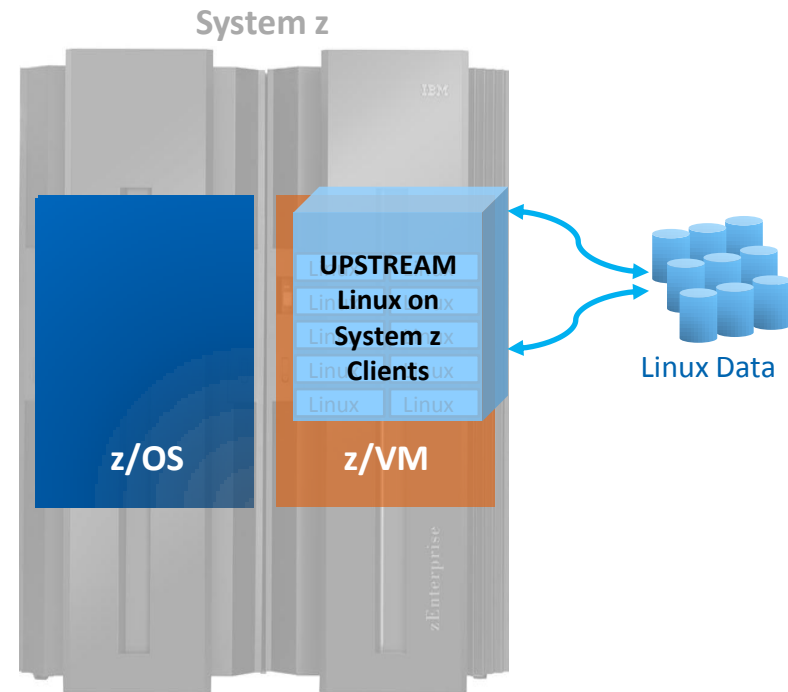




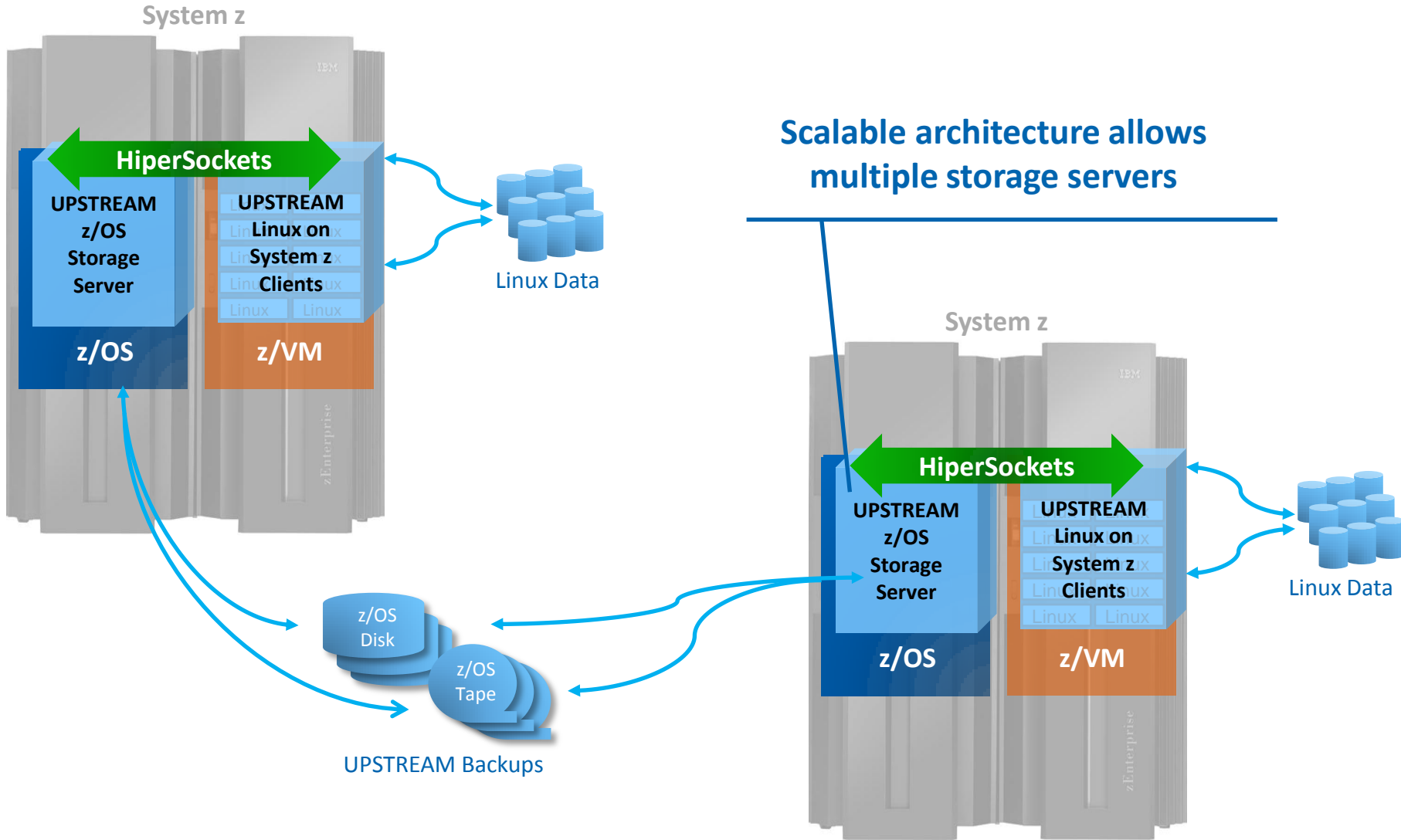
# UPSTREAM for Linux on System z scalable architecture



**UPSTREAM architecture provides scalability to protect your data as your business grows**

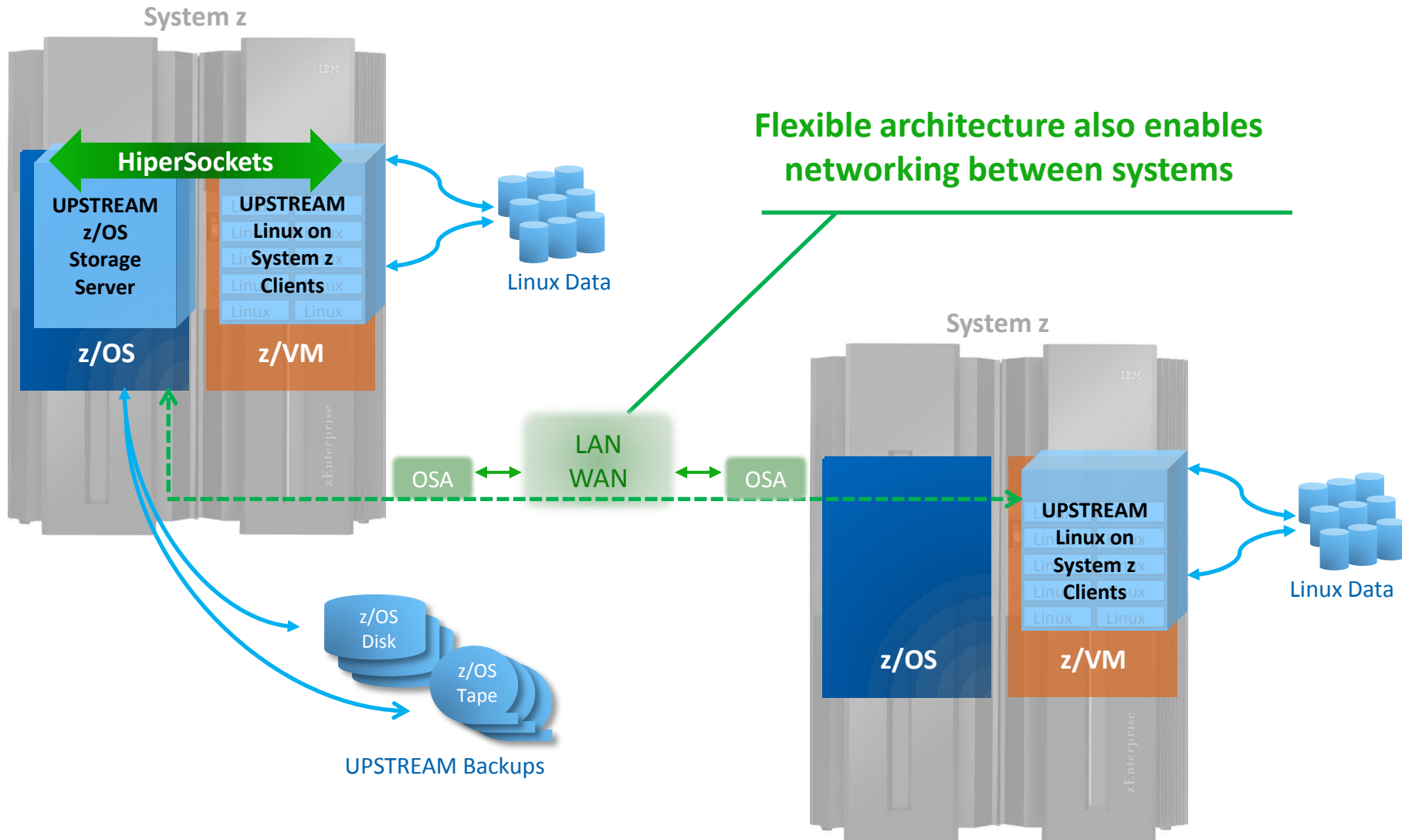


# UPSTREAM for Linux on System z scalable architecture



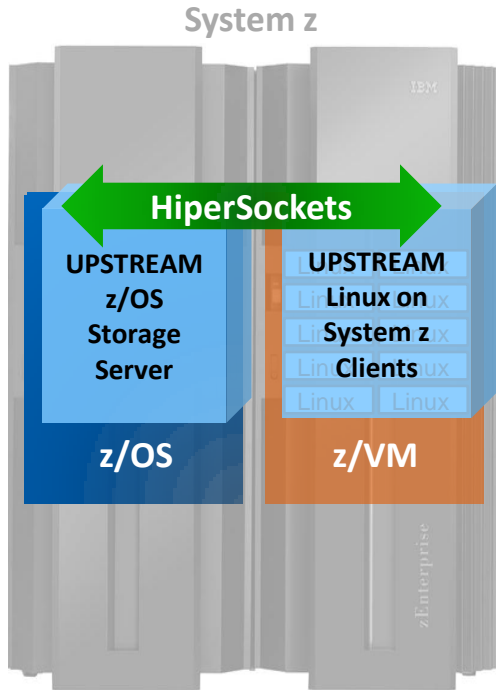
# UPSTREAM for Linux on System z

## scalable architecture

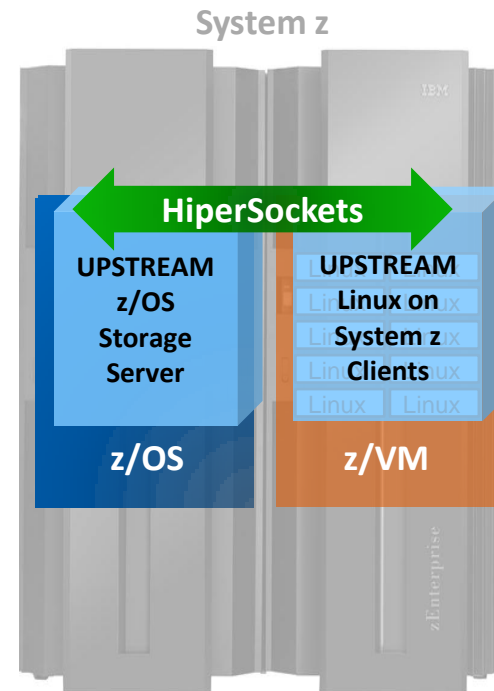
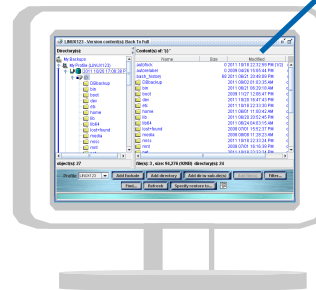


# UPSTREAM for Linux on System z

## centralized control and view of backups

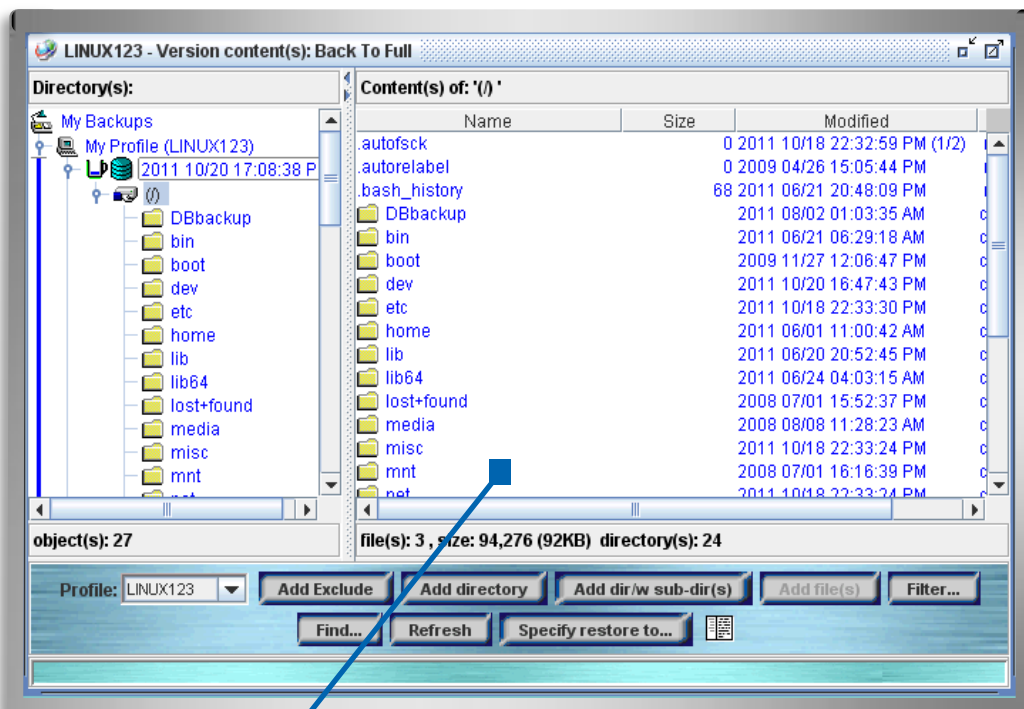


Flexible management interface provides centralized view and control of Linux on System z backups



# UPSTREAM “Director”

save time by simplifying and automating data protection



User-friendly graphical management interface for centralized single view and control of Linux on System z backups

- Communicate, control and monitor Linux on System z backups
  - Initiate backups and restores
  - Check status of running operations
  - Retrieve log files
  - Perform profile configuration
  - Run pre- and post-processing jobs
- Run from web browser for easy cross platform operations
- Keep storage administrators efficient, aware and advised

# data reduction technology

reduce overhead and speed up backup/recovery

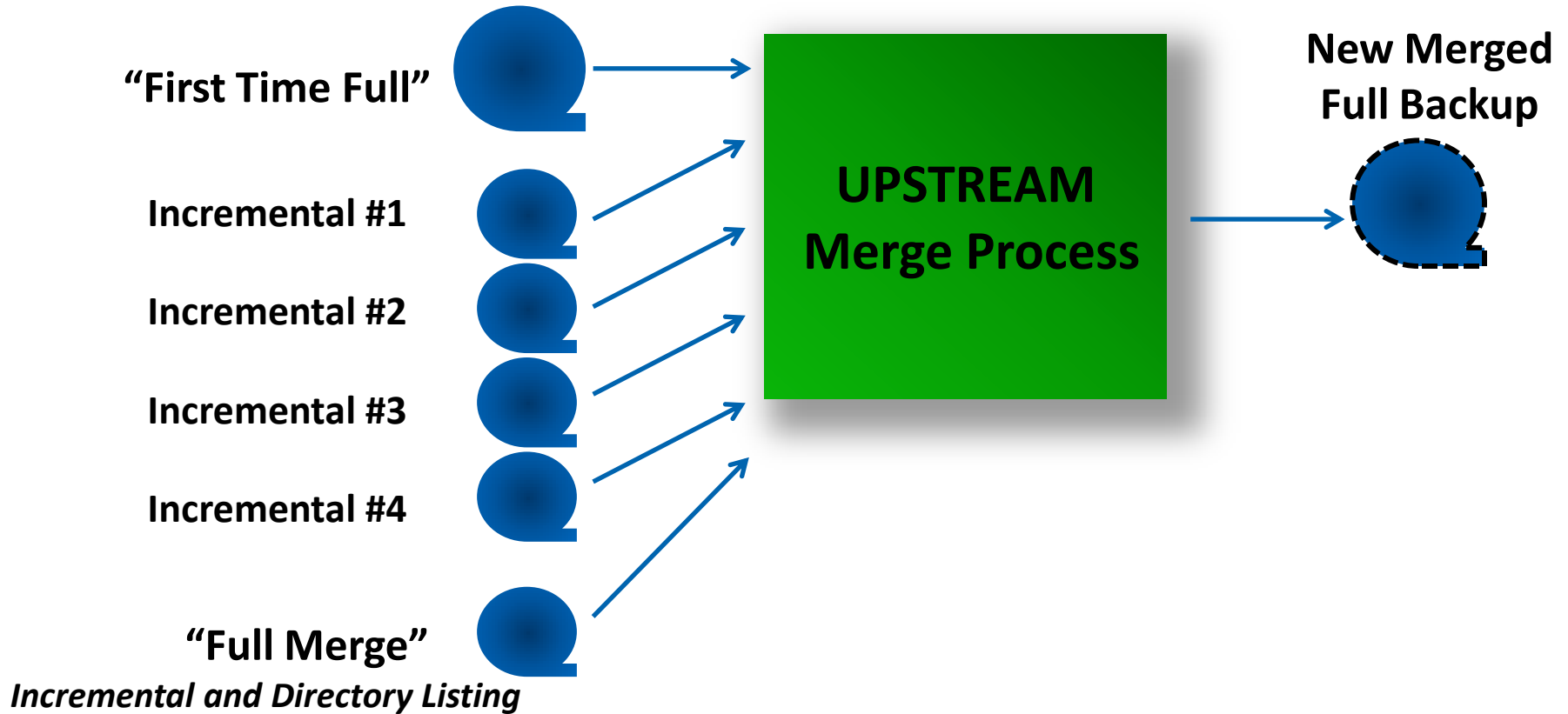
## Advanced Data Reduction Technology Features

- Data Compression
  - 5 levels available
- Synthetic Full Merge Backup
  - Logical file granularity
  - Incremental backup processing
  - Eliminates need to do more than one “traditional” full backup
- Block level segmented backup support
- Exclude/Include
- Migration or disk grooming of inactive data
- Integration with leading mainframe de-duplication hardware appliance makers



# synthetic full merge technology

minimizes data transmission and reduces backup time




# high performance database agents

efficient, reliable protection for large amounts of data



On-line agents for DB2/UDB, ORACLE, LOTUS Notes



Manage large amounts of data within scheduled backup window with “hot backup” technology



Perform backups without bringing down database



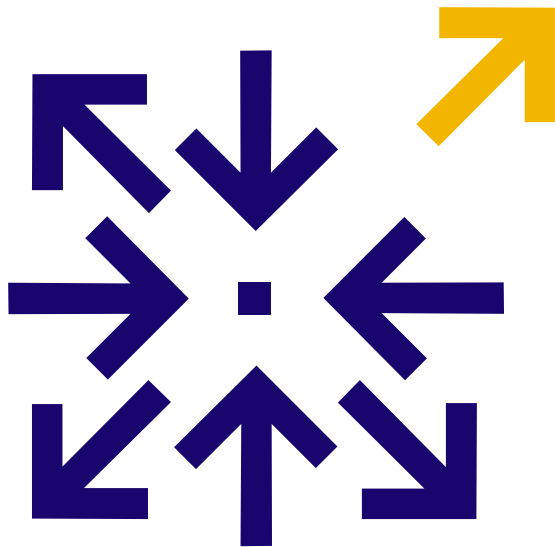
Allows continuous customer access



# UPSTREAM

## “Rescuer” facility

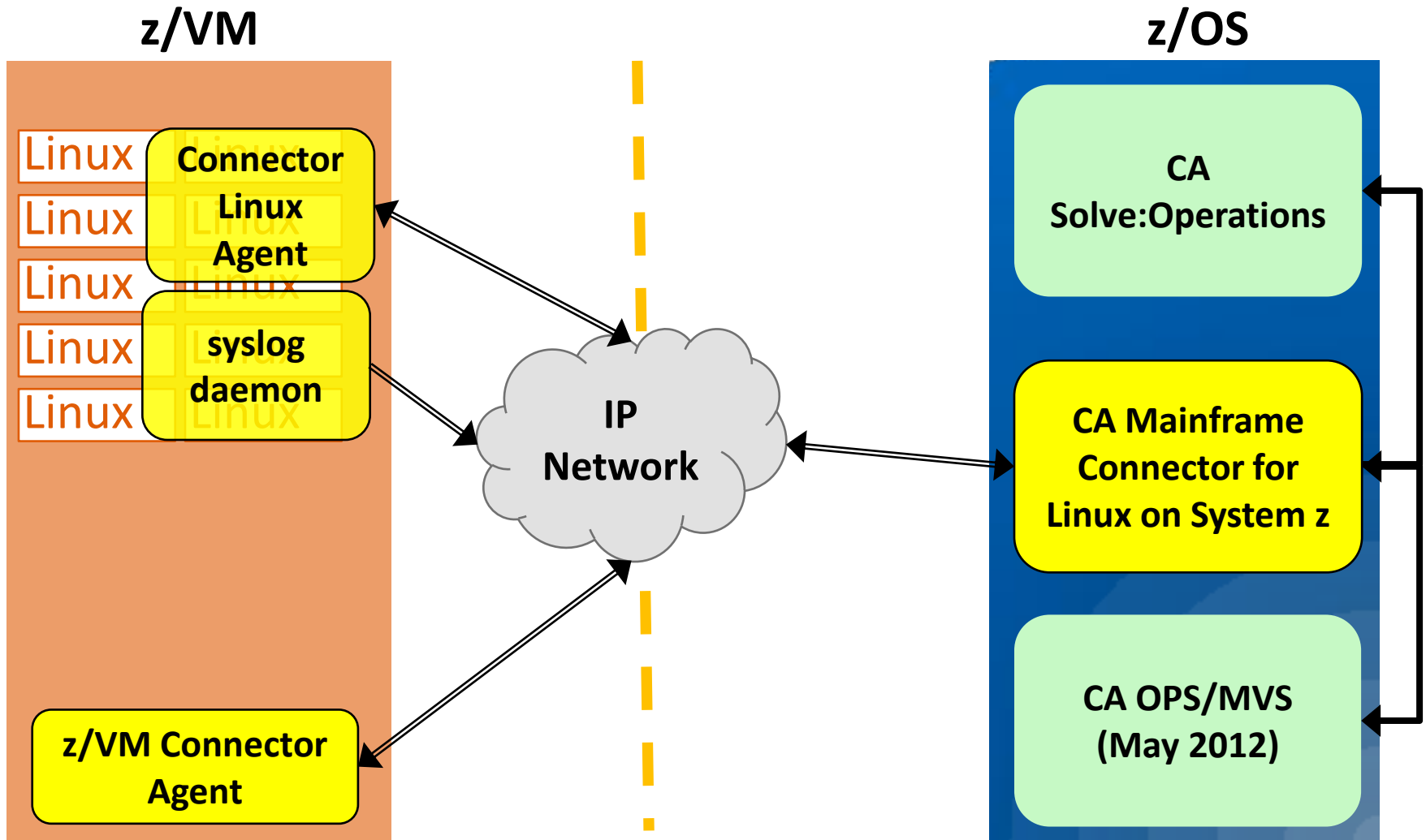
### Quick and easy disaster recovery of Linux on System z applications, systems, configurations and data



- Backup the whole system without taking it offline
- Clone a complete machine easily
- Reduces training and administration while saving resources
- Makes recovery more consistently successful

centrally monitor and manage z/OS, z/VM,  
and Linux on System z

# CA Mainframe Connector for Linux on System z



Cross-platform automation and integrated message handling for Linux on System z

# VM and Linux resources managed from one pane of glass

```

QANM1031----- Resource Monitor -----CA31-0022
Command ==> █

                S=Status L=Trans
System  Class Resource
$SERVICE SVC  FRED
CA31    DASD  DA
CA31    INIT  1
CA31    INTNL PR(SOLVCICS)
CA31    JES   JES2
CA31    JOB   CICSPROD
CA31    PRT   PRT10
CA31    SPOOL SPOOL
CA31    STC   DENMX9JV
CA31    STC   D10ADIST
CA31    STC   D10AIRLM
CA31    STC   D10AMSTR
CA31    STC   QANM10
CA31    TAPE  0E7B
CA31    TAPE  0E7C
ZVM011  LINUX  LINUX181
ZVM011  LXAPP  LINUX181.CALXAGNT
ZVM011  LXAPP  LINUX181.QA1
ZVM011  LXAPP  LINUX181.QA2
ZVM011  LXAPP  LINUX181.QA3
ZVM011  LXAPP  LINUX181.QA4
ZVM011  LXAPP  LINUX181.QA5
ZVM011  LXAPP  LINUX181.QA6
ZVM011  LXAPP  LINUX181.QA7
ZVM011  LXAPP  LINUX181.QA8
ZVM011  LXAPP  LINUX181.QA9
ZVM011  LXAPP  LINUX181.QA10
ZVM011  LXAPP  LINUX181.QA11
ZVM011  LXAPP  LINUX181.QA12
ZVM011  LXAPP  LINUX181.QA13
ZVM011  VMGST  ZVM011
**END**
    
```

```

QANM911----- Graphical Monitor : linux -----LINUXAPPS
Command ==> █

LINUX113.QC1    ACTIVE
LINUX113.QC10   ACTIVE
LINUX113.QC8    DEGRADED
LINUX113.QC5    INACTIVE
LINUX113.QC12   INACTIVE
LINUX113.CALXAGN ACTIVE
LINUX113.QC22   INACTIVE
LINUX113.QC14   DEGRADED
LINUX113.QC18   FAILED
LINUX113.QC23   UNKNOWN
ZVM002          ACTIVE
LINUX113.QC2    ACTIVE
LINUX113.QC6    DEGRADED
LINUX113.QC4    INACTIVE
LINUX113.QC17   DEGRADED
LINUX113        ACTIVE
LINUX113.QC16   INACTIVE
LINUX113.QC13   ACTIVE
LINUX113.QC24   ACTIVE
LINUX113.QC20   ACTIVE
LINUX113.QC21   INACTIVE
LINUX113.QC19   ACTIVE
LINUX113.QC11   DEGRADED
LINUX113.QC7    INACTIVE
LINUX113.QC9    ACTIVE
LINUX113.QC3    INACTIVE
LINUX113.QC25   UNKNOWN
LINUX113.QC15   FAILED
    
```

System	Class	Resource	Status	Action
LINUX181	LXAPP	LINUX181.QA2	INACTIVE	MANUAL ATTENTION
LINUX181.QA2 HAS BEEN STOPPED BY KILL				
LINUX181	LXAPP	LINUX181.QA3	ACTIVE	MANUAL ATTENTION
LINUX181.QA3 IS STARTING				
LINUX181	LXAPP	LINUX181.QA5	ACTIVE	MANUAL ATTENTION
LINUX181.QA5 IS ACTIVE				
LINUX181	LXAPP	LINUX181.QA7	INACTIVE	MANUAL ATTENTION
LINUX181.QA7 HAS BEEN FORCED TERMINATED				
LINUX181	LXAPP	LINUX181.QA9	INACTIVE	MANUAL ATTENTION
LINUX181.QA9 HAS BEEN STOPPED BY KILL				
LINUX181	LXAPP	LINUX181.QA11	INACTIVE	MANUAL ATTENTION
LINUX181.QA11 IS INACTIVE				
LINUX181	LXAPP	LINUX181.QA13	ACTIVE	MANUAL ATTENTION
LINUX181.QA13 IS ACTIVE				
ZVM011	VMGST	ZVM011	ACTIVE	OK

# automate z/Linux operations

## command and response function

Bounce (shut down and immediately restart) a z/Linux guest

Bounce (shut down and immediately restart) a z/VM host and all of its z/Linux guests

Establish automated SLAs for z/Linux applications

Schedule the restart of a z/Linux guest.

Recover a z/Linux guest after an abend or unexpected shutdown (validate and start applications in the right order, etc).

Check and report the status of a z/Linux application.

Stop a z/Linux application, Start a z/Linux application.

Use Linux commands to perform operational processes against a z/Linux application

Establish Services that include both z/OS and z/Linux resources

# additional CA solutions that optimize Linux on System z

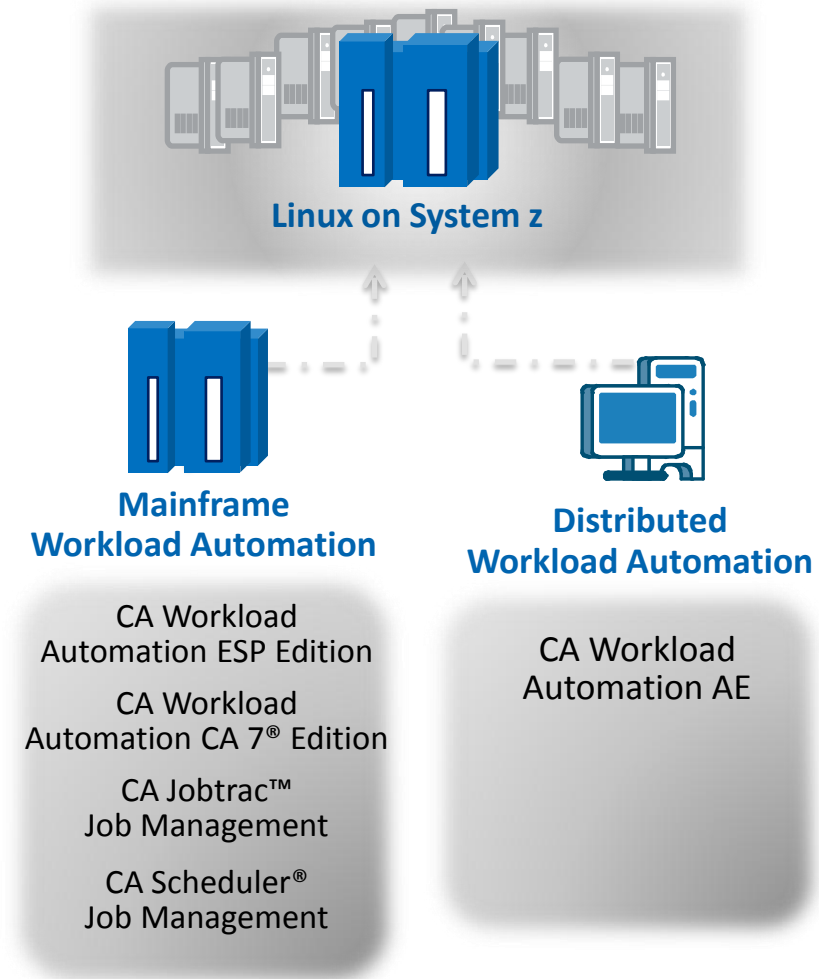
# CA solutions for flexible workload automation

## Challenge

- Need to streamline management of workloads running on Linux on System z
- Require support across multiple platforms

## CA Cross-Platform Workload Automation

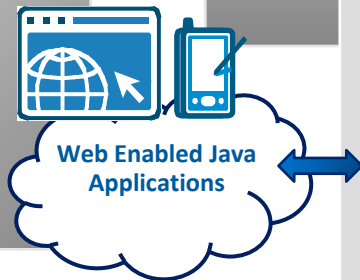
- Automate scheduling, execution and tracking of important Linux on System z workloads
- Collaboratively run Linux on System z workloads using CA mainframe and distributed workload management products



# secure entire z/VM and Linux on System z infrastructure

## CA SiteMinder® Web Access

Application security  
for web applications  
running on  
Linux on System z



## CA Top Secret® for z/VM CA ACF2™ for z/VM CA VM:Secure CA Access Control

Resource protection for z/VM  
and Linux operating system  
resources such as programs,  
files, directories, etc.

## CA PAM Client for Linux

Integrated user  
authentication

Validate Linux  
identities against  
existing z/OS or  
z/VM user definitions

z/VM

z/OS



# additional CA solutions supporting Linux on System z

<b>CA Easytrieve®</b>	<ul style="list-style-type: none"> <li>Information retrieval and report writing for Linux on System z</li> </ul>
<b>CA MIM™ Resource Sharing</b>	<ul style="list-style-type: none"> <li>Automate resource sharing for storage and tape devices and improved console management.</li> </ul>
<b>CA Gen</b>	<ul style="list-style-type: none"> <li>Modernize applications to Linux on System z using model-driven development; reuse assets and migrate without rewriting code.</li> </ul>
<b>CA XCOM™ Data Transport</b>	<ul style="list-style-type: none"> <li>Reliably and securely transfer mission critical data across multiple platforms including Linux on System z.</li> </ul>
<b>CA Storage Resource Manager</b>	<ul style="list-style-type: none"> <li>Enterprise wide view of storage resources across multiple platforms, including Linux on System z.</li> </ul>
<b>CA Workload Automation</b>	<ul style="list-style-type: none"> <li>Automate scheduling, execution and tracking of Linux on System z workloads using CA mainframe or distributed workload management solutions.</li> </ul>
<b>CA SYSVIEW® Performance Management</b>	<ul style="list-style-type: none"> <li>End-to-end view of web enabled Java applications running on Linux on System z; understand where in the stack problems may be occurring.</li> </ul>
<b>CA APM (formerly CA Wily)</b>	<ul style="list-style-type: none"> <li>Monitor performance of Linux on System z web enabled Java applications and troubleshoot problems before they occur.</li> </ul>
<b>CA SiteMinder® Agent</b>	<ul style="list-style-type: none"> <li>Secure web applications running under Linux on System z.</li> </ul>
<b>CA ControlMinder</b>	<ul style="list-style-type: none"> <li>Control access to Linux on System z servers, applications, and devices through host access control and privileged user management.</li> </ul>

# Summary

# CA management for Linux on System z

comprehensive, best in class portfolio

CA VM:Manager™ Suite  
for Linux on System z

CA Workload Automation

**Systems  
Management**

CA VM:Archiver™  
CA VM:Director™  
CA VM:Schedule™  
CA VM:Spool™  
CA VM:Operator™  
CA VM:Tape

UPSTREAM for  
Linux on System z

CA VM:Backup (HiDRO)

**Data  
Protection  
and Disaster  
Recovery**



**Performance  
and Capacity  
Management**

Velocity zVPS™  
Performance Suite

CA Top Secret® for z/VM  
CA ACF2™ for z/VM  
CA VM:Secure

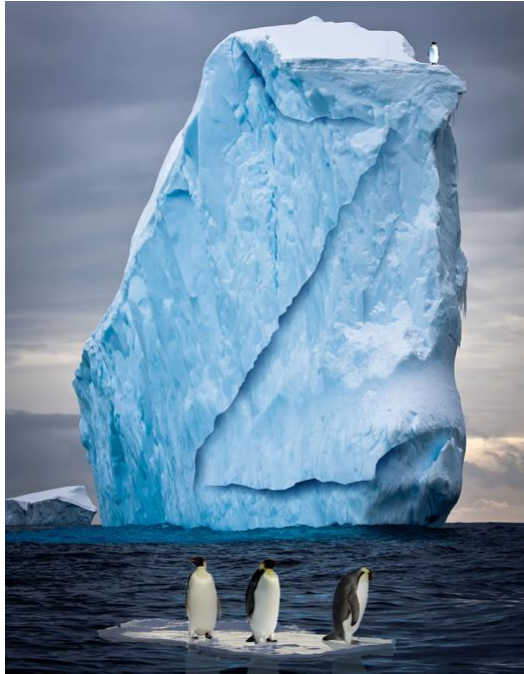
**Security  
Management**

**Provisioning**

CA VM:Secure  
CA VM:Director™  
CA VM:Archiver  
*CA AppLogic for Mainframe (2012)*

[ca.com/mainframe/linux](http://ca.com/mainframe/linux)





Linux on System z offers  
significant cost savings...  
...but who can help you  
optimize it?

**CA Technologies can**

Visit  
[ca.com/mainframe/linux](http://ca.com/mainframe/linux)  
today!

thank you

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