z/OS Introduction and Workshop

Overview of IBM Z
Systems Environment

Prelude

Can someone please share some documentation (links, blogs, papers, charts) on the **Future of Z** for **FSS** clients to understand why mainframes are **not legacy**, but here to stay? Thanks.

Prelude

Consider the DNA of IBM Z.

IBM Z was built from the ground up 56 years ago with a design vision like no other.

The design vision lives on today.

Prelude

The design vision included:

- Data throughput
- Investment protection through upward compatibility
- RAS(3) **Reliability**, **Availability**, **Serviceability**, **Scalability**, and last but far from least **Security**

These are critical to business and governments.

Prelude

During the past decades, these **design attributes** were **advanced and improved** with every new release of hardware.

Today's business digital world is **all about data throughput** with the design characters of IBM Z.

IBM Z was built for the **past, present, and future**.

In addition to data throughput, **financial mathematics** is different from other types of applied arithmetic.

Nothing handles **financial mathematics** of large financial institutions better than IBM Z.

Prelude

IBM Z distinctive strength in the digital world offers **application and innovation** with **economies of scale** resulting in significantly **reduced cost of doing business** with unparalleled service attributes.

What is Cloud?

What opportunities exist as a result of NewCo?

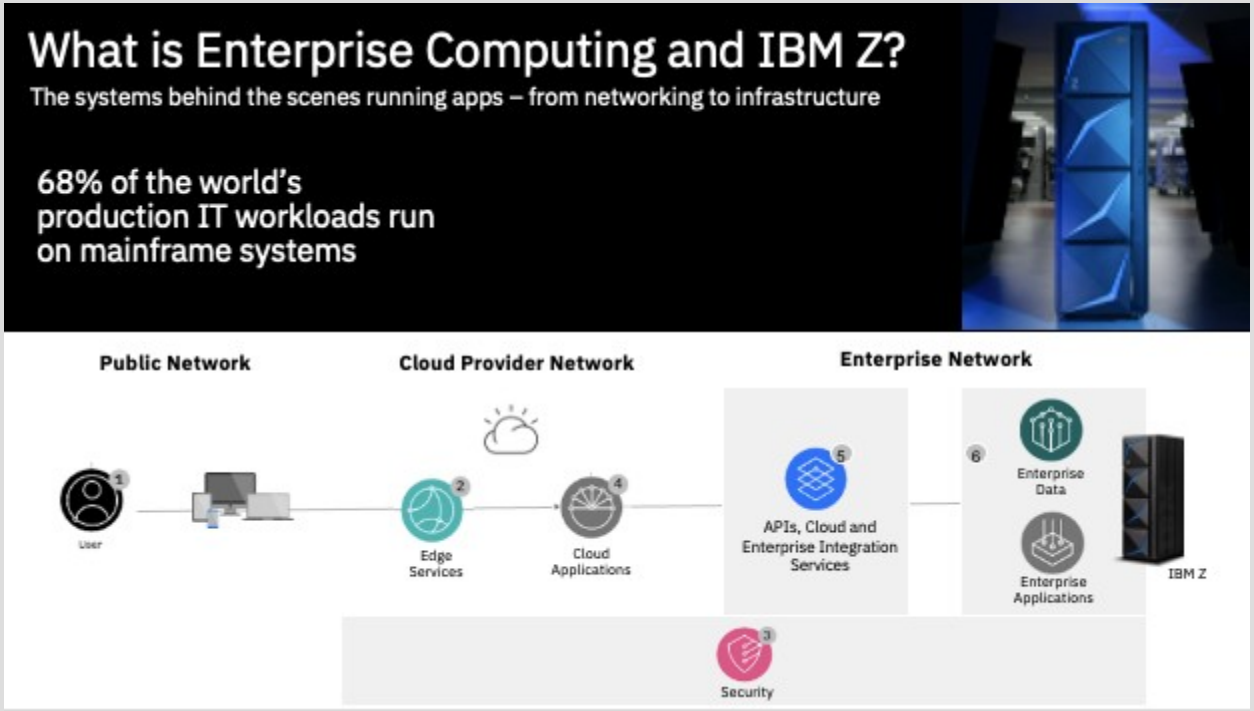
Prelude Nov 2020, Forbes Technology Council, Chris O'Malley

Misconception No. 4: It is easier and cheaper to rewrite apps and move them to a distributed system or the cloud than to maintain existing COBOL programs.

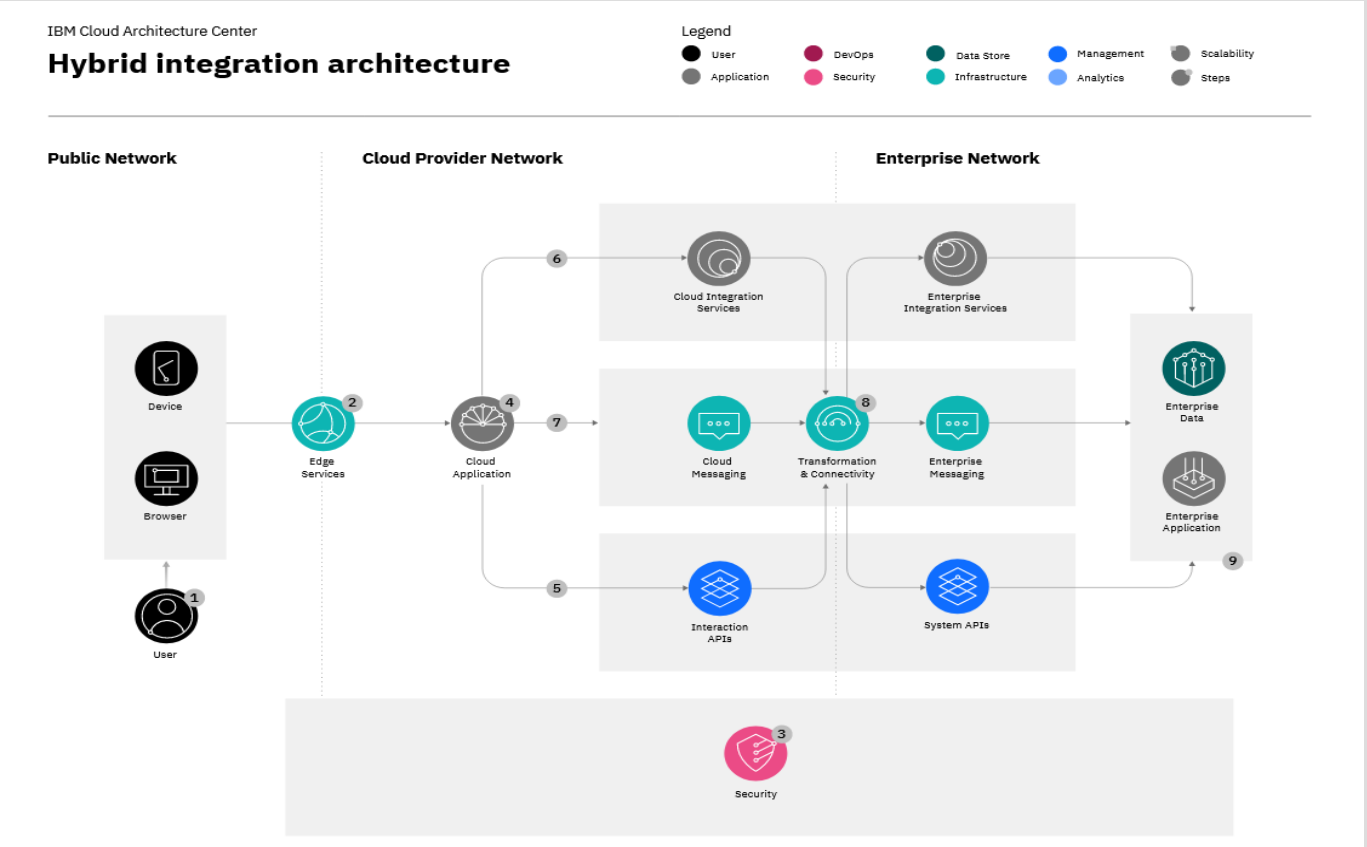
This may be the biggest falsehood of all. At my company, we've seen many instances where organizations have tried to **migrate** mission-critical data and **apps off the mainframe** with **disastrous results**. The **real solution is modernizing** the mainframe by investing in developers and easing operational management at an incremental cost, bringing Agile and DevOps to the platform.

The cloud is ideal for many applications, but the mainframe and COBOL are unequaled among modern enterprise technologies for their ability to handle high-volume transaction processing in terms of performance, scalability, security, and reliability.

Prelude


What is Enterprise Computing and IBM Z?
The systems behind the scenes running apps – from networking to infrastructure
68% of the world's production IT workloads run on mainframe systems
Public Network
Cloud Provider Network
Enterprise Network
1
User
2
Edge Services
4
Cloud Applications
5
APIs, Cloud and Enterprise Integration Services
6
Enterprise Data
Enterprise Applications
IBM Z
3
Security

Prelude



https://www.redhat.com/architect/modern-mainframe-computing

IBM

Unit Objectives

After completing this unit, you should be able to:

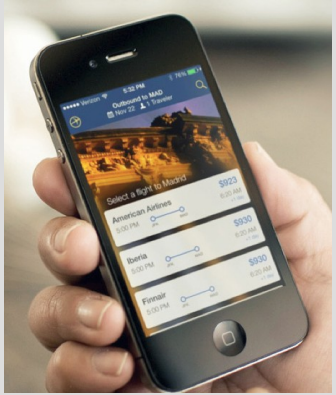
- Describe IBM Z Family of Processors
- List 5 IBM Z Operating Systems
- Discuss IBM Z Virtualization Technology
- Discuss Systems Support and Services Technical Roles
- Locate IBM Z Redbook Technical References

Role of the mainframe in World Wide Economy

The IBM “mainframe” is a large scale computing platform that controls and processes critical data.

Designed for the business world with 5 decades of technical advancements following strict design criteria that has defined expectations of a “mainframe”.

Large-Scale Transaction Processing



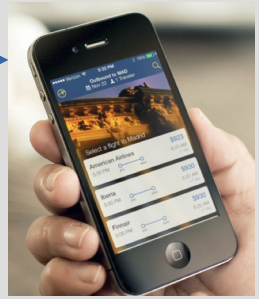
Currency Facts

8% of the money is physical

92% of the money is electronic

https://money.howstuffworks.com/currency6.htm

IBM Z Distinctive Strength
Large-Scale Transaction Processing



Technology Genetics Resulting in a Best of Breed Server

Decades ago, IBM **was** only 1 of numerous mainframe providers. IBM computer design for the requirements of business made the word mainframe synonymous with IBM

Decades of technology advancements enabled business competitiveness, efficiency, and global trade

Built to maximize data throughput using advanced technology for management of processors, memory, and input/output

https://en.wikipedia.org/wiki/Mainframe_computer

https://en.wikipedia.org/wiki/IBM_mainframe

a major tool of business and government for nearly 5 decades as a result of:

Upward Compatibility

Investment protection of business critical applications with decades of functional advancements and tuning

Time tested technology with applied evolution is a matured technology and frequently superior technology

Data processing economies of scale
Reduced costs of doing business with increased capability

Industry Trusted and Recognized

Reliability, Availability, Serviceability, Security, Scalability

Essential Technology of Large Enterprises
IBM Z

IBM Z Environment

- Hardware Architecture
- Five Unique Operating Systems
- Virtualization

IBM Z Hardware Architecture

Redundancy and automatic fail over

- Z means zero

I/O Architecture

- Throughput capability only found in IBM Z family
- Channel adapters with supporting unique I/O protocol with its own processors and memory per adapter.
- Fiber optic cable connectivity to disk, tape, printers and network

Five Unique Operating Systems

z/OS
http://www.ibm.com/systems/z/os/zos ← Flagship Operating System

z/VM
http://www.ibm.com/systems/z/os/zvm ← Virtual Management / Hypervisor

z/TPF
http://www.ibm.com/systems/z/os/tpf ← Transactional System

z/VSE
http://www.ibm.com/systems/z/os/zvse ← Similar to z/OS excluding feature/function

Linux on IBM Z (LinuxONE)
http://www.ibm.com/systems/z/os/linux ← Most commonly used

IBM Mainframes & Flagship Operating System

IBM Z Family of 'Mainframes' Architecture

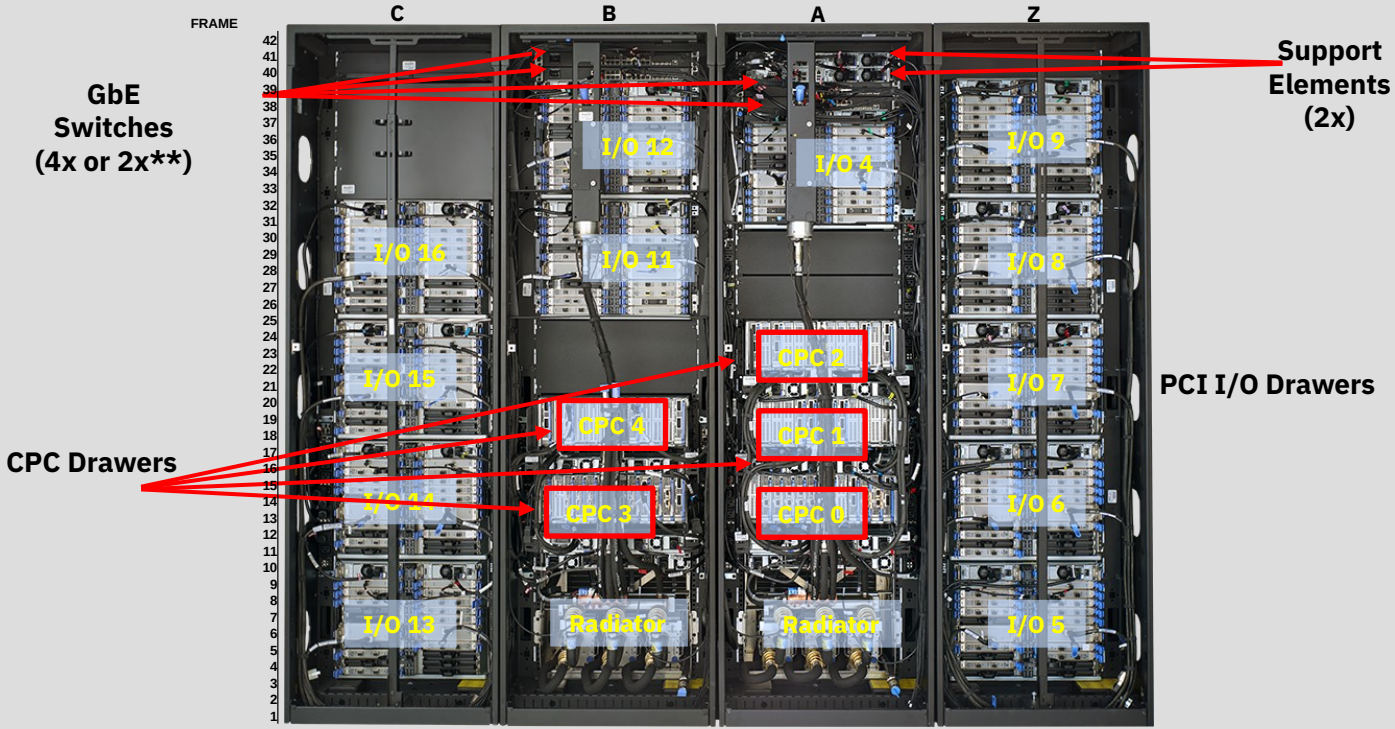
- z/Architecture (2000) z/OS

IBM Mainframe – The original DNA
https://en.wikipedia.org/wiki/IBM_System/360_architecture

Previous IBM 'Mainframe' Architectures

- System 390 Architecture (1990) OS/390
- System 370 Architecture (1970) MVS
- System 360 Architecture (1964) MVT

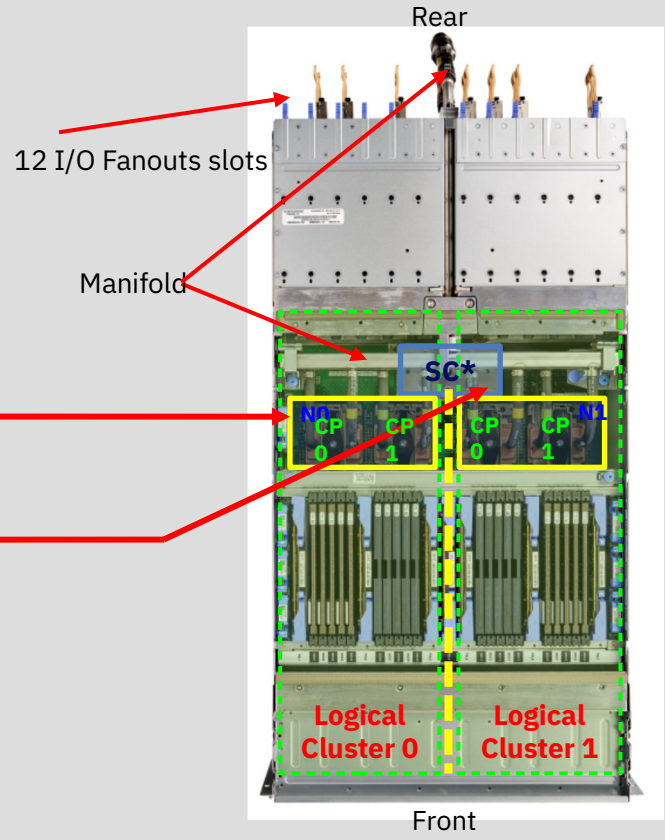
IBM Z
z15


FRAME
C
B
A
Z
GbE Switches (4x or 2x**)
Support Elements (2x)
PCI I/O Drawers
CPC Drawers
I/O 12
I/O 4
I/O 9
I/O 16
I/O 11
I/O 8
CPC 2
I/O 15
I/O 7
CPC 4
CPC 1
I/O 14
CPC 3
CPC 0
I/O 6
I/O 13
Radiator
Radiator
I/O 5

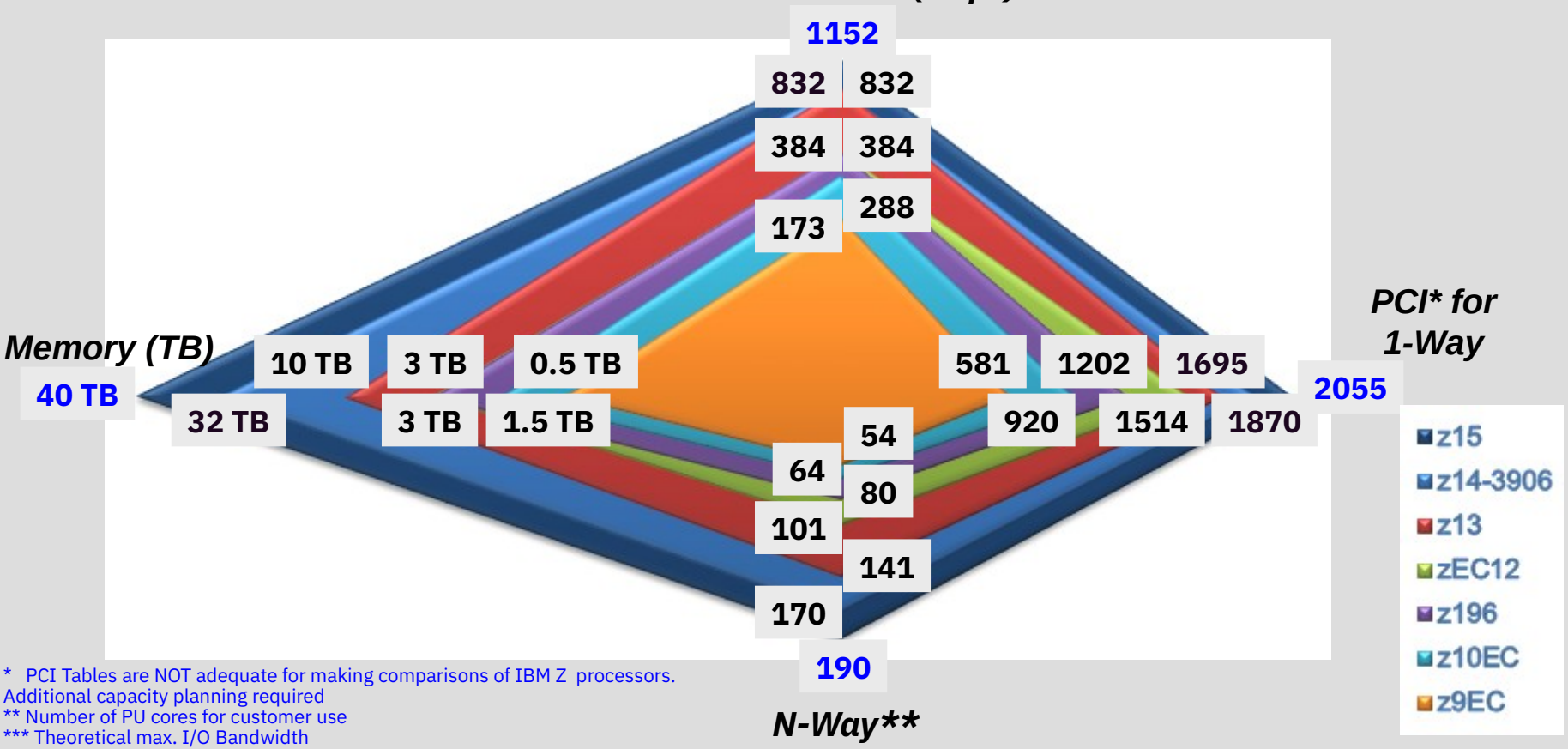
z15 Processor Drawer

Each PU SCM:
- 14nm
- Four PU SCMs
- One Memory Controller per PU Chip
- Five DDR4 DIMM slots per Memory Controller
- 20 DIMMs total per drawer

Each drawer:
- Two logical PU clusters (0 and 1)
- Four PU Chips per CPC Drawer:
  - 41 active PUs per drawer - Max34, Max71, Max108 and Max145
  - 43 active PUs per drawer – Max190
- One SC Chip (960 MB L4 cache)
- DIMM slots: 20 DIMMs to support up to 8 TB of addressable memory (10 TB RAIM)
- Water cooling for PU SCMs, air cooled SC SCM
- Two Flexible Support Processors/ OSC Cards
- 12 fanout slots for PCIe+ I/O drawer or PCIe coupling fanouts (ICA SR1.1).



IBM Z Capacity



* PCI Tables are NOT adequate for making comparisons of IBM Z processors. Additional capacity planning required
** Number of PU cores for customer use
*** Theoretical max. I/O Bandwidth

Virtualization

LPAR (PR/SM)
- Hardware partitioning
- Processors and I/O Channels may be shared or dedicated
- Real memory must be dedicated
- Capable of hosting 1 of the 5 unique operating systems

z/VM
- Industrial strength hypervisor
- Processors, I/O Channels and **Real memory** may be shared or dedicated
- Operating system partitioning of CPUs, I/O devices, and memory
- 50+ years of technology evolution
- Capable of hosting 1000’s of guest operating systems

Hipersockets and VSwitch
- All hosted operating systems capable of using internal hardware for network communication with near zero network delay
- Server consolidation benefits include elimination of cables and significantly reduced cost of power per server.

Information Technology Organization

Chief Information Officer (CIO)

Application Development Support and Services
- Frequently organized by critical business services

Information Technology Support and Services

Data Center Operation Staff
- Production Control Analysts
- Computer Operators
- Tape Operators
- Print Operators
- Network Operators

Systems Administration
- Systems Programmers
- Security Administrators
- Database Administrators
- Disk Storage Administrators

Information Technology Management Responsibilities

Budget & Cost Control

- Technology Contract Negotiations
- Hardware & Software Vendor Management
- Staff and Facilities

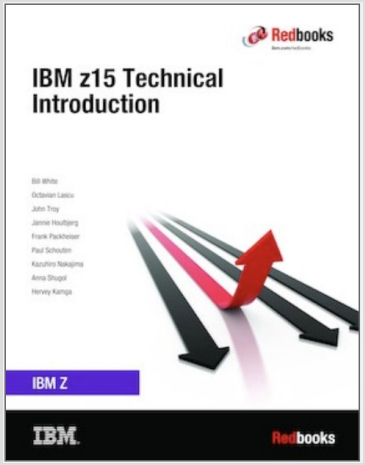
Service Level Agreements

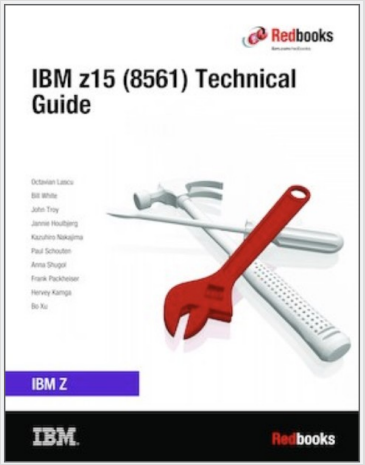
- Availability and Downtime Avoidance
- Response Time Commitments

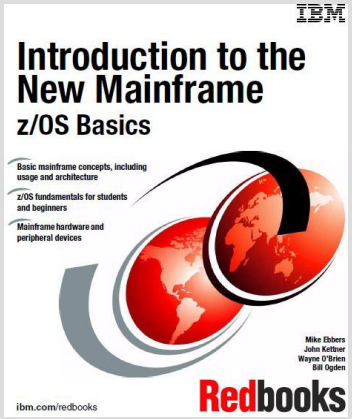
Change Management

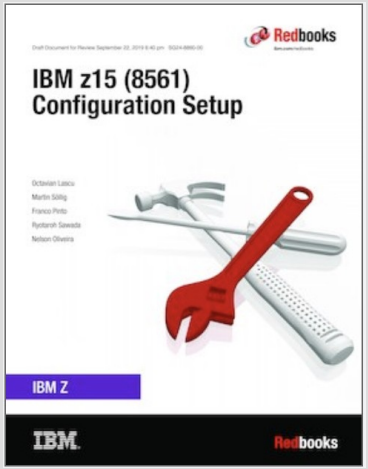
- Maintain Hardware and Software Currency
- Risk Mitigation

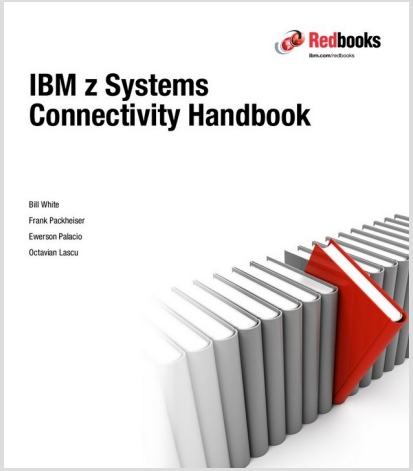
Disaster Recovery and Business Continuity

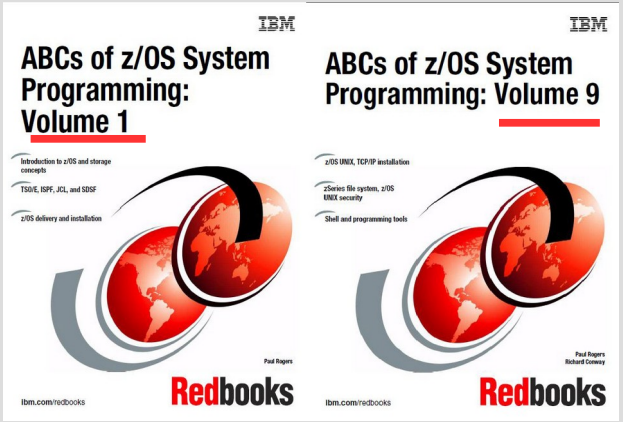












http://www.ibm.com/redbooks

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