Enterprise Computing Mainframe

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Contents

- Two Parts
  - Mainframe (This set of slides)
  - Enterprise programming (COBOL, Tools and Techniques)
- Mainframe
  - What is a Mainframe? Who uses them? Who runs them?
  - Important characteristics: reliability, availability, security
  - Computing power, batch, transaction, online processsing
  - Operating system & Programming
  - Jobs, internships, salary
  - Learning resources
  - Demonstrations
  - CSUN Enterprise Computing project

Why Learn Enterprise Computing?

- The World economy runs on Enterprise systems
    - Banks, brokerage, stock exchanges
  - Point of sell transactions
    - Travel sites, air line ticketing, supermarket stock control
  - Healthcare & Insurance systems
  - Large manufacturing and commerce systems
  - Government computing
- Enterprise systems run on Mainframes
  - Why? Speed, simplicity, reliability, scalability
- Good part of the software is based on legacy code
  - COBOL

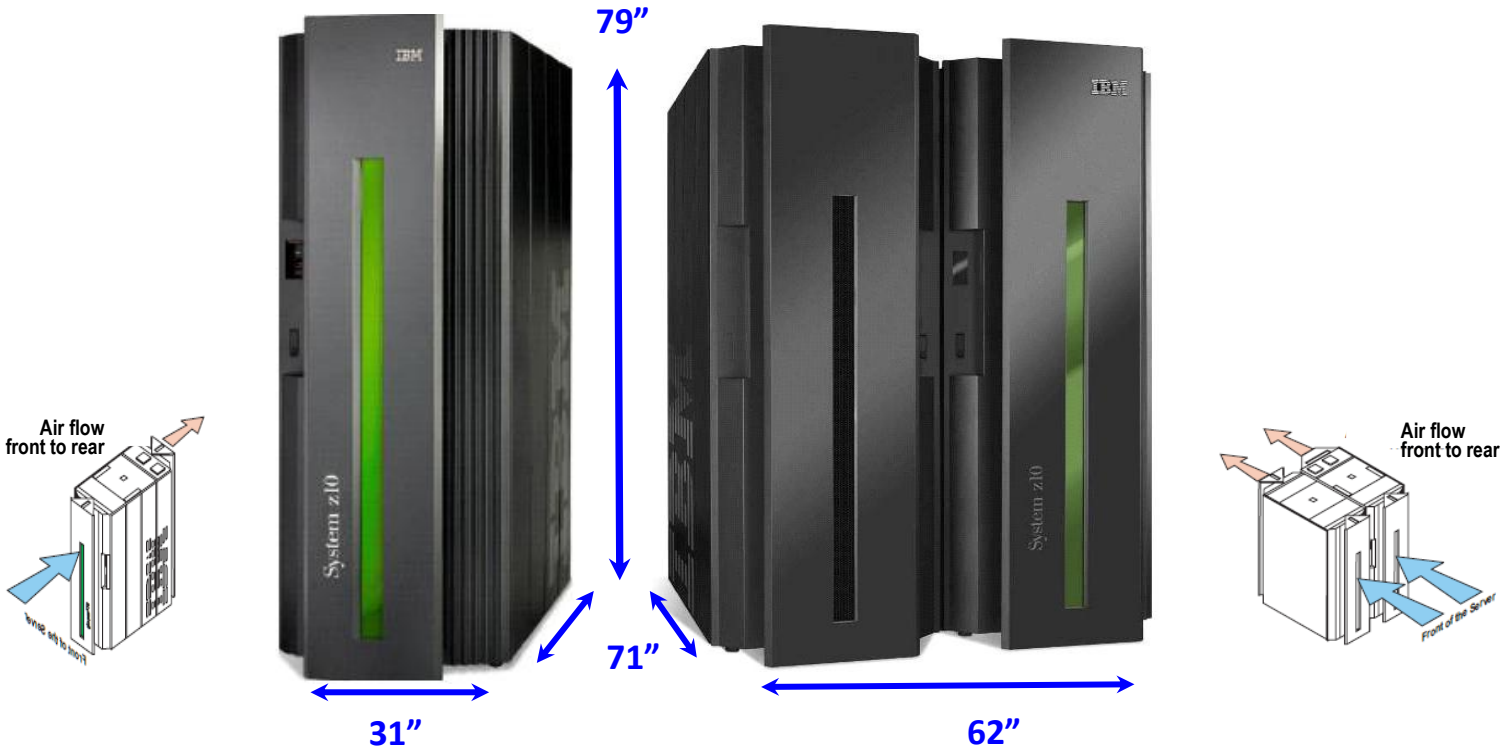
What is a Mainframe?

- Part 1
  - http://www.youtube.com/watch?v=d0-pLcgq-2M

People don’t know mainframes

- Hollywood Myths vs. Reality

Modern Mainframe Physical Dimensions



Business Class (BC) **Enterprise Class (EC)**

What is a mainframe

- Part 2
  - http://www.youtube.com/watch?v=ewsaYde59C0

Webopedia

"A very large and expensive computer capable of supporting hundreds, or even thousands, of users simultaneously.

In the hierarchy that starts with a simple microprocessor (in watches, for example) at the bottom and moves to supercomputers at the top, mainframes are just below supercomputers.

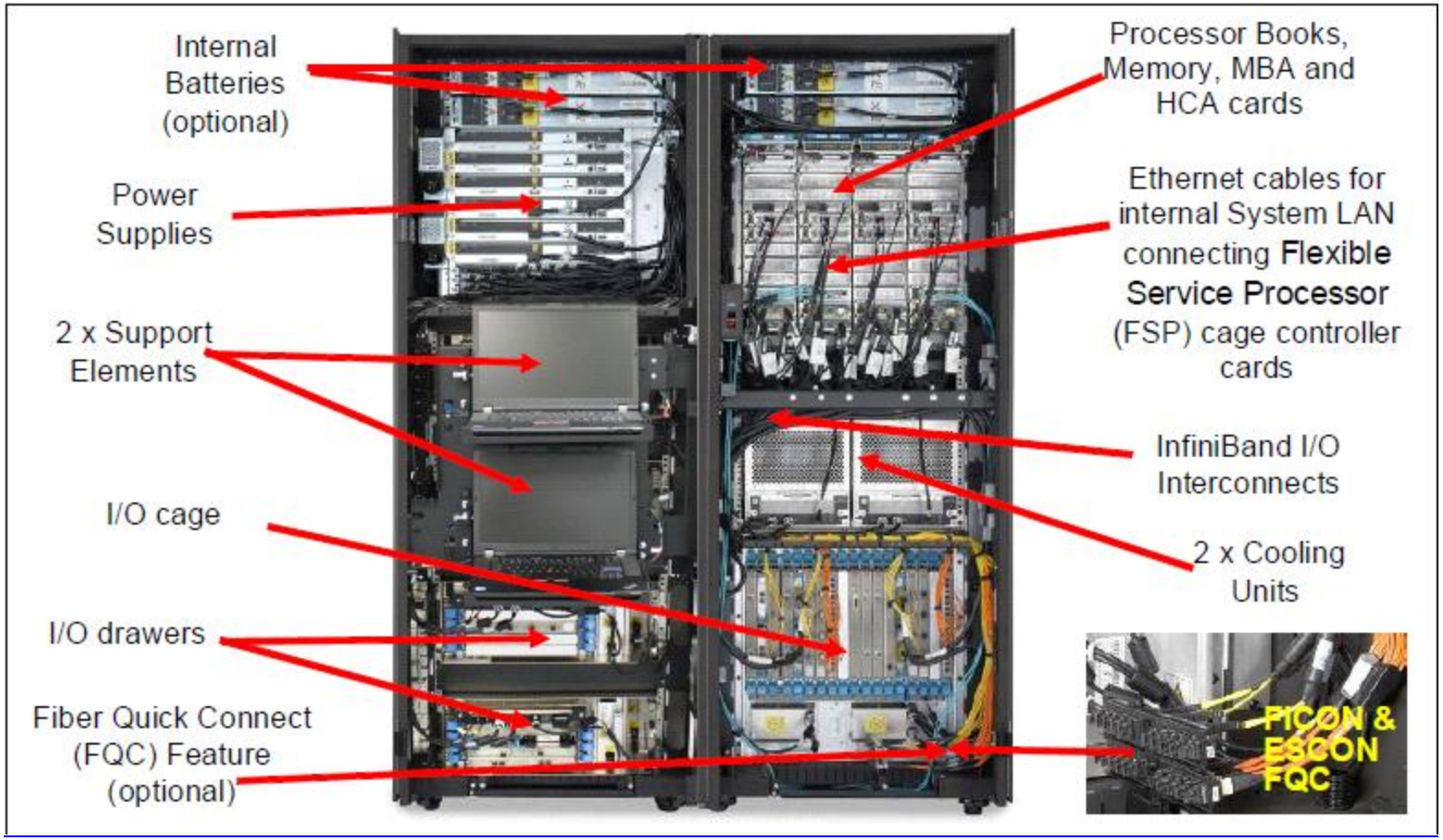
In some ways, mainframes are more powerful than supercomputers because they support more simultaneous programs. But supercomputers can execute a single program faster than a mainframe."

http://www.webopedia.com/TERM/M/mainframe.html

A Real Important Thing About Mainframes

- High Reliability
  - Nonstop system running
  - Redundancy
  - Monitoring
- High Availability
  - Redundancy, Symmetric multiprocessing (sysplexing)
- High Security
  - Everything is tight, closely controlled system
  - Not easy to hack

What Does a Mainframe Look Like?



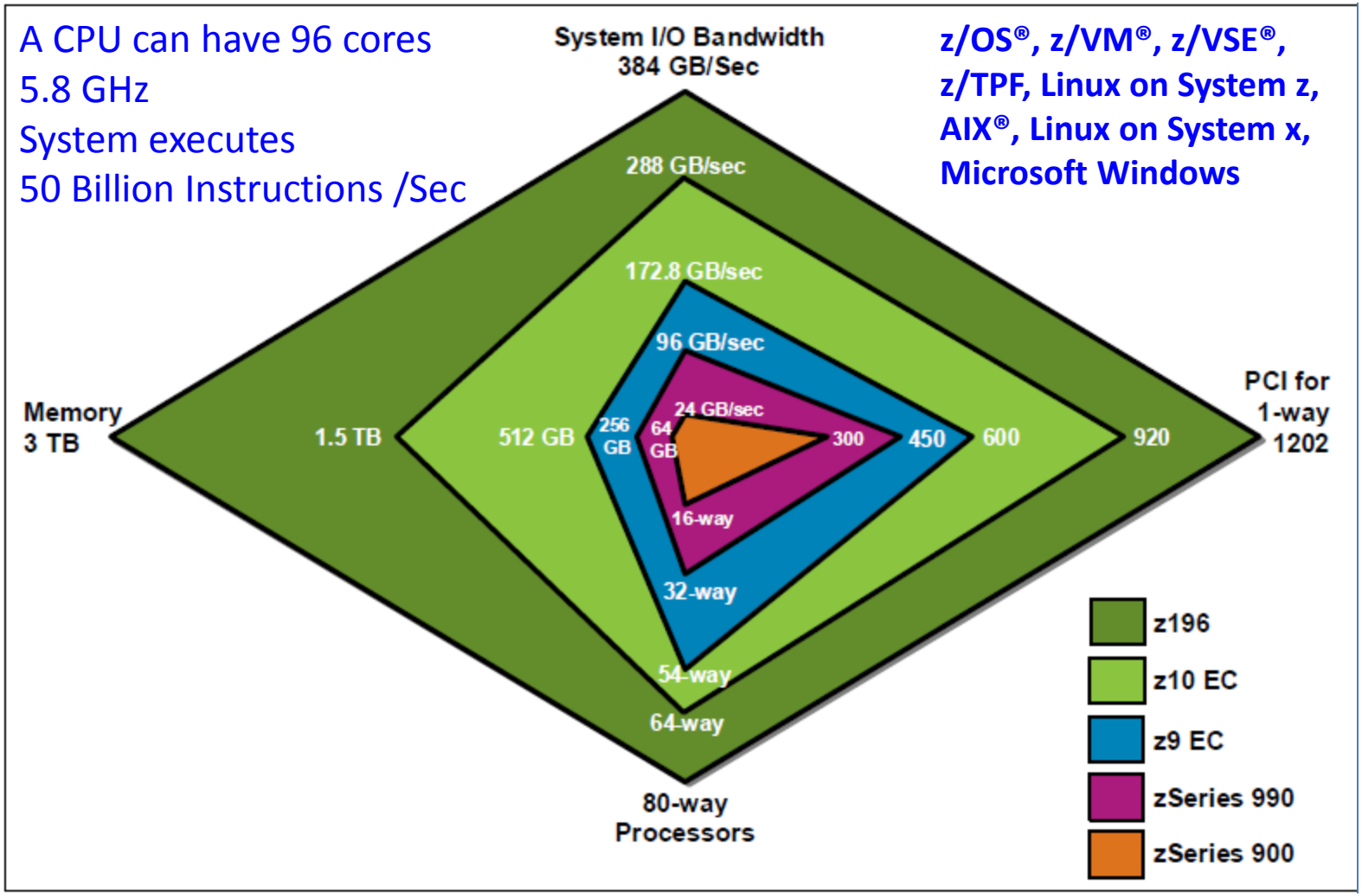
z/196 Enterprise System

World's most powerful mainframe system

Mainframes are Ultra Powerful

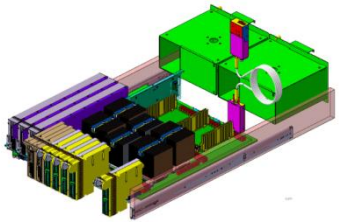
A CPU can have 96 cores
5.8 GHz
System executes
50 Billion Instructions /Sec

z/OS®, z/VM®, z/VSE®, z/TPF, Linux on System z, AIX®, Linux on System x, Microsoft Windows



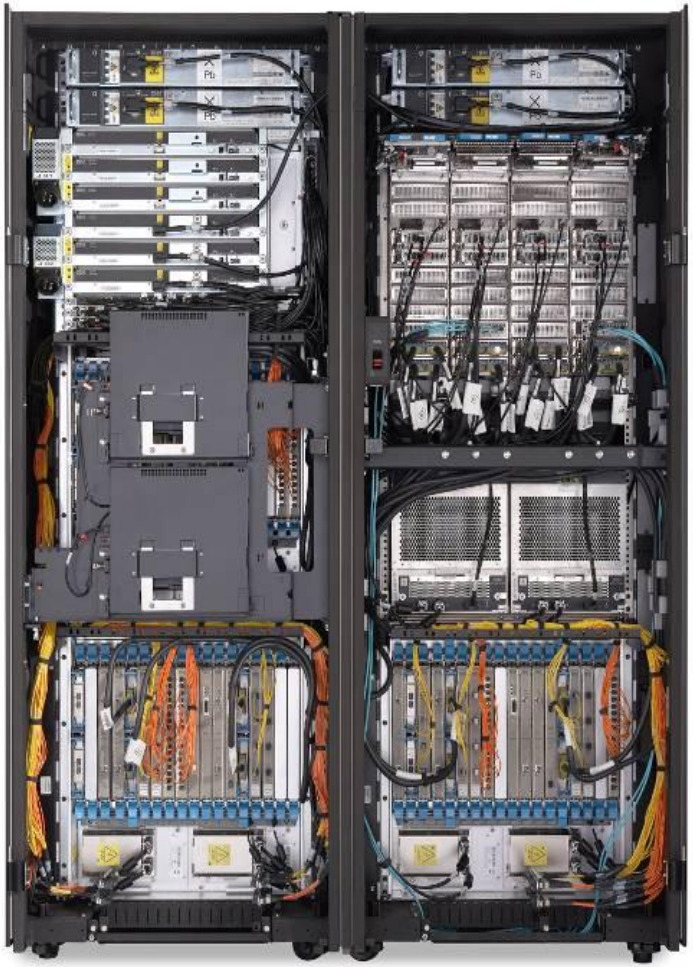
What is the transfer rates of a fast SATA drive? 6GB/S

Another Look



- One drawer houses the Central Processing Complex (CPC)
- One to four drawers house the I/O features.

Business Class design is based on Drawers



- Up to four Books house the Central Processing Complex
- One to three cages house the I/O features

Enterprise Class design is based on Books

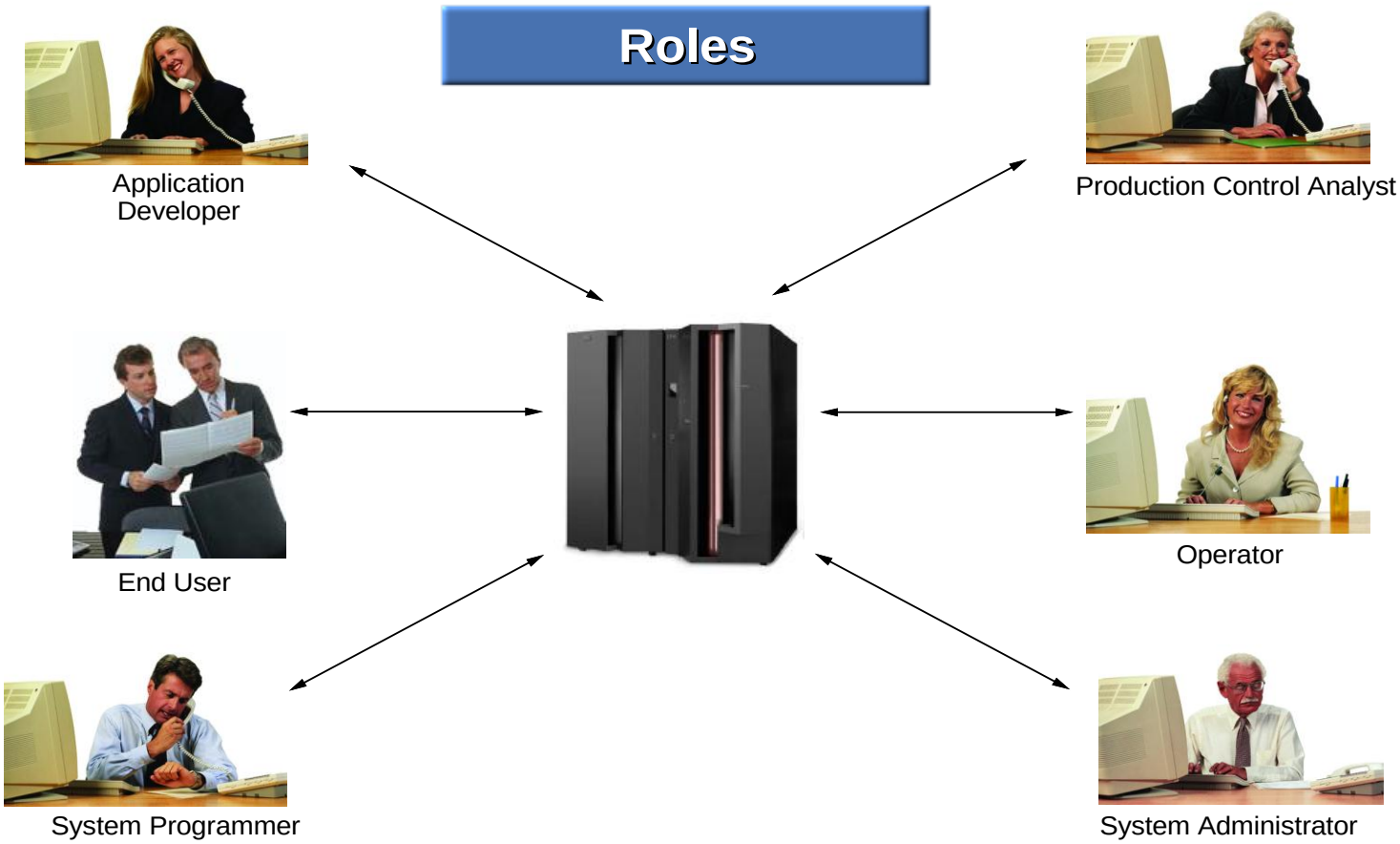
Who Runs Mainframes?

- Most Fortune 1000 companies use a mainframe environment
  - 60% of all data available on the Internet is stored on mainframe computers

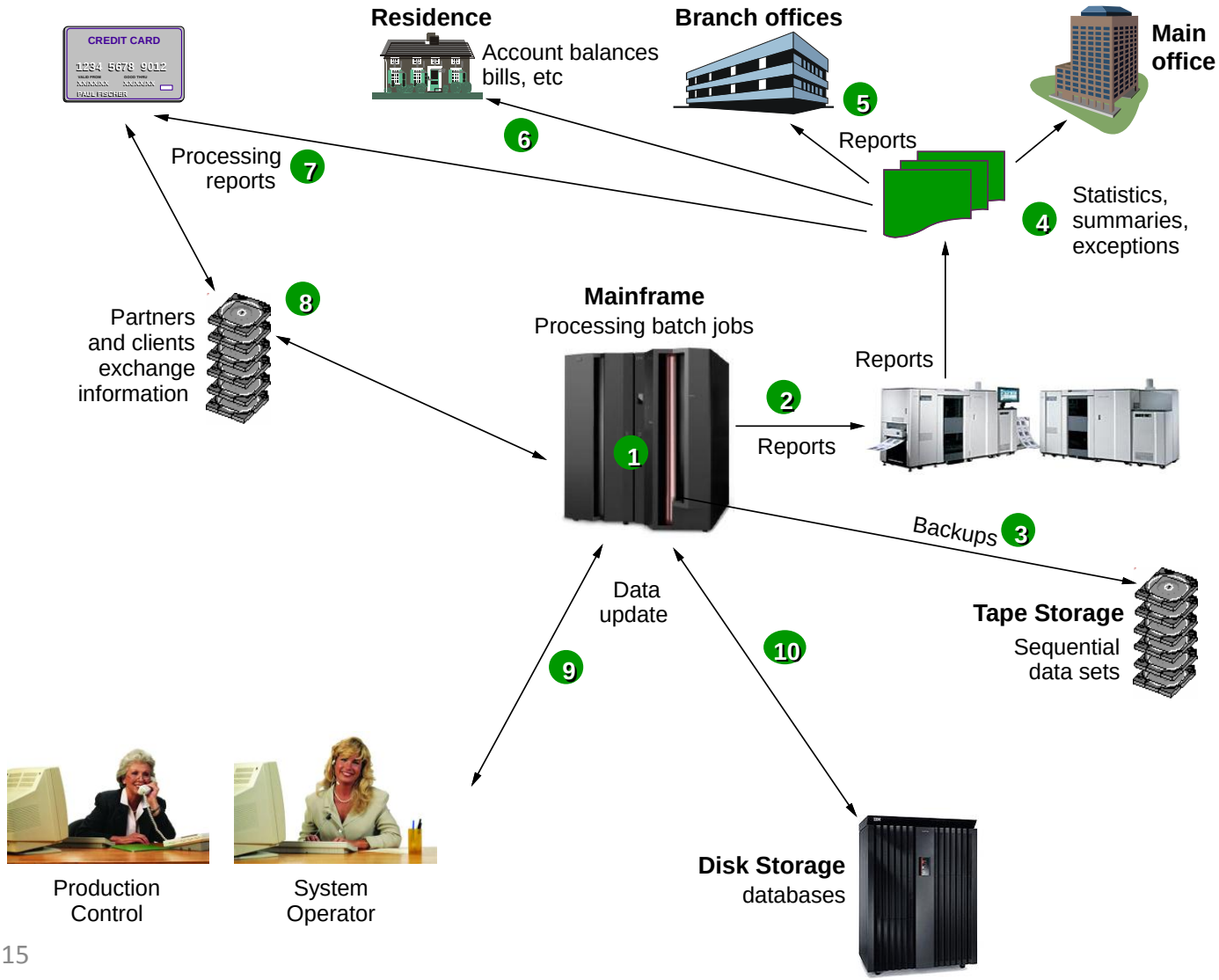
- Why mainframes?
  - Large-scale transaction processing
    - Thousands of transactions per second
  - Support thousands of users and application programs
  - Simultaneously accessing resources
  - Terabytes of information in databases
  - Large-bandwidth communications

- There are more mainframe transactions processed daily than Web pages served

Who Uses Mainframes?



Mainframes Do Batch processing



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Mainframes Do Transaction processing

ATMs

Account activities

1

SNA or TCP/IP network

4

Requests

Branch office automation systems

2

Branch offices

3

Office automation systems

Mainframe

Accesses database

5

queries and updates

6

Central office

Business analysts

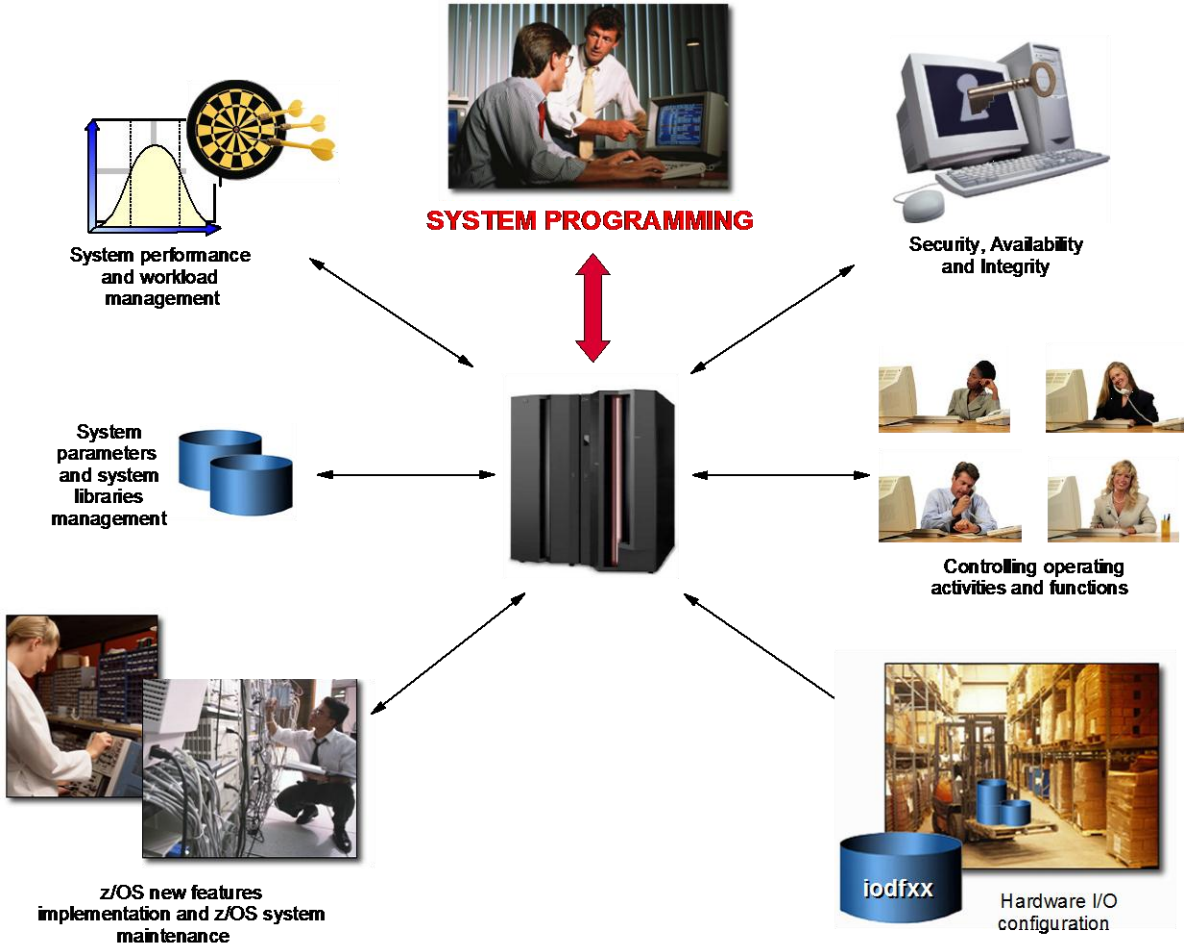
Inventory control

Disk storage controller

Stores database files

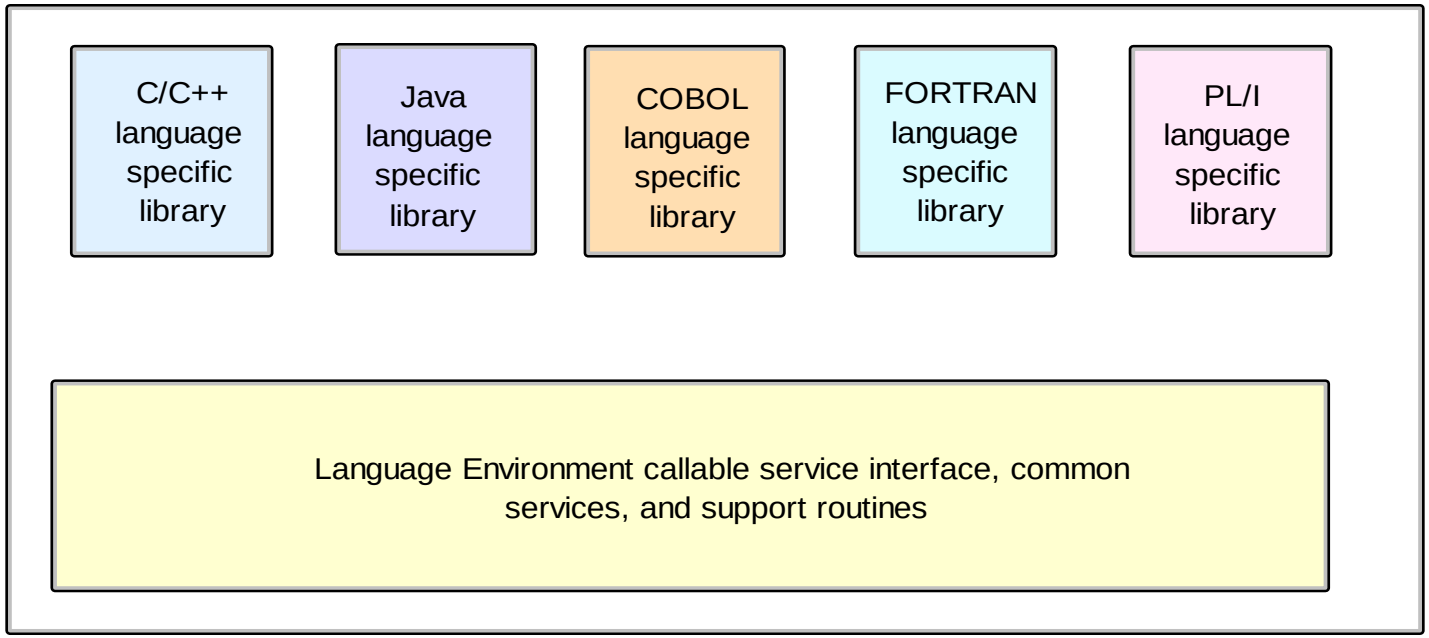
Programming For Mainframes

- Systems Programming Installs, customizes, maintains operating system and utilities



Programming For Mainframes

- Application programmers design and code applications using IDE (Rational, Eclipse)
  - Not much different from ordinary applications
  - Batch programs & Transaction Processing
  - Database intensive

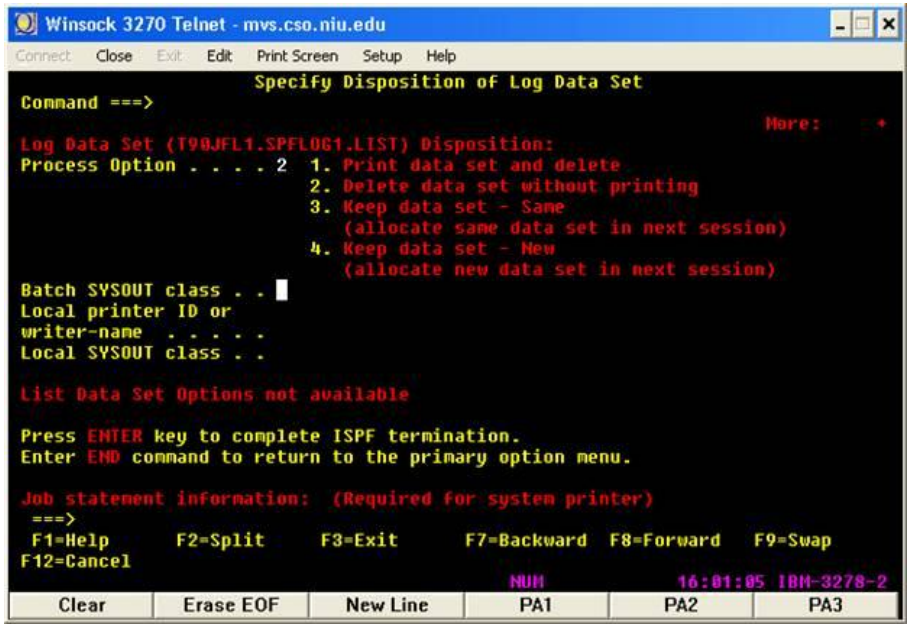


IBM z/OS Interfaces

- IBM Rules the mainframe world z/OS
- TSO/E
  - Allows users to logon to z/OS and use a limited set of basic commands. This is sometimes called using TSO in its *native mode*.
- ISPF
  - Provides a menu-driven interface system for accessing many of the most commonly used z/OS functions.
  - Implemented by TSO

- z/OS UNIX shell and utilities
  - Allows users to write and invoke shell scripts and utilities, and use the shell programming language.

TSO Interface



ISPF Interface has Panels

Action Bar

Panel Options

Dynamic Status Area

Command Line

Function Keys

```
 Menu  Utilities  Compilers  Options  Status  Help
--------------------------------------------------------------------------------
                          ISPF Primary Option Menu

0  Settings       Terminal and user parameters          User ID . : AUES100
1  View           Display source data or listings       Time. . . : 16:14
2  Edit           Create or change source data          Terminal. : 3278
3  Utilities      Perform utility functions             Screen. . : 1
4  Foreground     Interactive language processing       Language. : ENGLISH
5  Batch          Submit job for language processing    Appl ID . : ISR
6  Command        Enter TSO or Workstation commands     TSO logon : LOGON
7  Dialog Test    Perform dialog testing                TSO prefix: AUES100
8  LM Facility    Library administrator functions       System ID : SYS1
9  IBM Products   IBM program development products      MVS acct. : ACCNT#
10 SCLM           SW Configuration Library Manager      Release . : ISPF 5.2
11 Workplace      ISPF Object/Action Workplace

S  SDSF           System Display and Search Facility

Enter X to Terminate using log/list defaults

Option ===> _____________________________________________________________

F1=Help      F2=Split     F3=Exit      F7=Backward  F8=Forward   F9=Swap
F10=Actions  F12=Cancel
```

Job Control Language

- Used to control batch job execution
  - Authentication and accounting
  - Request resources- very detailed
    - Programs, memory, disk space, files
  - Somewhat complicated
    - Systems programmers write JCL for use by
      - Application programmers
      - System operators

JCL Example

```
//MYJOB      JOB 1
//MYSORT     EXEC PGM=SORT
//SORTIN     DD DISP=SHR,DSN=IBMUSER.AREA.CODES
//SORTOUT    DD SYSOUT=*
//SYSOUT     DD SYSOUT=*
//SYSIN      DD *
  SORT FIELDS=(1,3,CH,A)
/*
```

MYJOB Job name
MYSORT Step name
SORTIN DD name for program input
SORTOUT DD name for program output
SYSOUT Where to send system output messages (such as a data set)
SYSIN Specifies whether the input will be data or control statements.

COBOL Programming

- Billions of lines of live code in use
- There is no sunset date for COBOL
- Billions of $ invested
- Verbose but has evolved a great deal

Mainframe Jobs Pay More

$86,000
Entry level

Source: http://www.indeed.com/salary?q1=IBM+cics+programmer&l1=

$119,000
2-3 years

Mainframe Jobs

$55,000
Entry level

IBM z/OS related job postings for students
www.SystemzJobs.com

$63,000
1 to 2 years

Regular IT Jobs

Mainframe Jobs

- Mainframe programming jobs in LA area
  http://www.indeed.com/salary?q1=Mainframe+System+Programmer&l1=Los+Angeles%2C+CA

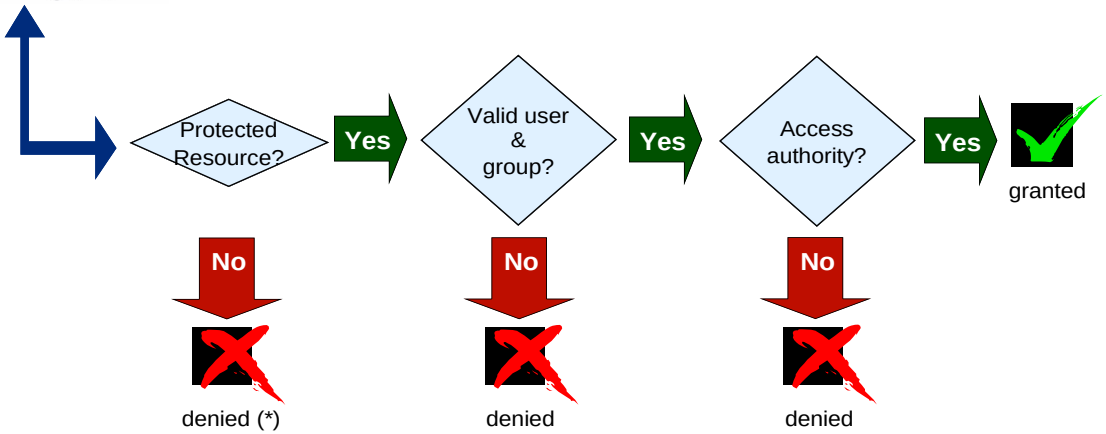
- IBM System Z Job Openings- Worldwide
  http://www.systemzjobs.com

Mainframes Are Greener

- Increasing number of server farms creates an environmental problem
- Mainframes use less energy & generate less heat- better for the environment
- http://www.youtube.com/watch?v=VoYatTeav4E&feature=player_embedded#!

Resource Access Control Facility

- RACF provides the basic security framework on z/OS mainframes
  - Identify and authenticate users
  - Authorize users to access protected resources
  - Log and report attempted unauthorized access
  - Control means of access to resources



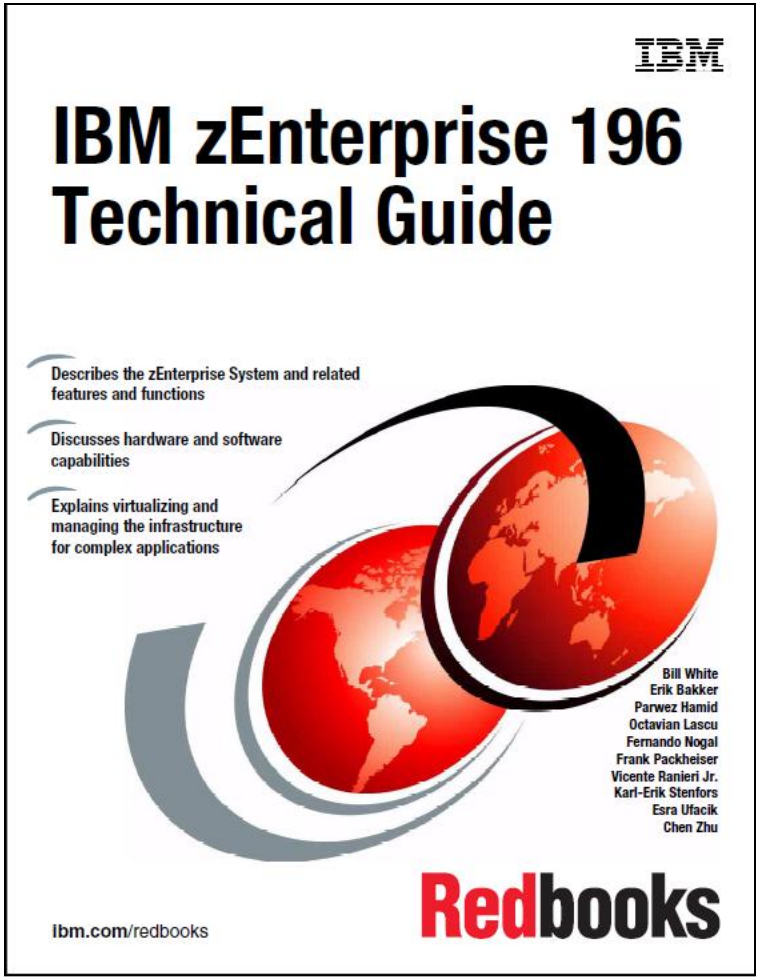
(*) if Protect All option is in effect

Independent Reports Support Mainframes for Business

- Forrester Research
  http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=PM&subtype=AB&htmlfid=ZSC03133USEN
- Edison Report
  http://www-03.ibm.com/systems/z/solutions/cloud/index.html

- There are many more studies on the benefits of using mainframe computers
  - look for them

Many Free Learning Resources



IBM Red Books cover the whole spectrum

Free PDF Download

Put it in Kindle or iPad

http://www.redbooks.ibm.com/

Many web based learning resources,
Do a Google search using search parameters:
z/OS, IBM Enterprise computing, RDz UT

CSUN Enterprise Computing Project

- Gain professional knowledge, build confidence, and be job ready by discovering and learning mainframe technologies. Gain opportunities for internships/jobs. Both locally and nationwide
- Help establish an enterprise learning environment at CSUN (lab, Eclipse environment, Rational Development system, RDz/UT Virtual environment)
- You will learn mainframe programming including systems programming
  - Learn z/OS stuff
    - Systems Programming
    - Application Programming (COBOL/C/Java)
    - Transaction processing applications
    - DB2 and IMS database systems
- You will support development of Enterprise Computing Courseware
- You will take part in "Master the Mainframe" competition
- Stipend based on effort and accomplishments
- Comp490/1 (undergraduate) or Comp696/698 credits (graduate)

What Do You Need To Join The Project

- Excellent programming skills
- Ability to make progress on your own
  - Research tools and techniques, find solutions
- About 3.2-3.5 GPA in the Major subjects
- Recommendation email from a professor with whom you took a “serious” programming or SW eng class
  - Prof can email it to me shan@csun.edu
  - Can be from CSUN or elsewhere
  - Send an email to shan@csun.edu, if interested

How to Join?

- Send me an email (shan@csun.edu) with the following information
  - Subject line should say
    - Enterprise Computing Project- <Your last name>, <First name>
  - Body of the email should have
    - Your contact information (your email, phone #)
    - Name of the professor who is sending the reference and the class (class name, semester)
      - Give email if not from CSUN
  - Attach
    - A few focused statements stating why you are a strong candidate to join the team. This should be no more than 1 page. Bullets with some explanatory text for each bullet will be acceptable.
    - A copy of your DPR in PDF format

Related Videos
(Play on your own time)

- Fastest z/Enterprise systems
- http://www-03.ibm.com/systems/z/hardware/

- What is the IBM enterprise system? http://www.youtube.com/watch?v=m9rC4yYbW2E