Business Machines for Enterprise Computing

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A Look at the History and Current Use of Mainframe Computers

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An early mainframe called S/360. It was used for science and business applications.

Definitions

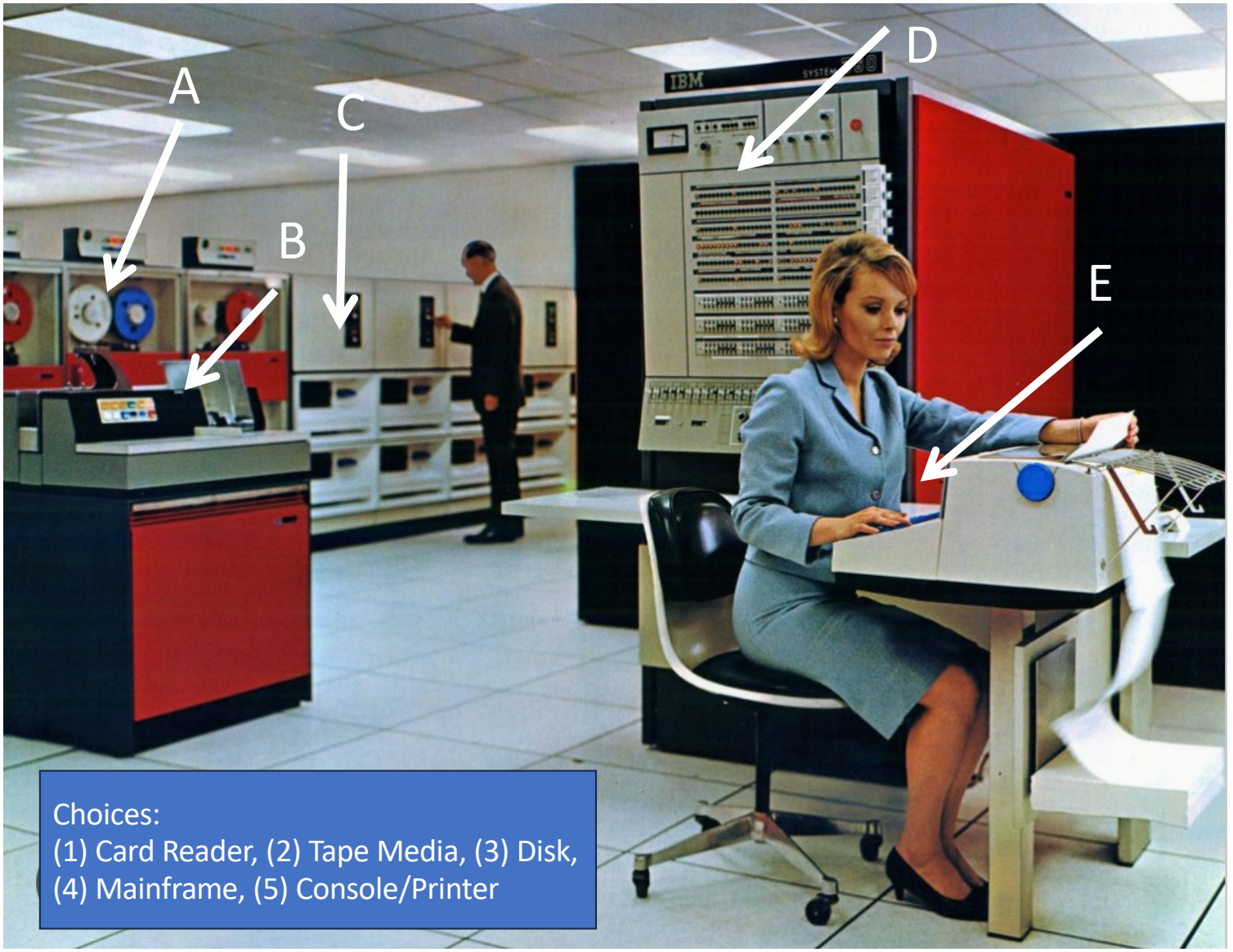
What Business Machines?

Mainframes or **Enterprise Platforms** also called **IBM zSystems**

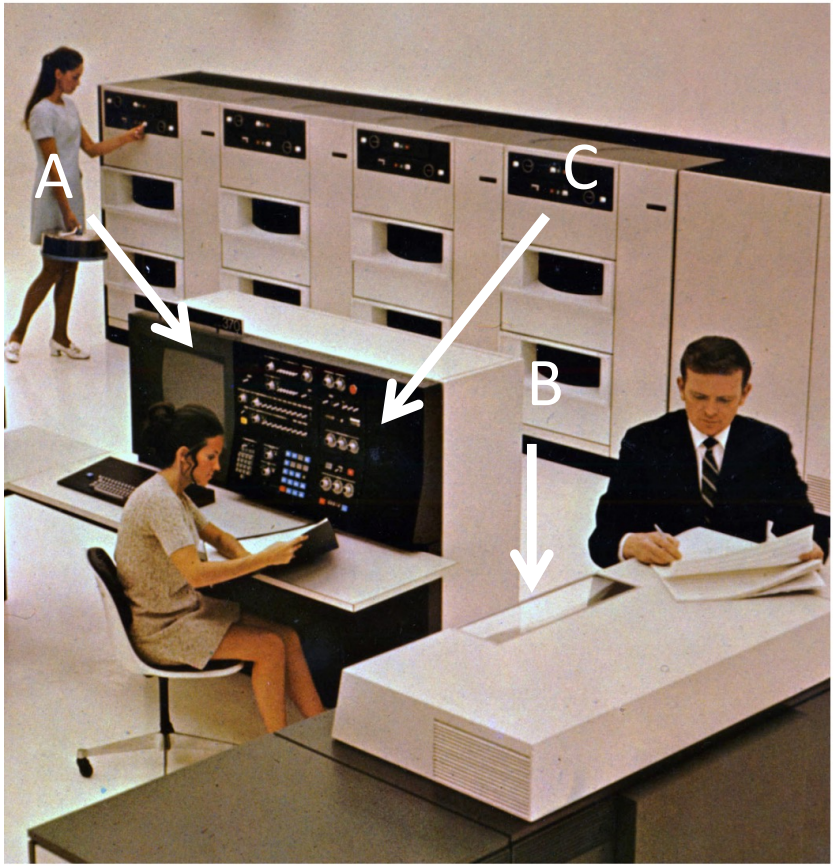
What is Enterprise Computing?

- Use of advanced computing systems, software, and infrastructure including encryption and AI engines
- Supports an organization's complex, large-scale operations
- Employed by companies that typically have exceptional computational needs

Business Machines


A
B
C
D
E
IBM
Choices:
(1) Card Reader, (2) Tape Media, (3) Disk,
(4) Mainframe, (5) Console/Printer

Then, Around 1970



mainframe system

When System/370 debuted, Watson Jr. predicted that the computer would “stand out as the landmark for the 1970s.” As it turned out, it was IBM’s leading mainframe through the 1980s.

And Now, 2025

This is 1 fully configured computer (it looks like 4, right?)

IBM z16 Configuration: PDU base I/O and CP Expansion

Max 168/200

- 4 frame expansion
- 8 line cords required
- 168-200 CPs (**Factory Build Only**)
- 9-12 I/O Drawers (192 I/O Cards Max)

Max 168/200

- 3 Frame Expansion
- 6 line cords required
- 168-200 CPs (**Factory Build Only**)
- 4-9 I/O Drawers (144 I/O Cards Max)

How Do You Scale These Business Machines?

- Enterprises can combine servers and have them work on a common workload using a technology called *Parallel Sysplex*.
- Parallel Sysplex allows up to 32 Z mainframes to be linked to form a single logical computing platform.

Why do that? Why combine them?

1. Workload Sharing
2. Shared Data Access
3. High Availability
4. Scalability
5. Centralized Management

When Did IBM Create Mainframes? How Big a Project?

IBM's development of the System/360 mainframe in the early 1960s was one of the most ambitious and expensive business projects in American history.

Launched: April 7, 1964
Investment: Estimated $5 billion over four years

Equivalent to $45–$50 billion today, adjusted for inflation.

Often referred to as “IBM’s $5 billion gamble” or a “bet-the-business” move.

Was It Revolutionary?

Before System/360

- IBM had multiple incompatible product lines (e.g., 1400 series, 7000 series).
- Customers had to rewrite software every time they upgraded hardware.
- There was no standard architecture across systems.

System/360 Introduced

- A single, unified architecture for both *business* and *scientific* computing.
- Software compatibility across models.
- Scalability: Customers could start small and upgrade without rewriting code.
- The 8-bit byte standard, still used today.

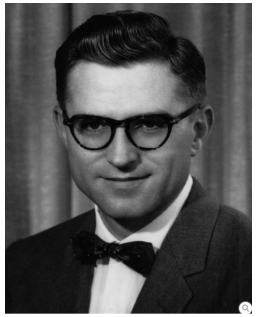
Letter A (from our alphabet)	11000001 in Binary	C1 in Hexadecimal

Note: EBCDIC is 8-bit standard, 8 bits are a byte

What were the Engineering and Organizational Feats? What was the mainframe's Impact and Legacy?

Engineering leadership required

• Led by Gene Amdahl (chief architect), Fred Brooks (software), and Erich Bloch (hardware).



Required IBM to

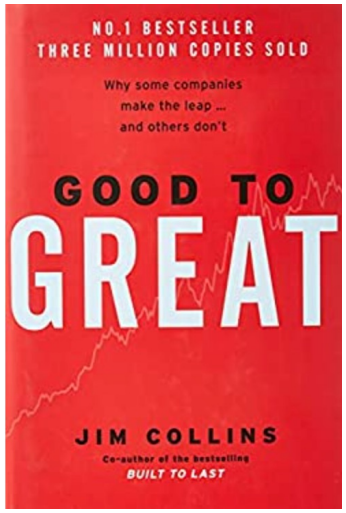
• Develop its own Solid Logic Technology (SLT); build new manufacturing, distribution and infrastructure; reorganize the company too

Impact

• The gamble paid off: Over 1,000 units sold in the first month.
• By the late 1980s, System/360 and its descendants accounted for over half of IBM's revenue.
• It became the foundation of modern enterprise computing and influenced generations of systems, including today's IBM Z mainframes.

Legacy

• Ranked by Jim Collins as one of the top three business accomplishments of all time, alongside Ford's Model T and Boeing's 707 jetliner.



What Did a Mainframe cost in 1964? What about today? What Do You Get?

Feature	IBM System/360 (1964)	IBM z17 (2025)
Cost Range	$133K-$5.5M	$2.5M-$10M
Performance	Thousands to millions of instructions/sec	Billions of AI decisions/day
Architecture	Solid Logic Technology (SLT) replacing tubes	AI-optimized, quantum-safe
Pricing Model	Purchase of rental	Usage-based (added)
Legacy Compatibility	Introduced 8-bit byte standard	Backward compatible to System/360

Innovations and The State of Things

Key Innovations

- **COBOL (1959)**: Still widely used in mainframe environments
- **Core Memory**: Replaced vacuum tubes for faster, more reliable storage
- **Virtualization**: VM systems allowed multiple OSes and workloads on one machine
- **Docker & Kubernetes**: Modern IBM Z systems support containerized applications

Mainframes Today

- **Size:** Smaller footprint overall compared to early systems
- **Capacity:** Able to processing **1 trillion web transactions per day**
- Supporting **millions of Docker containers**
- **Users:** banking, healthcare, government, and logistics for mission-critical workloads

Enterprise Organizations

What Enterprises and What Applications?

Banking & Financial Services

- Bank of America
- JPMorgan Chase
- Citigroup
- Wells Fargo
- BNP Paribas
- Deutsche Bank
- HSBC
- Capital One
- American Express
- FIS, Fiserv, First Data (payment processors)

Many of the world's largest banks rely on IBM Z. These institutions use mainframes for:

- Core banking systems
- ATM and POS transaction processing
- Batch settlement and reconciliation
- Many COBOL-based legacy applications

What Enterprises and What Applications?

Insurance

- Aetna
- MetLife
- Liberty Mutual
- Blue Cross Blue Shield
- Allianz
- AIG
- State Farm
- MassMutual

These institutions use mainframes for:

- Policy management
- Claims processing
- Actuarial systems

What Enterprises and What Applications?

Airlines & Travel

Mainframes are used for reservation systems, loyalty programs, and ticketing:

- Delta Air Lines
- British Airways
- Air France
- Amadeus
- Sabre
- Emirates

Healthcare

Used for patient records, billing, and insurance processing:

- Kaiser Permanente
- UnitedHealth Group
- Express Scripts
- Medicare
- Emblem Health

What Enterprises and What Applications?

Government

Mainframes support tax, social security, and defense systems:

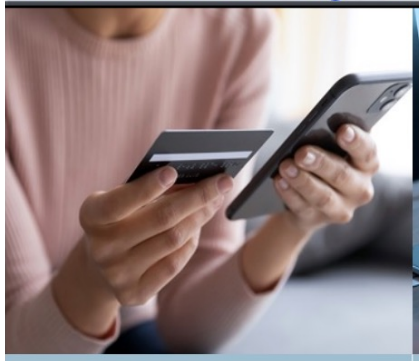
- IRS
- Social Security Administration
- U.S. Department of the Treasury
- State governments
- Customs & Border Enforcement

Retail

Retailers use mainframes for inventory, logistics, and POS systems:

- Walmart
- Target
- Home Depot
- Macy’s
- Kroger

Use Cases by Industry



Banking

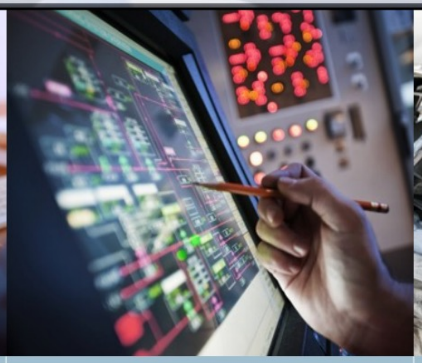
Examples

- Compliance Testing: account ID take over and identity theft
- Gaming the system – reward cards and account openings
- Interest rate forecasting
- Loan processing & approval

Finance

Examples

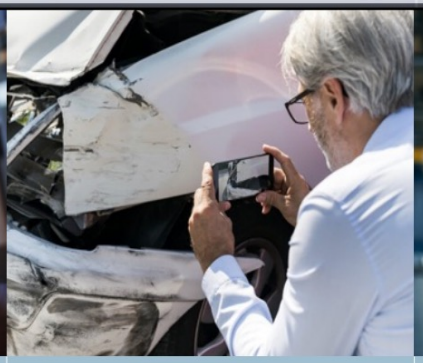
- Enable point-of-sale payment processing with fraud detection
- Financial crimes detection, anti-money laundering (AML)
- Wealth management with predictive models



Trading

Examples

- High frequency trading analytics
- Algorithmic trading
- Clearing & Settlements



Insurance

Examples

- Real-time fraud detection for claims and images
- Claims adjudication
- Pricing & actuarial analysis for better risk assessment

Other

Examples

- Supply Chain
- Payroll processing
- Manufacturing
- Scientific research
- Computer design
- Biosecurity
- Mining
- Healthcare

Design thinking IBM z16 co-created with clients

70+
enterprises

- IBM Z Sponsor user program
- IBM Z Design Council
- GM Advisory Council
- Cross section of users (geos, industries, size)
- 1 on 1 Interviews and Surveys
- Hill value validation
- Prototype evaluations

1100+
interaction hours

2x more engagements over IBM z15 from developers, architects, to execs

Driven by early engagements across IBM Z and LinuxONE

Innovations through cross-team alignment from product management, design, marketing, development, sales and support

23
user personas

- Application Architect
- Application Developer
- Application Owner
- Auditor
- Chief Data Officer
- Chief Privacy Officer
- Chief Sustainability Officer
- Cloud Architect
- CTO, CIO, CFO, CISO / CIRO
- Data Architect
- Dev Ops Engineer
- Director of Mainframe Datacenter
- Evidence Provider
- Infrastructure Architect
- Line of Business Owner
- Security Architect
- System Admin
- VP of AI / Analytics
- VP of Application Development
- VP of Infrastructure

What Fills Me With Wonder?

1. **Instruction Set** – Over 1,000 machine instructions
2. **Virtualization** – Every programs behaves like it ”owns” the machine
3. **COBOL** – You can start programming business applications after 3 months of learning
4. **Parallel Processing** – There are significant concurrent activities and they are beautifully orchestrated
5. **Implementation of the zero-downtime goal** – It really is zero downtime

Questions?

Backup

If you were going to get a mainframe from IBM, what would be the variables that impacted the price?

When purchasing an IBM z17 mainframe, several key hardware and software configuration variables affect the overall price.

1. Number of Processors (CPs)
2. Specialty Processors (zIIP, zAAP, IFL, ICF, AIU)
3. Memory (RAM)
4. Storage and I/O Configuration
5. Software Licensing - IBM uses Tailored Fit Pricing, which includes:
   - Usage-based billing (e.g., per MSU or workload type).
   - Bundled software packages (e.g., z/OS, DB2, CICS, MQ).
   - Capacity on demand options.
6. Physical Configuration
7. Security and Compliance Features
8. Support and Services

Note: Software costs can exceed hardware costs depending on the environment.