# Unit II : Learn industry-critical enterprise computing skills

- Mainframe System Administrator,
- Mainframe Application Developer/Programmer,
- Mainframe Modernization Architect,
- Database Administrator (DBA),
- Storage Administrator,
- System Programmer (SysProg),
- Network Administrator,
- Mainframe DevOps Engineer,
- Cybersecurity Engineers

# *Application development life cycle*
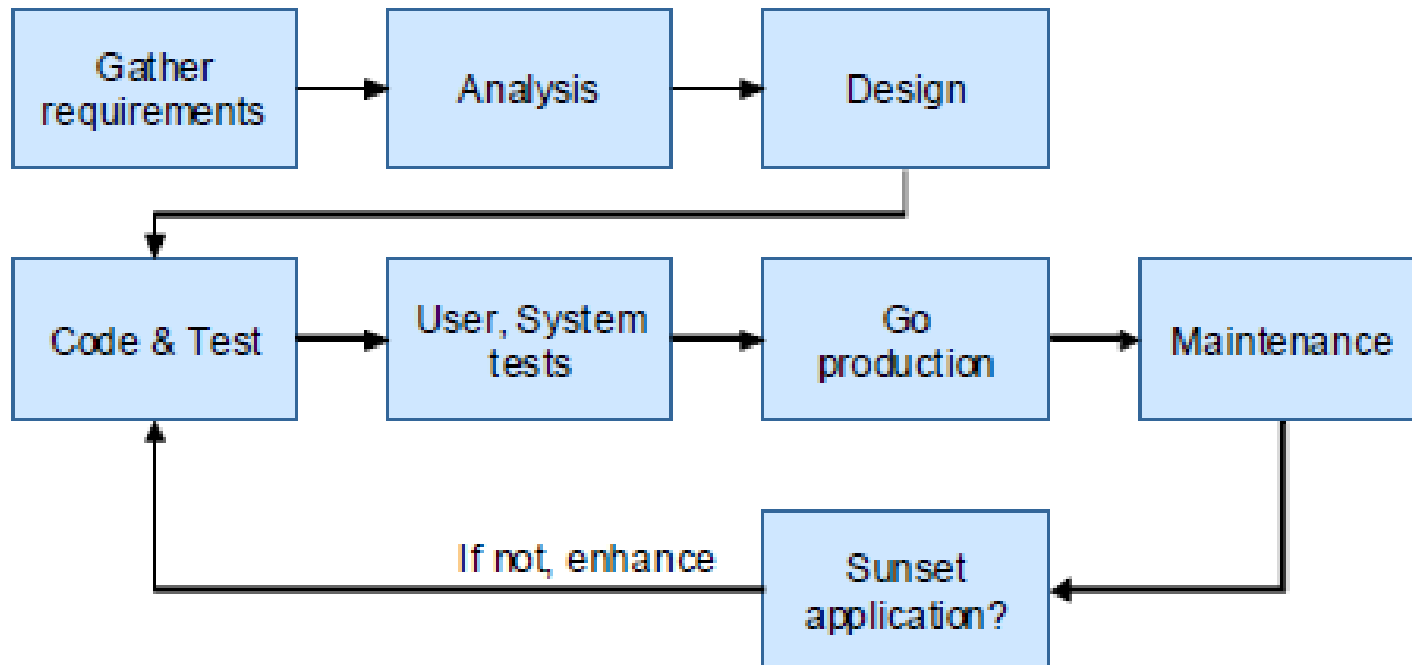
 Application sunsetting, also called application retirement or application decommissioning or application neutering, refers to the process followed for shutting down an outdated application while retaining its data.

Design phase
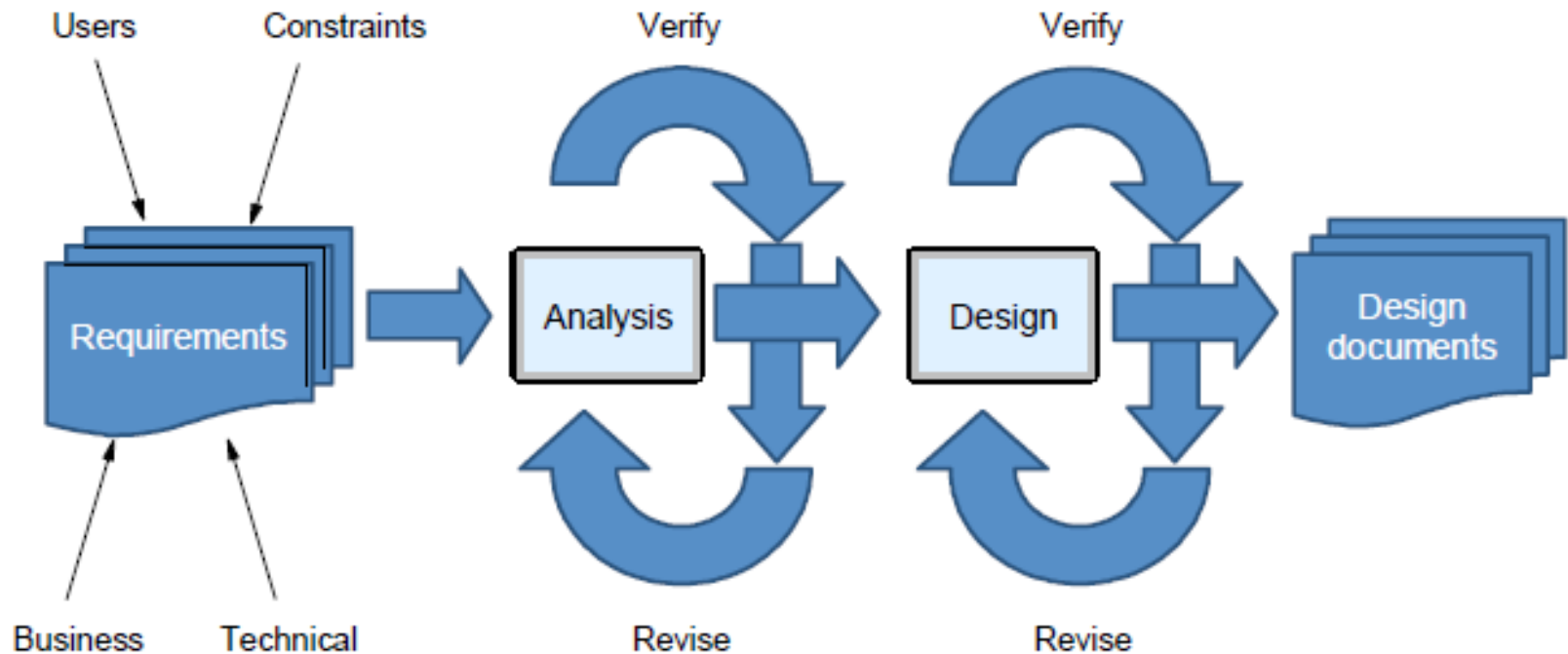
After all of the requirements have been gathered, analyzed, verified, and a design has been produced, we are ready to pass on the programming requirements to the application programmers

Development phase
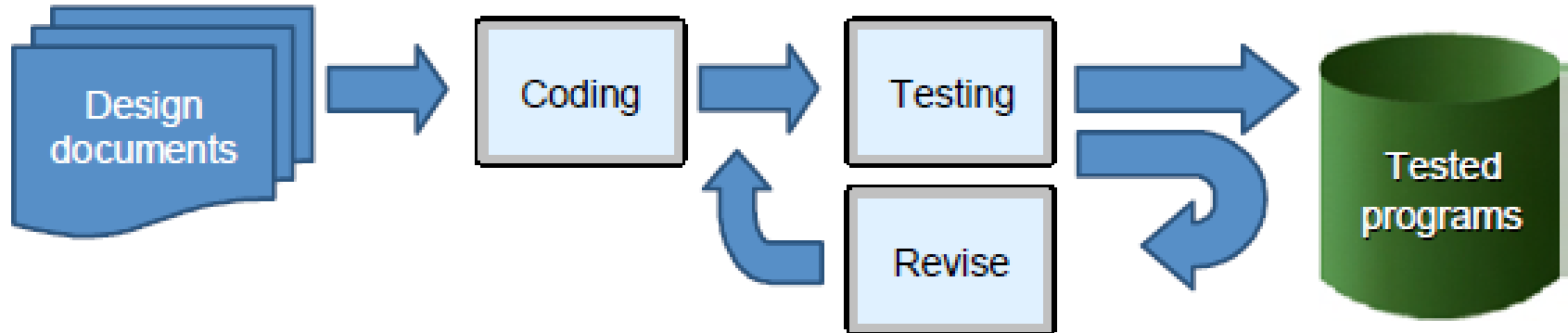
- The programmers take the design documents (programming requirements) and then proceed with the iterative process of coding, testing, revising, and testing again

Testing
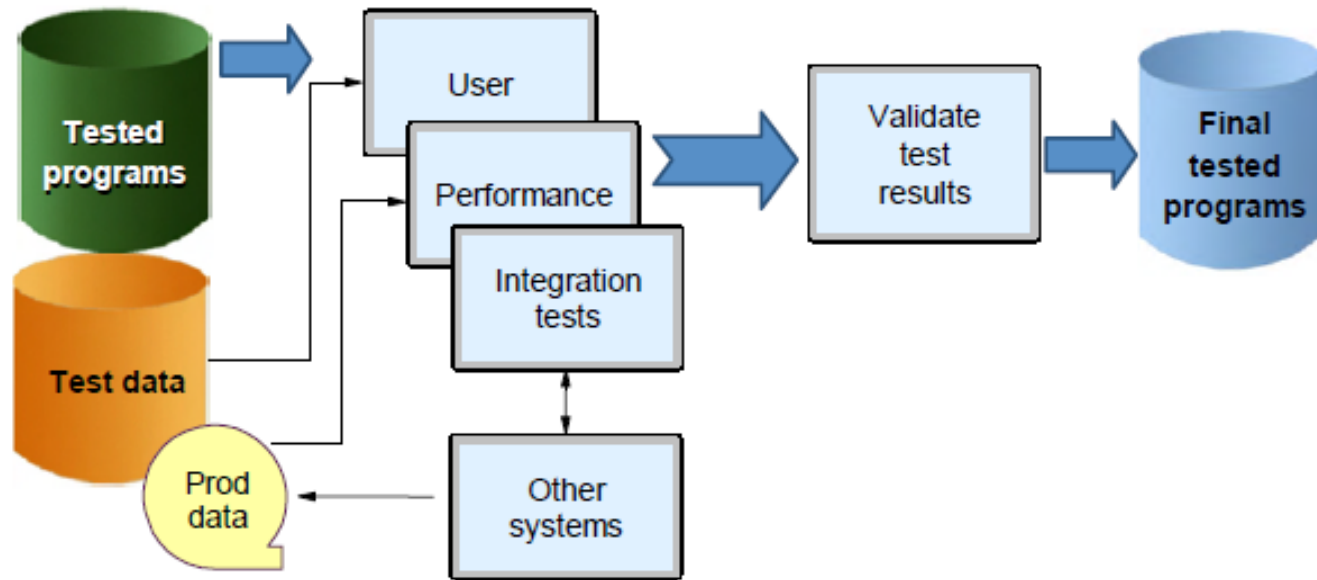
- After the programs have been tested by the programmers, they will be part of a series of formal user and system tests. These tests are used to verify usability and functionality from a user point of view, as well as to verify the functions of the application within a larger framework

Production
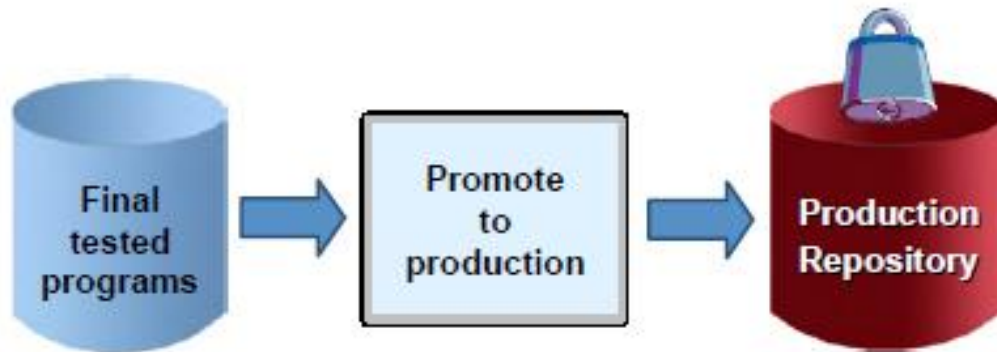
- The final phase in the development life cycle is to go to production
- the development team needs to provide documentation which consists **of user training and operational procedures.**
- In production, the changes and enhancements are handled by a group (possibly the same programming group) that performs the maintenance. At this point in the life cycle of the application, changes are tightly controlled and must be rigorously tested before being implemented into production

Roles
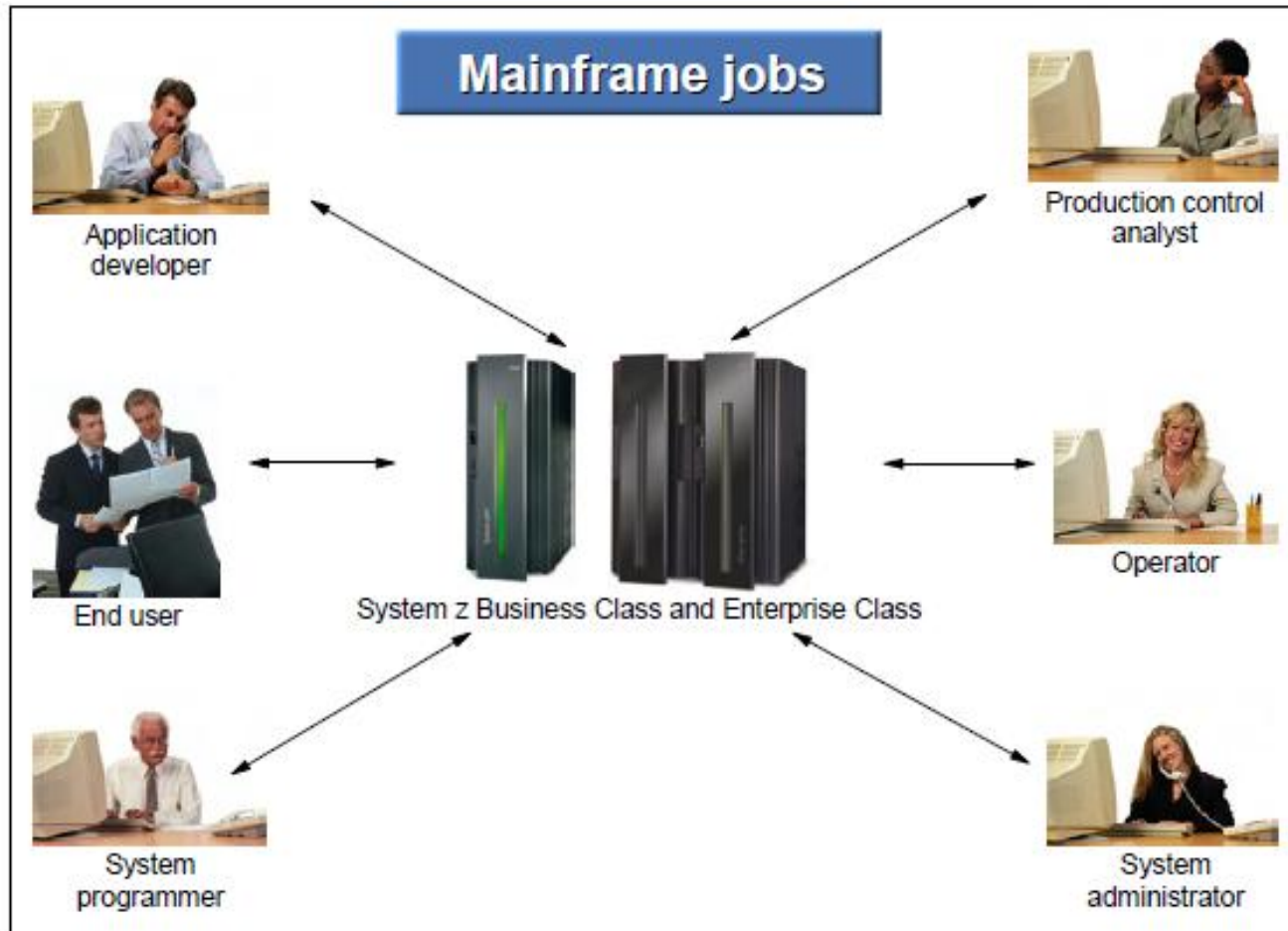
Roles

- Often require cooperation among the various roles:
  - Installing and configuring system software
  - Designing and coding new applications to run on the mainframe
  - Introduction and management of new workloads on the system, such as batch jobs and online transaction processing
  - Operation and maintenance of the mainframe software and hardware

System Administrator

- Database administrator (DBA) and the security administrator.
- Not allowed to have unlimited access to sensitive data or resources.
- maintains the system software environment for business purposes, perform day-to-day tasks related to maintaining the critical business data that resides on the mainframe,
- Installing software
- Adding and deleting users and maintaining user profiles
- Maintaining security resource access lists
- Managing storage devices and printers
- Managing networks and connectivity
- Monitoring system performance

Application Designer

- Based on requirements gathered from business analysts and users, the designer creates a design specification
- **Batch or online**
- **Data sources and access methods**
  - What data must be stored?
  - How will the data be accessed? This includes a choice of access method.
  - Are the requests ad hoc (unscheduled queries,) or predictable?
  - Will we choose PDS(partitioned data set) , VSAM (Virtual Storage Access Method) , or a database management system (DBMS),
  - such as IMS(**Information Management System)** or DB2?
- **Availability and workload requirements**
  - What is the quantity of data to store and access?
  - Is there a need to share the data?
  - What are the response time requirements?
  - What are the cost constraints of the project?
  - How many users will access the application at once?
  - What is the availability requirement of the application (24x7, 8:00 a.m. to 5:00
  - p.m. on weekdays, and so on)?
- **Exception handling**

Application Developer/Programmer,

- build, test, and deliver mainframe applications for the company's users and customers
- Based on the application designer's specifications, the programmer constructs an application program using a variety of tools. The process includes several iterations of code changes and compilation, application builds, and unit testing
- Programmer responsible for maintaining and enhancing the company's existing mainframe applications
- Uses Common Business Oriented Language (COBOL) or PL/I, languages such
- Testing process that can include functional, integration, and system tests.as Java and C/C++

Mainframe Modernization Architect

- **Mainframe modernization is a process enterprises use to migrate their existing legacy systems to a newer, more technologically advanced ecosystem**. Some of the most frequently targeted areas for modernization are code, interface, potential cost savings and performance.
- Replatforming
- **Mainframe migration to the cloud:**
- **Code optimization:**
- responsible for analyzing, designing, and implementing code and database changes to support the successful modernization and migration of mainframe applications to the cloud or on a modern cloud-connected mainframe
- developing modifications to the modernization tools as well as involvement in modernizing client mainframe applications and databases.
- Converting mainframe source code and database structures to a modern distributed application/application systems architecture.
- Supporting client mainframe application modernization projects through the solution design, calibration, code and data conversion, testing, and validation phases.
- Mainframe Architect is responsible for designing, developing, and overseeing the architecture of mainframe systems to ensure they meet organizational needs efficiently and effectively

1. System Design and Architecture:

➢ Designing Mainframe Systems: Create scalable, reliable, and secure system architectures.

➢ Integration: Design integration points with other systems and applications.

➢ Performance Optimization: Ensure system performance is optimized through effective architecture design.
2. Technology Selection and Implementation:

➢ Technology Evaluation: Assess and select mainframe hardware, software, and tools.

➢ Implementation Planning: Plan and oversee the implementation of new technologies or upgrades.

• 3. Capacity Planning and Scalability:

➢ Capacity Management: Monitor system capacity and plan for future growth.

➢ Scalability Design: Design systems that can scale effectively with increasing workloads.

• 4. Security and Compliance:

➢ Security Design: Implement security measures to protect data and applications.

➢ Compliance: Ensure systems comply with regulatory requirements and industry standards.

• 5. Performance Monitoring and Troubleshooting:

➢ Monitoring: Set up and manage performance monitoring tools and processes.

➢ Troubleshooting: Resolve complex performance and system issues.

• 6. Disaster Recovery and Business Continuity:

➢ Planning: Develop disaster recovery and business continuity plans.

➢ Testing: Regularly test and update recovery plans.

Database Administrator (DBA)

- DBMS-inverted list, hierarchic, network, or relational.

- **IMS/DB**: IBM's Information Management System (IMS) is a database management system that was widely used in mainframe environments. **a hierarchical database** that stores data in a tree-like structure.

- **IDMS**: IDMS (Integrated Database Management System) is **a relational database** management system developed by IBM. It was widely used in mainframe environments, particularly in the 1980s and 1990s.

- **DB2**: DB2 (Database 2) is **a relational database** management system developed by IBM. It was first introduced in the 1980s ,one of the **most popular relational** databases on the mainframe.

- **IMS/VSAM**: IMS/VSAM (IMS Virtual Storage Access Method) is a **file-based database** that allows for random access to data stored on disk. It is **still widely used** in mainframe environments **today**.

- **Adabas**: Adabas (Adaptive Database System) is **a relational database** management system developed by Software AG. It was widely used in mainframe environments, particularly in the 1980s and 1990s.

- **Natural**: Natural is a **relational database** management system developed by Software AG. It was widely used in mainframe environments, particularly in the 1980s and 1990s.

- **CICS**: CICS (Customer Information Control System) is an online transaction processing system developed by IBM. It includes a database component that allows for the storage and retrieval of data.

Database Administrator (DBA)

- DBA is primarily responsible for specific databases in the subsystem, maintenance of current information about the data in the database.
- The DBA creates the hierarchy of data objects, beginning with the database, then table spaces, tables, and any indexes or views that are required. This person also sets up the referential integrity definitions and any necessary constraints.
- ➢ Providing the standards for, and the administration of, databases and their use
- ➢ Guiding, reviewing, and approving the design of new databases
- ➢ Determining the rules of access to the data and monitoring its security
- ➢ Ensuring database integrity and availability, and monitoring the necessary activities for reorganization backup and recovery
- ➢ Approving the operation of new programs with existing production databases, based on results of testing with test data.

Storage Administrator

- Storage monitoring tools installations and use.
- Monitor and add new storage volumes as needed.
- Initialize/Add new DASD volumes and Add new tape volumes. ...
- Manage and Define SMS rules and ACS routines.
- Manage and Maintaining DFHSM & Catalog's.
- Storage dataset (RMM/HSM CDS & Catalog file) reorganization.
- Disk and space management.
- Planning, management and execution of installations, upgrades and maintenance fixes for storage & backup management software and hardware platforms
- Experience in generating all type of storage reports, SMF and Dcollect.

System Programmer (SysProg),

- The system programmer performs the following tasks:

➢ **Installs, customizes, and maintains the operating system, and also installs or upgrades products that run on the system.**

➢ Planning hardware and software system upgrades and changes in configuration

➢ Training system operators and application programmers

➢ Automating operations

➢ Performing capacity planning-monitoring and allocating existing data processing resources to applications according to SLA. Capacity planning is the process of planning for sufficient computer capacity in a cost-effective manner to meet the future service needs for all users.

➢ Running installation jobs and scripts

➢ Performing installation-specific customization tasks

➢ Integration-testing the new products with existing applications and user procedures

➢ System-wide performance tuning to meet required levels of service

- System programmers are needed to install and maintain the *middleware on the* mainframe, such as database management systems, online

Network Administrator

- Network administration on z/OS requires a good working **knowledge of z/OS** itself. It also requires a good **knowledge of networking hardware.**

Task	Description
Problem source identification	When something does not function as expected, the network administrator is one of the first persons to work towards resolution.
Network control	VTAM(Virtual Telecommunications Access Method), TCP/IP, and their associated applications must be started, stopped, monitored, and maintained as required.
Planning	Planning includes network architecture decisions, such as what role z/OS plays in the network and how z/OS should be situated in the network.
Change control	In a z/OS network environment, all changes are part of a planned and controlled process. The z/OS network administrator would work with other network administrators.
Hardware evaluation	If a new feature is to be added to the z/OS host or to the network used by the z/OS host, then an evaluation of the impact of the feature must be assessed.
Software evaluation	In the TCP/IP world, new networking applications and updated existing ones are literally a daily phenomenon.
Installation of hardware and	Once the decision is made, the actual software or hardware

- **Network Management**: Managing the mainframe network, including configuring and monitoring network devices, routers, and switches.

- **TCP/IP Configuration**: Configuring and managing TCP/IP settings, including IP addresses, subnet masks, and default gateways.

- **Mainframe Software Maintenance**: Performing maintenance tasks on mainframe software, including applying patches, updates, and fixes.

- **Data Transfer Management**: Managing data transfer between the mainframe and other systems, including configuring and monitoring FTP, SFTP, and other file transfer protocols.

- Communicating with end-users and other stakeholders about network issues and outages

Mainframe DevOps Engineer

- A DevOps engineer is a professional who **combines expertise in software development and IT operations** to streamline and **automate the process of creating, testing, and deploying software applications.**

- Collaborating with development and operations teams to identify and address bottlenecks in the software development lifecycle.

- Designing and implementing automation tools and frameworks for continuous integration, delivery, and deployment.

- Monitoring and managing infrastructure, ensuring optimal performance, security, and scalability.

- Troubleshooting and resolving issues related to application development, deployment, and operations.

- Implementing and maintaining version control systems, configuration management tools, and other DevOps-related technologies.

- Ensuring compliance with industry best practices and organizational policies.

- Continuously improving processes and tools to enhance efficiency and productivity.

Cybersecurity Engineer

- **Access Control and Authentication**: Implement and manage access control systems, including authentication, authorization, and accounting (AAA) mechanisms.
- **Mainframe Security Architecture**: Design and implement secure mainframe architectures, including secure configurations, access controls, and encryption.
- **Vulnerability Assessment and Penetration Testing**: Identify and remediate vulnerabilities in mainframe systems, applications, and data using vulnerability scanning and penetration testing tools.
- **Mainframe Security Monitoring**: Monitor mainframe systems and networks for security incidents, such as unauthorized access, data breaches, or malware infections.
- **Data Encryption**: Implement encryption technologies to protect sensitive data at rest and in transit.
- **Mainframe Security Hardening**: Harden mainframe systems by applying security patches, configuring secure settings, and disabling unnecessary features.
- **Security Information and Event Management (SIEM)**: Integrate mainframe security logs with SIEM systems to provide centralized log collection, analysis, and reporting.