

Cyber Security Notes
(UNIT-3 Complete Notes
With University
Papers(2016-17,2015-16))

Information system Development

- An information system goes through a series of phases from conception to implementation.
 - This process is called the Software-Development Life-Cycle.
- Software-development life-cycle is used to facilitate the development of a large software product in a systematic, well-defined, and cost-effective way.

Secure information system development

- Secure information systems are developed by **integrating** risk analysis and management activities at the **start** of the system development (SDLC) and continuing throughout.
- Security can be integrated into any (and ideally all) of these phases.
- In most organizations that use a variant of the waterfall model,
- security is included with the toll gate style mentioned previously, often at the end of each phase before moving to the next one.

Secure information system development

- Integrating security at the initial phase
- Integrity security at the Development Phase
- Integrity security at the Implementation Phase
- Integrity security at the Maintenance Phase
- Integrity security at the Disposal Phase

SDLC Process

Requirements

Design

Development

Testing

Deployment

Secure SDLC Process

Risk
Assessment

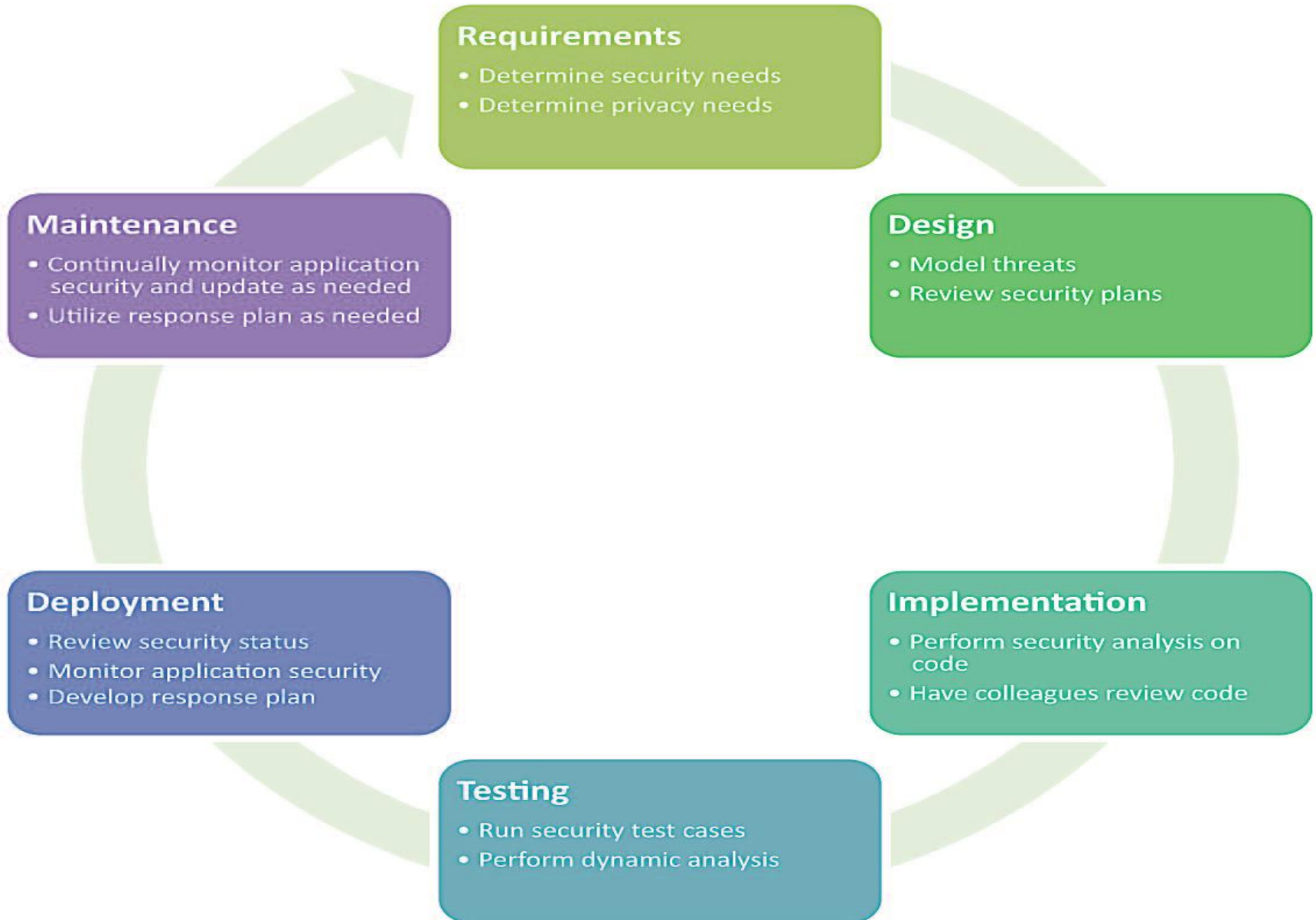
Threat
Modeling
& Design
Review

Static
Analysis

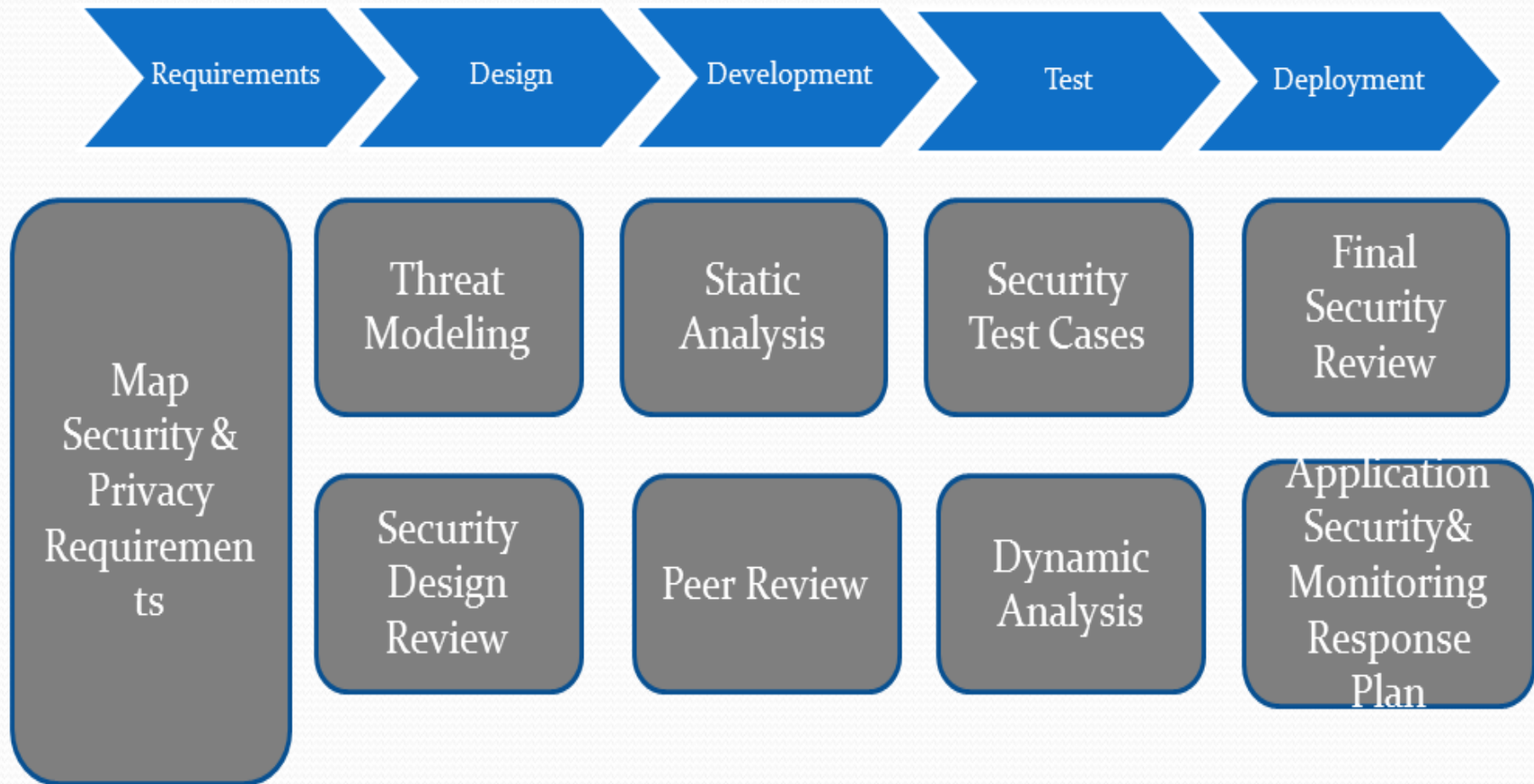
Security
Testing &
Code Review

Security
Assessment
& Secure
Configuration

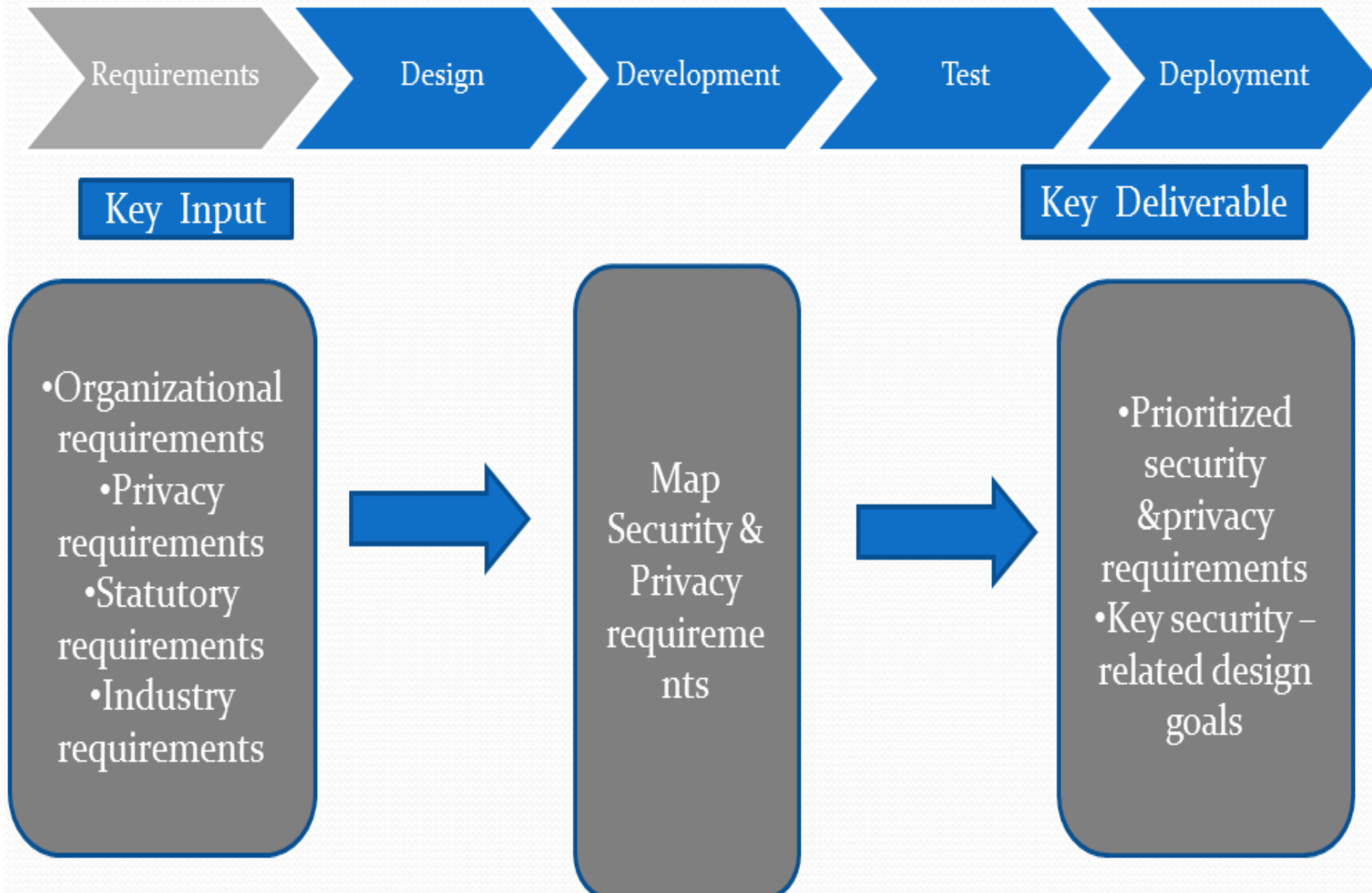
Secure SDLC



Security in SDLC



Requirements Phase



Design Phase



Key Inputs

- Inputs from previous phases
- Design principles
- Data flow diagrams
- Technical and nontechnical security control requirements



Threat Modeling

Security Design Review



Key Deliverables

- Well categorized and ranking threats
- High level mitigation plan
- Security architecture and design document

Development Phase



Key Inputs

- Inputs from previous phases
- Source code
- Source coding standard(s)
- Source configuration standard(s)
- Unit test case



Static Analysis

Peer review



Key Deliverables

- Vulnerabilities from automated analysis
- Vulnerabilities from peer review and unit testing

Test Phase



Key Inputs

- Inputs from previous phases
- Requirements documentation
- Software deployed in test environment



Security Test Cases

Dynamic analysis



Key Deliverables

- Security test cases document
- Prioritized list of Vulnerabilities from automated and manual analysis

Deployment Phase



Key Inputs

- Inputs from previous phases
- Finalized application ready to be deployed



Final Security Review

Application Security Monitoring & Response plan



Key Deliverables

- Security review sign-off
- Security Monitoring & Response plan

Integrating Security at Initial Phase

- Initial phase is where the decision is taken to develop a system.
- In this phase security consideration **primarily involves business risk related to confidentiality, integrity and availability.**
 - security is looked at more in terms of business risks with input from the information security office.
 - This phase include initiating project security planning, processes, assessing the business impact of an activity

Key security activities of Initial Phase

- Security must be implemented from Initial phase of business requirements in terms of confidentiality, integrity, and availability;
- Define the threats and possible security constraints for business.
- Determination of information categorization.
- Determination of any privacy requirements.

Integrating Security at **Development Phase**

- Development phase is where the shape of the information system is actually built.
- Primary security activities at development stage of system development include **risk assessment, security control selection and documentation.**
- Role of the Phase :
 - Security **architecture design preparation,**
 - security **control development,**
 - security **documentation and development**

Key security activities of development phase

- Conduct the risk assessment and use the results to supplement the baseline security controls;
 - Analyze security requirements;
 - Perform functional and security testing;
 - Prepare initial documents for system certification and accreditation; and
 - Design security architecture.

Integrating Security at Implementation Phase

- Implementation/Assessment is the third phase of the SDLC.
- During this phase, the system will be installed and evaluated in the organization's operational environment.

Key security activities of Implementation phase

- Integrate the information system into its environment;
- Plan and conduct system certification activities in synchronization with testing of security controls; and
- Complete system accreditation activities.

Integrating Security at Maintenance Phase

- In this phase, systems are in place and **operating, enhancements and/or modifications** to the system are developed and **tested**, and hardware and/or **software is added** or replaced.
- The operational system is periodically assessed to determine how the system can be made more **effective, secure, and efficient**.
- Operations continue as long as the system can be effectively adapted to respond to an organization's needs while maintaining an agreed-upon risk level .

Key security activities of maintenance phase

- Conduct an operational readiness review;
- Manage the configuration of the system ;
- Institute processes and procedures for assured operations and continuous monitoring of the information system's security controls; and
- Perform reauthorization as required.

Integrating security at the Disposal Phase

- Disposal phase is the final stage in the SDLC.
- where the legacy systems are replaced by newer systems.

Application development security

- Secure development of application is a practice to ensure that the code and processes that go into developing applications are as secure as possible. Secure development entails the utilization of several processes, including the implementation of a Security Development Lifecycle (SDL) and secure coding itself.
- Some of the primary issues to the secure development of applications are as follows
- Less trained/skilled developers
- Difficulty of finding the right information related to specific security measures for particular applications.

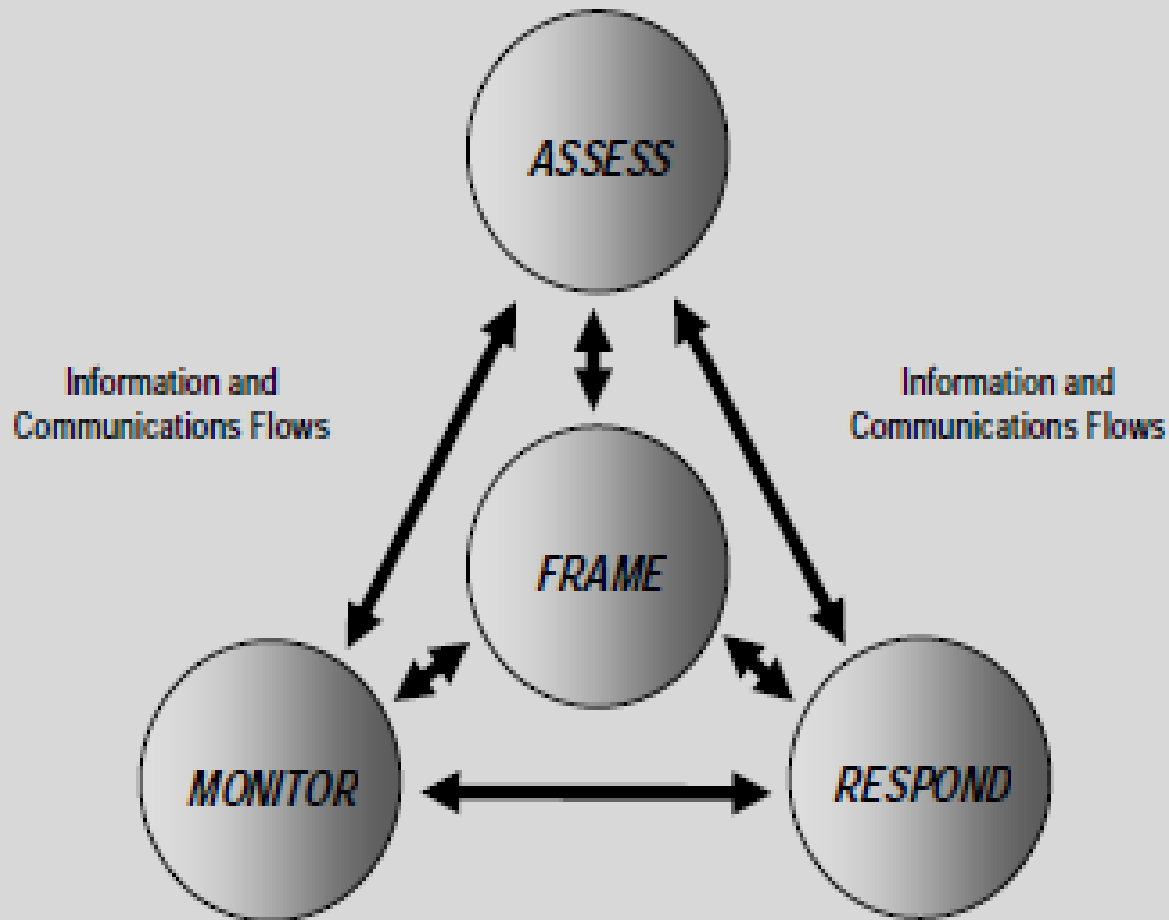
Information security Governance and Risk Management

- Information security needs to be governed and managed properly because **information has become one of the most critical business driver in recent years.**
- Information systems are the subject to **serious threats** that can have adverse effect on the organizational operations.

Risk Management

Risk management is the continuing process to identify, analyze, evaluate, and treat loss exposures and monitor risk control and financial resources to mitigate the adverse effects of loss.

Risk management Process



Risk management

- **Assessing:** assessment of risk means to **analyze the level of risk** and the level of security provided with our organization.
- **Framing:** Framing the risk means to **sense the threat and inform** all the related activities that execute in a sequential manner to be ready to control and avert a possible damage.
 - In this activity we **analyze the possible risk** associated with the security of information system and organization, and then try to **define certain action for individual case**.
- **Monitoring:** It involves **continuously checking the information system and keeping an eye on other threat and vulnerability** that maybe encountered by the organization.
 - It also helps in analyzing whether the system is continuously secure or not.
- **Responding:** Responding to risk means to take **preventive or corrective measures so that system can kept protected** from any kind of threats, whether internal or external.

Differences between Risk Management, Risk Assessment, and Risk Analysis

Risk Management

Risk management is the continuing process to identify, analyze, evaluate, and treat loss exposures and monitor risk control and financial resources to mitigate the adverse effects of loss.

Risk Assessment

Risk assessment includes processes and technologies that identify, evaluate, and report on risk-related concerns. the risk assessment process is a “key component” of the risk management process. it is primarily concerned with the Identification and Analysis phases.

Risk Analysis

Risk analysis can be considered the evaluation component of the broader risk assessment process, which determines the significance of the identified risk concerns.

Security architecture and Design

- Security Architecture and Design of a system means a bundle of following components:-hardware, software and operating system and how to use those component to design, architect, and evaluate secure computer systems
- Security Architecture and Design is a **three-part domain**.
 1. The **first part** covers the **hardware and software** required to have a secure computer system
 2. The **second part** covers the **logical models required to keep the system secure**
 3. and the **third part** covers **evaluation models** that quantify how secure the system really is.

Secure System Design Concept

- We can design a secure system by implementing **software and hardware** specifically and including following principles
 - Layering
 - Abstraction
 - Security domains
 - The ring model
 - Open-closed systems

- **Layering**

- Layering separates hardware and software functionality into modular tiers.
- A **generic list** of security architecture layers is as follows :

- 1. Hardware (bottom layer)**

- 2. Kernel and device drivers**

- 3. Operating System**

- 4. Applications (Top Layer)**

- **Abstraction:** Abstraction hides unnecessary details from the user.
- Complexity is the enemy of security:
 - the more complex a process is, the less secure it is. That said, computers are tremendously complex machines.
- Abstraction provides a way to manage that complexity.
 - For example ,while music is being played from a file through the speaker of the computer system. The user is only concerned with playing of music just with click without knowing the internal working of music player.

- **Security Domains** : A security domain is the list of objects a subject is allowed to access.
 - With respect to kernels, two domains are user mode and kernel mode.
 - **Kernel mode (also known as supervisor mode)** is where the kernel lives, allowing low-level access to **memory, CPU, disk**, etc. It is the most trusted and powerful part of the system.
 - **User mode** is where **user accounts** and **their processes** live. The two domains are separated: an error or security lapse in user mode should not affect the kernel.

- **The Ring Model:**

- The ring model is a form of CPU hardware layering that separates and protects domains (such as kernel mode and user mode) from each other.
- Many CPUs, such as the Intel 86 family, have four rings, ranging from ring 0 (kernel) to ring 3.

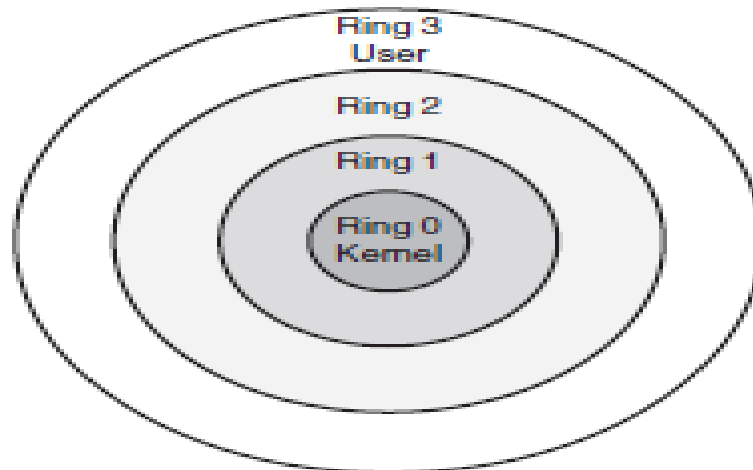
- The rings are (theoretically) used as follows:

Ring 0: Kernel

Ring 1: Other OS components that do not fit into ring 0

Ring 2: Device drivers

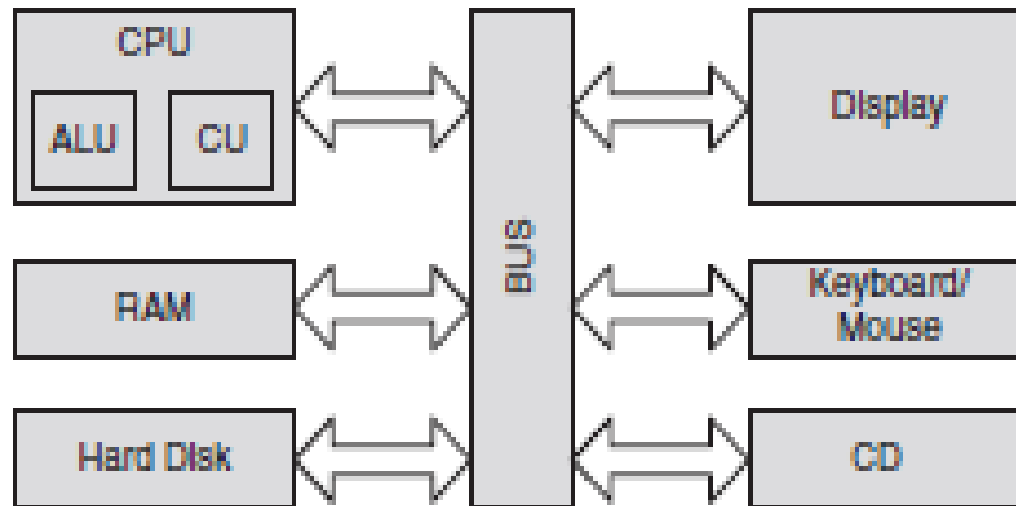
Ring 3: User applications



- **Open and Closed Systems:**
- **An open system** uses open hardware and standards, using standard components from a variety of vendors.
 - Ex - Assembled Desktop computer
- **Close systems-** only use proprietary hardware or software from specific vendor.
 - Ex- Branded Desktop (HP)

Secure hardware architecture

- Secure Hardware Architecture focuses on the physical computer hardware required to have a secure system.
- The hardware must provide confidentiality, integrity, and availability for processes, data, and users.



Security issues in 1.hardware, 2.data storage and 3.downloadable device

- Securing computer system means to **protect all of its components** that includes
 - hardware, software, storage devices, operating system and peripheral devices.
- Each component has its own vulnerability or weakness.
 - Hardware parts can be stolen and destroyed .
- Security of every component of the system is equally important.
 - We need to be able to **control our computer system completely** so that the information asset can be protected.

Security Issues in Hardware

- Hardware is the component on which the entire computer system is based this include **processor, hard drive and monitor**.
- Hardware mainly faces security issues related to **stealing, destruction, gaining unauthorized access and breaking the security code** of conduct.
 - Any breaking of code of conduct **needs proper security measures** such as placing the **hardware with your controlled environment**.

Counter Security Measures in hardware

To secure H/W from unauthorized access, following mechanism should be used-

- Biometric access control.
- Authentication token (entry via smart card).
- Radio Frequency Identification (RFID).
- Use VPN to provide complete security over internet.
- Use strong passwords.
- Provide limited access to the devices.

2. **Security Issues with Storage Devices**

- Data storage devices are used to save information.
- Devices such as compact disk(CD), digital versatile disk(DVD), memory cards, flash drives etc.

2. Security Issues with Storage Devices

- **The main issue faced by these devices is-**
 - Loss and theft of data.
 - Improper disposal of data.
 - Introduction to malwares in your system.
 - Denial of data i.e., attack on availability of data.
- **All these issues can be overcome by using following measures-**
 - Making people aware of the various kinds of attacks.
 - Educating people regarding various cyber laws of the nation.
 - Making the people understandable the importance of security.
 - Implement certain policies and procedures that provide security for the storage devices and data.

3. Security Issues with Downloadable (Peripheral) devices (PD)

- **E.g. PD-USB: PDA, External Hard Drive**
- **Security Issues related to them are-**
 - **Stealing of data.**
 - **Destruction of data.**
 - **External attacks(virus etc.).**
- **Measures include:**
 - **Protection of data from theft/ manipulation**
 - **Protection of devices from being stolen or destroyed**
 - **Protection of environment from undesired access.**

Physical Security of IT Assets

- An IT asset is a piece of software or hardware within an information technology environment.
- Tracking of IT assets within an IT asset management system can be crucial to the operational or financial success of an enterprise.
- IT assets are integral components of the organization's systems and network infrastructure. Security of data and asset is equally important.
- Physical security of our asset, especially the IT asset is also very important.
 - there are several issues that need to be countered in order to apply total security control.
- We may need to lock and other access control techniques to protect our asset from unwanted users.

Physical Security of IT Assets(Threats)

- **Threats for physical security are as follows:-**

(1) Physical access exposure to human beings : Organizations own employees are one of the main factors to cause physical security threats.

- Can be controlled through
 - strong authentication mechanism
 - restricted use of resources
 - restricted area and building
 - Proper standards for verification and validation of user identity.

(2) Physical access exposure to natural disasters:- Natural disasters may destroy your computer systems or all data storage systems and might interrupt your network.

- for example fire, lightening, or electronic interruption
- Can't be controlled, but recovery measures could be taken.

Physical Security of IT Assets(Measures)

- **Measures** to ensure physical security of IT assets-

(1)Physical access controls

- Through photo IDs, biometric authentication systems, entry logs, magnetic locks using electronic keycard, computer terminal locks.

(2)Electronic and visual surveillance systems

- Through closed circuit television(CCTV), RFID sensors
- CCTV cameras are also called the third eye because if human being missed noticing some people entering a restricted zone, these cameras could capture the event or photos.

(3) Intrusion Detection Systems(IDS):-

IDS is a way of dealing with unauthorized access to information system assets.

Backup Security Measures

- Following practices should be performed for maintaining proper data backup security-
 - Assigning responsibility, authority and accountability.
 - Assessing risks.
 - Developing data protection processes.
 - Communicating the processes to the concerning people.
 - Executing and testing the process.

1. Assign Accountability, Responsibility and Authority

- Make storage security a function of overall information security policies and architecture
- Divide duties where data is highly sensitive.
- ensure that the person authorizing access is not the person charged with responsibility for execution.

2. Assessing Risk

- Perform a Risk Analysis of the Entire Backup Process.
- Execute a Cost/Benefit Analysis on Backup Data Encryption
- Identify Sensitive Data.

3. Develop Data Protection Process

- Adopt a Multi-Layered Security Approach
- . Authentication: Authorization: Encryption Auditing:
- Copy Your Backup Tapes

4. Communicating the processes to the concerning people

- it is important to ensure that the people responsible for carrying out its security are informed and trained.
- Security policies are the most important aspect of assigning accountability, responsibility and authority.

5. Executing and testing the process

- Once the end-to-end plan has been developed, defined and communicated to the appropriate people, it is time to begin execution and testing process.

Payment Systems

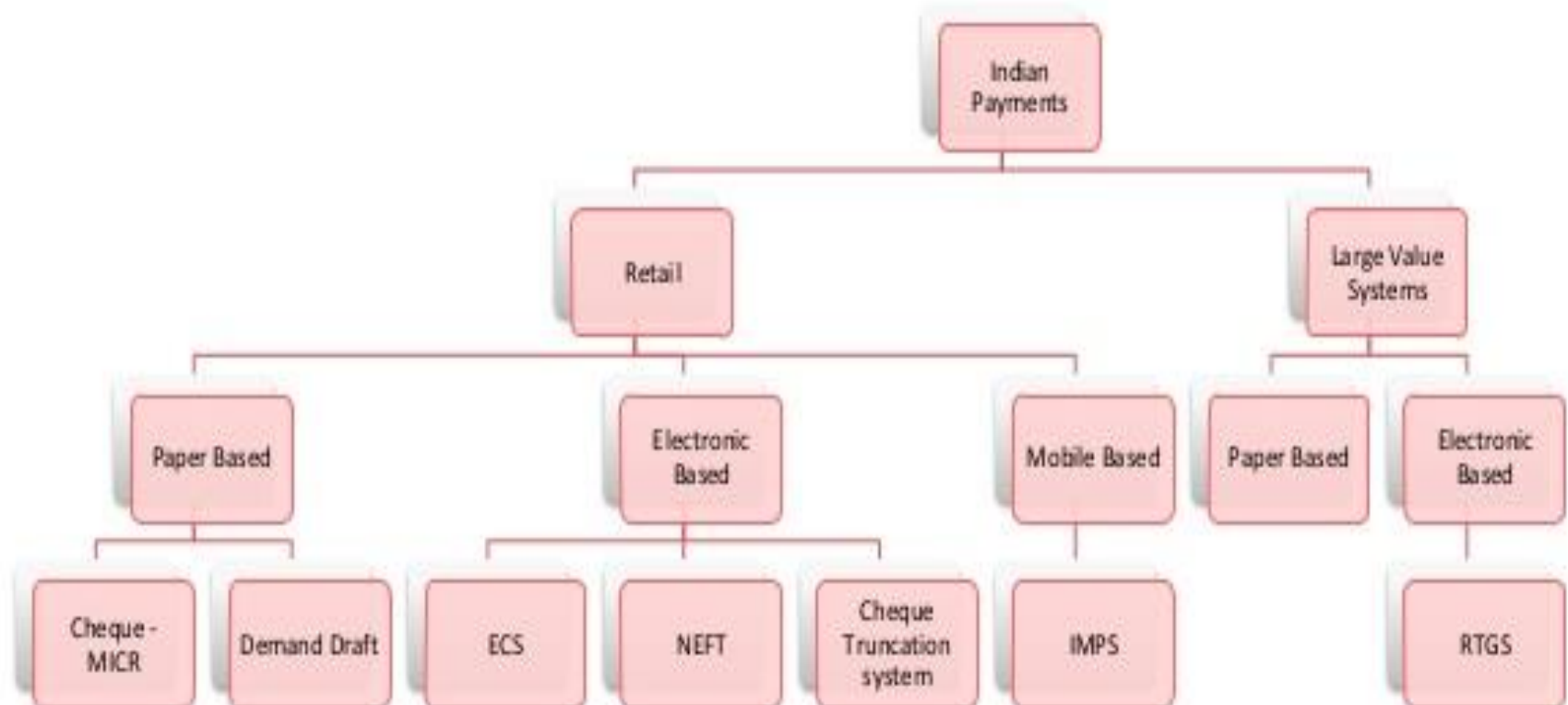
Definition:

- Financial system supporting transfer of funds from payers to payee/s.

Role:

- Payment systems to provide safe, efficient, affordable, easily accessible and robust payment services
- Payment systems help in the smooth flow of money in the economy thus increasing the liquidity in the hands of the customer enhancing his purchasing capacity
- Payment systems would also help minimize cases of fraud, use of counterfeit notes and black money

Classification



Electronic Clearing Service (ECS)

- It was introduced by RBI
- Provided an alternative method of effecting bulk transaction
- Avoided need for issuing and handling paper instrument
- User has to submit the mandate to the bank. (E.g.: MICR -Cancelled Cheque)
- No Transaction limit
- There are two types of ECS:
 - ECS – Debit - There is multiple debit from vast section of people and corresponding single credit entry. E.g.: Bill payment
 - ECS - Credit - Electronic fund transfer from one account to many transactions transfers. E.g.: Salary Payment

Real Time Gross Settlement (RTGS)

- Introduced by RBI in 2004
- RTGS systems are managed by RBI. Transfer anywhere within India.
- Funds for > Rs 2 lakh to be transferred through RTGS. Lower funds cannot be transferred . Upper Transaction limit set by individual bank.
- Payment instruction handled individually.
- Payment is final and irrevocable and the receiver can utilize the funds immediately
- RTGS Timings:
 - Weekdays : 9:15 AM to 4:15 PM
 - Saturday : 9:15 AM to 1:15 PM ; No settlement on Sundays and Holidays
- Service Charge applicable to customer
- Steps for Transaction : Register Payee & Transfer Funds

National Electronic Funds Transfer System (NEFT)

- It was launched by RBI in 2005
- It permits to transfer funds of lower value. Neither lower limit nor upper limit
- Transfer anywhere within India
- Operate on a deferred net settlement (DNS) basis which settles transactions in batches.
- NEFT Timings:
 - Weekdays: 12 times every hour from 8:00 AM to 7:00 PM
 - Saturday : 6 times every hour from 8:00 AM to 1:00 PM
 - No transfer on Sundays and Holidays
- Service Charge is applicable to the Customer
- Steps for Transaction : Register Payee & Transfer Funds

InterBank Mobile Payment Service (IMPS)

- Initiated by NPCI along with 4 Member banks
 - SBI, Bank of India, Union Bank of India and ICICI Bank
- Launched on 22nd November 2010
- Service available to Public
- To participate in IMPS, Banks should have approval from RBI
- Available with 54 Banks



Objective of IMPS

- Make a Mobile as Channel
- Available – 24 X 7 X 365
- No more sharing of bank account details
- Instant
- Payment – Simple, convenient
- Time & cost saving
- Safe & Secure
- Immediate Confirmation
- Use existing payments infrastructure (existing ATM networks)



Comparison with other payments

	<u>IMPS</u>		<u>NEFT</u>	<u>RTGS</u>
Time to Process	Instantaneous 		Operates every one hour	Instantaneous
Availability	24 X 7 X 365 		Available in working hours	Available in working hours
Restriction on Amount	Maximum 5 Lakh		Maximum 5 Lakh	> 2 Lakh Maximum 5 Lakh
Service Charge	Tiered Charges		Tiered Charges	Tiered Charges
Geographic spread	Supported by 54 Banks 		78,000 enabled bank branches	78,000 enabled bank branches
Channels	Mobile – SMS, Mobile Application USSD Internet 		Internet, Branch	Internet, Branch
Reliability	Low due to Mobile Service 		High	High

What is Unified Payment Interface ?

Objective of a unified payments system is to offer an architecture and a set of APIs on top of existing systems to facilitate online instant payments and financial inclusion.

Push & Pull Payments

- The payments can be both sender (payer) and receiver (payee) initiated and are carried out in a secure, convenient, and integrated fashion

Easy Instant Payments

- The unified payment system is expected to further propel easy instant payments via mobile, web, and other applications

Scalable Architecture

- This next generation payment system provides an ecosystem driven scalable architecture and a set of APIs taking full advantage of mass adoption of smartphone

1 Click 2FA & Virtual address

- Virtual payment addresses, single click 2 factor authentication, Aadhaar integration, use of payer's smartphone for secure credential capture, etc. are some of the core features

Why UPI?

GLOBAL

Available on all android phones(most popular mobile OS).

SECURITY

More secure way to transact on mobile platform.

CONVENIENCE

One App for all transaction needs.

NEXT GEN

More than 700 Million smartphones users by 2020.

*To be launched in IOS soon.



What Is Biometrics?

Biometrics, also known as biometric authentication, refers to the identification of humans by their characteristics or traits.

Since biometric identifiers are unique to individuals, they are more reliable in verifying identity than token and knowledge-based methods.

What are Types of Biometrics Identifiers?

Factors of Biometric Systems

Universality

Acceptability

Uniqueness

Permanence

Circumvention

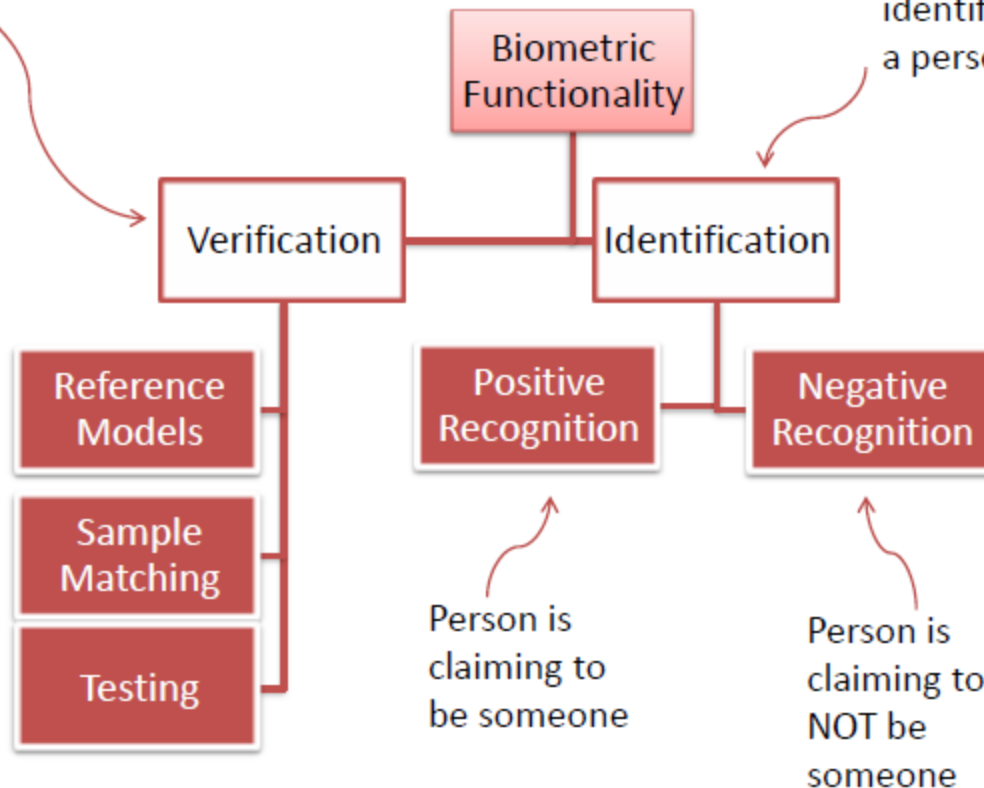
Measurability (Collectability)

Performance

What is the Functionality of Biometric Systems?

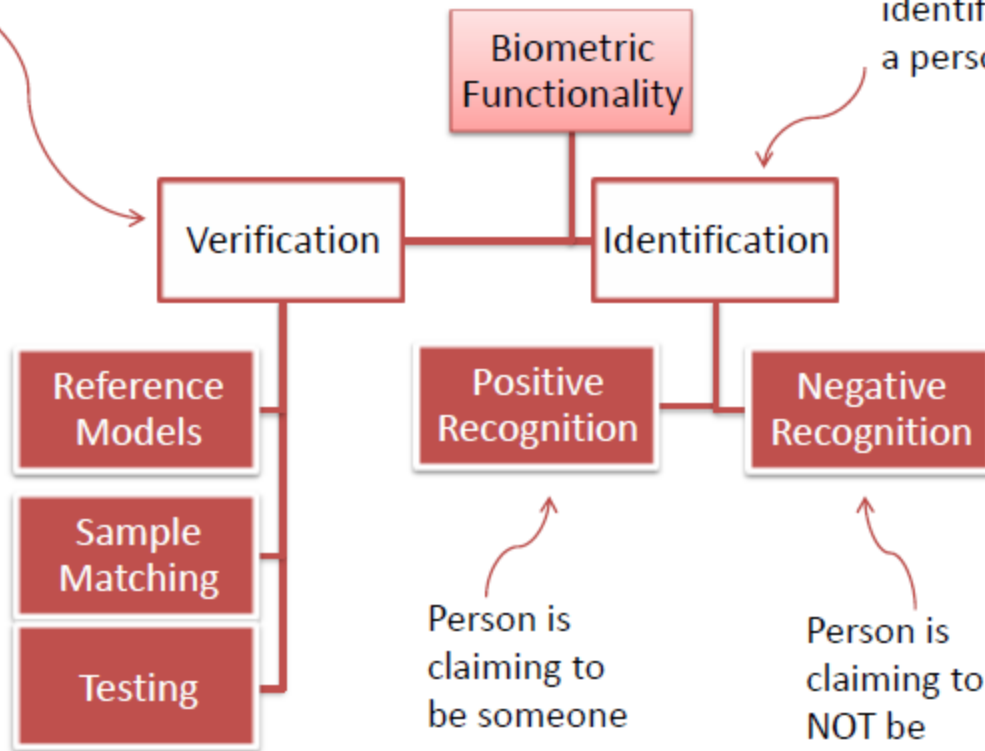
For checking if a person is who they say they are

For identifying a person



What is the Functionality of Biometric Systems?

For checking if a person is who they say they are



For identifying a person

Person is claiming to be someone

Person is claiming to NOT be someone

Criteria for Selection of Biometric Systems :

Security

Convenience

Legacy

Environmental

Servicing

Financial

Manageability






Multipurpose

Availability

Benefits of Biometrics :

1. Biometric identification can provide extremely accurate, secured access to information.
2. Current methods like password verification have many problems (easy-to-hack and forgettable).
3. Automated biometric identification can be done very rapidly and uniformly with a minimum of training.
4. The identity can be verified without resorting to documents that may be stolen, lost, or altered.

Comparison Between Different Technique

BIOMETRIC	FINGERPRINT	FACE	HAND GEOMETRY	IRIS	VOICE
					
Barriers to universality	Dirt, Dryness	Hair, Glasses, Age	Hand Injury	Poor Lighting	Noise, Clods
Distinctiveness	High	Low	Medium	High	Low
Performance	High	Medium	Medium	High	Low
Collectivity	Medium	High	High	Medium	Medium
Performance	High	Low	Medium	High	Low
Acceptability	Medium	High	Medium	Low	High
Potential for circumvention	Low	High	Medium	Low	High

Applications of Biometric System

- Criminal identification
- Internet banking
- Attendance system
- Airport, Bank security
- PC login security
- Prevents unauthorized access to private data
- Financial transaction management

Comparison of Electronic Payment Systems

	Online credit card payment	Electronic Cash	Electronic Checks	Smart Cards
Actual payment time	Paid later	Prepaid	Paid later	Prepaid
Transaction Information Transfer	Store & bank checks the status	Free transfer	Payment indication must be endorsed	Smart card of both parties make transfer
Online & offline transaction	Online	online	Offline allowed	Offline allowed
Bank A/C Involvement	Credit card a/c	No involvement	Bank a/c	Smart card a/c
Users	Any legitimate credit card users	Anyone	Anyone with bank a/c	Anyone with bank or credit card a/c
Party to which payment is made	Distributing bank	Store	Store	Store
Mobility	Yes	No	No	Yes

E-cash

- An e-commerce system that uses e-cash refers to a system in which money is only exchanged electronically.
- To use e-cash, link your personal bank account to other payee accounts.
- To make payments using your e-cash account, you can make a deposit to the other person's e-cash account if you have their banking information, or request a transfer to their bank account.



Cash Versus Credit Transactions

Cash Transaction

Payment is made immediately

Buyer chooses goods to purchase

Payment is made

Receipt given by supplier to customer

V's

Credit Transaction

Payment is made at a later date

Credit is offered, payment is made later than the delivery of goods date or provision of the service date

Differences between Risk Management, Risk Assessment, and Risk Analysis

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MALWARE VS ADWARE VS SPYWARE

MALWARE

A software program that is intentionally created to cause damage to a computer, server or a computer network

Covers a range of malicious software

Can harm the computer in multiple ways depending on its type. It can destroy data and resources, cause configuration and network issues and many more

ADWARE

A software program that generates revenues for a developer by automatically generating online advertisements in the user's interface

A type of malware

Provides profit to the developer by generating online advertisement on the user's interface

SPYWARE

A software program that aims to gather information from users without their knowledge

A type of malware

Tracks the activities and gathers information about the user without his knowledge

VIRUS VERSUS MALWARE

VIRUS

A software that is capable of copying itself and has a detrimental effect like corrupting the system or destroying data

There are no further classifications

McAfee antivirus plus, Kaspersky, Avira, Avast Pro are some anti-virus software

MALWARE

A variety of hostile or intrusive software that harms a computer

Virus, spyware, worms, Trojans, ransomware, adware are types

Malwarebytes, SpyBot Search and Destroy are some anti-malware software

Visit www.PEDIAA.com

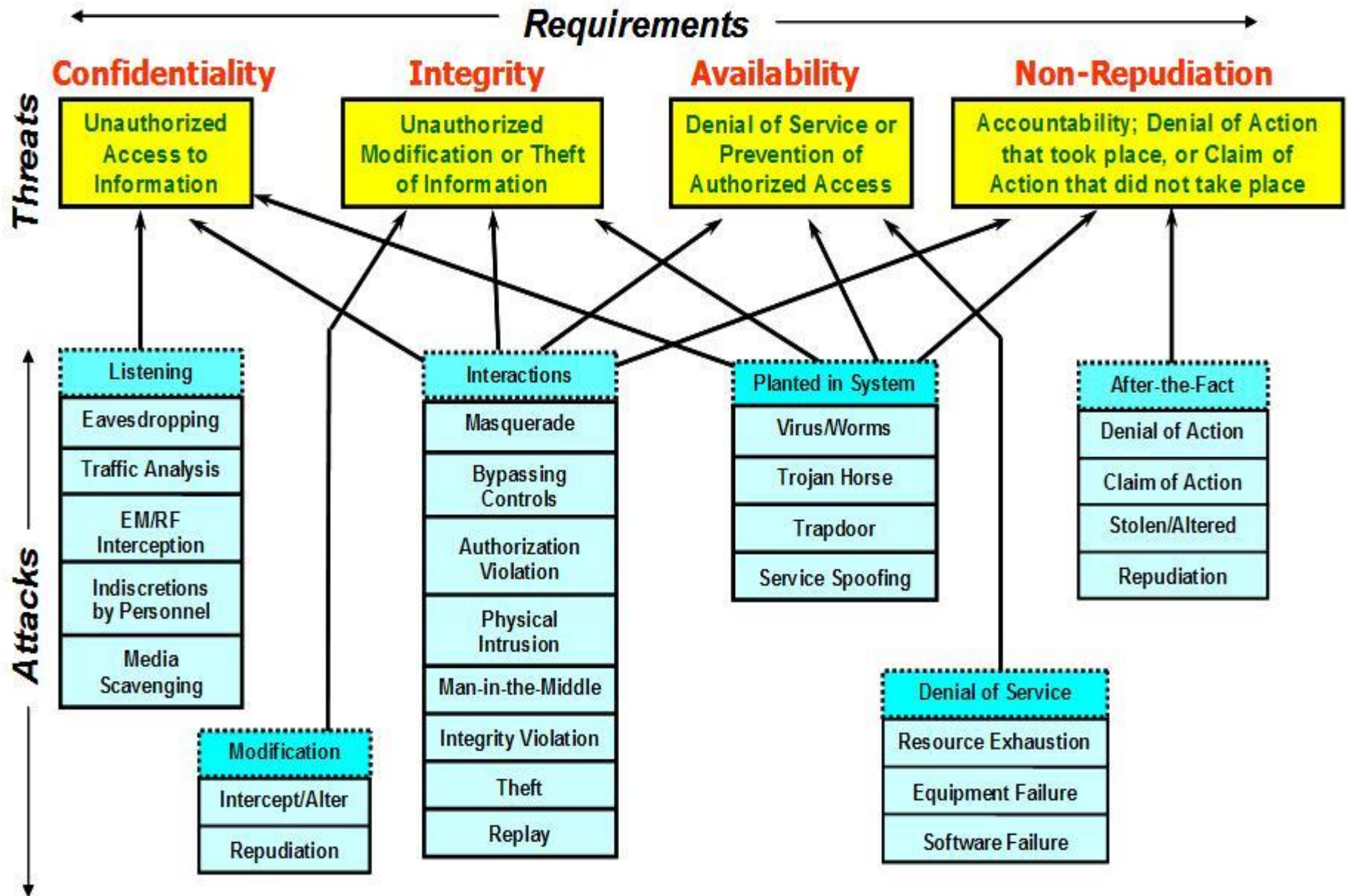
Differences between cybersecurity and cybercrime

	Cybersecurity	Cybercrime
Types of crimes	Crimes where a computer network, software or hardware is the target (ransomware, viruses, worms, SQL injection, distributed denial of service attacks)	Crimes where the human or the human's data is the target (romance scams, cyberbullying, hate speech, sexting, child pornography trafficking, trolling)
Victims	Corporations and governments	Families and individuals
Academic programs	Computer science, computer engineering, information technology	Criminology, psychology, sociology
Intellectual focus	Applied science oriented – coding, networking and engineering strategies for making networks more secure	Basic science oriented – theoretical understandings of how and why crime is committed

The Conversation, CC-BY-ND

Source: Roderick Graham

Security Requirements, Threats, and Attacks



Types of Malwares

- **Adware:** The least dangerous and most lucrative Malware. Adware displays ads on your computer.
- **Spyware:** Spyware is software that spies on you, tracking your internet activities in order to send advertising (Adware) back to your system.
- **Virus:** A virus is a contagious program or code that attaches itself to another piece of software, and then reproduces itself when that software is run. Most often this is spread by sharing software or files between computers.
- **Worm:** A program that replicates itself and destroys data and files on the computer. Worms work to “eat” the system operating files and data files until the drive is empty.
- **Trojan:** The most dangerous Malware. Trojans are written with the purpose of discovering your financial information, taking over your computer’s system resources, and in larger systems creating a “denial-of-service attack ” Denial-of-service attack: an attempt to make a machine or network resource unavailable to those attempting to reach it. Example: AOL, Yahoo or your business network becoming unavailable.

- **Rootkit:** It is the hardest of all Malware to detect and therefore to remove; many experts recommend completely wiping your hard drive and reinstalling everything from scratch. It is designed to permit the other information gathering Malware ~~in~~ to get the identity information from your computer without you realizing anything
- **Back doors:** Back doors are much the same as Trojans or worms, except that they open a “backdoor” onto a computer, providing a network connection for hackers or other Malware to enter or for viruses or SPAM to be sent.
- **Key loggers:** Records everything you type on your PC in order to glean your log-in names, passwords, and other sensitive information, and send it on to the source of the key logging program. Many times key loggers are used by corporations and parents to acquire computer usage information.
- **Ransom ware:** If you see this screen that warns you that you have been locked out of your computer until you pay for your cyber crimes. Your system is severely infected with a form of Malware called Ransom ware
- **Browser Hijacker:** This dangerous Malware will redirect your normal search activity and give you the results the developers want you to see. Its intention is to make money off your web surfing.

Access Control

Access Control domain covers mechanisms by which a system grants or revokes the right to access data or perform an action on an information system.

- File permissions, such as “create”, “read”, “edit”, or “delete” on a file server.
- Program permissions, such as the right to execute a program on an application server.
- Data right, such as the right to retrieve or update information in a database.

Access Control

- Access Control is the process or mechanism for giving the authority to access the specific resources, applications and system.
- Access control defines a set of conditions or criteria to access the system and its resources.
- There are three main access Control model first is *Mandatory access control model*, second is *Discretionary access control model* and third is *Role based access control models*.

Types of Access control

- **Mandatory access control (MAC) :**
- in this security policy users do not have the authority to override the policies and it totally controlled centrally by the security policy administrator.
- The security policy administrator defines the usage of resources and their access policy, which cannot be overridden by the end users, and the policy, will decide who has authority to access the particular programs and files.
- MAC is mostly used in a system where priority is based on confidentiality.

Types of Access control

- **Discretionary access control (DAC) :**
- This policy Contrast with Mandatory Access Control (MAC) which is determined by the system administrator while DAC policies are determined by the end user with permission.
- In DAC, user has the complete authority over the all resources it owns.
- and also determines the permissions for other users who have those resources and programs.

Types of Access control

- **Role-based access control (RBAC) :**
- This policy is very simple to use.
- In RBAC roles are assigned by the system administrator statically. In which access is controlled depending on the roles that the users have in a system.
- (RBAC) is mostly used to control the access to computer or network resources depending on the roles of individual users within an organization.
- Due to the static role assignment it does not have complexity. Therefore it needs the low attention for maintenance .

Difference between Authentication and authorization

Authentication is any process by which a system verifies the identity of a User who wishes to access it.

- Since Access Control is normally based on the identity of the User who requests access to a resource, Authentication is essential to effective Security.
- Authentication may be implemented using Credentials, each of which is composed of a User ID and Password. Alternately, Authentication may be implemented with Smart Cards, an Authentication Server or even a Public Key Infrastructure.

Authorization is the process of giving someone permission to do or have something.

- In multi-user computer systems, a system administrator defines for the system which users are allowed access to the system and what privileges of use (such as access to which file directories, hours of access, amount of allocated storage space, and so forth).

Identification vs. Authentication

Identification	Authentication
Determine identity of the person	Determines if person is indeed who he claims to be
No identity claim M-1 mapping. Cost of computation \propto #records of users.	Identity claim from the user 1-1 mapping. The cost of computation independent of #records
Captured biometric signatures from a set of known biometric feature stored in the system	Captured biometric signatures may be unknown to the system



Types of Authentication

SINGLE-FACTOR	TWO-STEP	TWO-FACTOR	MULTI FACTOR
Single process based on one category of factor	Additive process: Authenticate once with a single factor and then again with another single factor from the same category	Multiplicative process: Combination from the knowledge or inherence factor and the possession factor derives a stronger single credential than each independent credential	Multiplicative process: Combination of three or more, each from a separate category of factors, derives a stronger single credential than each independent factor
Includes the following factors: <u>Knowledge factor</u> : one thing you "know" <i>or</i> <u>Inherence factor</u> : one thing you "are"	Includes the following factors: <u>Knowledge factor or inherence factor</u> : one thing you "know" <i>or</i> "are" <i>plus</i> <u>Knowledge factor or inherence factor</u> : one thing you "know" <i>or</i> "are"	Includes the following factors: <u>Knowledge and inherence factor</u> : one thing you "know" <i>or</i> one thing you "are" <i>plus</i> <u>Possession factor</u> : one thing you "have"	Includes the following factors: <u>Knowledge factor</u> : one thing you "know" <i>plus</i> <u>Inherence factor</u> : one thing you "are" <i>plus</i> <u>Possession factor</u> : one thing you "have"
Examples: <ul style="list-style-type: none"> ▪ PIN ▪ Password ▪ Finger print ▪ Iris scan 	Examples: <ul style="list-style-type: none"> ▪ Two physical keys ▪ Two passwords (user + one time only password via SMS, generator, email) ▪ Two forms of biometric identification 	Examples: <ul style="list-style-type: none"> ▪ Password or biomarker with an identity card ▪ PIN, secret key or biomarker with a hardware token 	Examples: <ul style="list-style-type: none"> ▪ Password and fingerprint and identity card ▪ PIN and iris scan and hardware token

What is CCTV Cameras ?

- CCTV Camera is an electronic devices, which can capture audio, video and images very sharply from 25 meters.
- It is an excellent product, that helps to provide security solutions for industrial & commercial buildings.
- It have facility to record high resolution audio & video.
- Now a day's CCTV Cameras is very popular and demanding product.

Components of CCTV System

□ Analog System

- Camera
- DVR
- Hard Disk for recording
- Wiring – for Video - Coaxial or CAT 5(with video balun)
- Wiring – for power (not required iv video balun is used)
- Power Supply
- Connector – BNC or RJ45 (in case of video balun)

Wireless CCTV systems

- Wireless CCTV systems are increasingly becoming a popular choice among CCTV buyers on account of the ease of installing such a system, lack of cabling requirements and assured mobility. The key advantages are:
- A wireless camera can be moved to other locations requiring observation while it is difficult to move a wired camera.
- Best suited for locations requiring temporary observation or in a temporary location.
- Wireless camera can be hidden to detect theft or pilferage
- Wireless recording and monitoring device need not be in the same line of sight allowing observation of any place from another remote location.
- Wireless systems are cost effective, re-deployable and portable.

At the same time, there are some disadvantages of wireless CCTV systems, which are listed below :-

- Wireless systems require a dedicated frequency to transmit signals from the camera to the receiving and recording station.
- Frequencies may be subject to various interruptions by use of electric motored products, air conditioning, fluorescent lighting or cordless telephones which affect the picture quality.
- Wireless camera may not provide the best picture quality as such systems are susceptible to picture distortion while wired cameras provide relatively better picture quality.
- Wireless CCTV cameras may need electric power which implies a wire runs through the camera though the video connection is wireless.
- Wireless systems require wireless technology-specific expertise to diagnose and fix break downs in the system.

Wired CCTV Systems

Wired CCTV systems connect the camera to the recording device and monitor with the help of standard coaxial cables or Unshielded Twisted Pair (UTP) cables or fiber optic cables.

The key advantages of wired CCTV systems are:

- Provides the best picture quality with zero interference
- The camera can be located hundreds of meters away from the recording or monitoring equipment.
- All sensors can be run from a single power supply

The key disadvantages are:

- Cabling and installing can be a tedious task, requiring help from experts
- Observation is fixed to a specific area and the camera cannot be easily moved to another location.

Overall, wireless cameras are relatively more expensive than traditional wired cameras. Wireless CCTV systems are a preferred choice in specific locations devoid of easy cabling facilities and for individuals requiring an easy-to-install solution. The wired CCTV system is a preferred choice when good picture quality and economy considerations gain precedence.

Camera Types

CCTV Cameras will normally be Monochrome only, Colour only & Colour/Mono and are available in a wide range housings.

- Fixed Box Camera & Lens - These are normally mounted internally on brackets or inside an externally rated housing. The camera comes with a separate lens which is interchangeable.
- Internal/External Dome Camera - These come with a built-in lens which can be fixed or varifocal type.
- External Bullet Camera - These come with a built-in lens which can be fixed or varifocal type and normally have built-in Infra Red LED to provide a monochrome image in low lighting conditions.
- Covert Camera - These are usually in the guise of an Intruder Alarm Motion Detector or a Smoke detector unit although other types are available and they are not readily identifiable as a CCTV Camera.
- Full Function Camera - A full function or Pan/Tilt/Zoom (PTZ) camera is a camera which can be controlled via the CCTV Recorder, Joystick or Network Connection. These cameras can be fully controlled to view various areas within a site and are especially useful on sites where there is an operator in control of the system at all times.

The difference between digital CCTV and analogue CCTV is all around the encoding of the signal. Here are the major differences:

Digital CCTV	Analogue CCTV
<p>Store as many recordings, from as many cameras as you want. You're only limited by the size of the data storage on your computer or server.</p>	<p>You need to change the tape every day, and have the space to store the videos.</p>
<p>Image quality is superior and doesn't degrade over multiple copies or time, and it's cheap to copy data to CDs to pass information around.</p>	<p>When you copy or record over tapes the picture quality degrades, so you'll need to replace them.</p>
<p>Digital CCTV recorders, or DCRs record up to 100 images per second, and can record simultaneously from each camera</p>	<p>Analogue systems and VCR record from each camera in turn.</p>
<p>It's easy to sort through recorded data, and you can even connect to the digital CCTV system over the internet to check on recordings or look through the archive.</p>	<p>You will need to manually search through recordings to find the incident you want.</p>

Difference between IP and CCTV Camera

- Analog CCTV systems connect to a DVR (digital video recorder) using coax cables and BNC connectors (not networked).
- IP Cameras connect directly to an existing Ethernet network. This connection could be wired or wireless and they can be accessed from anywhere.



Hybrid CCTV Systems

A Hybrid CCTV System can record and display IP Cameras and Analogue Cameras into the same Security Recorder.

This makes it possible to take full advantage of advanced features like video analytics, event controlled functionality, Megapixel Resolution and expansion via the existing LAN Network, whilst also connecting standard analogue (aging technology) CCTV Cameras.

Advantages of CCTV

- • CCTV surveillance cameras provide enhanced security with utmost clarity and with ease of access.
- • You can keep a track of production processes and other processes in industries and other production units.
- • They are a must for every retail stores, boutique, super markets and other shopping areas.
- • The CCTV surveillance systems are not easily damaged by dust, and severe climatic conditions.
- • During holidays they can be installed at your property thus they ensure the security of a home without making you worry anymore about your property when you are away.
- • For people who employ a babysitter at home, this CCTV system gives you utmost satisfaction about your concerns about your younger one at home while looked after by a baby sitter.
- • You can connect the CCTV surveillance system to your mobile phone and can easily access the live streaming of the recordings.

DISADVANTAGES OF CCTV CAMERA SYSTEM

- **Do Not Work Always:** CCTV camera system cannot monitor every area of your office or home at all times. Hence it cannot be considered as a foolproof method for crime prevention.
- **Privacy Concerns:** Invasion of privacy is the major issue when it comes to any security system device like the CCTV camera system. It lowers the employee morale and hampers productivity at times. Constant monitoring of every activity might put the workers ill at ease.
- **Initial Costs:** The initial costs incurred per camera are high. The installation may also increase the initial expenditure. It depends upon the complexity of the CCTV camera system as well.

COMMON TO ALL BRANCHES
THEORY EXAMINATION (SEM-IV) 2016-17
CYBER SECURITY

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer.

SECTION – A

- 1. Attempt all of the following questions: 10 x 2 = 20**
- (a) What is CIA (Confidentiality, Integrity and Availability) trade?
 - (b) What are the threats to information system?
 - (c) What is System Development Life Cycle (SDLC)?
 - (d) Define the terms RTGS and NEFT.
 - (e) What do you mean by virus, worm and IP spoofing?
 - (f) How cyber security is different from computer security?
 - (g) State the difference between Risk Management and Risk Assessment.
 - (h) Explain briefly about disposal of data.
 - (i) Define IT asset and the security of IT Assets.
 - (j) What is the need of cyber laws in India?

SECTION – B

- 2. Attempt any five parts of the following question: 5 x 10 = 50**
- (a) What are biometric? How can a biometric be used for access control? Discuss the criteria for selection of biometrics.
 - (b) What is Intrusion Detection System (IDS)? Explain its type in detail.
 - (c) What are the backup security measures? Discuss its type.
 - (d) What are the basic fundamental principles of information security? Explain.
 - (e) Write a short note on CCTV and its applications.
 - (f) What is Electronic cash? How does cash based transaction system differ from credit card based transactions?
 - (g) What do you mean by Virtual Private Networks? Discuss authentication mechanism used in VPN.
 - (h) **Write a short note on:**
 - (i) Database Security
 - (ii) Email Security
 - (iii) Internet Security

SECTION – C

- Attempt any two of the following questions: 2 x 15 = 30**
3. What is Electronic Data Interchange (EDI)? What are the benefits of EDI? How can it be helpful in governance?
 4. What is digital signature? What are the requirements of a digital signature system? List the security services provided by digital signature.
 5. Explain the following in detail :
 - (i) Private Key cryptosystem and Public key cryptosystems.
 - (ii) Firewall.

(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 199992

Roll No.

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Theory Examination (Semester-IV) 2015-16

CYBER SECURITY**Time : 2 Hours****Max. Marks : 50****Section-A**

Note : Attempt all the parts. All parts carry equal marks. Write answer of each part in short.

Q1. Attempt any five parts : (2×5=10)

- (a) What are the security threats? Discuss.
- (b) What do you understand by security structure and design?
- (c) Describe the Intellectual Property Issues (IPR).
- (d) Discuss the difference between Malware and spyware.

- (e) Who are the major victims of cyber-crime?
- (f) What do you know about Security Risk Management?
- (g) What are firewalls?
- (h) Is hacking always for financial gains?
- (i) Why backup is essential?
- (j) What is a virus? Explain.

Section-B

Q2. Attempt any four questions from this section. (4×5=20)

- (a) What are the key technological components used for security implementation?
- (b) What is the information security? Explain cyber-crime and cyber security in this reference.
- (c) Draw the diagrammatical approach to make difference between symmetric and asymmetric cryptography.
- (d) How can you say that intrusion detection system is the backbone of information system? Justify along with its categories.

(2)

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- (e) Write short note on:
 - i. Incident Response Plan
 - ii. Disaster Response Plan
 - iii. Business continuity Plan
- (f) Elaborate the difference between security and threats and explain web security.
- (g) What is security SDLC? Explain its different phases.
- (h) Explain and differentiate between integrating security at the implementation phase and the developing phase.

Section-C

Note: Attempt any two questions from this section.

(2×10=20)

- Q3. Elaborate the term access control. What is included in authorization process for (File, Program, Data rights) and explain the all types of controls. [5+5]
- Q4. What are the data security considerations? Explain in this reference Data backup security, data archival security and data disposal considerations. [5+5]

(3)

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P.T.O.

Q5. Write short notes on any two of the follows:

- (i) Intellectual Property Law
- (ii) Copyright Act
- (iii) Cyber Laws in India.