E-commerce security systems

Security is an essential part of any transaction that takes place over the internet. Customers will lose his/her faith in e-business if its security is compromised. Following are the essential requirements for safe e-payments/transactions −

Confidentiality − Information should not be accessible to an unauthorized person. It should not be intercepted during the transmission.
Integrity − Information should not be altered during its transmission over the network.
Availability − Information should be available wherever and whenever required within a time limit specified.
Authenticity − There should be a mechanism to authenticate a user before giving him/her an access to the required information.
Non-Repudiability − It is the protection against the denial of order or denial of payment. Once a sender sends a message, the sender should not be able to deny sending the message. Similarly, the recipient of message should not be able to deny the receipt.
Encryption − Information should be encrypted and decrypted only by an authorized user.
Auditability − Data should be recorded in such a way that it can be audited for integrity requirements.

Measures to ensure Security

Major security measures are following –

Encryption − It is a very effective and practical way to safeguard the data being transmitted over the network. Sender of the information encrypts the data using a secret code and only the specified receiver can decrypt the data using the same or a different secret code.

Digital Signature − Digital signature ensures the authenticity of the information. A digital signature is an e-signature authenticated through encryption and password.

Security Certificates − Security certificate is a unique digital id used to verify the identity of an individual website or user.

Security Protocols in Internet

We will discuss here some of the popular protocols used over the internet to ensure secured online transactions.

Secure Socket Layer (SSL)

It is the most commonly used protocol and is widely used across the industry. It meets following security requirements –

- Authentication
- Encryption
- Integrity

- Non-reputability

"https://" is to be used for HTTP urls with SSL, where as "http:/" is to be used for HTTP urls without SSL.

Secure Hypertext Transfer Protocol (SHTTP)

SHTTP extends the HTTP internet protocol with public key encryption, authentication, and digital signature over the internet. Secure HTTP supports multiple security mechanism, providing security to the end-users. SHTTP works by negotiating encryption scheme types used between the client and the server.

Secure Electronic Transaction

It is a secure protocol developed by MasterCard and Visa in collaboration. Theoretically, it is the best security protocol. It has the following components –

Card Holder's Digital Wallet Software − Digital Wallet allows the card holder to make − secure purchases online via point and click interface.

Merchant Software − This software helps merchants to communicate with potential − customers and financial institutions in a secure manner.

Payment Gateway Server Software − Payment gateway provides automatic and standard − payment process. It supports the process for merchant's certificate request.

Certificate Authority Software − This software is used by financial institutions to issue − digital certificates to card holders and merchants, and to enable them to register their account agreements for secure electronic commerce.

Security Threats to E-commerce:

E-Commerce security requirements can be studied by examining the overall process, beginning with the consumer and ending with the commerce server. Considering each logical link in the commerce chain, the assets that must be protected to ensure secure e-commerce include client computers, the messages travelling on the communication channel, and the web and commerce servers – including any hardware attached to the servers. While telecommunications are certainly one of the major assets to be protected, the telecommunications links are not the only concern in computer and e-commerce security. For instance, if the telecommunications links were made secure but no security measures were implemented for either client computers or commerce and web-servers, then no communications security would exist at all.

Client threats

Until the introduction of executable web content, Web pages were mainly static. Coded in HTML, static pages could do little more than display content and provide links to related pages with additional information. However, the widespread use of active content has changed this perception.

Active content: Active content refers to programs that are embedded transparently in web pages and that cause action to occur. Active content can display moving graphics, download and play audio, or implement web-based spreadsheet programs. Active content is used in e-commerce to place items one wishes to purchase into a shopping cart and to compute the total invoice amount, including sales tax, handling, and shipping costs. The best known active content forms are Java applets, ActiveX controls, JavaScript, and VBScript.

Malicious codes: Computer viruses, worms and trojan horses are examples of malicious code. A trojan horse is a program which performs a useful function, but performs an unexpected action as well. Virus is a code segment which replicates by attaching copies to existing executables. A worm is a program which replicates itself and causes execution of the new copy. These can create havoc on the client side.

Server-side masquerading*:* Masquerading lures a victim into believing that the entity with which it is communicating is a different entity. For example, if a user tries to log into a computer across the internet but instead reaches another computer that claims to be the desired one, the user has been spoofed. This may be a passive attack (in which the user does not attempt to authenticate the recipient, but merely accesses it), but it is usually an active attack.

Communication channel threats

The internet serves as the electronic chain linking a consumer (client) to an e-commerce resource. Messages on the internet travel a random path from a source node to a destination node. The message passes through a number of intermediate computers on the network before reaching the final destination. It is impossible to guarantee that every computer on the internet through which messages pass is safe, secure, and non-hostile.

Confidentiality threats: Confidentiality is the prevention of unauthorized information disclosure. Breaching confidentiality on the internet is not difficult. Suppose one logs onto a website – say www.anybiz.com – that contains a form with text boxes for name, address, and email address. When one fills out those text boxes and clicks the submit button, the information is sent to the web-server for processing. One popular method of transmitting data to a web-server is to collect the text box responses and place them at the end of the target server‘s URL. The captured data and the HTTP request to send the data to the server is then sent. Now, suppose the user changes his mind, decides not to wait for a response from the anybiz.com server, and jumps to another website instead – say www.somecompany.com. The server somecompany.com may choose to collect web demographics and log the URL from which the user just came (www.anybiz.com). By doing this, somecompany.com has breached confidentiality by recording the secret information the user has just entered.

Integrity threats: An integrity threat exists when an unauthorized party can alter a message stream of information. Unprotected banking transactions are subject to integrity violations. Cyber vandalism is an example of an integrity violation. Cyber vandalism is the electronic defacing of an existing website page. Masquerading or spoofing – pretending to be someone you are not or representing a website as an original when it really is a fake – is one means of creating havoc on websites. Using a security hole in a domain name server (DNS), perpetrators can substitute the address of their website in place of the real one to spoof website visitors. Integrity threats can alter vital financial, medical, or military information. It can have very serious consequences for businesses and people.

Availability threats: The purpose of availability threats, also known as delay or denial threats, is to disrupt normal computer processing or to deny processing entirely. For example, if the processing speed of a single ATM machine transaction slows from one or two seconds to 30 seconds, users will abandon ATM machines entirely. Similarly, slowing any internet service will drive customers to competitors' web or commerce sites.

Server threats

The server is the third link in the client-internet-server trio embodying the e-commerce path between the user and a commerce server. Servers have vulnerabilities that can be exploited by anyone determined to cause destruction or to illegally acquire information.

Web-server threats: Web-server software is designed to deliver web pages by responding to HTTP requests. While web-server software is not inherently high-risk, it has been designed with web service and convenience as the main design goal. The more complex the software is, the higher the probability that it contains coding errors (bugs) and security holes – security weaknesses that provide openings through which evildoers can enter.

Commerce server threats: The commerce server, along with the web-server, responds to requests from web browsers through the HTTP protocol and CGI scripts. Several pieces of software comprise the commerce server software suite, including an FTP server, a mail server, a remote login server, and operating systems on host machines. Each of this software can have security holes and bugs.

Database threats: E-commerce systems store user data and retrieve product information from databases connected to the web-server. Besides product information, databases connected to the web contain valuable and private information that could irreparably damage a company if it were disclosed or altered. Some databases store username/password pairs in a non-secure way. If someone obtains user authentication information, then he or she can masquerade as a legitimate database user and reveal private and costly information.

Common gateway interface threats: A common gateway interface (CGI) implements the transfer of information from a web-server to another program, such as a database program. CGI and the programs to which they transfer data provide active content to web pages. Because CGIs are programs, they present a security threat if misused. Just like web-servers, CGI scripts can be set up to run with their privileges set to high – unconstrained. Defective or malicious CGIs with free access to system resources are capable of disabling the system, calling privileged (and dangerous) base system programs that delete files, or viewing confidential customer information, including usernames and passwords.

Password hacking: The simplest attack against a password-based system is to guess passwords. Guessing of passwords requires that access to the complement, the complementation functions, and the authentication functions be obtained. If none of these have changed by the time the password is guessed, then the attacker can use the password to access the system.

Security Requirements for E-Commerce:

Authentication:

This is the ability to say that an electronic communication (whether via email or web) does genuinely come from who it purports to.Without face-to-face contact, passing oneself off as someone else is not difficult on the internet.

In online commerce the best defence against being misled by an imposter is provided by unforgeable digital certificates from a trusted authority (such as VeriSign). Although anyone can generate digital certificates for themselves, a trusted authority demands real-world proof of identity and checks its validity before issuing a digital certificate. Only certificates from trusted authorities will be automatically recognized and trusted by the major web browser and email client software.

Authentication can be provided in some situations by physical tokens (such as a drivers license), by a piece of information known only to the person involved (eg. a PIN), or by a physical property of a person (fingerprints or retina scans). Strong authentication requires at least two or more of these. A digital certificate provides strong authentication as it is a unique token and requires a password for its usage.

Privacy:

In online commerce, privacy is the ability to ensure that information is accessed and changed only by authorized parties. Typically this is achieved via encryption. Sensitive data (such as credit card details, health records, sales figures etc.) are encrypted before being transmitted across the open internet – via email or the web. Data which has been protected with strong

128bit encryption may be intercepted by hackers, but cannot be decrypted by them within a short time. Again, digital certificates are used here to encrypt email or establish a secure HTTPS connection with a web-server. For extra security, data can also be stored long-term in an encrypted format.

Authorization:

Authorization allows a person or computer system to determine if someone has the authority to request or approve an action or information. In the physical world, authentication is usually achieved by forms requiring signatures, or locks where only authorized individuals hold the keys.

Authorization is tied with *authentication*. If a system can securely verify that a request for information (such as a web page) or a service (such as a purchase requisition) has come from a known individual, the system can then check against its internal rules to see if that person has sufficient authority for the request to proceed.

In the online world, authorization can be achieved by a manager sending a digitally signed email. Such an email, once checked and verified by the recipient, is a legally binding request for a service. Similarly, if a web-server has a restricted access area, the server can request a digital certificate from the user‘s browser to identify the user and then determine if they should be given access to the information according to the server‘s permission rules.

Integrity:

Integrity of information means ensuring that a communication received has not been altered or tampered with. Traditionally, this problem has been dealt with by having tight control over access to paper documents and requiring authorized officers to initial all changes made – a system with obvious drawbacks and limitations. If someone is receiving sensitive information online, he not only wants to ensure that it is coming from who he expects it to (authentication), but also that it hasn‘t been intercepted by a hacker while in transit and its contents altered. The speed and distances involved in online communications requires a very different approach to this problem from traditional methods.

One solution is afforded by using digital certificates to digitally ―sign‖ messages. A travelling employee can send production orders with integrity to the central office by using their digital certificate to sign their email. The signature includes a hash of the original message – a brief numerical representation of the message content. When the recipient opens the message, his email software will automatically create a new hash of the message and compare it against the one included in the digital signature. If even a single character has been altered in the message, the two hashes will differ and the software will alert the recipient that the email has been tampered with during transit.

Non-repudiation:

Non-repudiation is the ability to guarantee that once someone has requested a service or approved an action. Non-repudiation allows one to legally prove that a person has sent a specific email or made a purchase approval from a website. Traditionally non-repudiation has been achieved by having parties sign contracts and then have the contracts notarized by trusted third parties. Sending documents involved the use of registered mail, and postmarks and signatures to date-stamp and record the process of transmission and acceptance. In the realm of e-commerce, non-repudiation is achieved by using digital signatures. Digital signatures which have been issued by a trusted authority (such as VeriSign) cannot be forged and their validity can be checked with any major email or web browser software. A digital signature is only installed in the personal computer of its owner, who is usually required to provide a password to make use of the digital signature to encrypt or digitally sign their communications. If a company receives a purchase order via email which has been digitally signed, it has the same legal assurances as on receipt of a physical signed contract.

Security policy for E-commerce:

The security policy may cover issues like:

- What service types (e.g., web, FTP, SMTP) users may have access to?
- What classes of information exist within the organization and which should be encrypted before being transmitted?
- What client data does the organization hold. How sensitive is it? How is it to be protected?
- What class of employees may have remote access to the corporate network?
- Roles and responsibilities of managers and employees in implementing the security policy.
- How security breaches are to be responded to?

The security policy should also consider physical aspects of network security. For example, Who

- has access to the corporate server?
- Is it in a locked environment or kept in an open office?
- What is the procedure for determining who should be given access? The security policy regulates the activities of employees just as much as it defines how IT infrastructure will be configured. The policy should include details on how it is to be enforced

- How individual responsibilities are determined?

For it to be effective, the policy needs regular testing and review to judge the security measures. The review process needs to take into account any changes in technology or business practices which may have an influence upon security. Lastly, the policy itself needs to be regarded as a living document which will be updated at set intervals to reflect the evolving ways in which the business, customers and technology interact. **Security Standards:**

There are various standards pertaining to the security aspects of enterprises. Some of them are

- ISO 17799 (Information technology – Code of practice for information security management).
- (ISO/IEC 2000).
- SSE-CMM (Systems security engineering – Capability maturity model).
- (SSE-CMM 2003).
- COBIT (Control objectives for information and related technology).
- (COBIT 2000).

ISO 17799 provides detailed guidelines on how a management framework for enterprise security should be implemented. It conceives ten security domains. Under each domain there are certain security objectives to be fulfilled. Each objective can be attained by a number of controls. The controls may prescribe management measures like guidelines and procedures, or some security infrastructure in the form of tools and techniques. It details various methods that can be followed by enterprises to meet security needs for e-commerce. It talks about the need for security policies, security infrastructure, and continuous testing in the same manner as has been detailed above.

The main objective of the COBIT is the development of clear policies and good practices for security and control in IT for worldwide endorsement by commercial, governmental and professional organizations. The SSE-CMM is a process reference model. It is focused upon the requirements for implementing security in a system or series of related systems that are in the Information Technology Security domain.

Firewall:

A firewall is a network security system that controls the incoming and outgoing network traffic based on an applied rule set. A firewall establishes a barrier between a trusted, secure internal network and another network (e.g., the Internet) that is assumed not to be secure and trusted. Firewalls exist both as software to run on general purpose hardware and as a hardware appliance.

Many hardware-based firewalls also offer other functionality to the internal network they protect, such as acting as a DHCP server for that network.

Many personal computer operating systems include software-based firewalls to protect against threats from the public Internet. Many routers that pass data between networks contain firewall components and, conversely, many firewalls can perform basic routing functions.

Types of Firewall:

There are different types of firewalls depending on where the communication is taking place, where the communication is intercepted and the state that is being traced.

- Network layer Firewall
- Application layer firewall
- Proxy server
- Network address translation

Network layer Firewall:

Network layer firewalls, also called packet filters, operate at a relatively low level of the TCP/IP protocol stack, not allowing packets to pass through the firewall unless they match the established rule set. The firewall administrator may define the rules; or default rules may apply.

Network layer firewalls generally fall into two sub-categories,

- Stateful Firewalls
- Stateless Firewalls

Stateful firewalls maintain context about active sessions, and use that "state information" to speed packet processing. Any existing network connection can be described by several properties, including source and destination IP address, UDP or TCP ports, and the current stage of the connection's lifetime (including session initiation, handshaking, data transfer, or completion connection). If a packet does not match an existing connection, it will be evaluated according to the rule set for new connections. If a packet matches an existing connection based on comparison with the firewall's state table, it will be allowed to pass without further processing.

Stateless firewalls require less memory, and can be faster for simple filters that require less time to filter than to look up a session. They may also be necessary for filtering stateless network protocols that have no concept of a session. However, they cannot make more complex decisions based on what stage communications between hosts have reached.

- **Application Layer Firewall:**

Application-layer firewalls work on the application level of the TCP/IP stack (i.e., all browser traffic, or all telnet or ftp traffic), and may intercept all packets traveling to or from an application. They block other packets (usually dropping them without acknowledgment to the sender).

On inspecting all packets for improper content, firewalls can restrict or prevent outright the spread of networked computer worms and trojans. The additional inspection criteria can add extra latency to the forwarding of packets to their destination.

Application firewalls function by determining whether a process should accept any given connection. Application firewalls accomplish their function by hooking into socket calls to filter the connections between the application layer and the lower layers of the OSI model. Application firewalls that hook into socket calls are also referred to as socket filters. Application firewalls work much like a packet filter but application filters apply filtering rules (allow/block) on a per process basis instead of filtering connections on a per port basis. Generally, prompts are used to define rules for processes that have not yet received a connection. It is rare to find application firewalls not combined or used in conjunction with a packet filter.

Also, application firewalls further filter connections by examining the process ID of data packets against a ruleset for the local process involved in the data transmission. The extent of the filtering that occurs is defined by the provided ruleset. Given the variety of software that exists, application firewalls only have more complex rulesets for the standard services, such as sharing services. These per process rulesets have limited efficacy in filtering every possible association that may occur with other processes.

- **Proxy server:**

A proxy server running either on dedicated hardware or as software on a general-purpose machine may act as a firewall by responding to input packets (connection requests, for example) in the manner of an application, while blocking other packets. A proxy server is a gateway from one network to another for a specific network application, in the sense that it functions as a proxy on behalf of the network user.

Proxies make tampering with an internal system from the external network more difficult and misuse of one internal system would not necessarily cause a security breach exploitable from outside the firewall. Conversely, intruders may hijack a publicly reachable system and use it as a proxy for their own purposes; the proxy then masquerades as that system to other internal machines. While use of internal address spaces enhances security, crackers may still employ methods such as IP spoofing to attempt to pass packets to a target network.

- **Network Address Translation:**

  Firewalls often have network address translation (NAT) functionality, and the hosts protected behind a firewall commonly have addresses in the "private address range", as defined in RFC 1918.

  Firewalls often have such functionality to hide the true address of protected hosts. Originally, the NAT function was developed to address the limited number of IPv4 routable addresses that could be used or assigned to companies or individuals as well as reduce both the amount and therefore cost of obtaining enough public addresses for every computer in an organization. Hiding the addresses of protected devices has become an increasingly important defense against network reconnaissance.

Digital Signatures:

A digital signature is a mathematical scheme for demonstrating the authenticity of a digital message or document. A valid digital signature gives a recipient reason to believe that the message was created by a known sender, such that the sender cannot deny having sent the message (authentication and non-repudiation) and that the message was not altered in transit (integrity). Digital signatures are commonly used for software distribution, financial transactions, and in other cases where it is important to detect forgery or tampering.

Digital signatures are often used to implement electronic signatures, a broader term that refers to any electronic data that carries the intent of a signature, but not all electronic signatures use digital signatures. In some countries, including the United States, India, Brazil, and members of the European Union, electronic signatures have legal significance.

A digital signature scheme typically consists of three algorithms;

- A key generation algorithm that selects a private key uniformly at random from a set of possible private keys. The algorithm outputs the private key and a corresponding public key.

- A signing algorithm that, given a message and a private key, produces a signature.
- A signature verifying algorithm that, given a message, public key and a signature, either accepts or rejects the message's claim to authenticity.

Applications of digital signatures:

Authentication:

Although messages may often include information about the entity sending a message, that information may not be accurate. Digital signatures can be used to authenticate the source of messages. When ownership of a digital signature secret key is bound to a specific user, a valid signature shows that the message was sent by that user. The importance of high confidence in sender authenticity is especially obvious in a financial context. For example, suppose a bank's branch office sends instructions to the central office requesting a change in the balance of an account. If the central office is not convinced that such a message is truly sent from an authorized source, acting on such a request could be a grave mistake.

Integrity:

In many scenarios, the sender and receiver of a message may have a need for confidence that the message has not been altered during transmission. Although encryption hides the contents of a message, it may be possible to change an encrypted message without understanding it. (Some encryption algorithms, known as nonmalleable ones, prevent this, but others do not.) However, if a message is digitally signed, any change in the message after signature invalidates the signature. Furthermore, there is no efficient way to modify a message and its signature to produce a new message with a valid signature, because this is still considered to be computationally infeasible by most cryptographic hash functions (see collision resistance).

Non-repudiation:

Non-repudiation, or more specifically non-repudiation of origin, is an important aspect of digital signatures. By this property, an entity that has signed some information cannot at a later time deny having signed it. Similarly, access to the public key only does not enable a fraudulent party to fake a valid signature.

Some digital signature algorithms:

- RSA-based signature schemes, such as RSA-PSS
- DSA and its elliptic curve variant ECDSA
- ElGamal signature scheme as the predecessor to DSA, and variants Schnorr signature and Pointcheval–Stern signature algorithm
- Rabin signature algorithm
- Pairing-based schemes such as BLS
- Undeniable signatures
- Aggregate signature - a signature scheme that supports aggregation: Given n signatures on n messages from n users, it is possible to aggregate all these signatures into a single signature whose size is constant in the number of users. This single signature will convince the verifier that the n users did indeed sign the n original messages.

- Signatures with efficient protocols - are signature schemes that facilitate efficient cryptographic protocols such as zero-knowledge proofs or secure computation.

Digital Certificate:

- It is an electronic document used to prove ownership of a public key. The certificate includes information about the key, information about its owner's identity, and the digital signature of an entity that has verified the certificate's contents are correct. If the signature is valid, and the person examining the certificate trusts the signer, then they know they can use that key to communicate with its owner.

- The most common use of a digital certificate is to verify that a user sending a message is who he or she claims to be, and to provide the receiver with the means to encode a reply. An individual wishing to send an encrypted message applies for a digital certificate from a Certificate Authority (CA). The CA issues an encrypted digital certificate containing the applicant's public key and a variety of other identification information. The CA makes its own public key readily available through print publicity or perhaps on the Internet.

- The recipient of an encrypted message uses the CA's public key to decode the digital certificate attached to the message, verifies it as issued by the CA and then obtains the sender's public key and identification information held within the certificate. With this information, the recipient can send an encrypted reply.

- The most widely used standard for digital certificates is X.509.

Contents of a Typical Digital Certificate:

- Serial Number: Used to uniquely identify the certificate.
- Subject: The person, or entity identified.
- Signature Algorithm: The algorithm used to create the signature.
- Signature: The actual signature to verify that it came from the issuer.
- Issuer: The entity that verified the information and issued the certificate.
- Valid-From: The date the certificate is first valid from.
- Valid-To: The expiration date.
- Key-Usage: Purpose of the public key (e.g. encipherment, signature, certificate signing...).
- Public Key: The public key.
- Thumbprint Algorithm: The algorithm used to hash the public key certificate.
- Thumbprint (also known as fingerprint): The hash itself, used as an abbreviated form of the public key certificate.

E- LOCKING

An electronic lock (or electric lock) is a locking device which operates by means of electric current. Electric locks are sometimes stand-alone with an electronic control assembly mounted directly to the lock. Electric locks may be connected to an access control system, the advantages of which include: key control, where keys can be added and removed without re-keying the lock cylinder; fine access control, where time and place are factors; and transaction logging, where activity is recorded. Electronic locks can also be remotely monitored and controlled, both to lock and to unlock.

OPERATIONS-

Electric locks use magnets, solenoids, or motors to actuate the lock by either supplying or removing power. Operating the lock can be as simple as using a switch, for example an apartment intercom door release, or as complex as a biometric based access control system.

There are two basic types of locks: "preventing mechanism" or operation mechanism.

TYPES OF E-LOCKING-

1) Electromagnetic lock-

The most basic type of electronic lock is a magnetic lock (informally called a "mag lock"). A large electro-magnet is mounted on the door frame and a corresponding armature is mounted on the door. When the magnet is powered and the door is closed, the armature is held fast to the magnet. Mag locks are simple to install and are very attack-resistant. One drawback is that improperly installed or maintained mag locks can fall on people,[dubious – discuss] and also that one must unlock the mag lock to both enter and to leave. This has caused fire marshals to impose strict rules on the use of mag locks and access control practice in general. Additionally, NFPA 101 (Standard for Life Safety and Security), as well as the ADA (Americans with Disability Act) require "no prior knowledge" and "one simple movement" to allow "free egress". This means that in an emergency, a person must be able to move to a door and immediately exit with one motion (requiring no push buttons, having another person unlock the door, reading a sign, or "special knowledge").

2) Electronic strikes-

Electric strikes (also called electric latch release) replace a standard strike mounted on the door frame and receive the latch and latch bolt. Electric strikes can be simplest to install when they are designed for one-for-one drop-in replacement of a standard strike, but some electric strike designs require that the door frame be heavily modified. Installation of a strike into a fire listed door (for open backed strikes on pairs of doors) or the frame must be done under listing agency authority, if any modifications to the frame are required (mostly for commercial doors and frames). In the US, since there is no current Certified Personnel Program to allow field installation of electric strikes into fire listed door openings, listing agency field evaluations would most likely require the door and frame to be de-listed and replaced.

3)Electronic deadbolts and latches-

Electric mortise and cylindrical locks are drop-in replacements for door-mounted mechanical locks. An additional hole must be drilled in the door for electric power wires. Also, a power transfer hinge is often used to get the power from the door frame to the door. Electric mortise and cylindrical locks allow mechanical free egress, and can be either fail unlocked or fail locked. In the US, UL rated doors must retain their rating: in new construction doors are cored and then rated. but in retrofits, the doors must be re-rated.

Electrified exit hardware, sometimes called "panic hardware" or "crash bars", are used in fire exit applications. A person wishing to exit pushes against the bar to open the door, making it the easiest of mechanically-free exit methods. Electrified exit hardware can be either fail unlocked or fail locked. A drawback of electrified exit hardware is their complexity, which requires skill to install and maintenance to assure proper function. Only hardware labeled "Fire Exit Hardware" can be installed on fire listed doors and frames and must meet both panic exit listing standards and fire listing standards.

ENCRYPTION IN E-COMMERCE

Encryption is the process of encoding information. This process converts the original representation of the information, known as plaintext, into an alternative form known as ciphertext. Only authorized parties can decipher a ciphertext back to plaintext and access the original information. Encryption does not itself prevent interference but denies the intelligible content to a would-be interceptor. For technical reasons, an encryption scheme usually uses a pseudo-random encryption key generated by an algorithm. It is possible to decrypt the message without possessing the key, but, for a well-designed encryption scheme, considerable computational resources and skills are required. An authorized recipient can easily decrypt the message with the key provided by the originator to recipients but not to unauthorized users. Historically, various forms of encryption have been used to aid in cryptography. Early encryption techniques were often utilized in military messaging. Since then, new techniques have emerged and become commonplace in all areas of modern computing.Modern encryption schemes utilize the concepts of public-key and symmetric-key.Modern encryption techniques ensure security because modern computers are inefficient at cracking the encryption. However, researchers at NIST and other cybersecurity experts suggest that the development of quantum computers may threaten current encryption systems.

USES-

Encryption has long been used by militaries and governments to facilitate secret communication. It is now commonly used in protecting information within many kinds of civilian systems. For example, the Computer Security Institute reported that in 2007, 71% of companies surveyed utilized encryption for some of their data in transit, and 53% utilized encryption for some of their data in storage.[17] Encryption can be used to protect data "at rest", such as information stored on computers and storage devices (e.g. USB flash drives). In recent years, there have been numerous reports of confidential data, such as customers' personal records, being exposed through loss or theft of laptops or backup drives; encrypting such files at rest helps protect them if physical security measures fail.[18][19][20] Digital rights management systems, which prevent unauthorized use or reproduction of copyrighted material and protect software against reverse engineering (see also copy protection), is another somewhat different example of using encryption on data at rest.[21]

Encryption is also used to protect data in transit, for example data being transferred via networks (e.g. the Internet, e-commerce), mobile telephones, wireless microphones, wireless intercom systems, Bluetooth devices and bank automatic teller machines. There have been numerous reports of data in transit being intercepted in recent years.Data should also be encrypted when transmitted across networks in order to protect against eavesdropping of network traffic by unauthorized users.

CYBER LAWS IN E-COMMERCE-

Cyber Law also called IT Law is the law regarding Information-technology including computers and internet. It is related to legal informatics and supervises the digital circulation of information, software, information security and e-commerce.

IT law does not consist a separate area of law rather it encloses aspects of contract, intellectual property, privacy and data protection laws. Intellectual property is a key element of IT law. The area of software licence is controversial and still evolving in Europe and elsewhere.

According to Ministry of Electronic and Information Technology, Government of India:

Importance of Cyber Law:

1) It covers all transaction over internet.

2) It keeps eyes on all activities over internet.

3) It touches every action and every reaction in cyberspace.

Area of Cyber Law:

Cyber laws contain different types of purposes. Some laws create rules for how individuals and companies may use computers and the internet while some laws protect people from becoming the victims of crime through unscrupulous activities on the internet. The major areas of cyber law include:

1)Fraud:

Consumers depend on cyber laws to protect them from online fraud. Laws are made to prevent identity theft, credit card theft and other financial crimes that happen online. A person who commits identity theft may face confederate or state criminal charges. They might also encounter a civil action brought by a victim. Cyber lawyers work to both defend and prosecute against allegations of fraud using the internet.

2)Copyright:

The internet has made copyright violations easier. In early days of online communication, copyright violations was too easy. Both companies and individuals need lawyers to bring actions to impose copyright protections. Copyright violation is an area of cyber law that protects the rights of individuals and companies to profit from their own creative works.

3)Defamation:

Several personnel use the internet to speak their mind. When people use the internet to say things that are not true, it can cross the line into defamation. Defamation laws are civil laws that save individuals from fake public statements that can harm a business or someone's personal reputation. When people use the internet to make statements that violate civil laws, that is called Defamation law.

4)Harassment and Stalking:

Sometimes online statements can violate criminal laws that forbid harassment and stalking. When a person makes threatening statements again and again about someone else online, there is violation of both civil and criminal laws. Cyber lawyers both prosecute and defend people when stalking occurs using the internet and other forms of electronic communication.

Advantages of Cyber Law:

1) Organizations are now able to carry out e-commerce using the legal infrastructure provided by the Act.

2) Digital signatures have been given legal validity and sanction in the Act.

3) It has opened the doors for the entry of corporate companies for issuing Digital Signatures Certificates in the business of being Certifying Authorities.

4) It allows Government to issue notification on the web thus heralding e-governance.

5) It gives authority to the companies or organizations to file any form, application or any other document with any office, authority, body or agency owned or controlled by the suitable Government in e-form by means of such e-form as may be prescribed by the suitable Government.

6 IT Act also addresses the important issues of security, which are so critical to the success of electronic transactions.

Public Key Infrastructure

The most distinct feature of Public Key Infrastructure (PKI) is that it uses a pair of keys to achieve the underlying security service. The key pair comprises of private key and public key.

Since the public keys are in open domain, they are likely to be abused. It is, thus, necessary to establish and maintain some kind of trusted infrastructure to manage these keys.

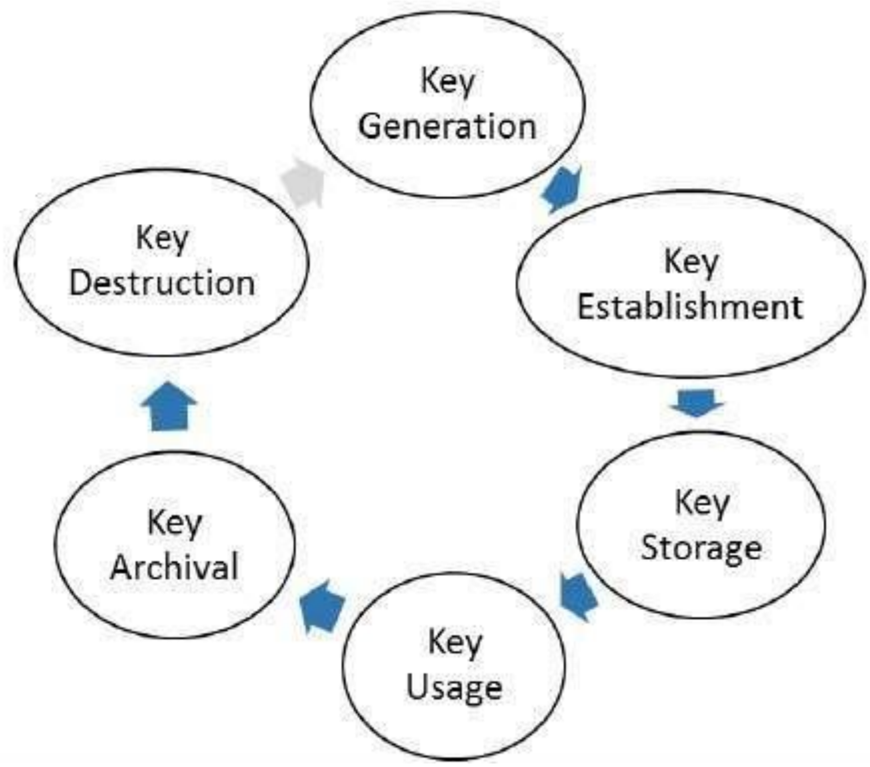
Key Management

It goes without saying that the security of any cryptosystem depends upon how securely its keys are managed. Without secure procedures for the handling of cryptographic keys, the benefits of the use of strong cryptographic schemes are potentially lost.

It is observed that cryptographic schemes are rarely compromised through weaknesses in their design. However, they are often compromised through poor key management.

There are some important aspects of key management which are as follows −

- Cryptographic keys are nothing but special pieces of data. Key management refers to the secure administration of cryptographic keys.
- Key management deals with entire key lifecycle as depicted in the following illustration −



- There are two specific requirements of key management for public key cryptography.
    - **Secrecy of private keys.** Throughout the key lifecycle, secret keys must remain secret from all parties except those who are owner and are authorized to use them.
    - **Assurance of public keys.** In public key cryptography, the public keys are in open domain and seen as public pieces of data. By default there are no assurances of whether a public key is correct, with whom it can be associated, or what it can be used for. Thus key management of public keys needs to focus much more explicitly on assurance of purpose of public keys.

The most crucial requirement of 'assurance of public key' can be achieved through the public-key infrastructure (PKI), a key management systems for supporting public-key cryptography.

Public Key Infrastructure (PKI)

PKI provides assurance of public key. It provides the identification of public keys and their distribution.

An anatomy of PKI comprises of the following components.

Public Key Certificate, commonly referred to as 'digital certificate'.Public Key Certificate, commonly referred to as 'digital certificate'.

-
- Private Key tokens.Private Key tokens.
- Certification AuthorityCertification Authority..
- Registration AuthorityRegistration Authority..
-

Certificate Management System.Certificate Management System.

Digital Certificate

For analogy, a certificate can be considered as the ID card issued to the person. People use ID cards such as a driver's license, passport to prove their identity. A digital certificate does the same basic thing in the electronic world, but with one difference.

Digital Certificates are not only issued to people but they can be issued to computers, software packages or anything else that need to prove the identity in the electronic world.

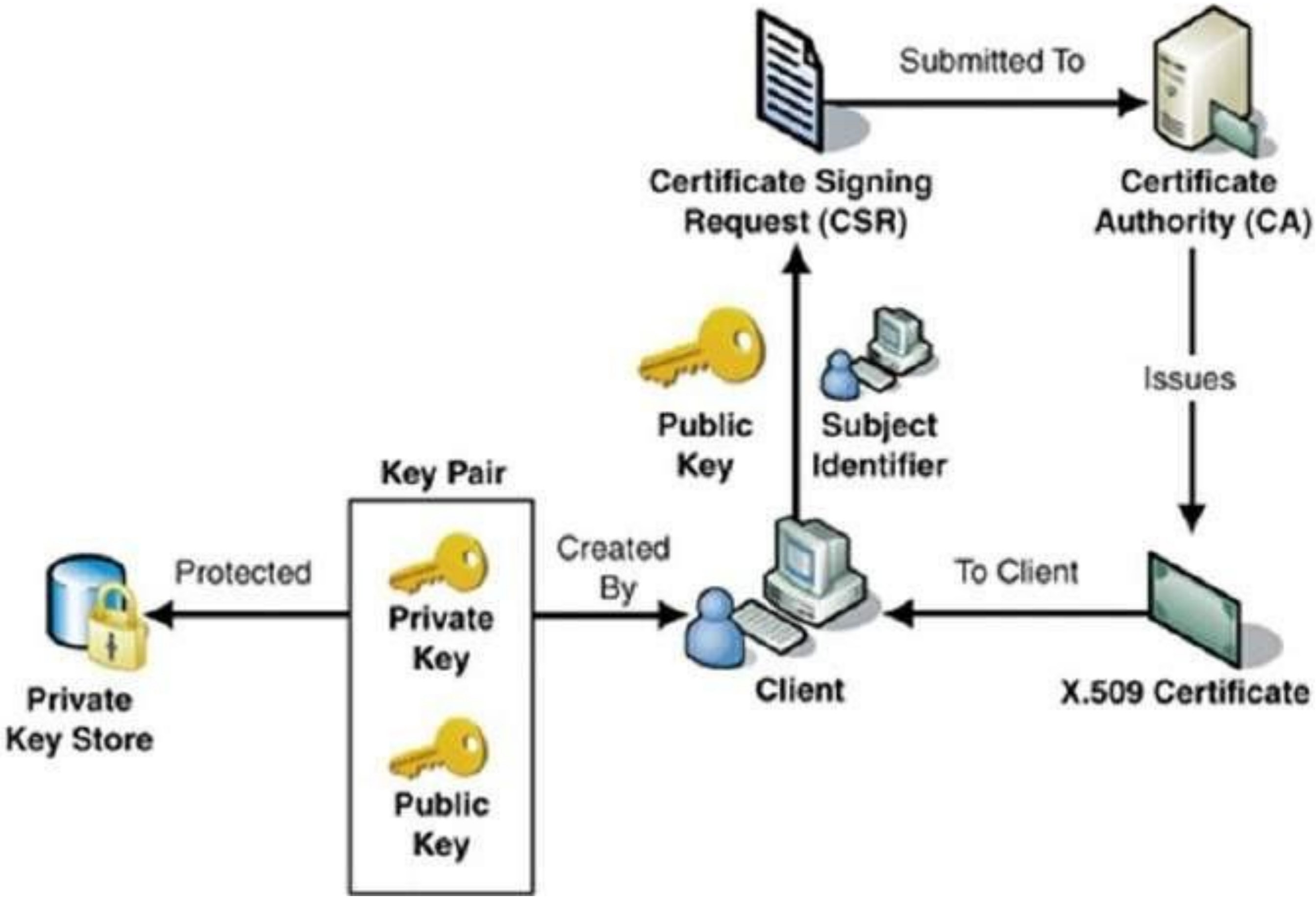
- Digital certificates are based on the ITU standard X.509 which defines a standard certificate format for public key certificates and certification validation. Hence digital certificates are sometimes also referred to as X.509 certificates.

  Public key pertaining to the user client is stored in digital certificates by The Certification Authority (CA) along with other relevant information such as client information, expiration date, usage, issuer etc.

- CA digitally signs this entire information and includes digital signature in the certificate.

- Anyone who needs the assurance about the public key and associated information of client, he carries out the signature validation process using CA's public key. Successful validation assures that the public key given in the certificate belongs to the person whose details are given in the certificate.

The process of obtaining Digital Certificate by a person/entity is depicted in the following illustration.



As shown in the illustration, the CA accepts the application from a client to certify his public key. The CA, after duly verifying identity of client, issues a digital certificate to that client.

Certifying Authority (CA)

As discussed above, the CA issues certificate to a client and assist other users to verify the certificate. The CA takes responsibility for identifying correctly the identity of the client asking for a certificate to be issued, and ensures that the information contained within the certificate is correct and digitally signs it.

Key Functions of CA

The key functions of a CA are as follows −

- **Generating key pairs** − The CA may generate a key pair independently or jointly with the client.
- **Issuing digital certificates** − The CA could be thought of as the PKI equivalent of a passport agency − the CA issues a certificate after client provides the credentials to

confirm his identity. The CA then signs the certificate to prevent modification of the details contained in the certificate.

- **Publishing Certificates** − The CA need to publish certificates so that users can find them. There are two ways of achieving this. One is to publish certificates in the equivalent of an electronic telephone directory. The other is to send your certificate out to those people you think might need it by one means or another.
- **Verifying Certificates** − The CA makes its public key available in environment to assist verification of his signature on clients' digital certificate.
- **Revocation of Certificates** − At times, CA revokes the certificate issued due to some reason such as compromise of private key by user or loss of trust in the client. After revocation, CA maintains the list of all revoked certificate that is available to the environment.

Classes of Certificates

There are four typical classes of certificate −

- **Class 1** − These certificates can be easily acquired by supplying an email address.
- **Class 2** − These certificates require additional personal information to be supplied.
- **Class 3** − These certificates can only be purchased after checks have been made about the requestor's identity.
- **Class 4** − They may be used by governments and financial organizations needing very high levels of trust.

Registration Authority (RA)

CA may use a third-party Registration Authority (RA) to perform the necessary checks on the person or company requesting the certificate to confirm their identity. The RA may appear to the client as a CA, but they do not actually sign the certificate that is issued.

Certificate Management System (CMS)

It is the management system through which certificates are published, temporarily or permanently suspended, renewed, or revoked. Certificate management systems do not normally delete certificates because it may be necessary to prove their status at a point in time, perhaps for legal reasons. A CA along with associated RA runs certificate management systems to be able to track their responsibilities and liabilities.

Private Key Tokens

While the public key of a client is stored on the certificate, the associated secret private key can be stored on the key owner's computer. This method is generally not adopted. If an attacker gains access to the computer, he can easily gain access to private key. For this reason, a private key is stored on secure removable storage token access to which is protected through a password.

Different vendors often use different and sometimes proprietary storage formats for storing keys. For example, Entrust uses the proprietary .epf format, while Verisign, GlobalSign, and Baltimore use the standard .p12 format.

Hierarchy of CA

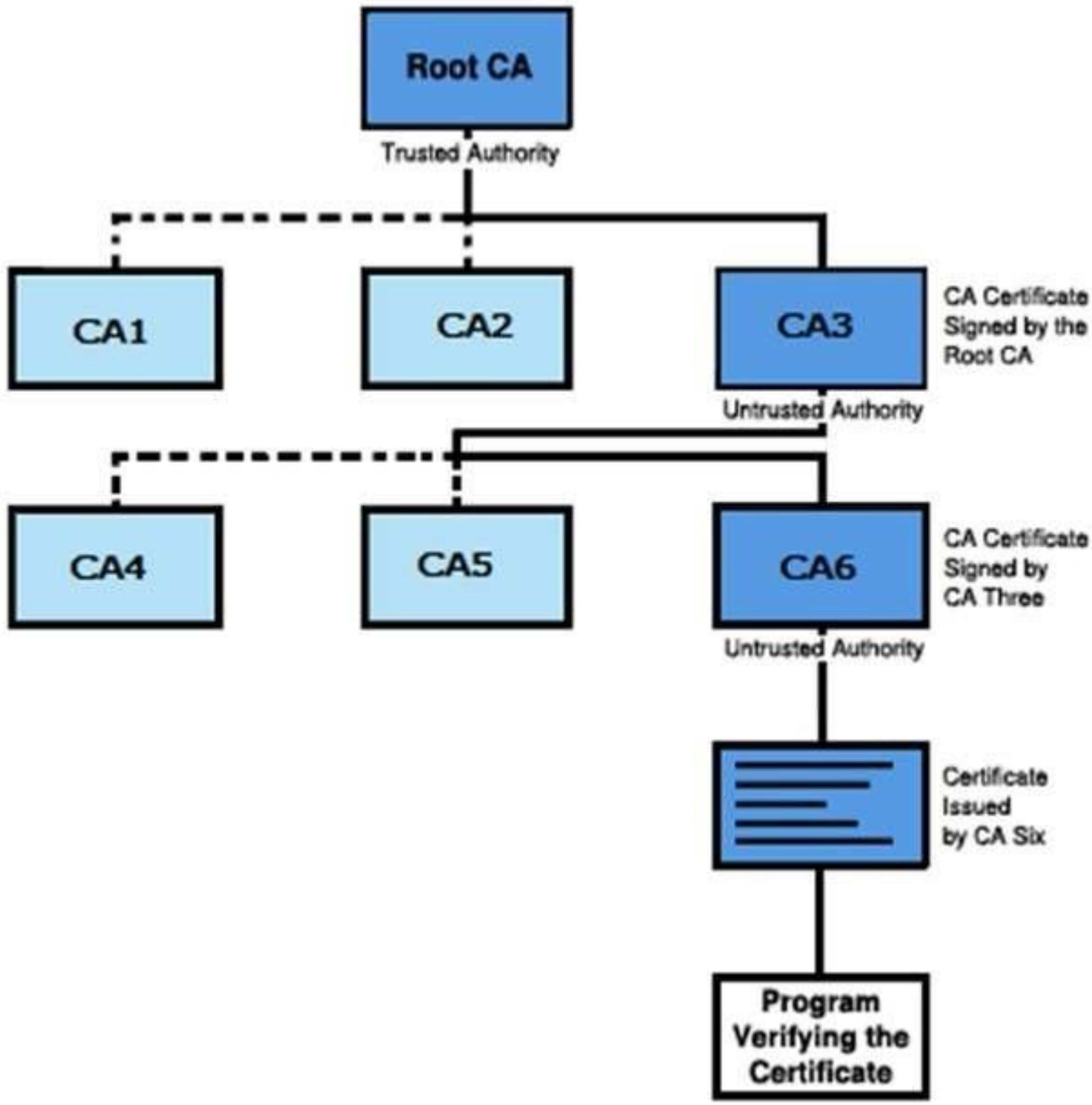
With vast networks and requirements of global communications, it is practically not feasible to have only one trusted CA from whom all users obtain their certificates. Secondly, availability of only one CA may lead to difficulties if CA is compromised.

In such case, the hierarchical certification model is of interest since it allows public key certificates to be used in environments where two communicating parties do not have trust relationships with the same CA.

- The root CA is at the top of the CA hierarchy and the root CA's certificate is a self-signed certificate.
- The CAs, which are directly subordinate to the root CA (For example, CA1 and CA2) have CA certificates that are signed by the root CA.
- The CAs under the subordinate CAs in the hierarchy (For example, CA5 and CA6) have their CA certificates signed by the higher-level subordinate CAs.

Certificate authority (CA) hierarchies are reflected in certificate chains. A certificate chain traces a path of certificates from a branch in the hierarchy to the root of the hierarchy.

The following illustration shows a CA hierarchy with a certificate chain leading from an entity certificate through two subordinate CA certificates (CA6 and CA3) to the CA certificate for the root CA.



Verifying a certificate chain is the process of ensuring that a specific certificate chain is valid, correctly signed, and trustworthy. The following procedure verifies a certificate chain, beginning with the certificate that is presented for authentication −

- A client whose authenticity is being verified supplies his certificate, generally along with the chain of certificates up to Root CA.
- Verifier takes the certificate and validates by using public key of issuer. The issuer's public key is found in the issuer's certificate which is in the chain next to client's certificate.
- Now if the higher CA who has signed the issuer's certificate, is trusted by the verifier, verification is successful and stops here.

- Else, the issuer's certificate is verified in a similar manner as done for client in above steps.

  This process continues till either trusted CA is found in between or else it continues till Root CA.