SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107

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DEPARTMENT OF INFORMATION TECHNOLOGY

Course Code and Name : 19IT602– CRYPTOGRAPHY AND CYBER SECURITY

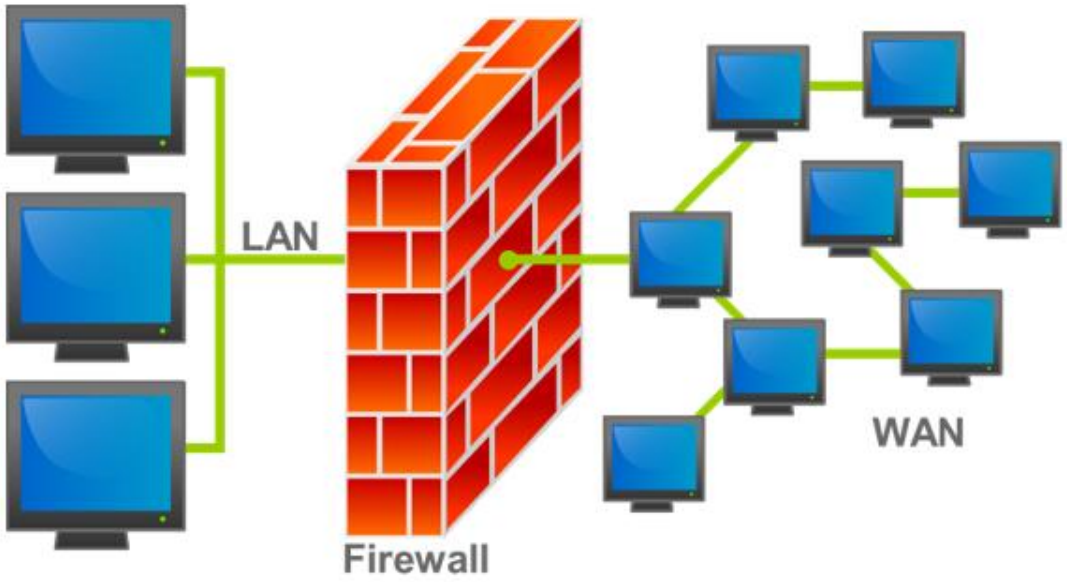
III YEAR / VI SEMESTER

Unit 5: CYBER SECURITY SAFEGUARDS AND SECURITY SERVICES

Topic : Firewalls

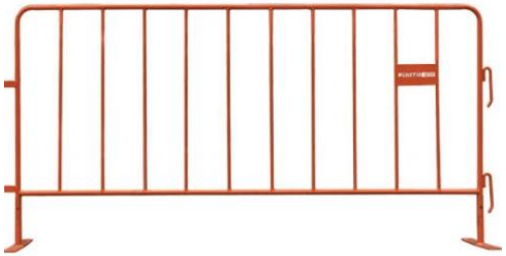
Firewalls

Firewall

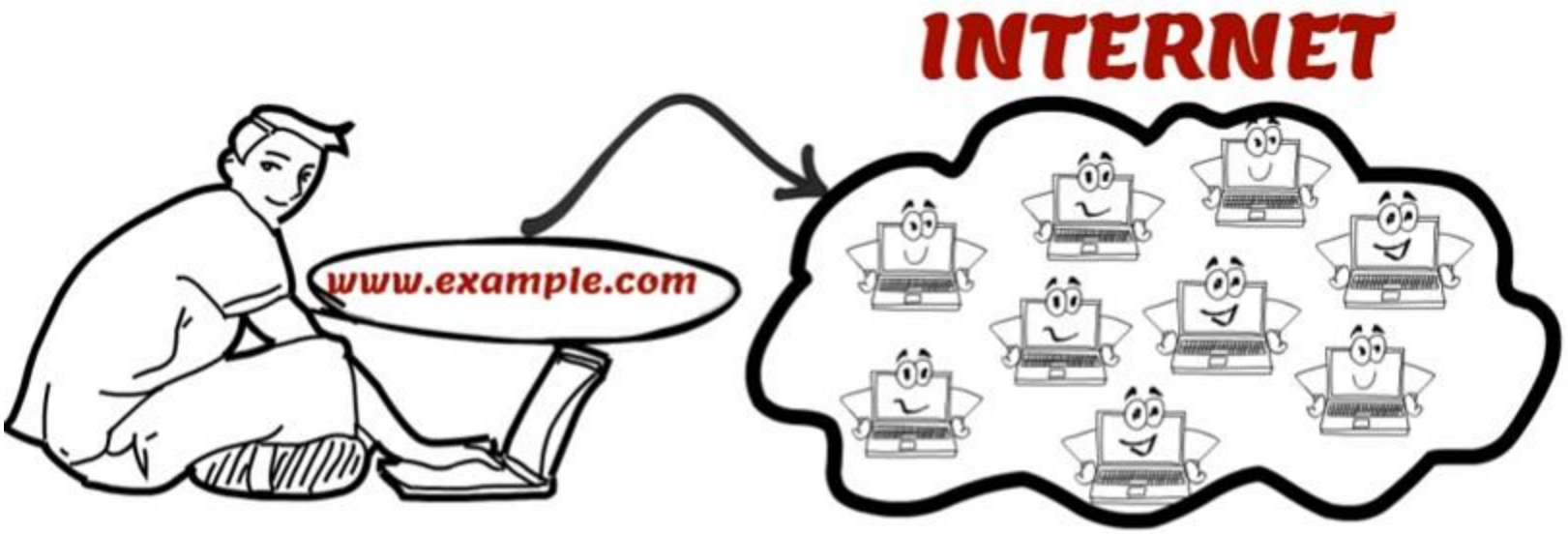


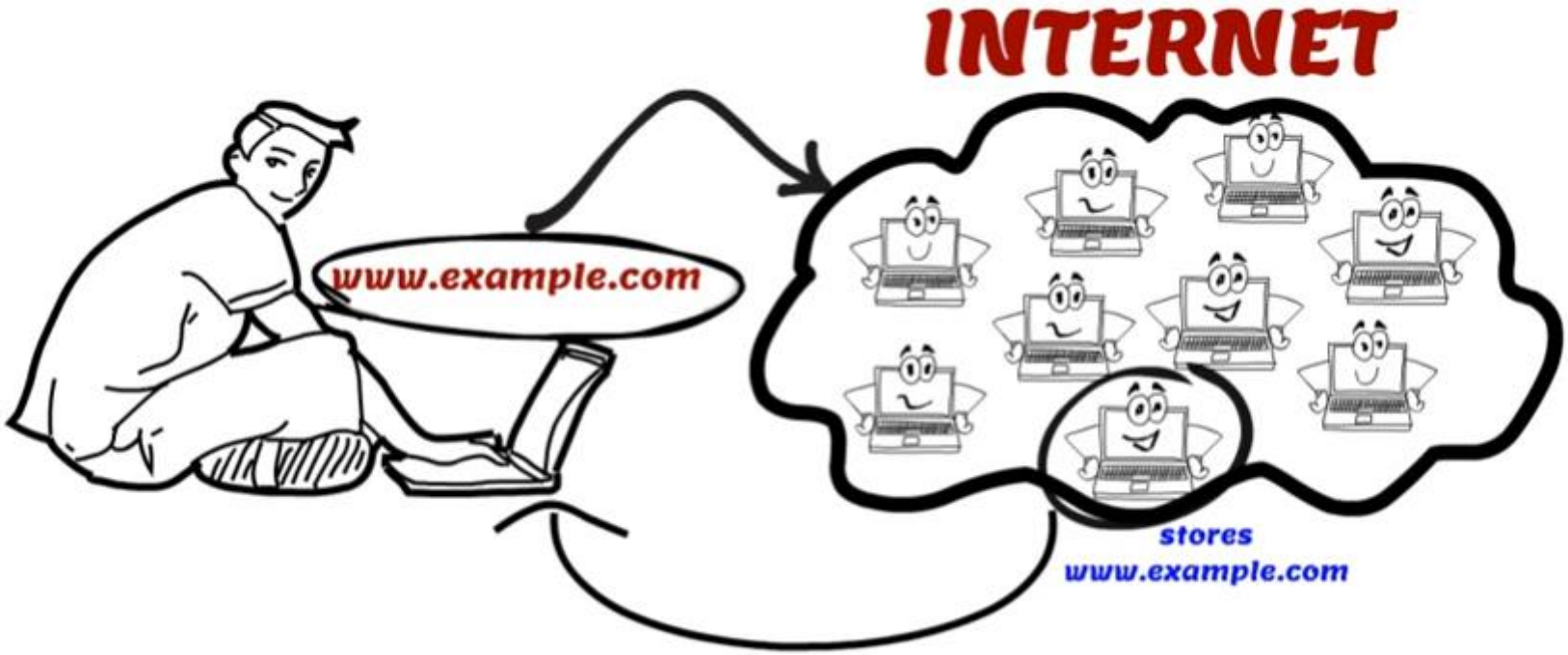
Firewall - Definition

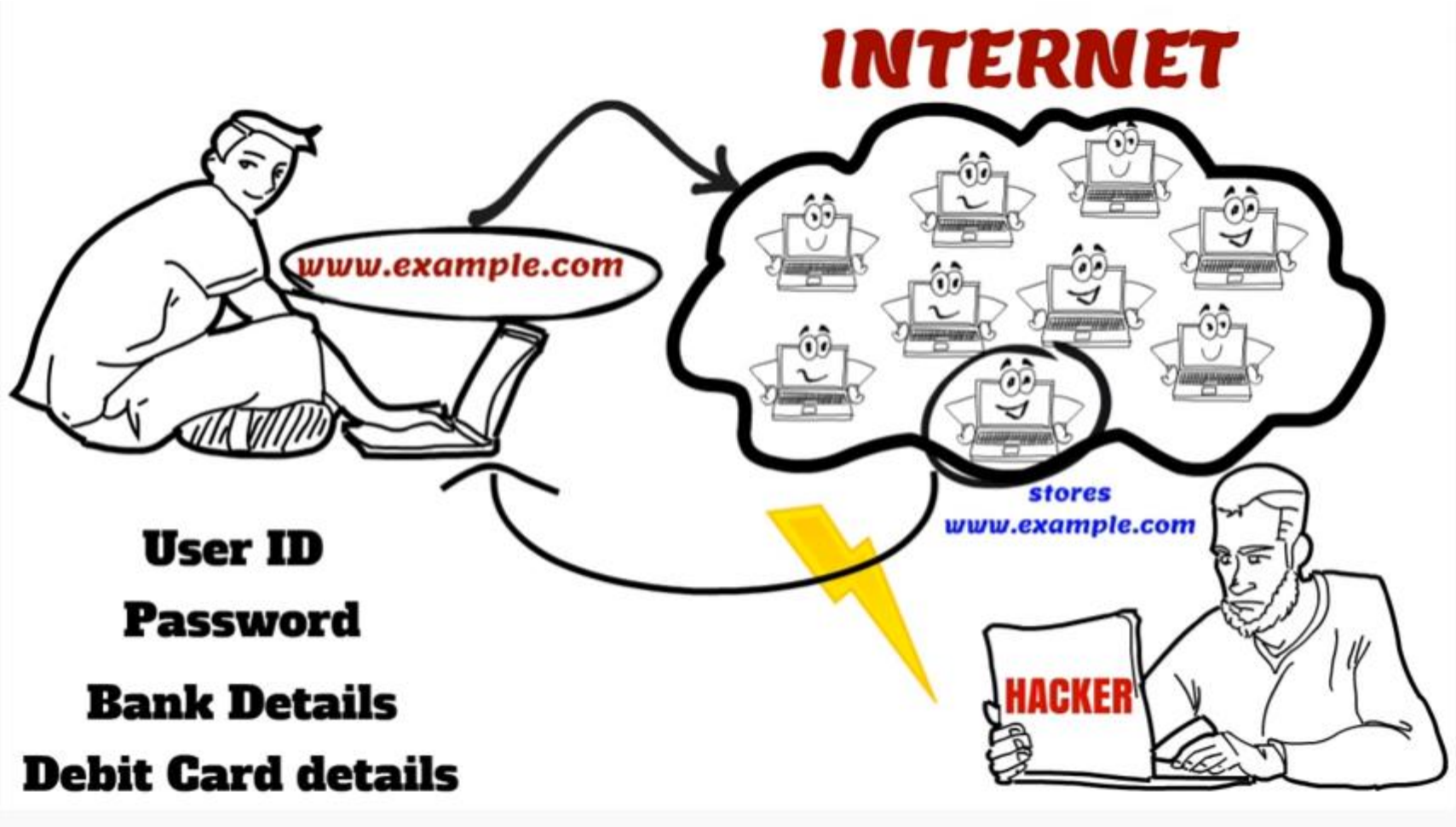
- Forms a **Barrier** through which the traffic going in each direction must pass
- **Authorize** which traffic to pass in each direction
- Firewalls can be an **effective means of protecting** a local system or network of systems from network-based security threats while at the same time **affording access to the outside world** via wide area networks and the Internet.

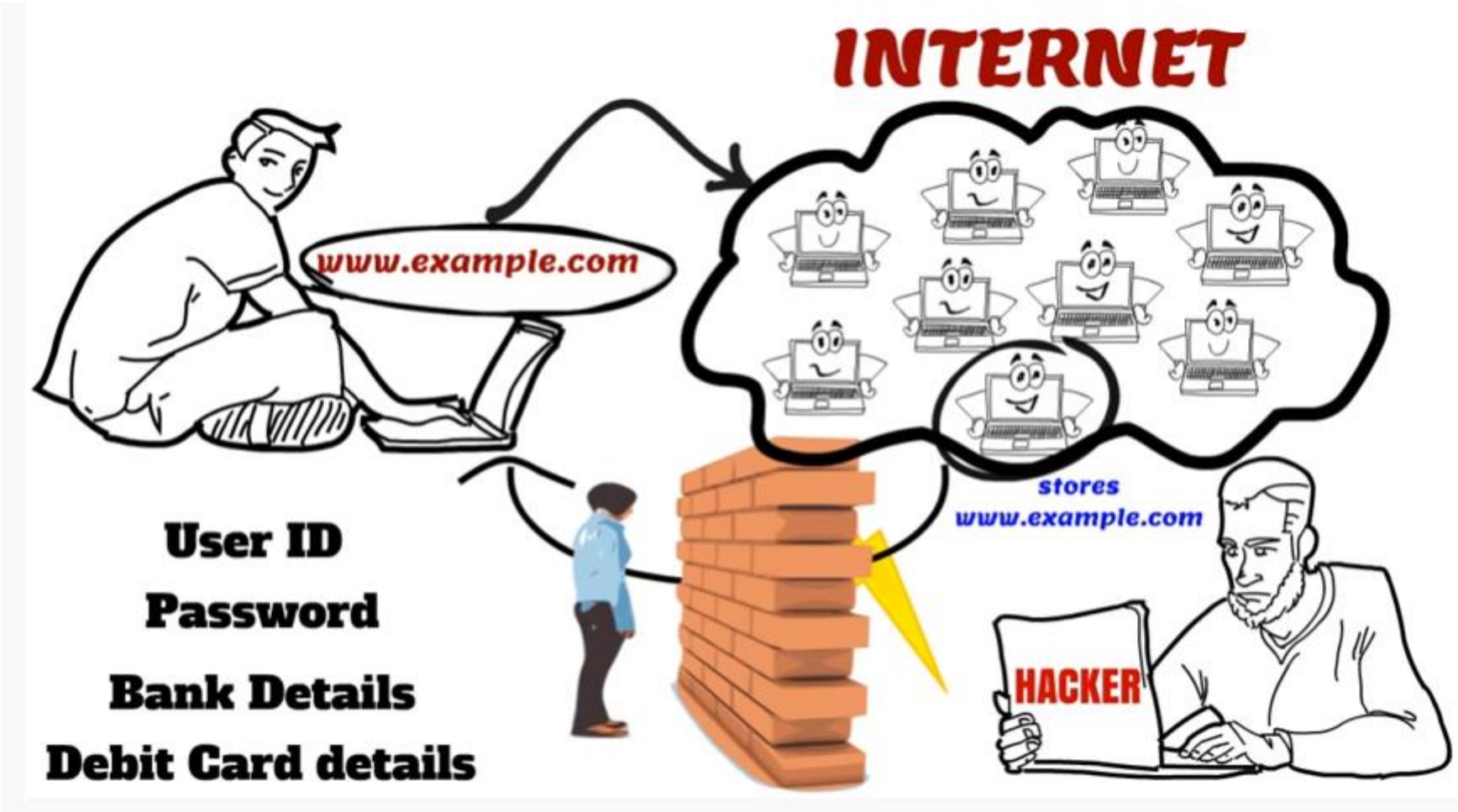


How Firewall Works?




INTERNET
www.example.com
stores
www.example.com


INTERNET
www.example.com
stores
www.example.com
User ID
Password
Bank Details
Debit Card details
HACKER


INTERNET
www.example.com
stores
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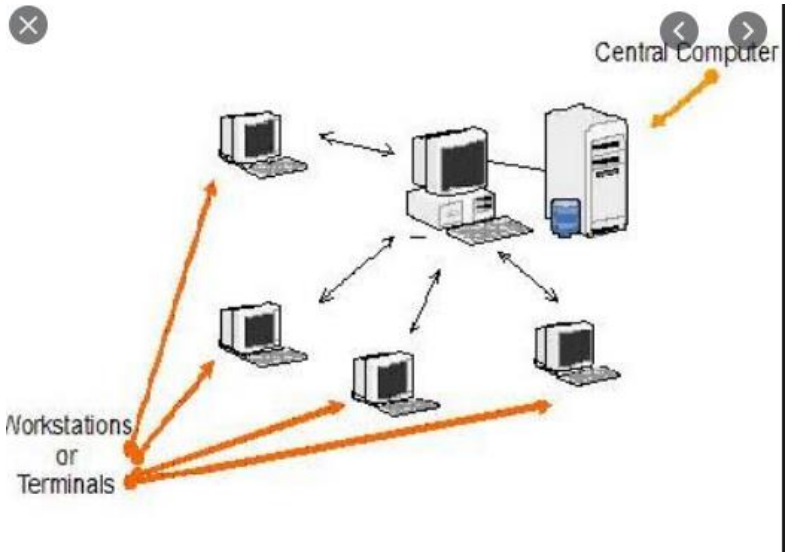
Need for Firewall

- Notable Developments
  - Centralized data processing system
  - LAN
  - Premises Network
  - Internet Connectivity
  - Enterprise-wide network



Firewall Design Goals

- Enforcement of security policies
  - All traffic from inside to outside, and vice versa, must pass through the firewall.
  - Only authorized traffic, as defined by the local security policy, will be allowed to pass.
- Dependable
  - The firewall itself is immune to penetration

General techniques

Control Access and enforce site security policy

- Service Control
- Direction Control
- User Control
- Behavior Control

Scope and Limitations

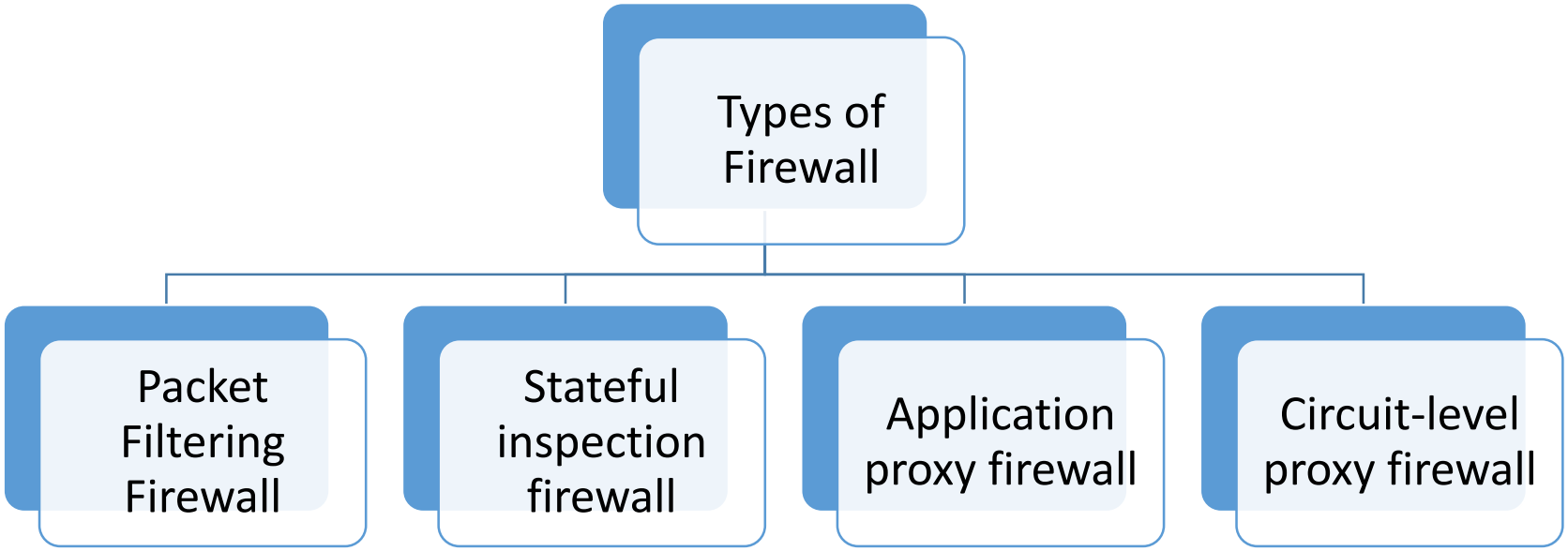
Scope

- Single Choke Point
- Monitor Security – related threats
- Convenient Platform
- Platform for IPSec

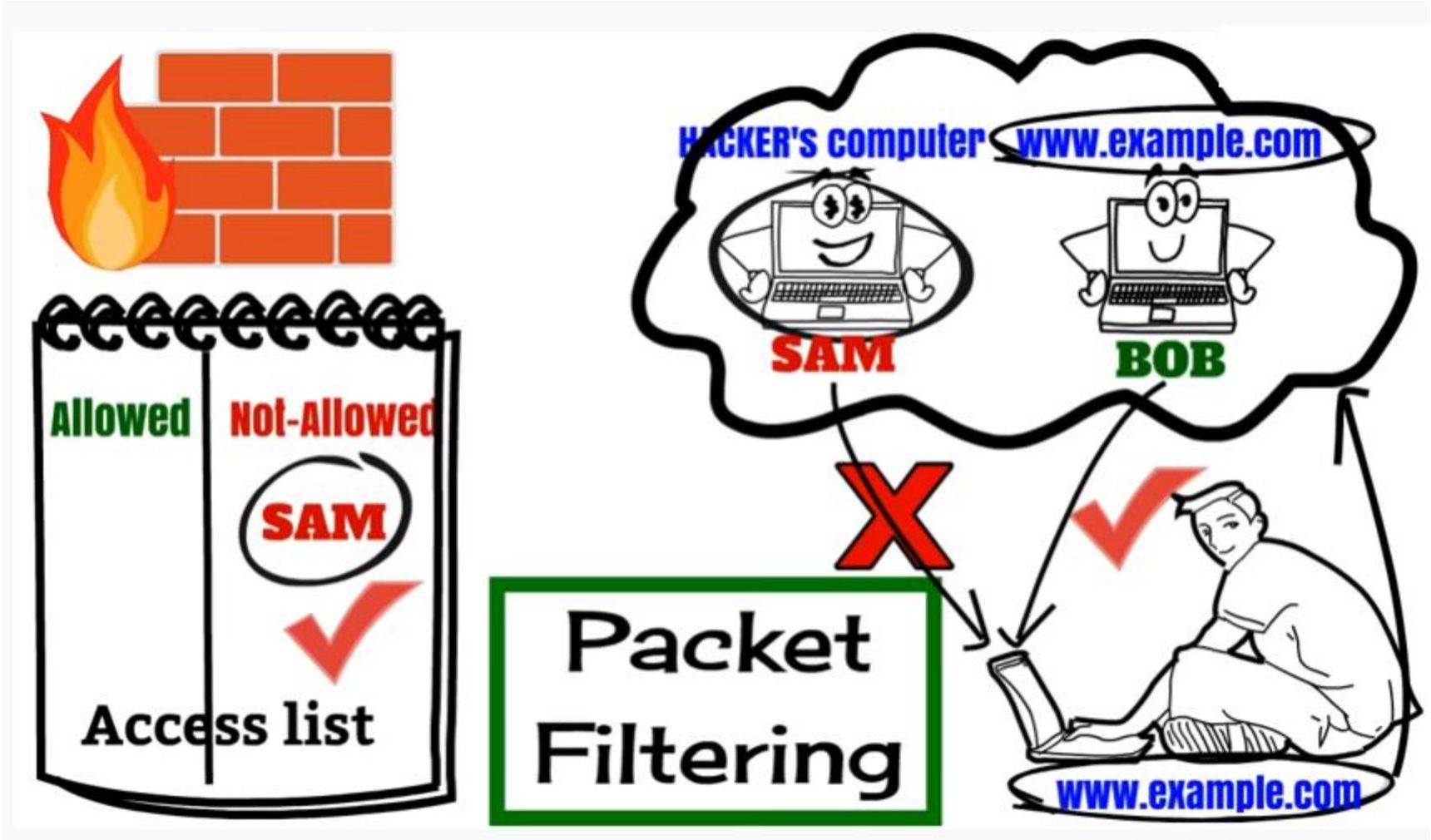
Limitations

- Cannot protect against attacks that bypass the firewall
- May not protect fully against internal threats
- improperly secured wireless LAN
- Portable devices – Affect when used internally

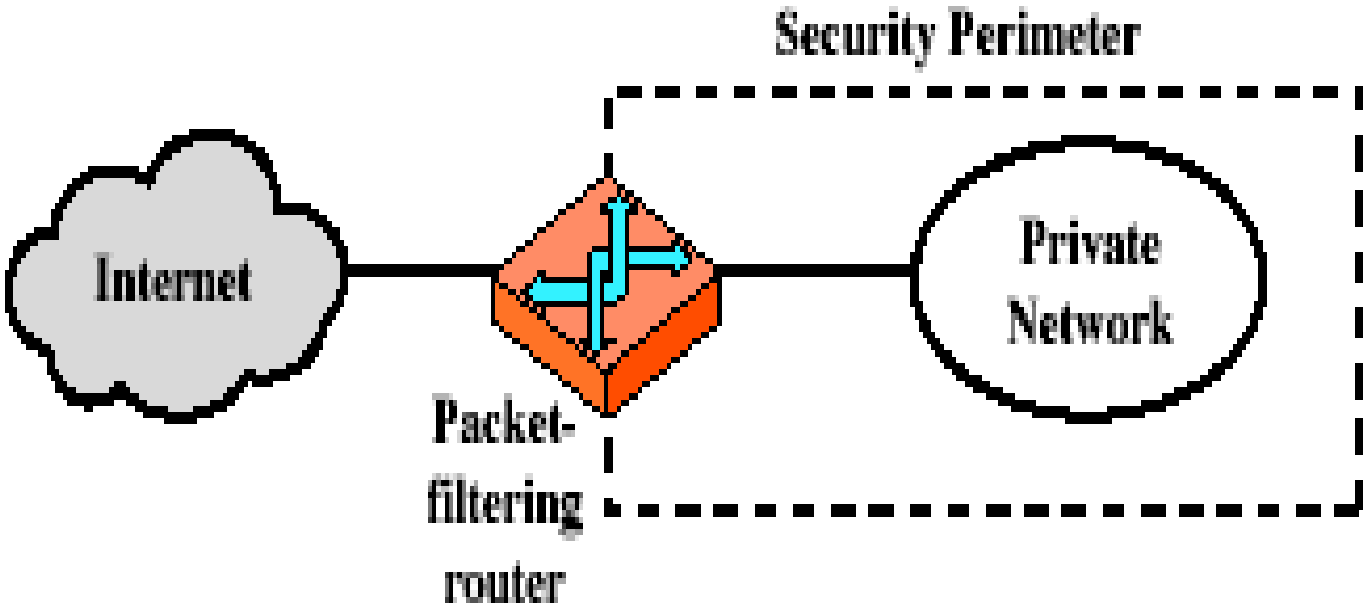
Types of Firewall



Packet Filtering Firewall



Firewalls – Packet Filters



(a) Packet-filtering router

Firewalls – Packet Filters

- simplest of components
- foundation of any firewall system
- examine each IP packet (no context) and permit or deny according to rules
- hence restrict access to services (ports)
- possible default policies
  - that not expressly permitted is prohibited
  - that not expressly prohibited is permitted

Rule Set A

action	ourhost	port	theirhost	port	comment
block	*	*	SPIGOT	*	we don't trust these people
allow	OUR-GW	25	*	*	connection to our SMTP port

Rule Set B

action	ourhost	port	theirhost	port	comment
block	*	*	*	*	default

Rule Set C

action	ourhost	port	theirhost	port	comment
allow	*	*	*	25	connection to their SMTP port

Rule Set D

action	src	port	dest	port	flags	comment
allow	{our hosts}	*	*	25		our packets to their SMTP port
allow	*	25	*	*	ACK	their replies

Rule Set E

action	src	port	dest	port	flags	comment
allow	{our hosts}	*	*	*		our outgoing calls
allow	*	*	*	*	ACK	replies to our calls
allow	*	*	*	>1024		traffic to nonservers

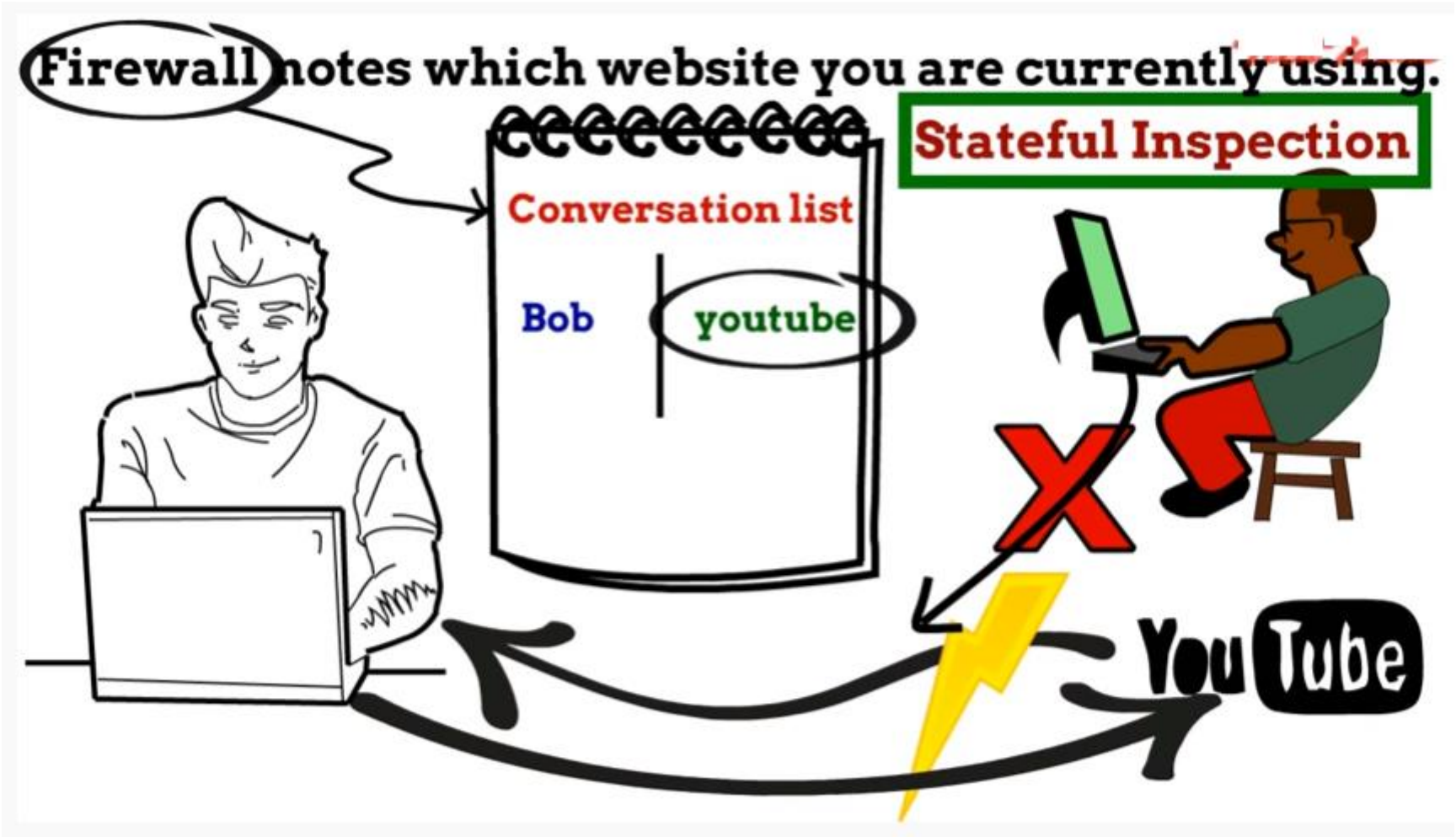
Advantage and Disadvantages

- Advantage
  - Simplicity
- Disadvantages
  - Do not examine upper-layer data, they cannot prevent attacks that employ application-specific vulnerabilities or functions
  - The logging functionality present in packet filter firewalls is limited.
  - Do not support advanced user authentication schemes.
  - Vulnerable to attacks
  - Small number of variables used in access control decisions, packet filter firewalls are susceptible to security breaches caused by improper configurations.

Attacks on Packet Filters

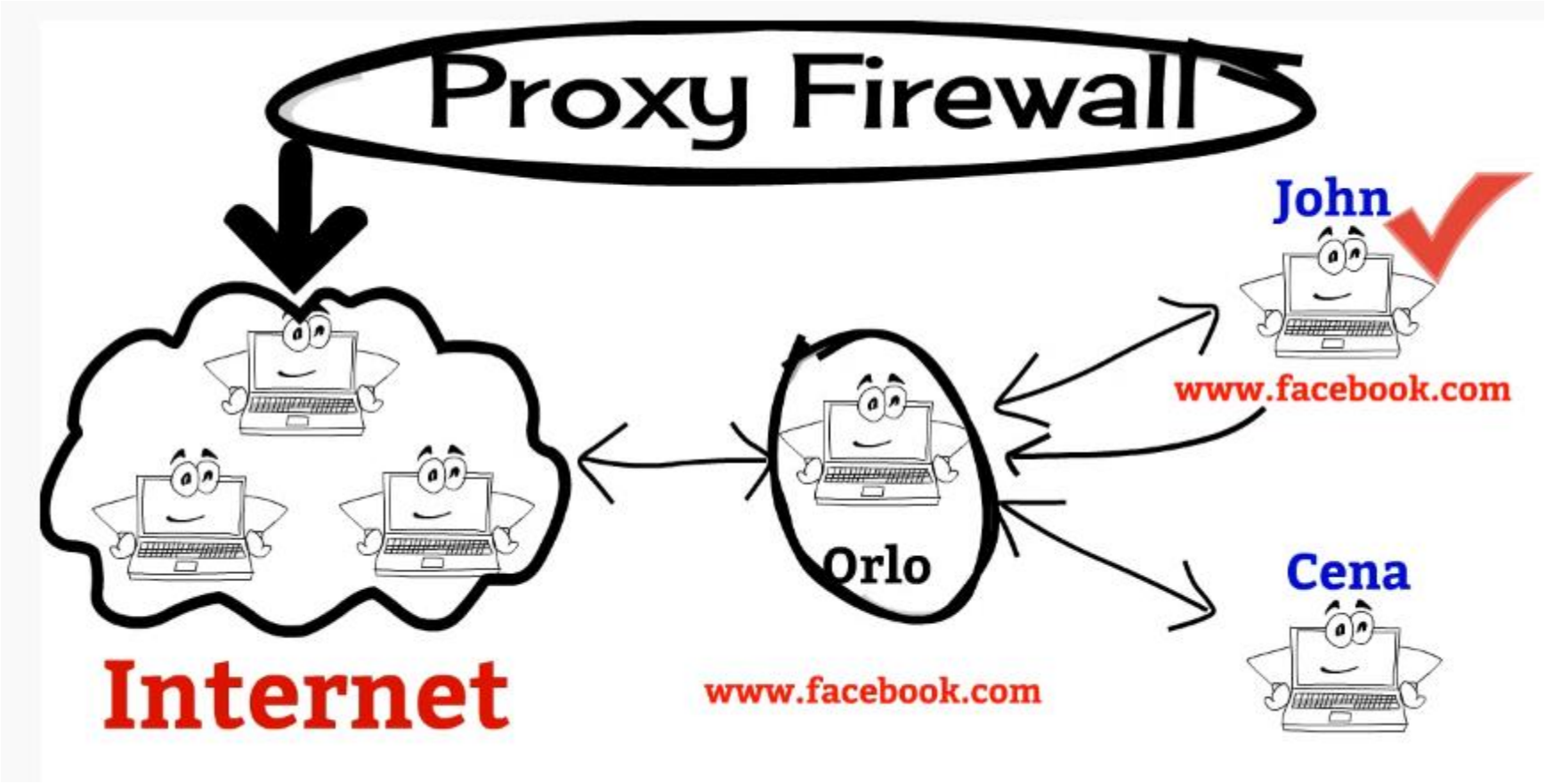
- IP address spoofing
  - fake source address to be trusted
  - add filters on router to block
- source routing attacks
  - attacker sets a route other than default
  - block source routed packets
- tiny fragment attacks
  - split header info over several tiny packets
  - either discard or reassemble before check

Stateful Inspection Firewall



- examine each IP packet in context
  - keeps tracks of client-server sessions
  - checks each packet validly belongs to one
- better able to detect bogus packets out of context

Application Level Gateway (or Proxy)



- use an application specific gateway / proxy
- has full access to protocol
  - user requests service from proxy
  - proxy validates request as legal
  - then actions request and returns result to user
- need separate proxies for each service
  - some services naturally support proxying
  - others are more problematic
  - custom services generally not supported

Advantages and Disadvantages

- Advantages:
  - Higher security than packet filters
  - Only need to scrutinize a few allowable applications
  - Easy to log and audit all incoming traffic
- Disadvantages:
  - Additional processing overhead on each connection (gateway as splice point)

Firewalls - Circuit Level Gateway

- relays two TCP connections
- imposes security by limiting which such connections are allowed
- once created usually relays traffic without examining contents
- typically used when trust internal users by allowing general outbound connections
- SOCKS commonly used for this

Thank you