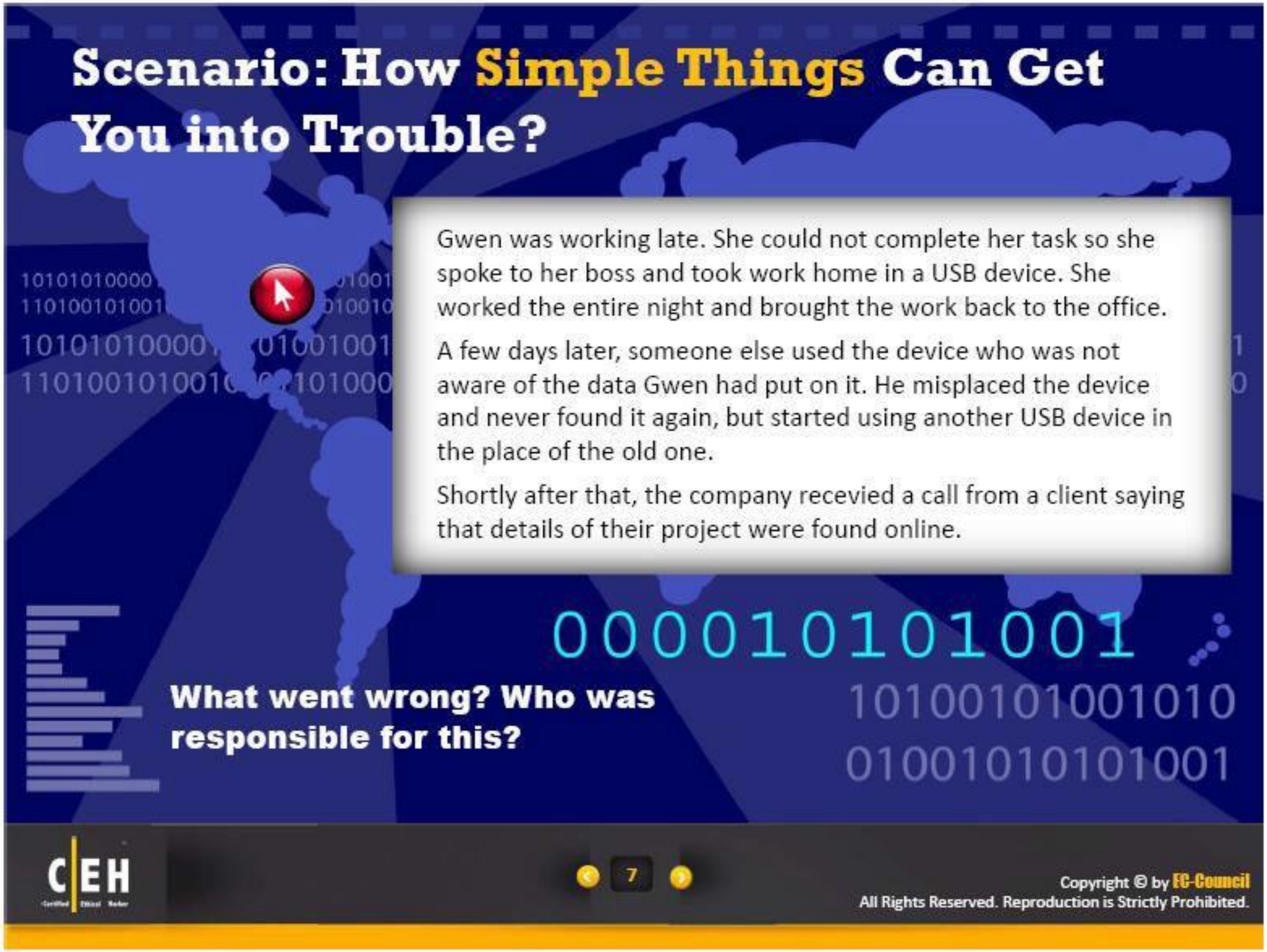
CYBER SECURITY AWARENESS TRAINING

Hasob

Integrated Services Limited

Module Objectives

- Elements of Information Security
- The Security, Functionality, and Usability Triangle
- Security Challenges
- Effects of Hacking
- Who is a Hacker?
- Hacker Classes
- Types of Hackers
- Hacking Phases
- Types of Attacks on a System
- Why Ethical Hacking is Necessary?
- Scope and Limitations of Ethical Hacking
- What Do Ethical Hackers Do?
- Skills of an Ethical Hacker
- Vulnerability Research



Scenario: How Simple Things Can Get You into Trouble?

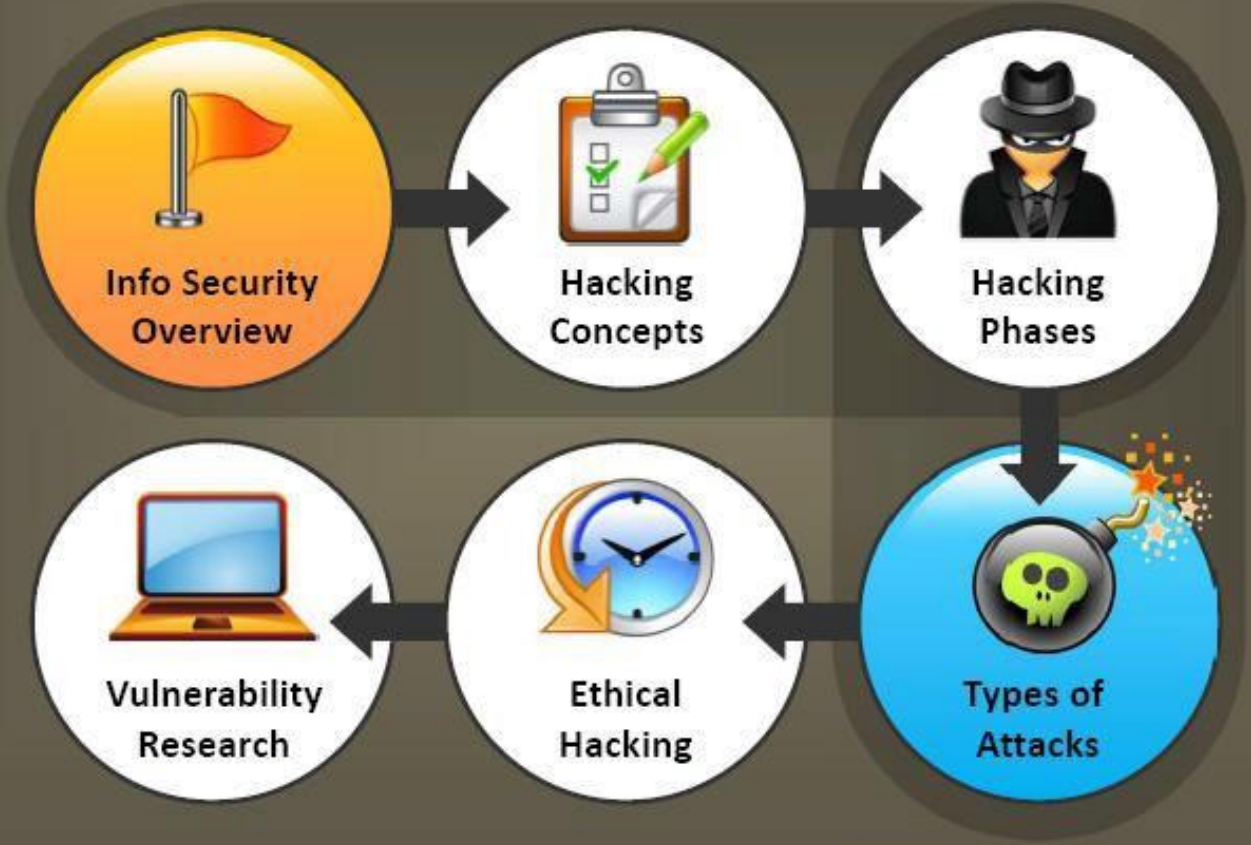
Gwen was working late. She could not complete her task so she spoke to her boss and took work home in a USB device. She worked the entire night and brought the work back to the office.

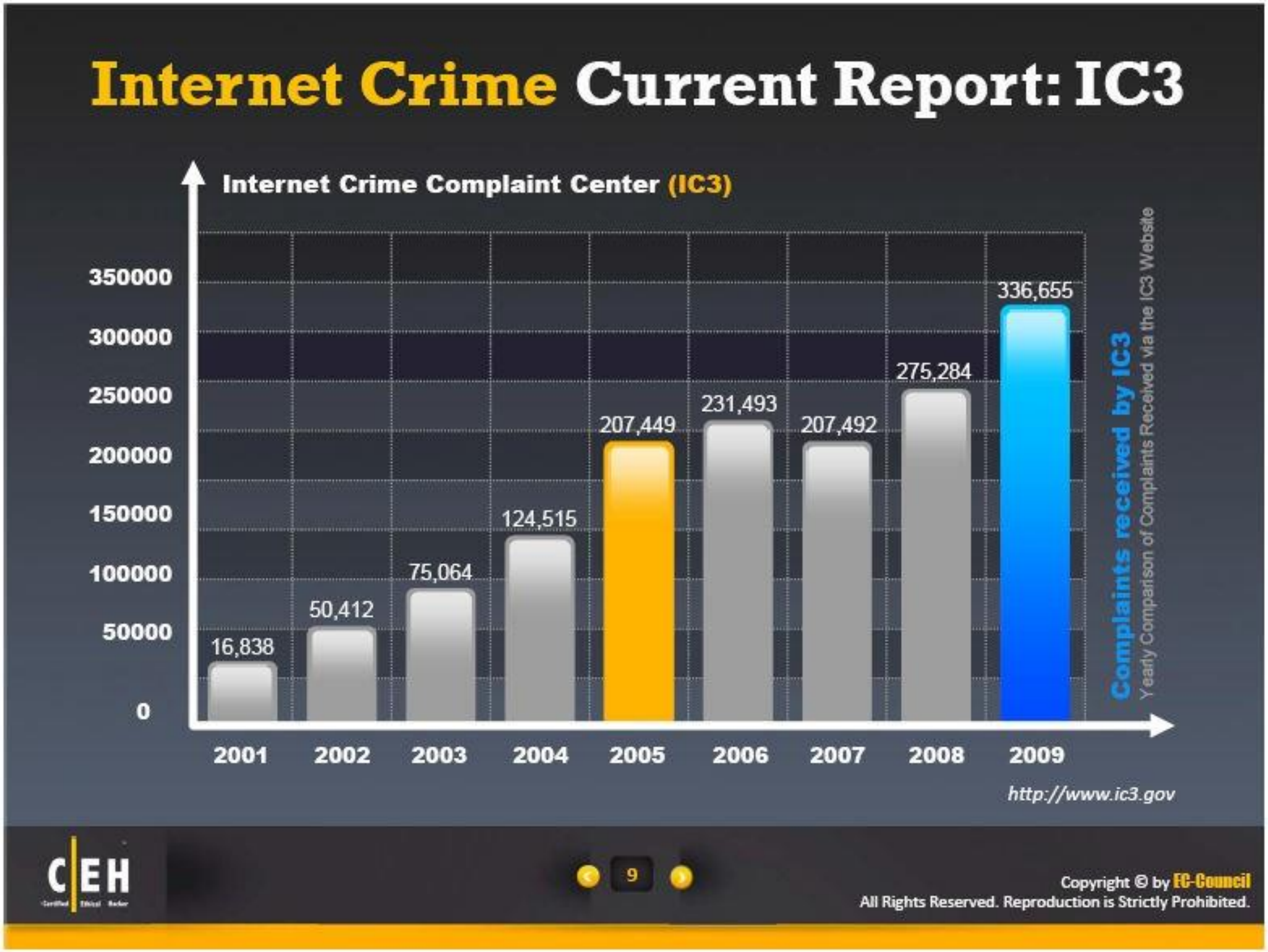
A few days later, someone else used the device who was not aware of the data Gwen had put on it. He misplaced the device and never found it again, but started using another USB device in the place of the old one.

Shortly after that, the company recevied a call from a client saying that details of their project were found online.

What went wrong? Who was responsible for this?

Module Flow


Info Security Overview
Hacking Concepts
Hacking Phases
Types of Attacks
Ethical Hacking
Vulnerability Research

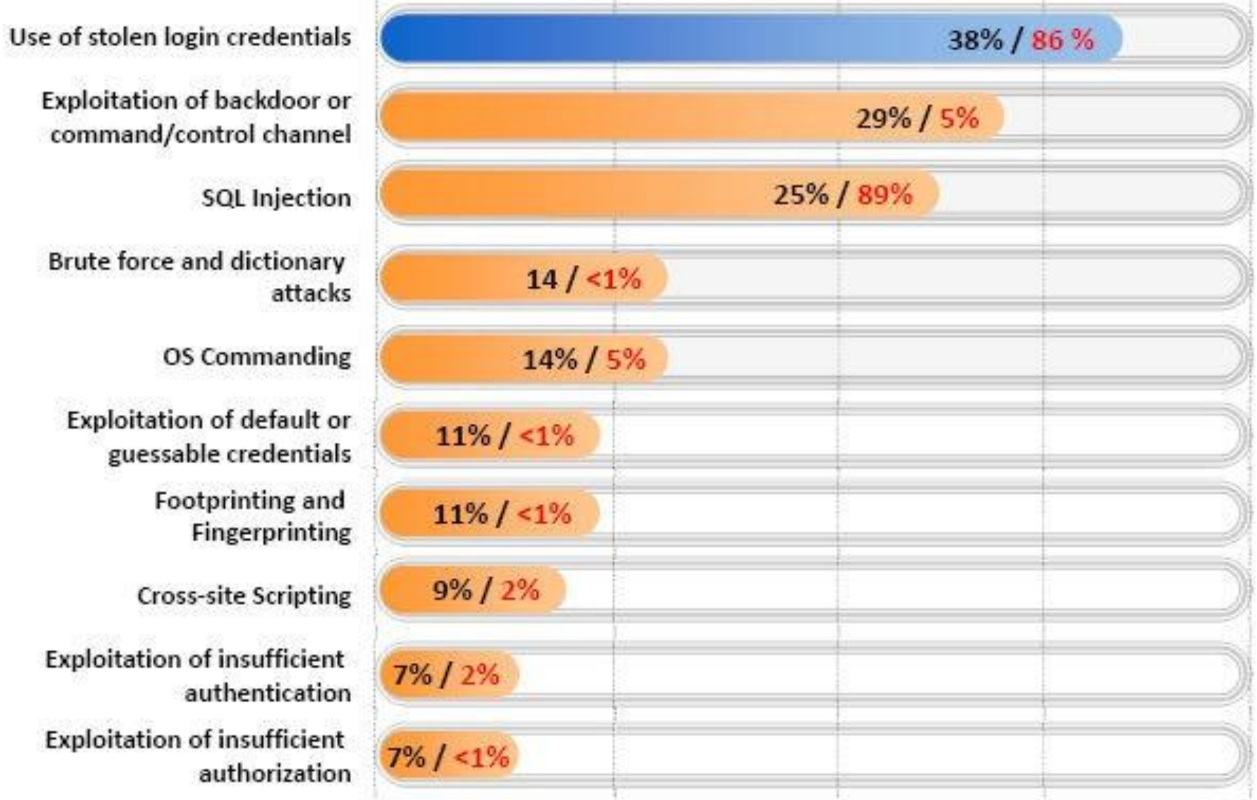


Internet Crime Current Report: IC3

http://www.ic3.gov

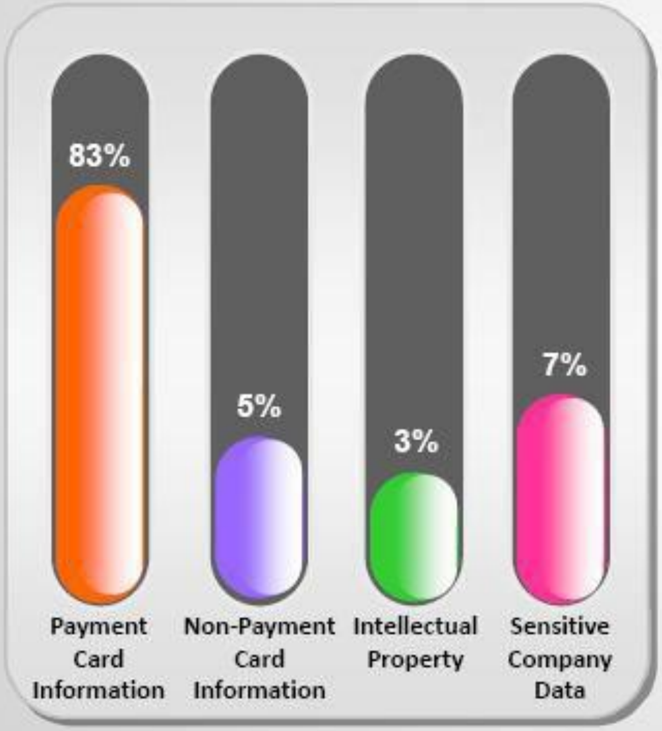
Data Breach Investigations Report

Types of hacking by percent of breaches and percent of records

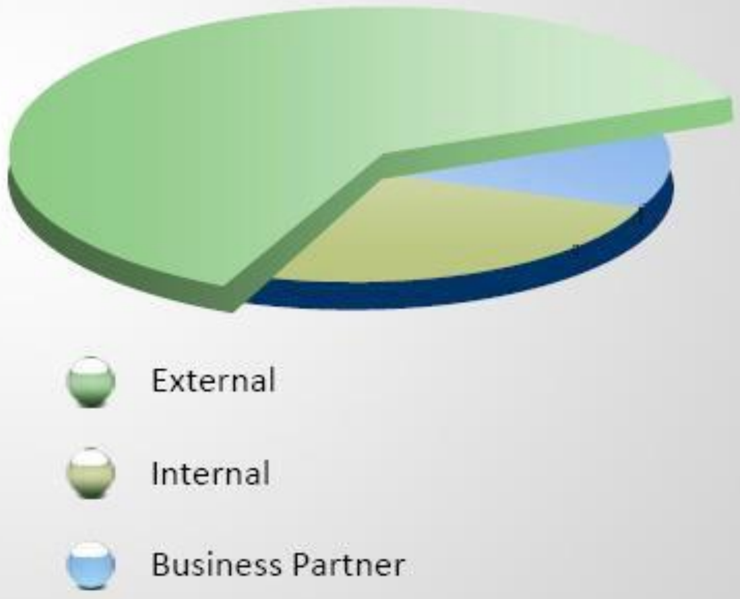


http://www.verizonbusiness.com

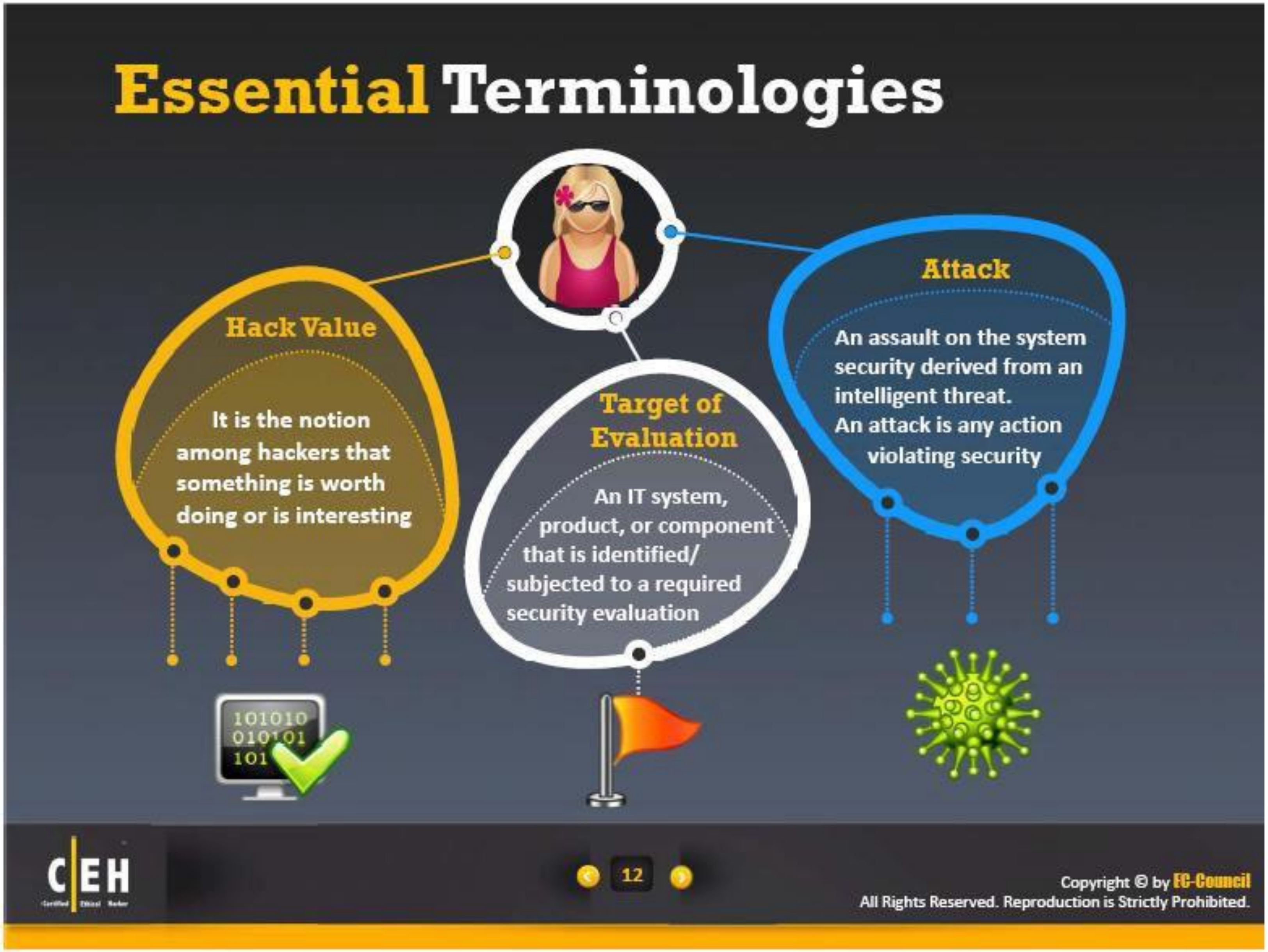
Types of Data Stolen From the Organizations



Source of Breach



UK Security Breach Investigations Report 2010, Source: *http://www.7safe.com*



Essential Terminologies

Hack Value

It is the notion among hackers that something is worth doing or is interesting

Target of Evaluation

An IT system, product, or component that is identified/ subjected to a required security evaluation

Attack

An assault on the system security derived from an intelligent threat.
An attack is any action violating security

Essential Terminologies

Exploit

A defined way to **breach the security** of an IT system through vulnerability

A Zero-Day

A computer threat that tries to **exploit computer application vulnerabilities** that are unknown to others or undisclosed to the software developer

Security

A state of well-being of information and infrastructure in which the possibility of **theft**, **tampering**, and **disruption of information and services** is kept low or tolerable

Essential Terminologies

Threat

An action or event that might compromise security

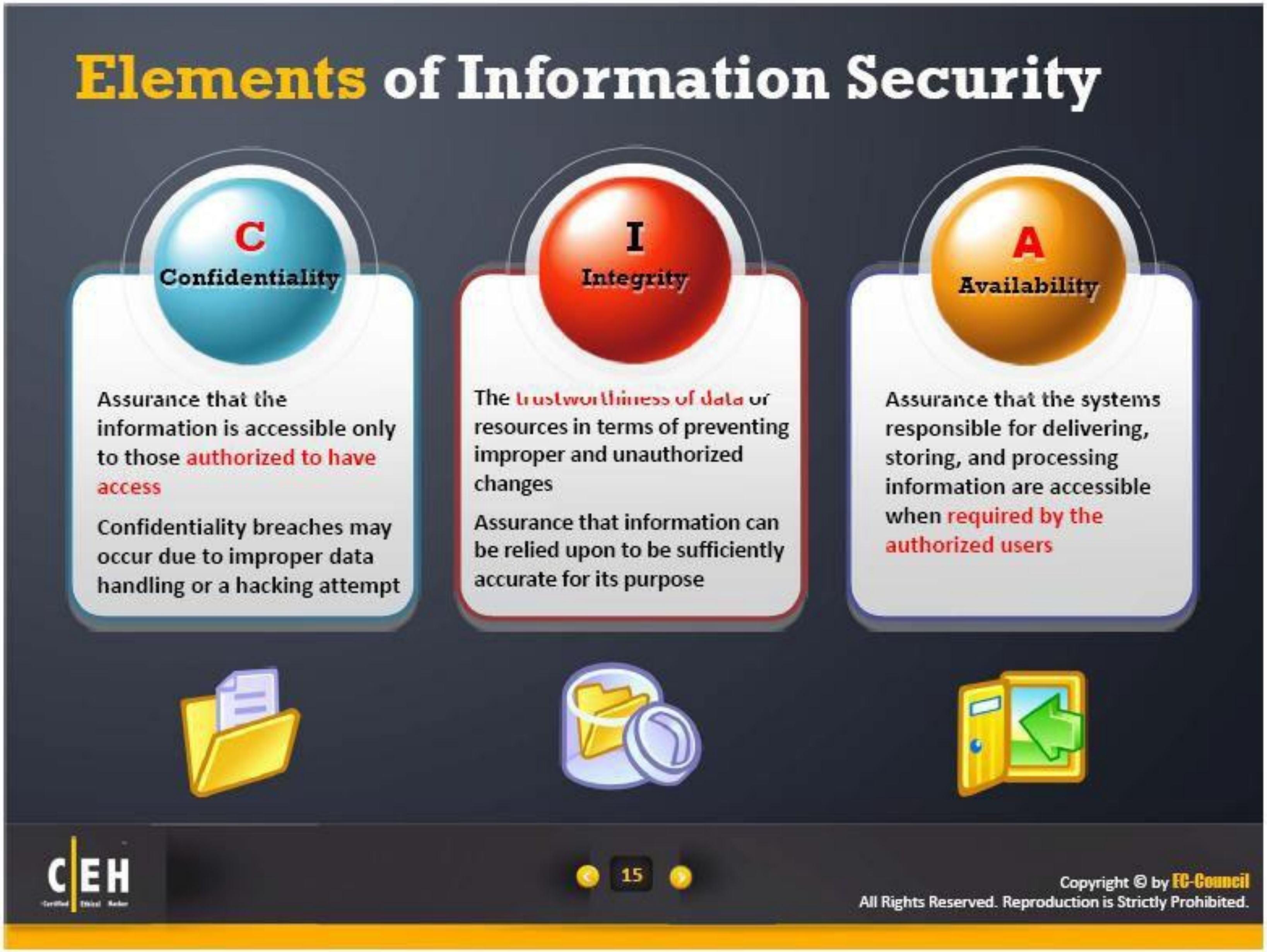
A threat is a potential violation of security

Vulnerability

Existence of a weakness, design, or implementation error that can lead to an unexpected and undesirable event compromising the security of the system

Daisy Chaining

Hackers who get away with database theft usually complete their task, then backtrack to cover their tracks by destroying logs, etc.



Elements of Information Security

C Confidentiality

Assurance that the information is accessible only to those authorized to have access

Confidentiality breaches may occur due to improper data handling or a hacking attempt

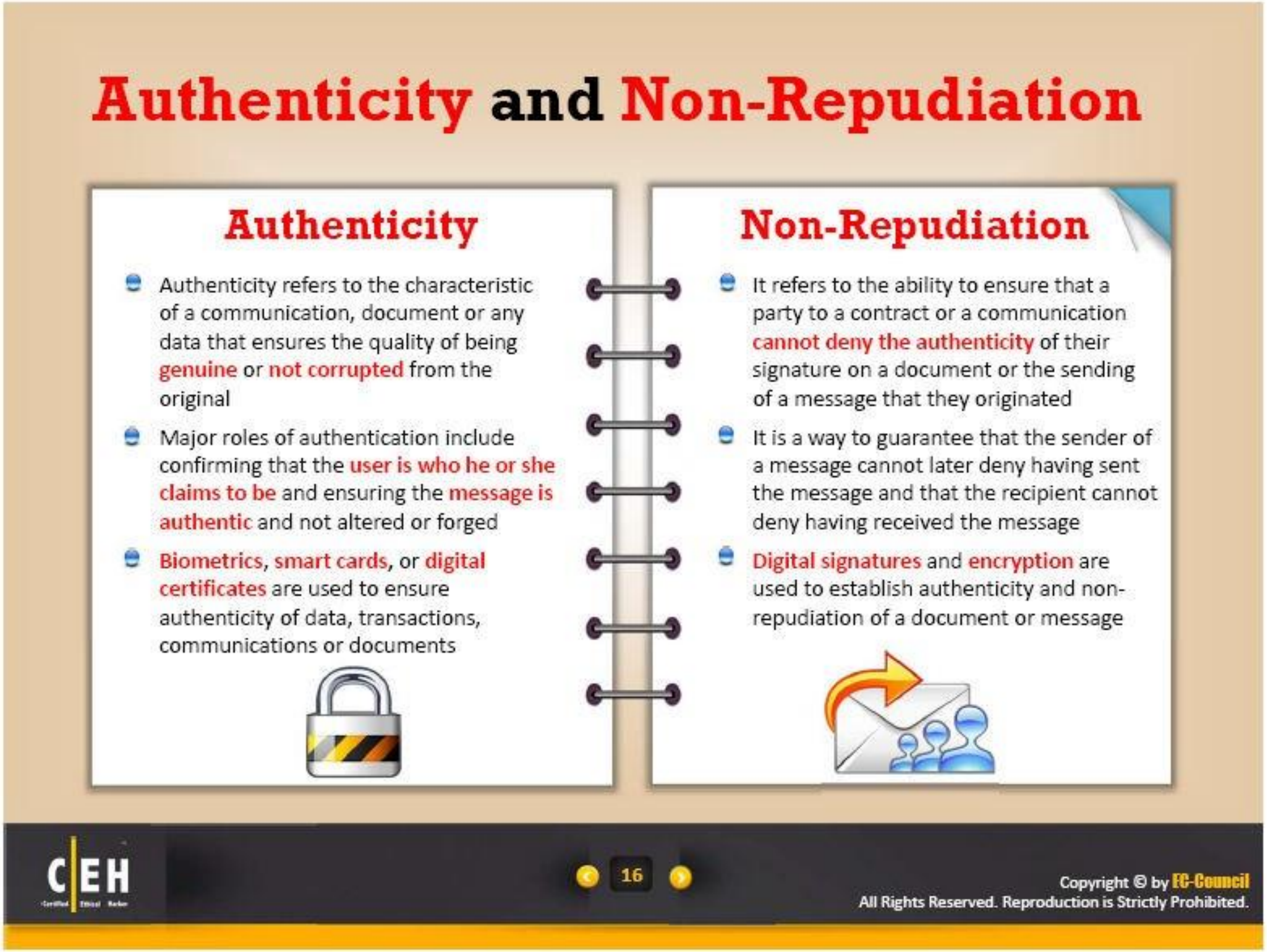
I Integrity

The trustworthiness of data or resources in terms of preventing improper and unauthorized changes

Assurance that information can be relied upon to be sufficiently accurate for its purpose

A Availability

Assurance that the systems responsible for delivering, storing, and processing information are accessible when required by the authorized users



Authenticity and Non-Repudiation

Authenticity

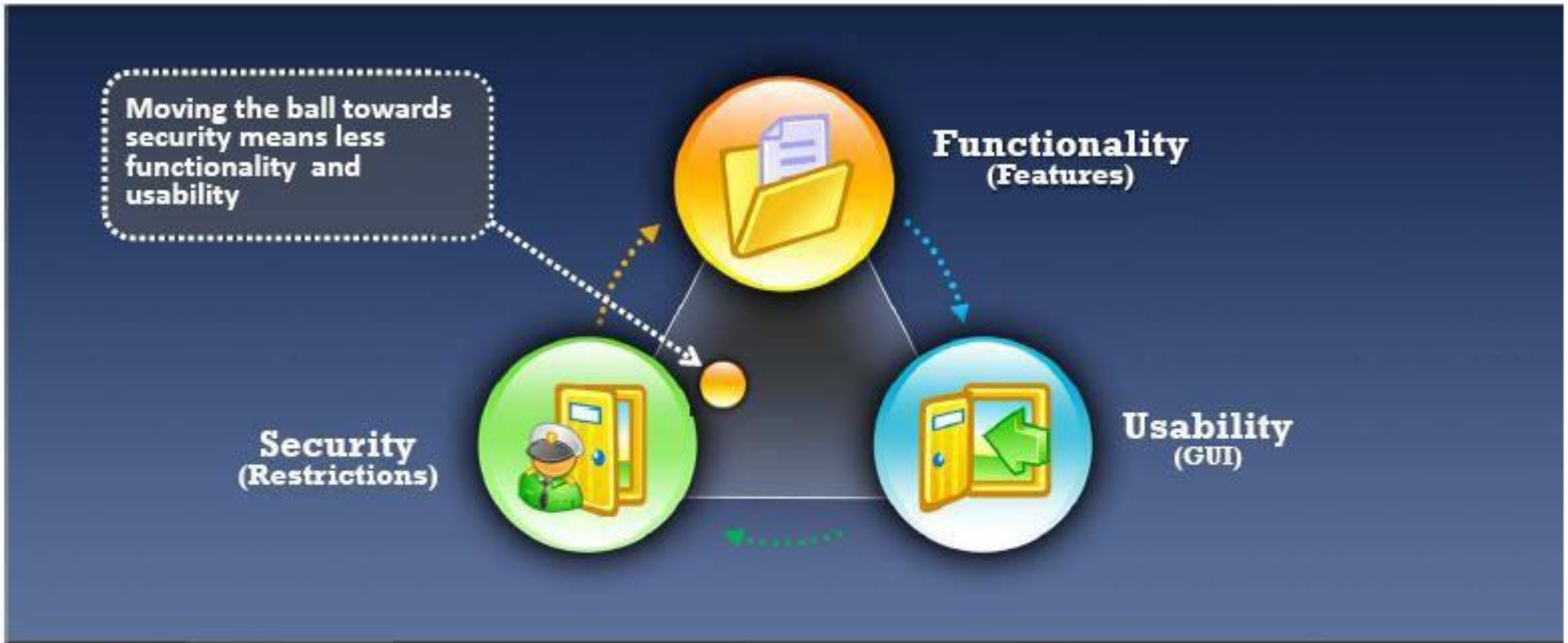
- Authenticity refers to the characteristic of a communication, document or any data that ensures the quality of being **genuine** or **not corrupted** from the original
- Major roles of authentication include confirming that the **user is who he or she claims to be** and ensuring the **message is authentic** and not altered or forged
- **Biometrics**, **smart cards**, or **digital certificates** are used to ensure authenticity of data, transactions, communications or documents

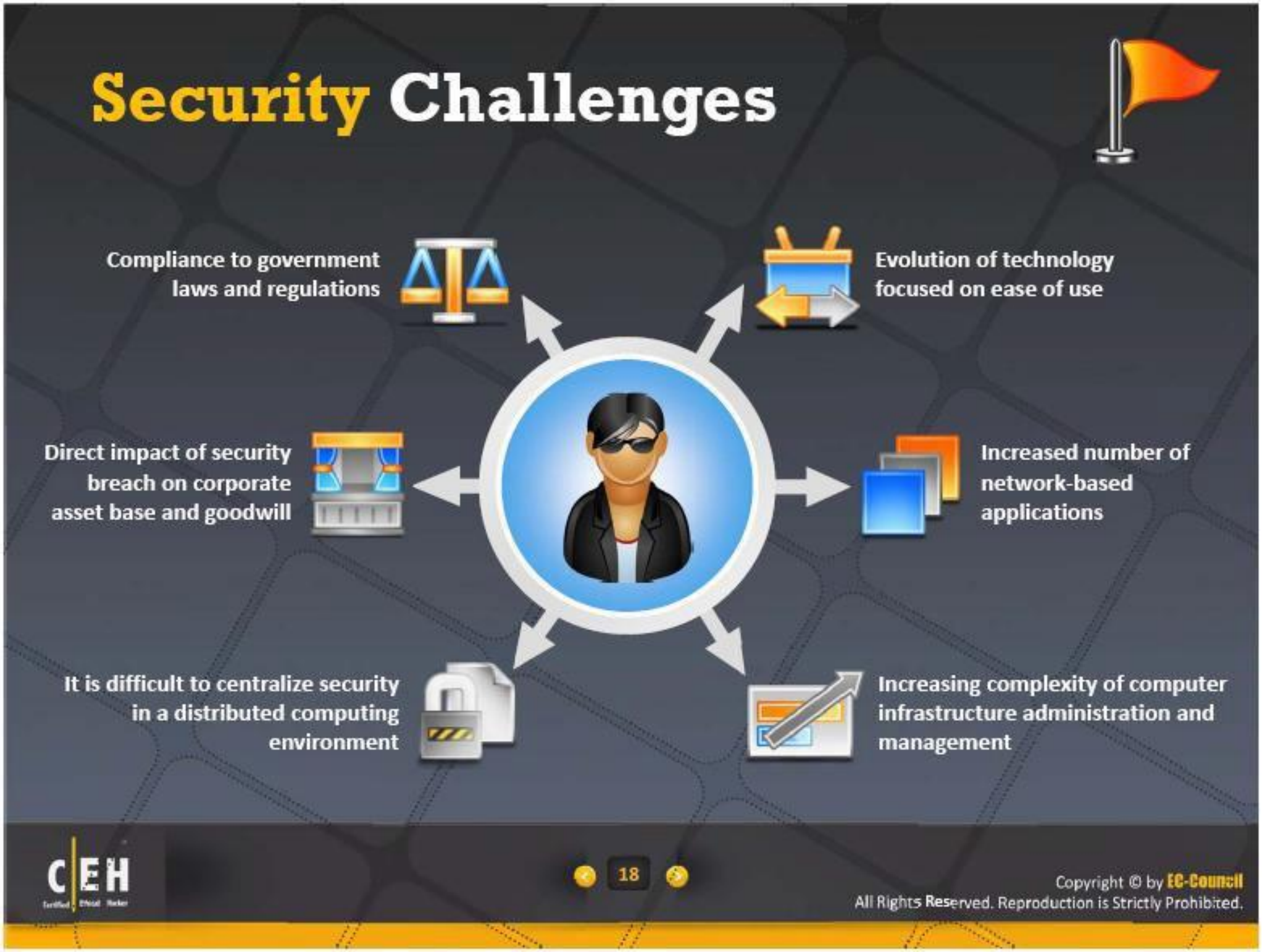
Non-Repudiation

- It refers to the ability to ensure that a party to a contract or a communication **cannot deny the authenticity** of their signature on a document or the sending of a message that they originated
- It is a way to guarantee that the sender of a message cannot later deny having sent the message and that the recipient cannot deny having received the message
- **Digital signatures** and **encryption** are used to establish authenticity and non-repudiation of a document or message

The Security, Functionality, and Usability Triangle

- Level of security in any system can be defined by the strength of three components:


Moving the ball towards security means less functionality and usability
Functionality
(Features)
Security
(Restrictions)
Usability
(GUI)



Security Challenges

Compliance to government laws and regulations

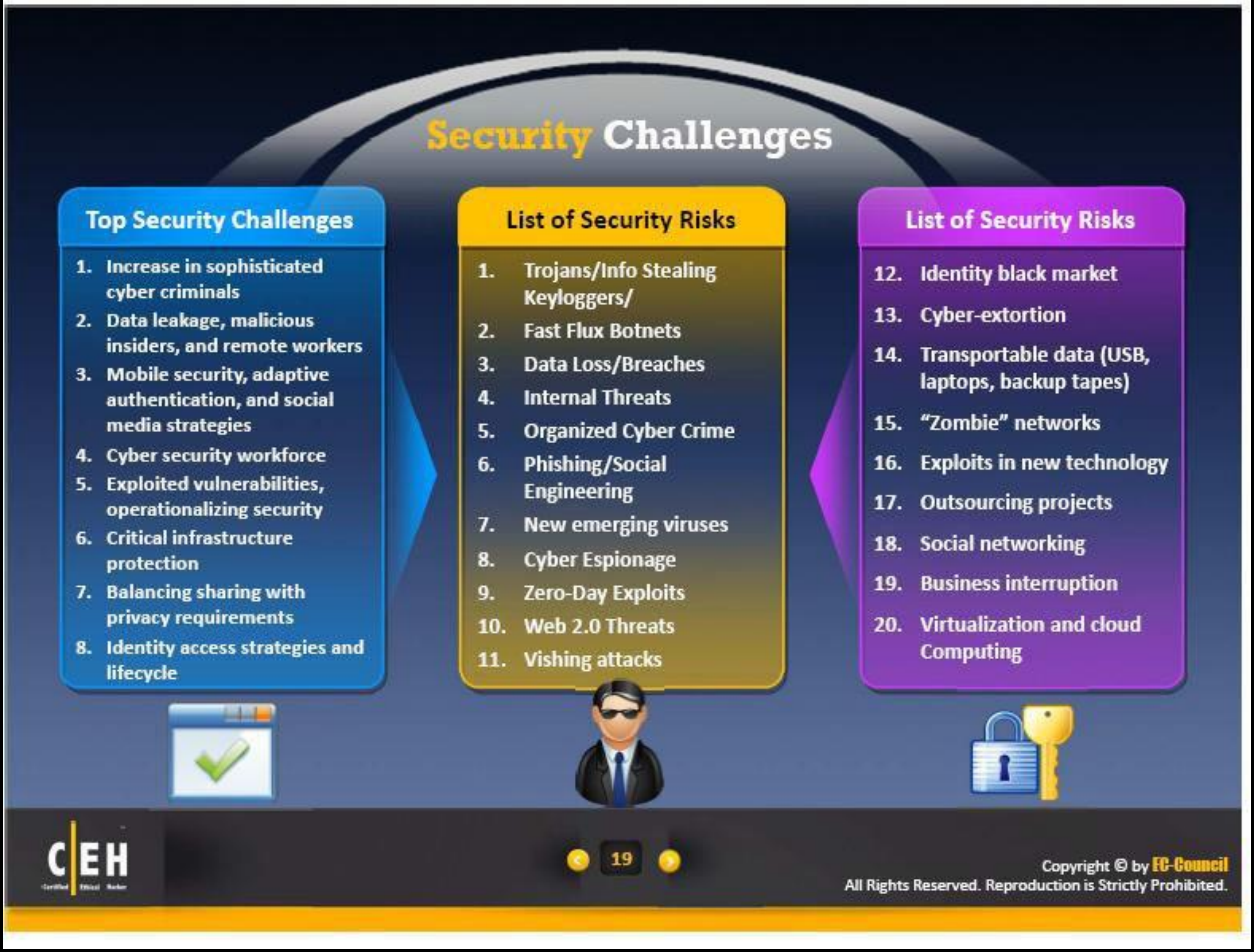
Evolution of technology focused on ease of use

Direct impact of security breach on corporate asset base and goodwill

Increased number of network-based applications

It is difficult to centralize security in a distributed computing environment

Increasing complexity of computer infrastructure administration and management



Security Challenges

Top Security Challenges

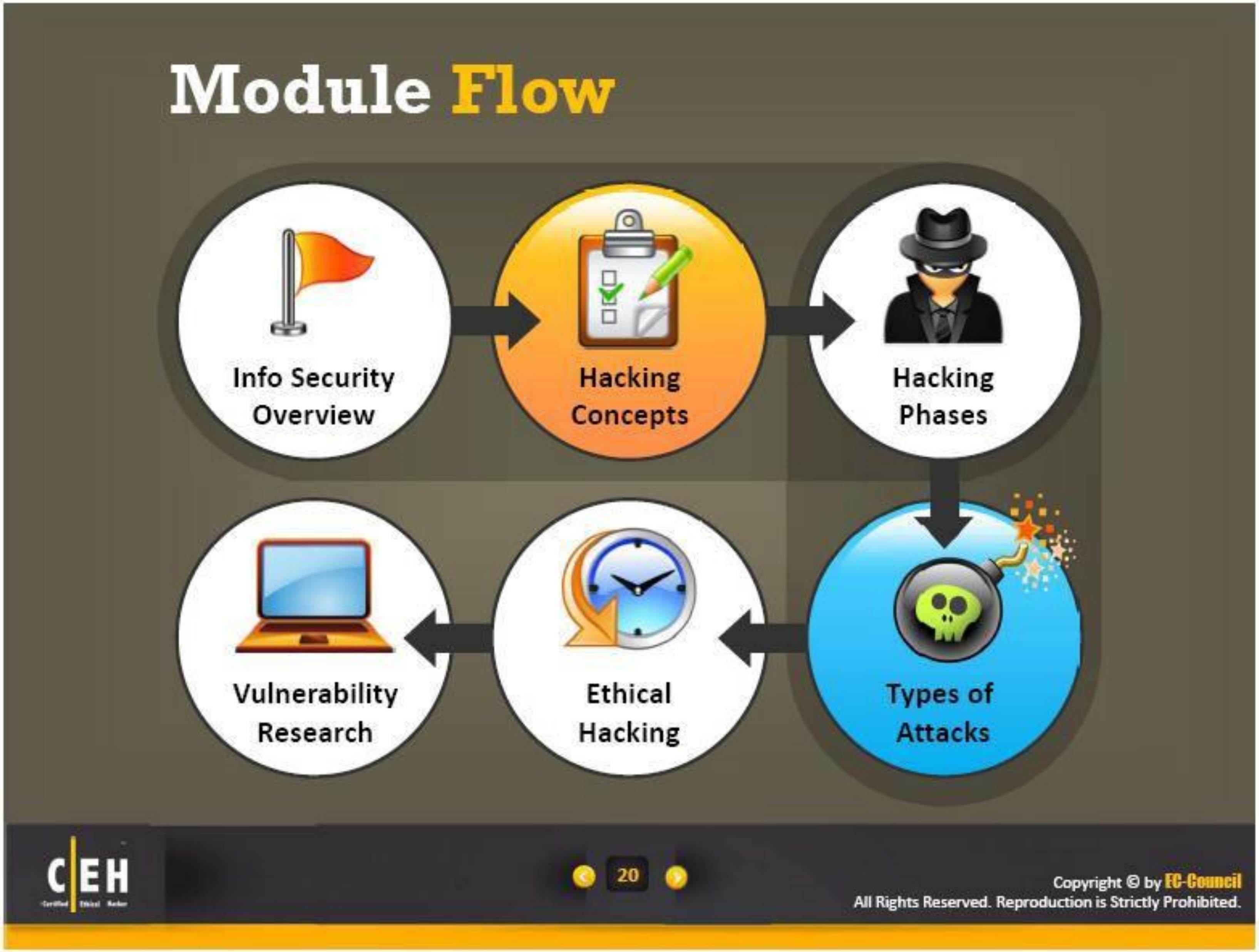
1. Increase in sophisticated cyber criminals
2. Data leakage, malicious insiders, and remote workers
3. Mobile security, adaptive authentication, and social media strategies
4. Cyber security workforce
5. Exploited vulnerabilities, operationalizing security
6. Critical infrastructure protection
7. Balancing sharing with privacy requirements
8. Identity access strategies and lifecycle

List of Security Risks

1. Trojans/Info Stealing Keyloggers/
2. Fast Flux Botnets
3. Data Loss/Breaches
4. Internal Threats
5. Organized Cyber Crime
6. Phishing/Social Engineering
7. New emerging viruses
8. Cyber Espionage
9. Zero-Day Exploits
10. Web 2.0 Threats
11. Vishing attacks

List of Security Risks

12. Identity black market
13. Cyber-extortion
14. Transportable data (USB, laptops, backup tapes)
15. “Zombie” networks
16. Exploits in new technology
17. Outsourcing projects
18. Social networking
19. Business interruption
20. Virtualization and cloud Computing



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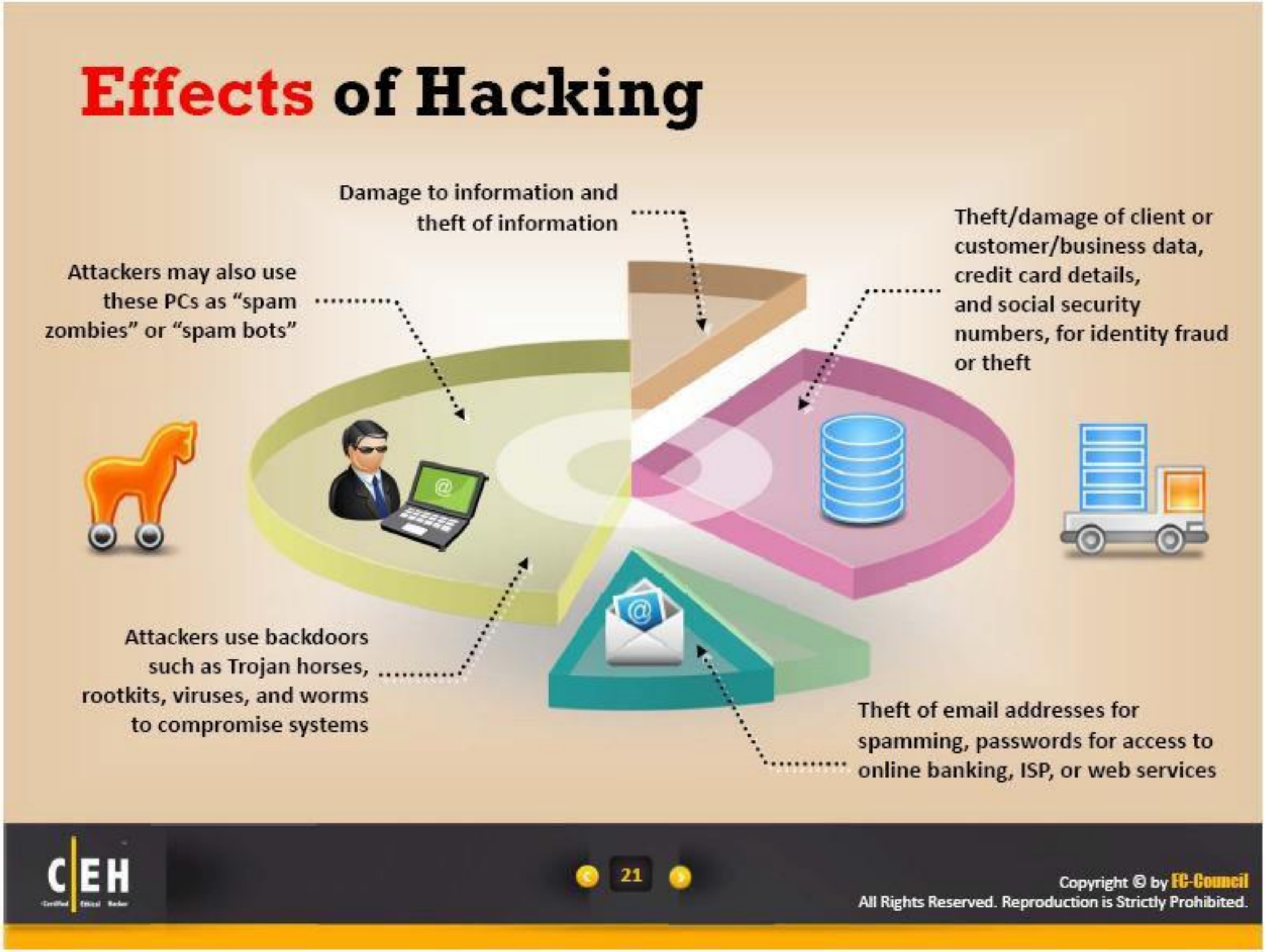
Vulnerability Research



Effects of Hacking

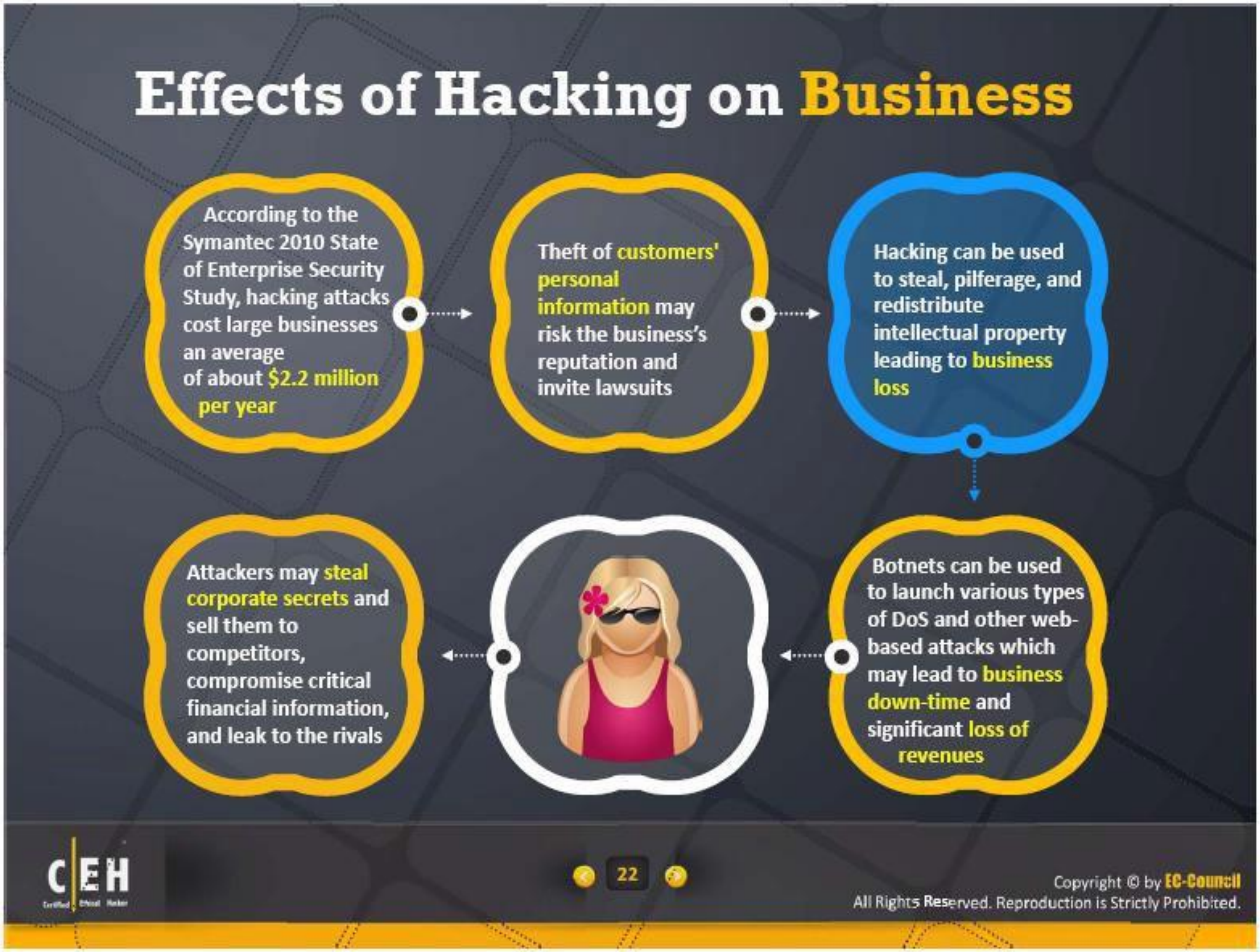
Damage to information and theft of information

Theft/damage of client or customer/business data, credit card details, and social security numbers, for identity fraud or theft

Attackers may also use these PCs as "spam zombies" or "spam bots"

Attackers use backdoors such as Trojan horses, rootkits, viruses, and worms to compromise systems

Theft of email addresses for spamming, passwords for access to online banking, ISP, or web services



Effects of Hacking on Business

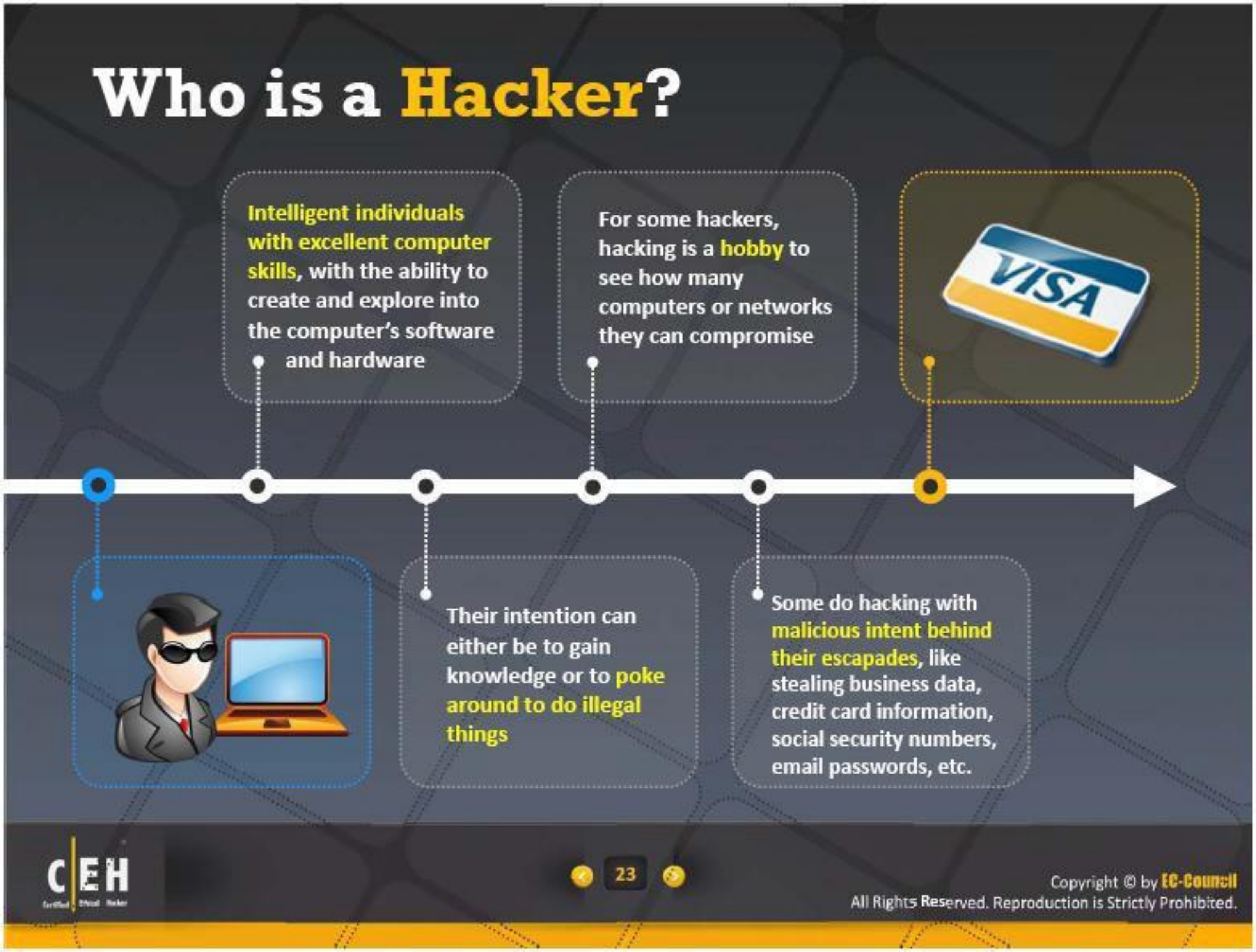
According to the Symantec 2010 State of Enterprise Security Study, hacking attacks cost large businesses an average of about **$2.2 million per year**

Theft of **customers' personal information** may risk the business's reputation and invite lawsuits

Hacking can be used to steal, pilferage, and redistribute intellectual property leading to **business loss**

Botnets can be used to launch various types of DoS and other web-based attacks which may lead to **business down-time** and significant **loss of revenues**

Attackers may **steal corporate secrets** and sell them to competitors, compromise critical financial information, and leak to the rivals



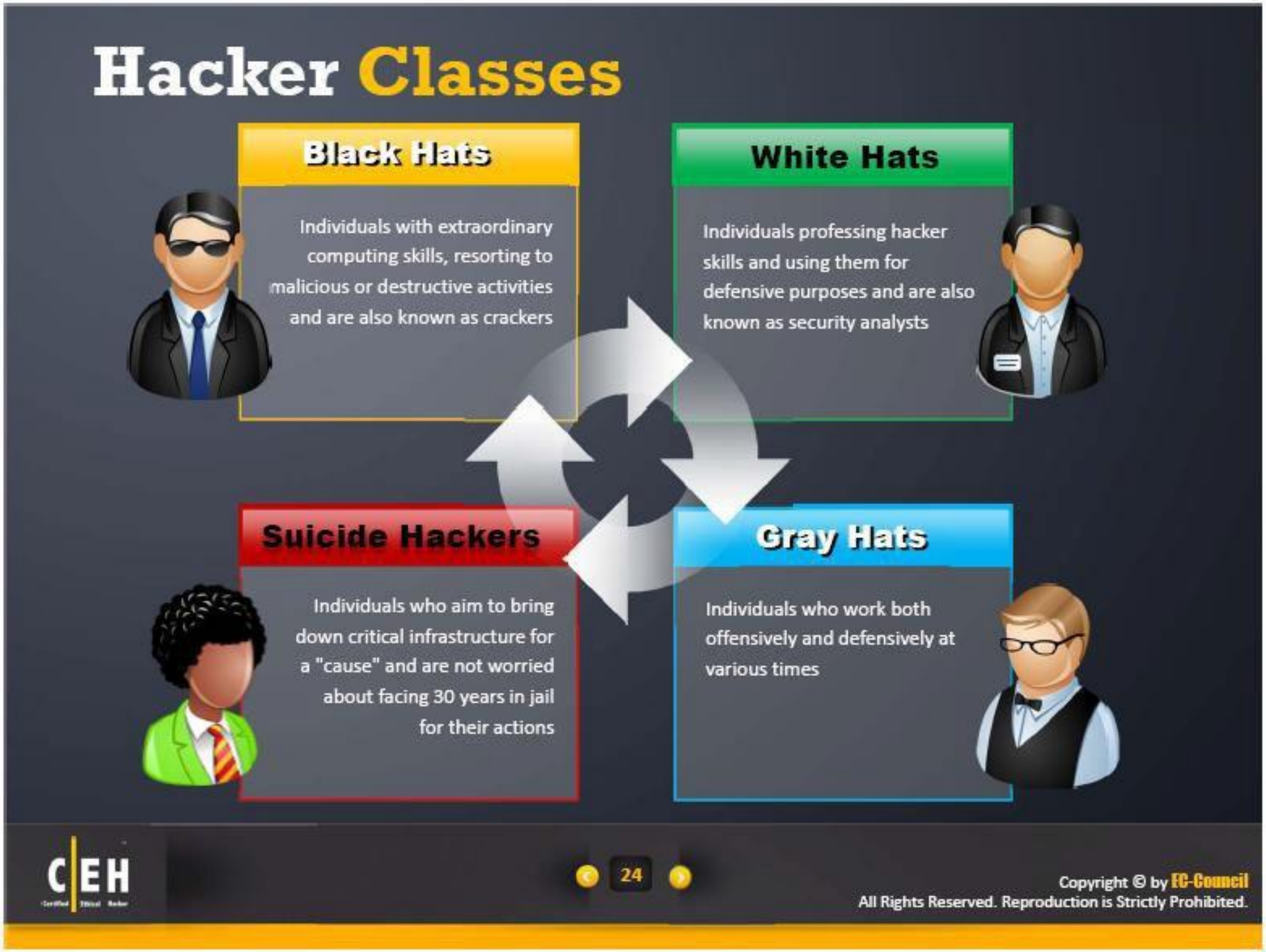
Who is a Hacker?

Intelligent individuals with excellent computer skills, with the ability to create and explore into the computer's software and hardware

Their intention can either be to gain knowledge or to poke around to do illegal things

For some hackers, hacking is a hobby to see how many computers or networks they can compromise

Some do hacking with malicious intent behind their escapades, like stealing business data, credit card information, social security numbers, email passwords, etc.



Hacker Classes

Black Hats

Individuals with extraordinary computing skills, resorting to malicious or destructive activities and are also known as crackers

White Hats

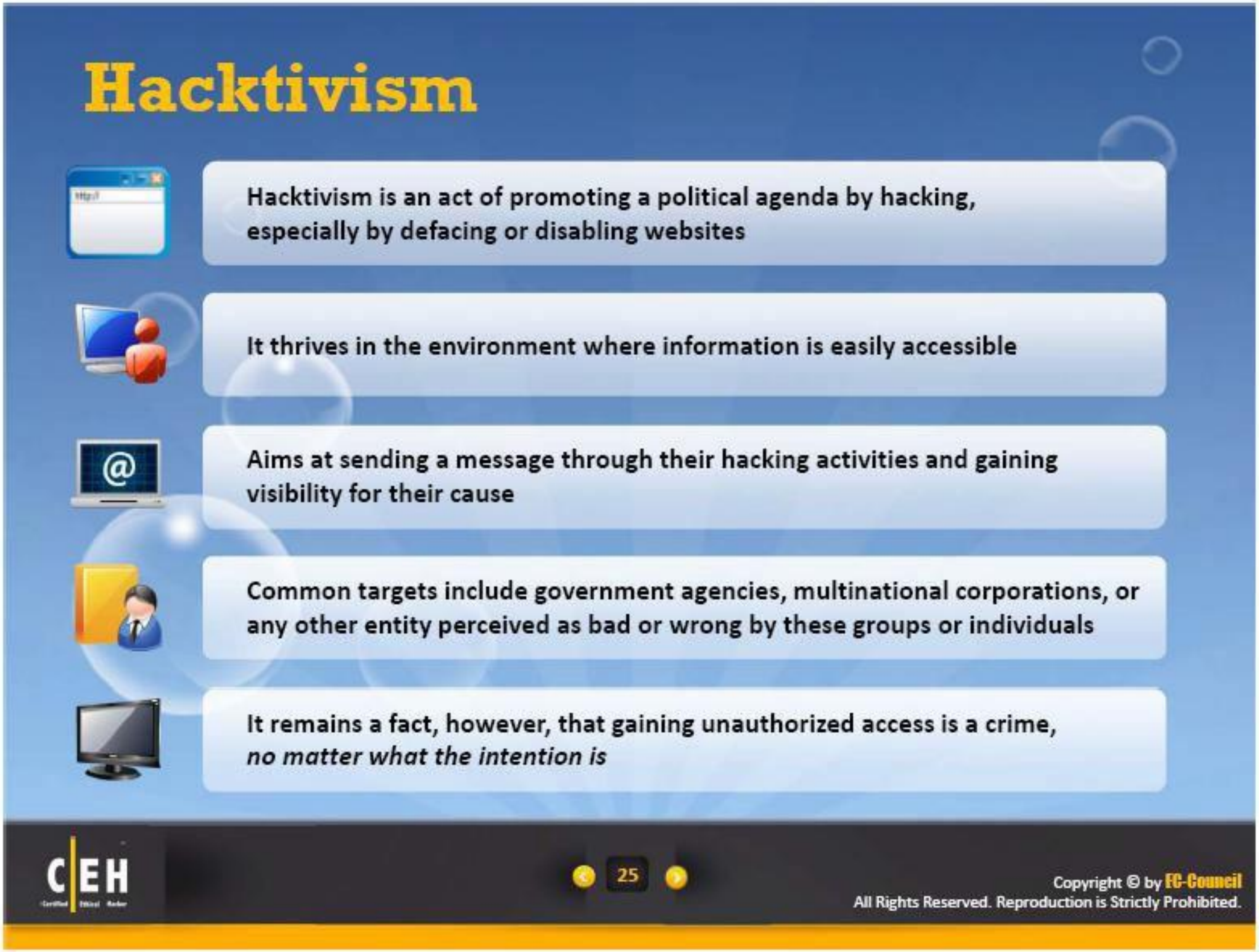
Individuals professing hacker skills and using them for defensive purposes and are also known as security analysts

Suicide Hackers

Individuals who aim to bring down critical infrastructure for a "cause" and are not worried about facing 30 years in jail for their actions

Gray Hats

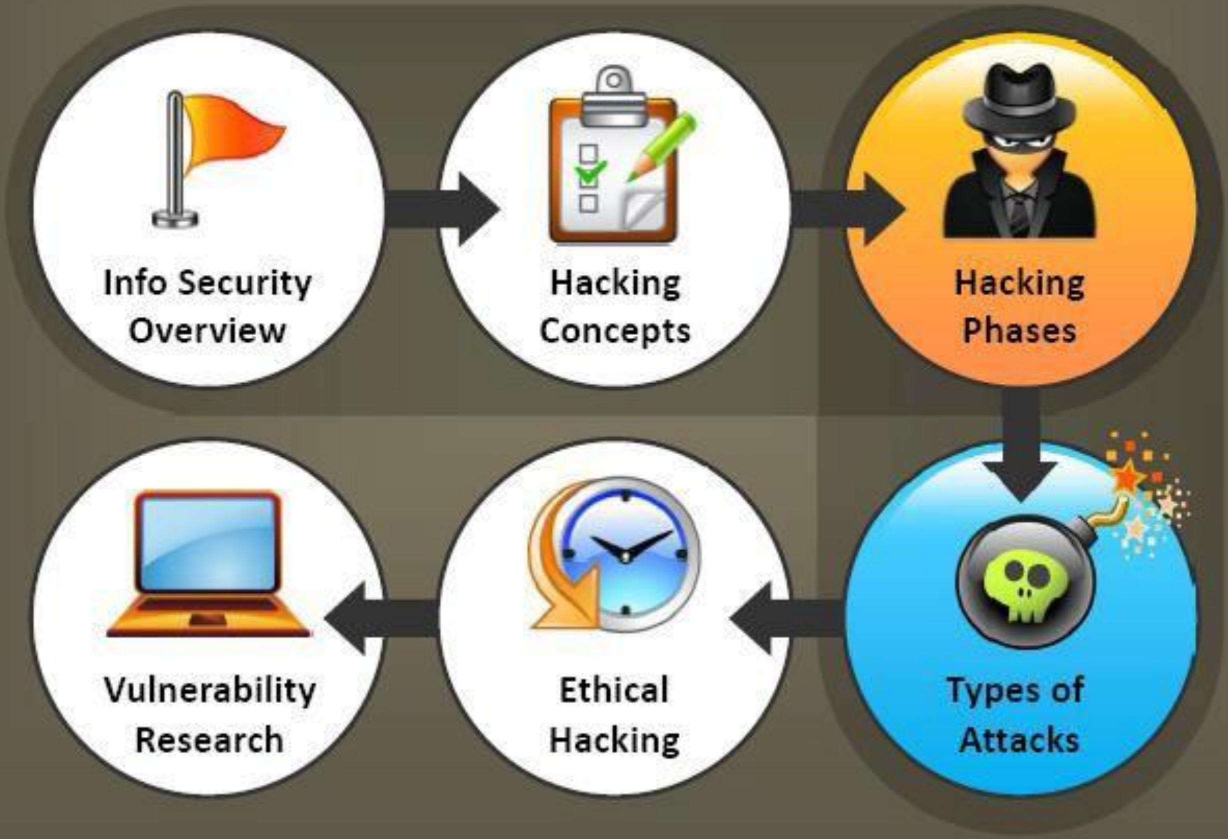
Individuals who work both offensively and defensively at various times



Hacktivism

- Hacktivism is an act of promoting a political agenda by hacking, especially by defacing or disabling websites
- It thrives in the environment where information is easily accessible
- Aims at sending a message through their hacking activities and gaining visibility for their cause
- Common targets include government agencies, multinational corporations, or any other entity perceived as bad or wrong by these groups or individuals
- It remains a fact, however, that gaining unauthorized access is a crime, *no matter what the intention is*

Module Flow



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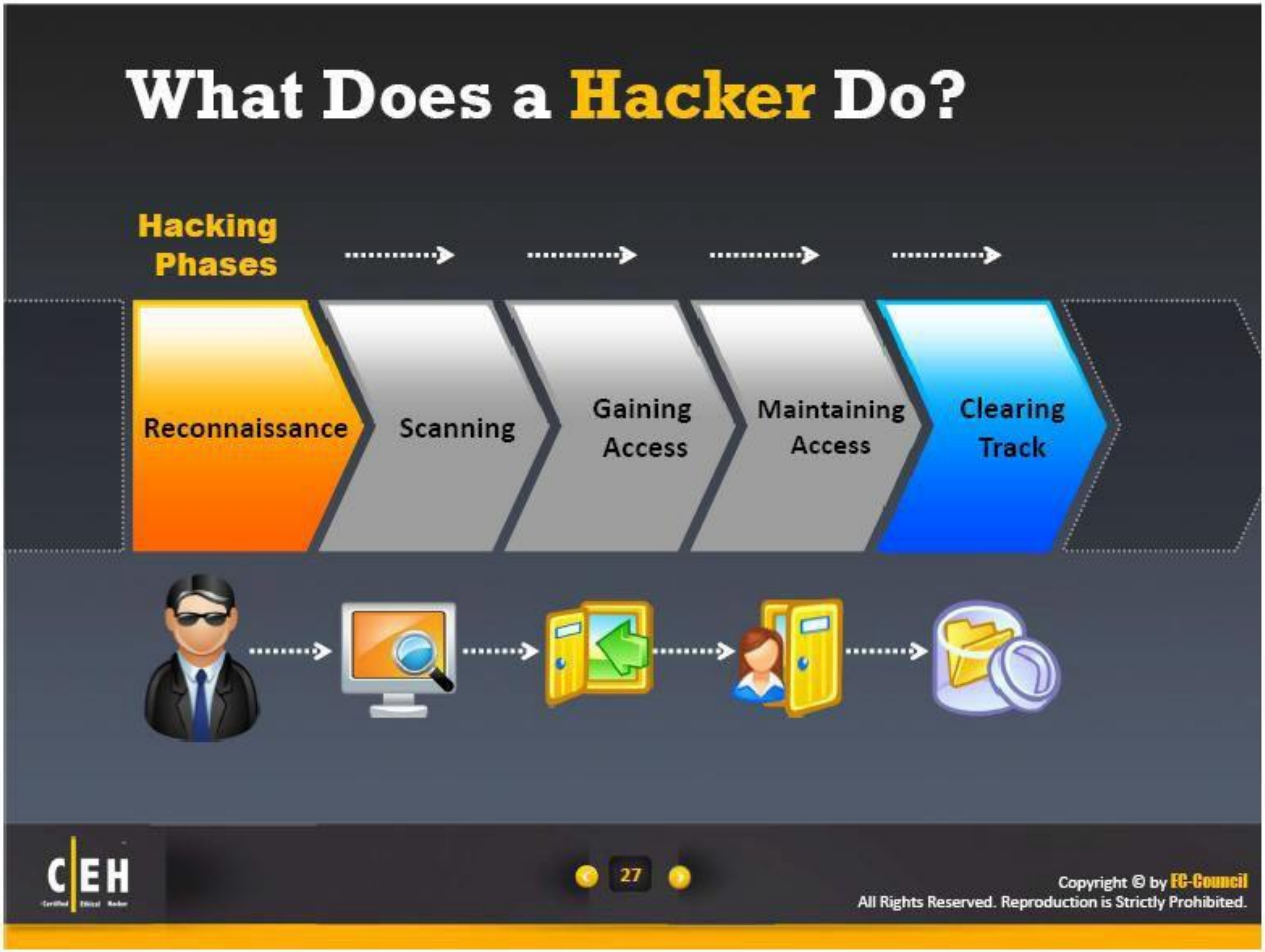
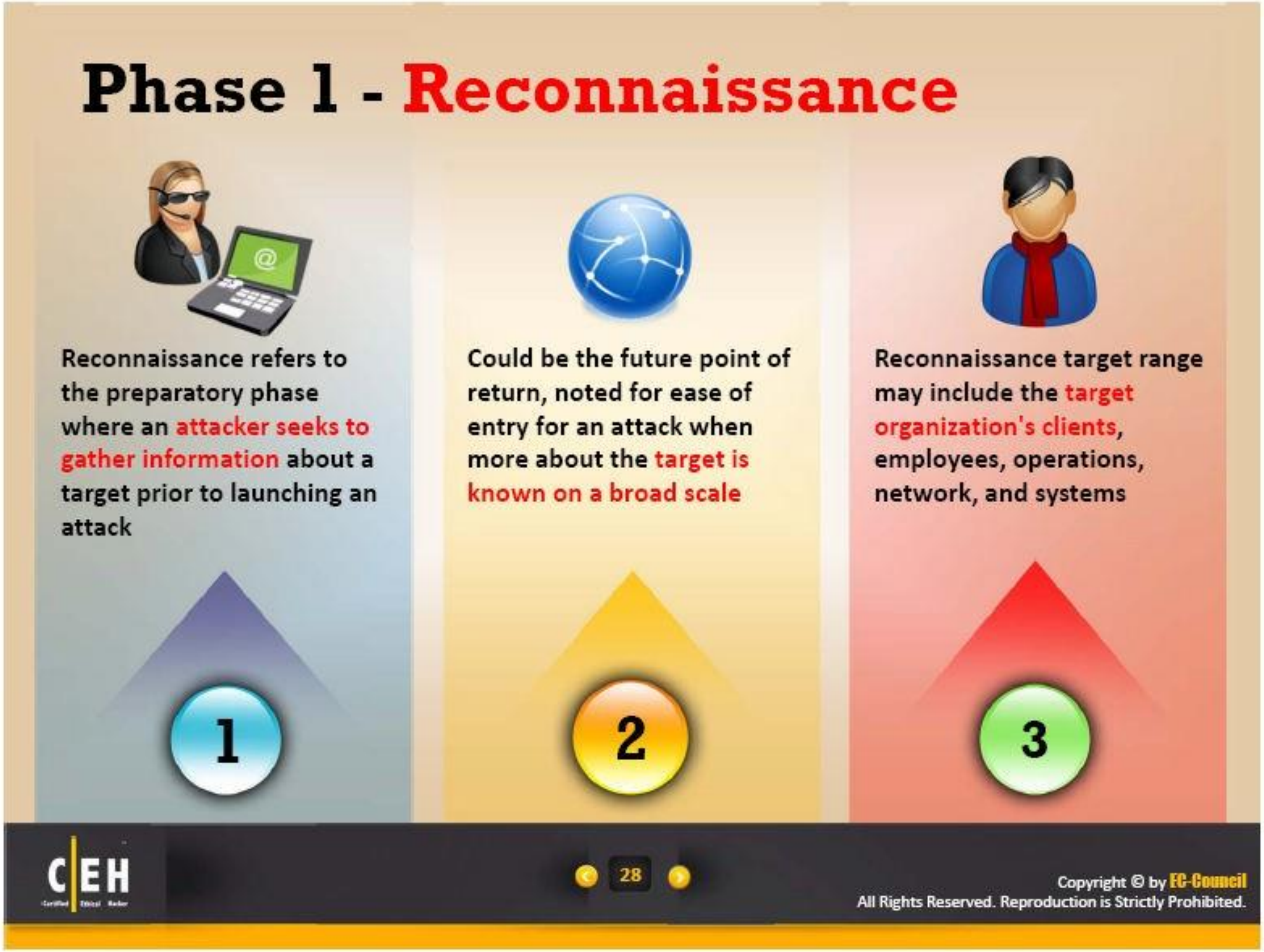


What Does a Hacker Do?

Hacking Phases

Reconnaissance → Scanning → Gaining Access → Maintaining Access → Clearing Track



Phase 1 - Reconnaissance

Reconnaissance refers to the preparatory phase where an **attacker seeks to gather information** about a target prior to launching an attack

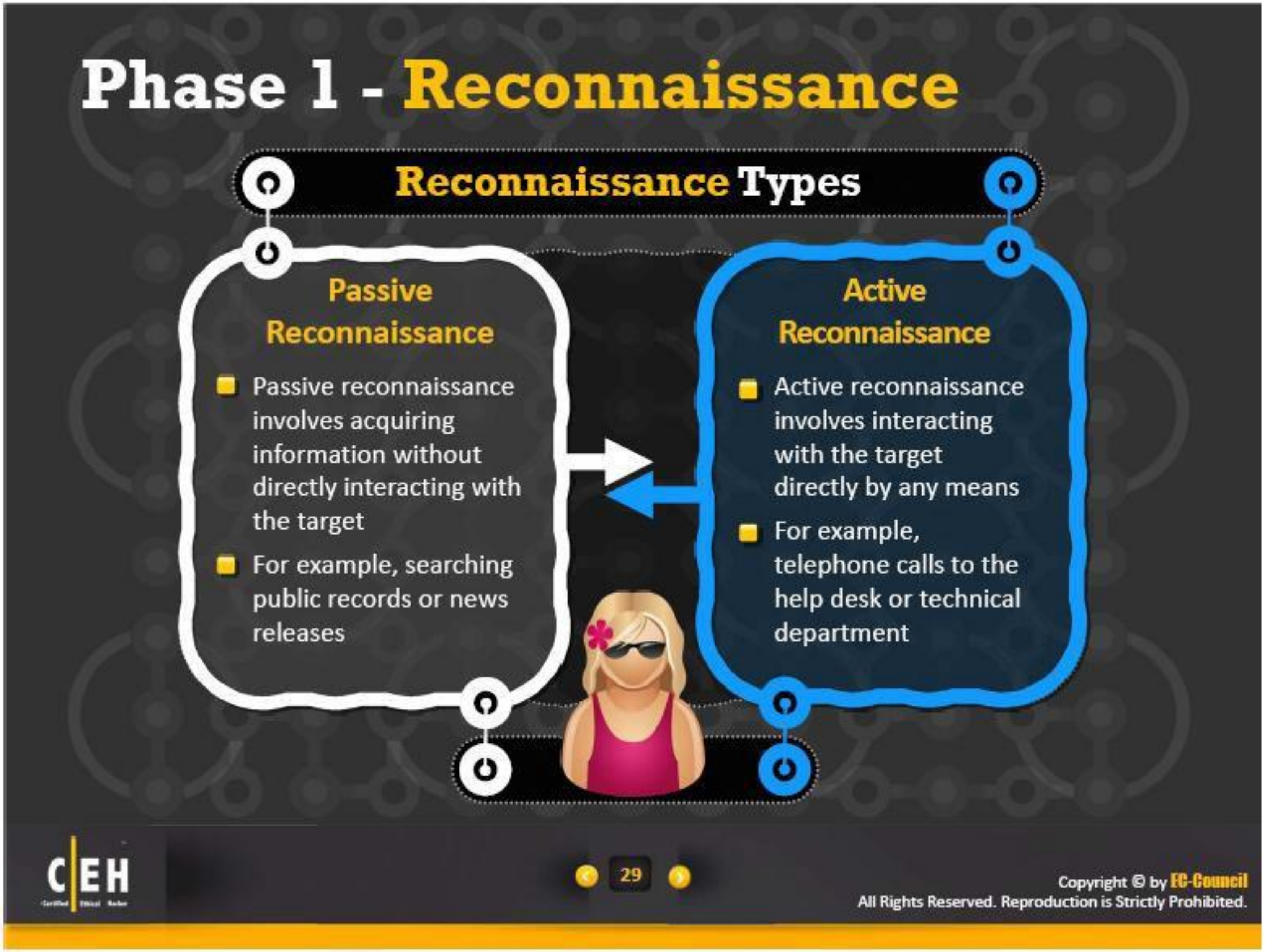
1

Could be the future point of return, noted for ease of entry for an attack when more about the **target is known on a broad scale**

2

Reconnaissance target range may include the **target organization's clients**, employees, operations, network, and systems

3



Phase 1 - Reconnaissance

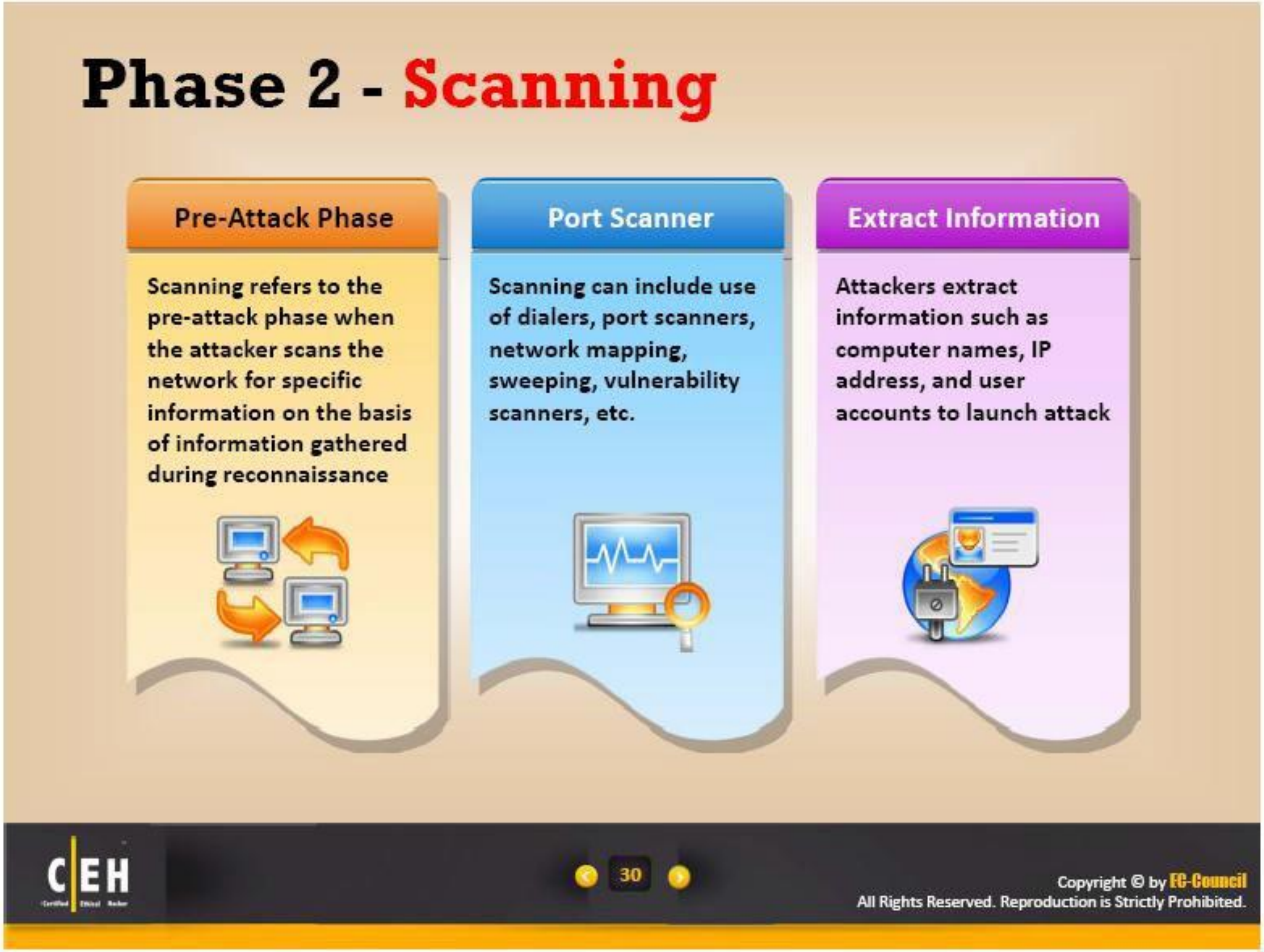
Reconnaissance Types

Passive Reconnaissance

- Passive reconnaissance involves acquiring information without directly interacting with the target
- For example, searching public records or news releases

Active Reconnaissance

- Active reconnaissance involves interacting with the target directly by any means
- For example, telephone calls to the help desk or technical department



Phase 2 - Scanning

Pre-Attack Phase

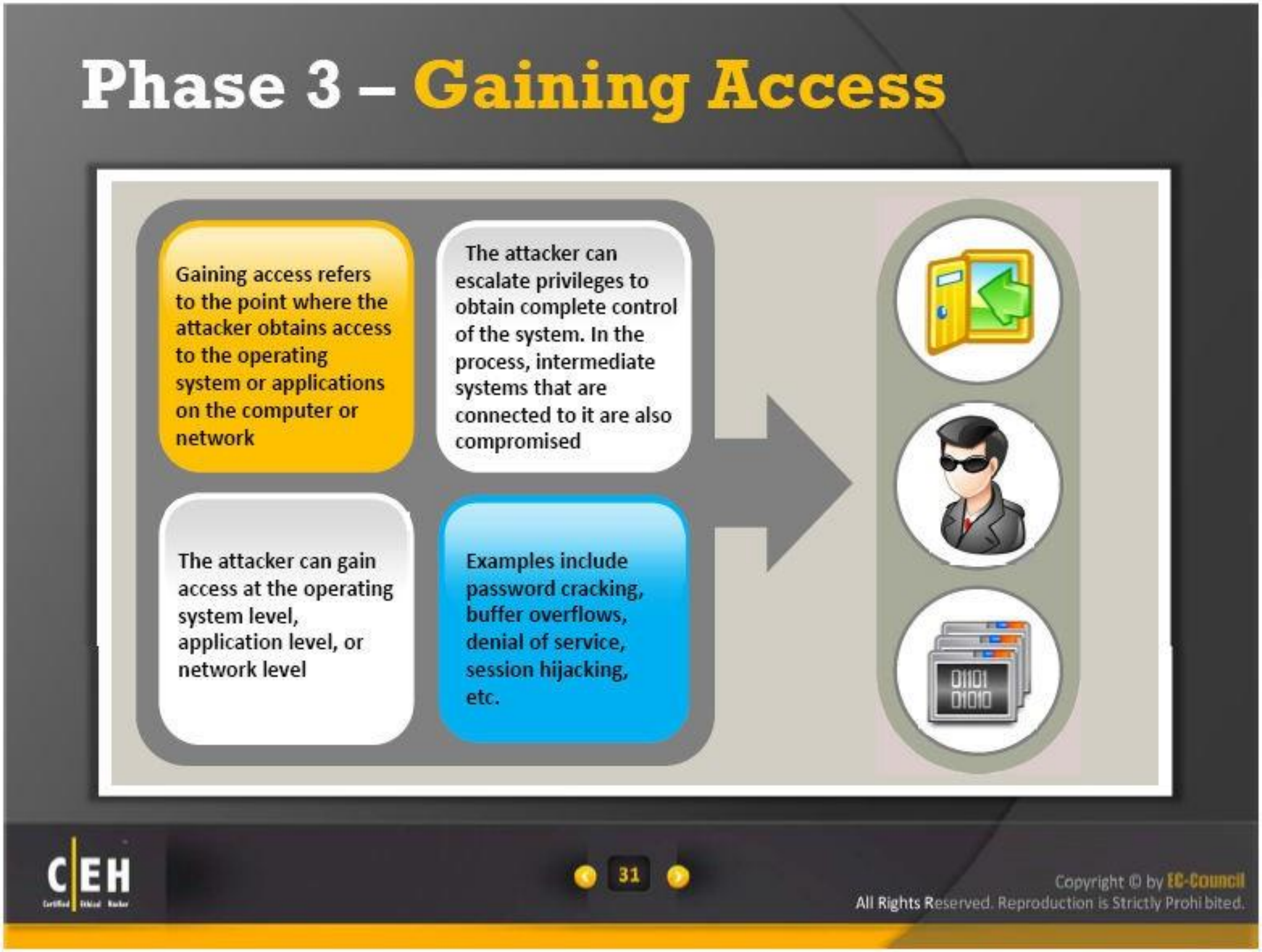
Scanning refers to the pre-attack phase when the attacker scans the network for specific information on the basis of information gathered during reconnaissance

Port Scanner

Scanning can include use of dialers, port scanners, network mapping, sweeping, vulnerability scanners, etc.

Extract Information

Attackers extract information such as computer names, IP address, and user accounts to launch attack



Phase 3 – Gaining Access

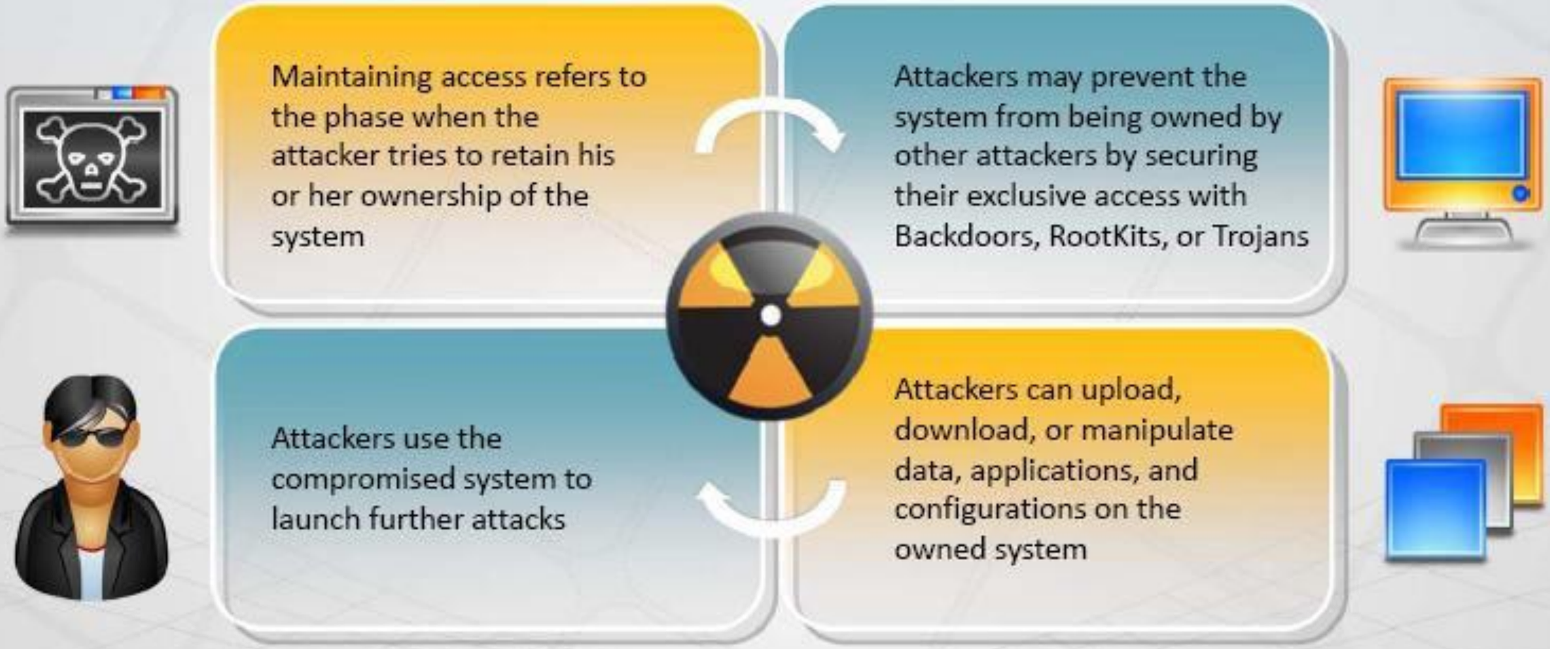
Gaining access refers to the point where the attacker obtains access to the operating system or applications on the computer or network

The attacker can escalate privileges to obtain complete control of the system. In the process, intermediate systems that are connected to it are also compromised

The attacker can gain access at the operating system level, application level, or network level

Examples include password cracking, buffer overflows, denial of service, session hijacking, etc.

Phase 4 – Maintaining Access

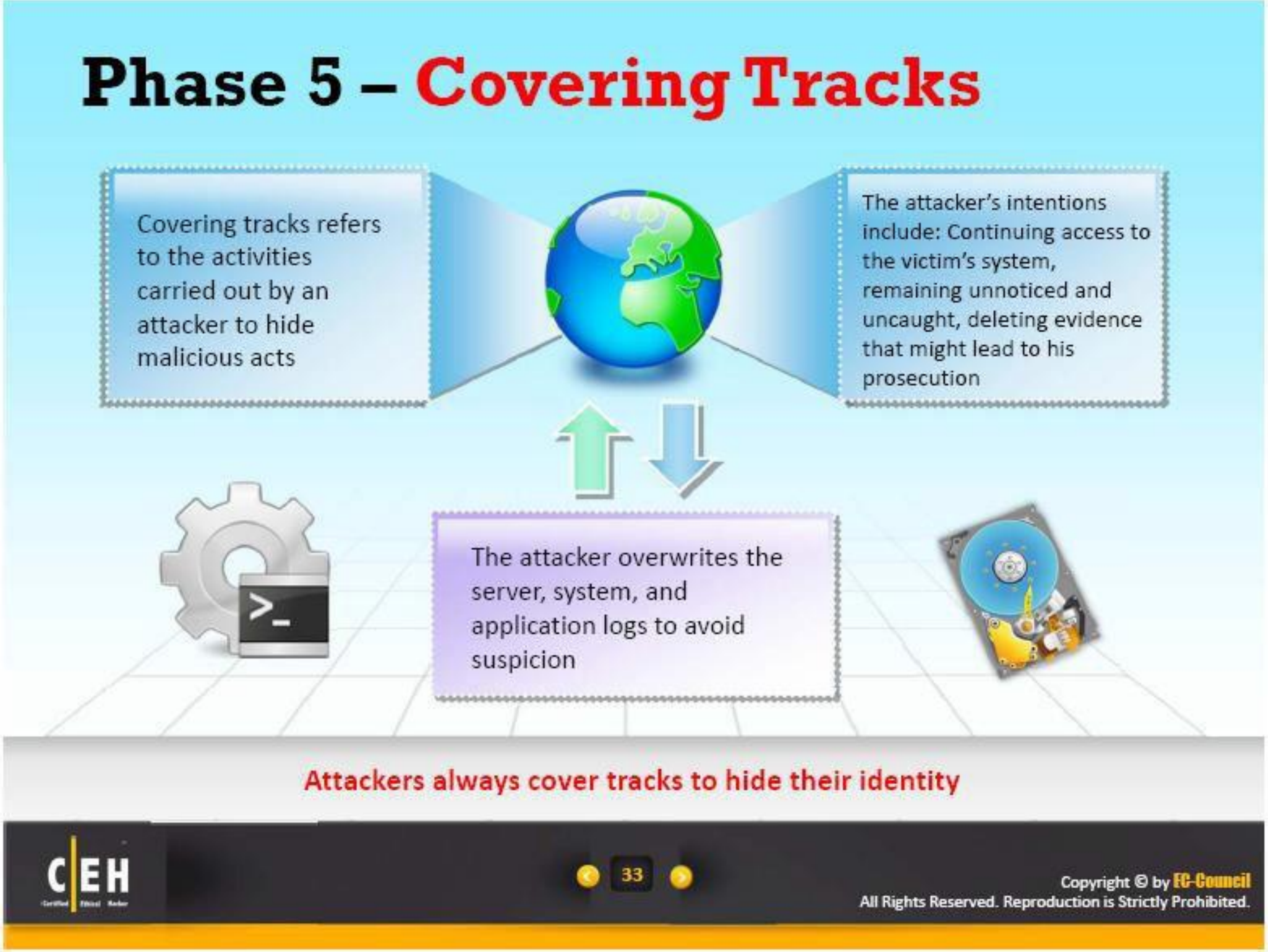


Maintaining access refers to the phase when the attacker tries to retain his or her ownership of the system

Attackers may prevent the system from being owned by other attackers by securing their exclusive access with Backdoors, RootKits, or Trojans

Attackers use the compromised system to launch further attacks

Attackers can upload, download, or manipulate data, applications, and configurations on the owned system



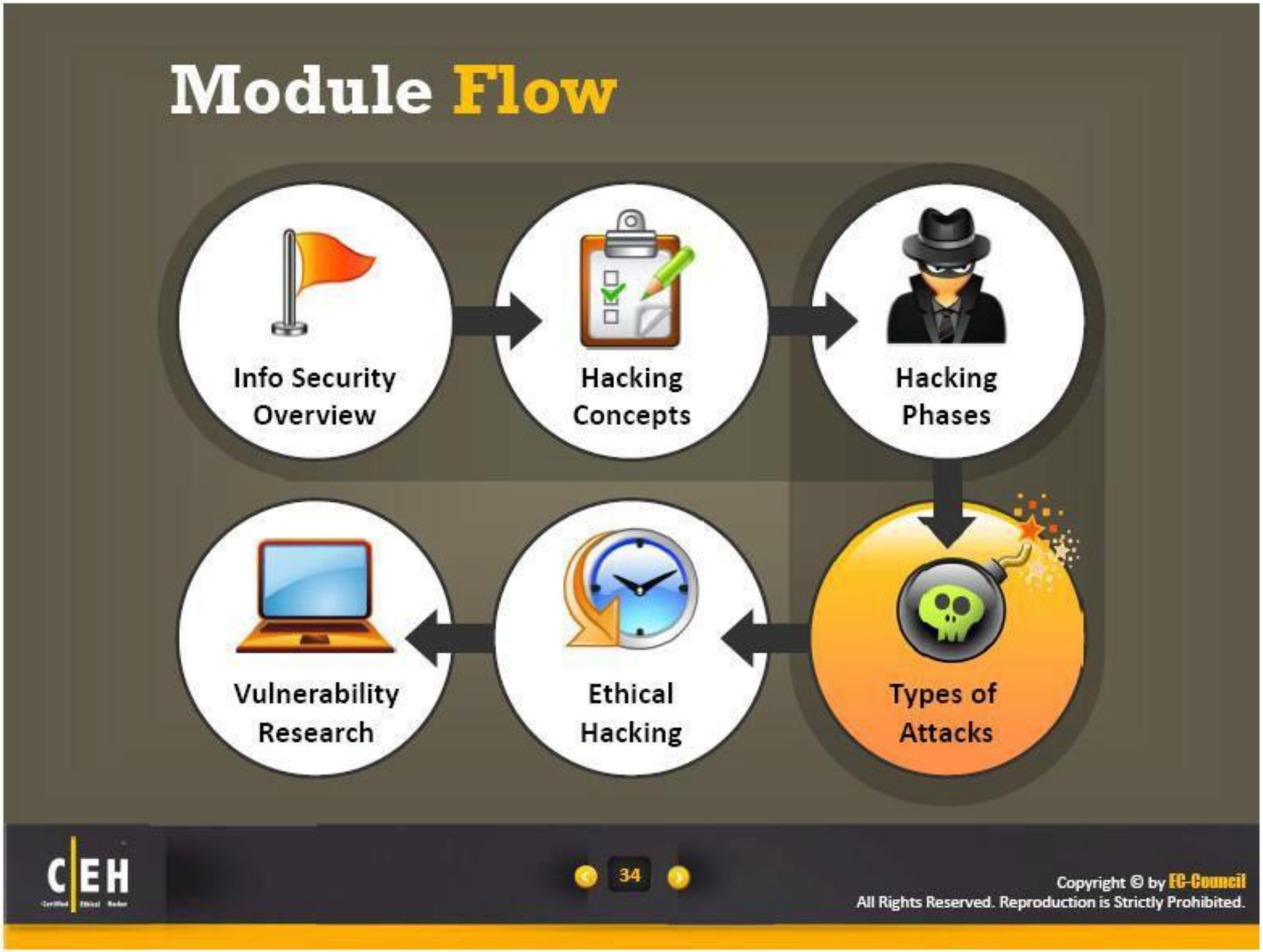
Phase 5 – Covering Tracks

Covering tracks refers to the activities carried out by an attacker to hide malicious acts

The attacker's intentions include: Continuing access to the victim's system, remaining unnoticed and uncaught, deleting evidence that might lead to his prosecution

The attacker overwrites the server, system, and application logs to avoid suspicion

Attackers always cover tracks to hide their identity



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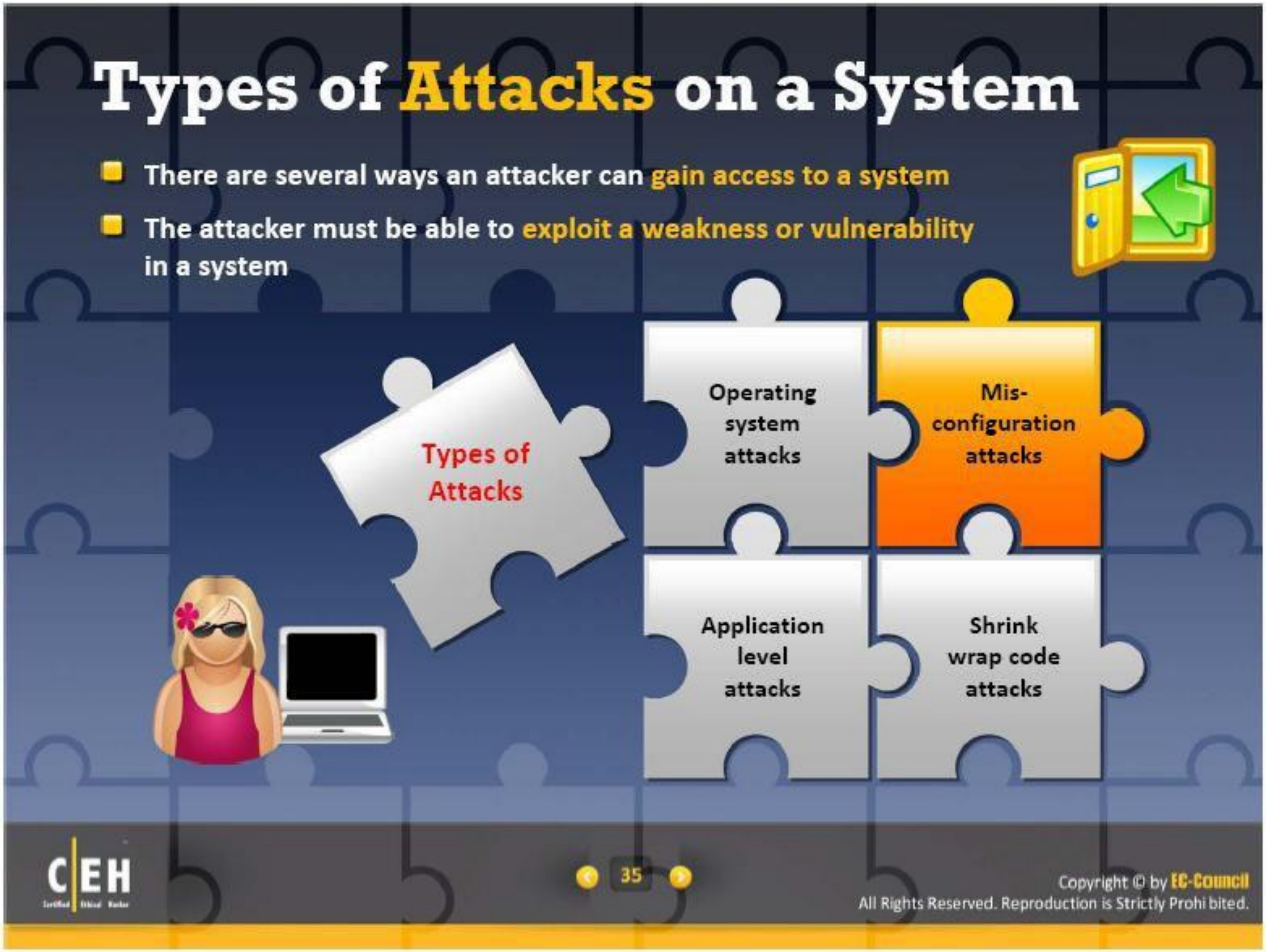


Types of Attacks on a System

- There are several ways an attacker can gain access to a system
- The attacker must be able to exploit a weakness or vulnerability in a system

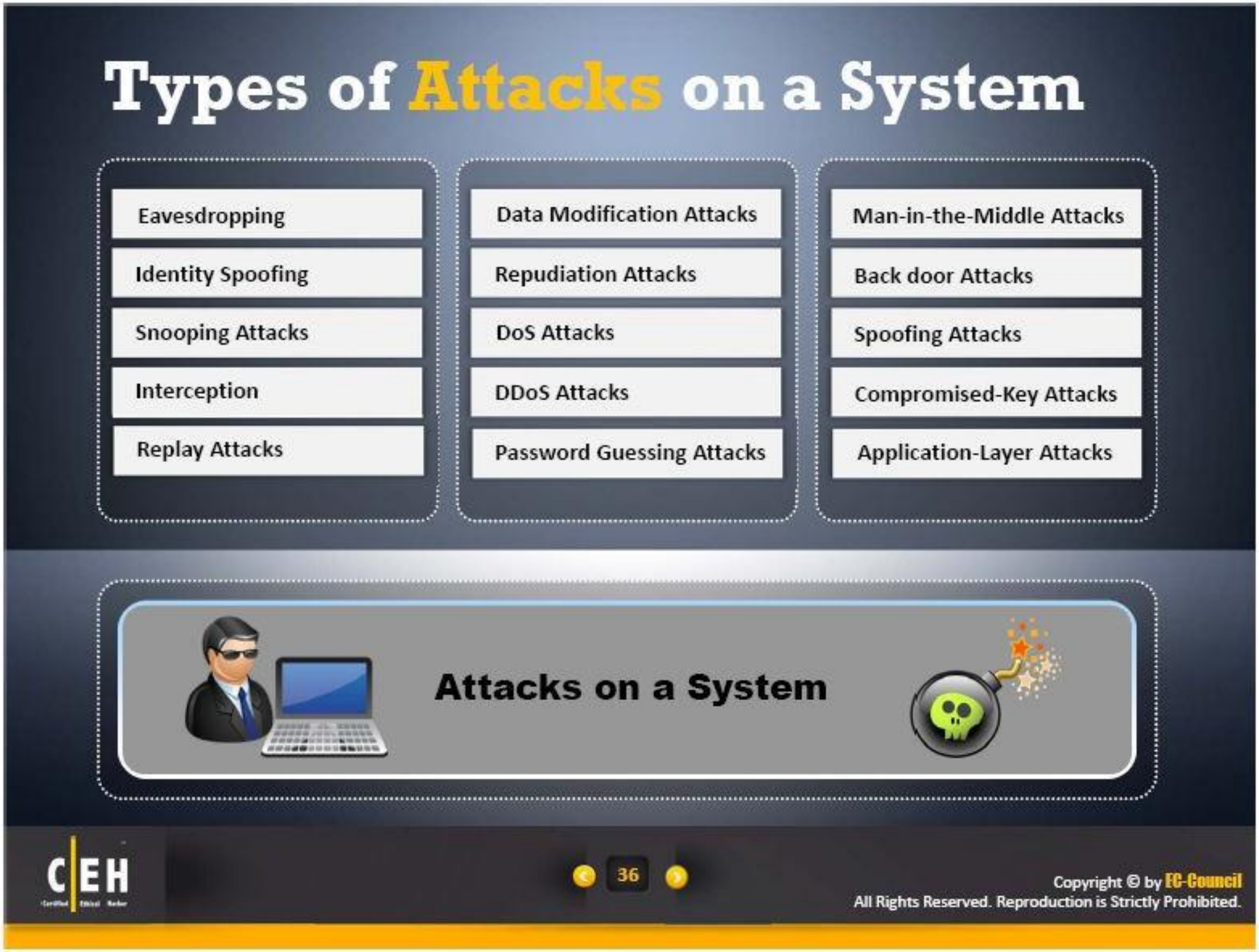
Types of Attacks

Operating system attacks

Mis-configuration attacks

Application level attacks

Shrink wrap code attacks



Types of Attacks on a System

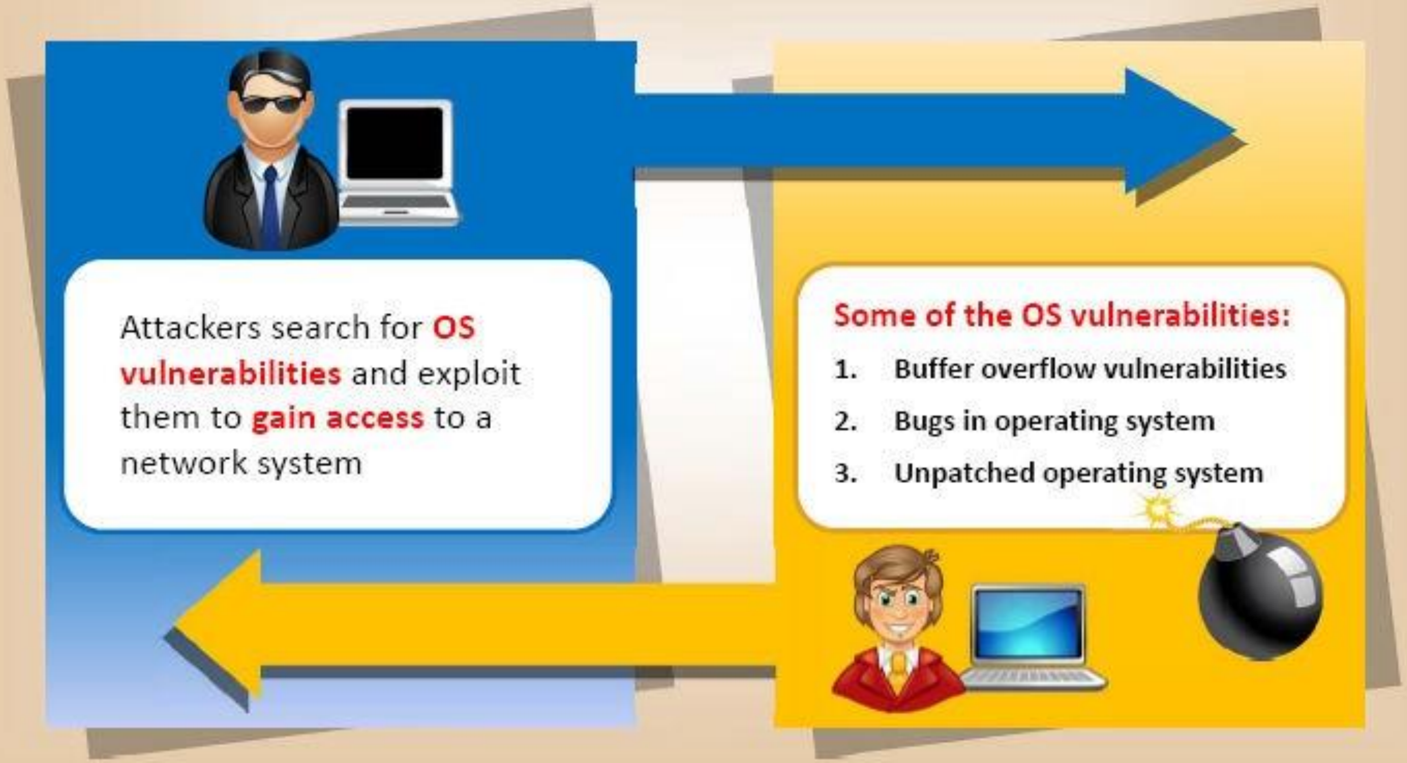
- Eavesdropping
- Identity Spoofing
- Snooping Attacks
- Interception
- Replay Attacks

- Data Modification Attacks
- Repudiation Attacks
- DoS Attacks
- DDoS Attacks
- Password Guessing Attacks

- Man-in-the-Middle Attacks
- Back door Attacks
- Spoofing Attacks
- Compromised-Key Attacks
- Application-Layer Attacks

Attacks on a System

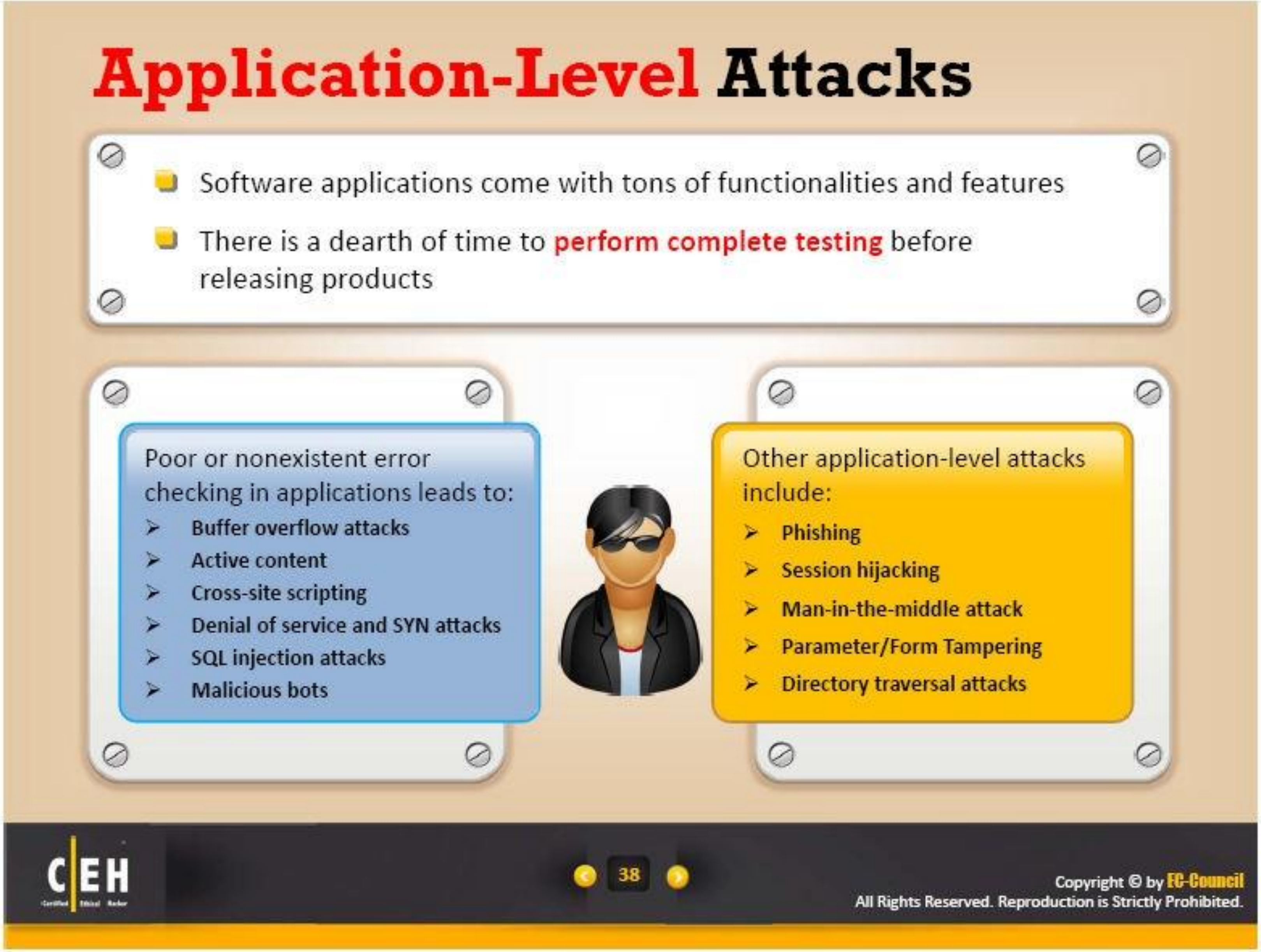
Operating System Attacks



Attackers search for **OS vulnerabilities** and exploit them to **gain access** to a network system

Some of the OS vulnerabilities:

1. **Buffer overflow vulnerabilities**
2. **Bugs in operating system**
3. **Unpatched operating system**



Application-Level Attacks

- Software applications come with tons of functionalities and features
- There is a dearth of time to **perform complete testing** before releasing products

Poor or nonexistent error checking in applications leads to:

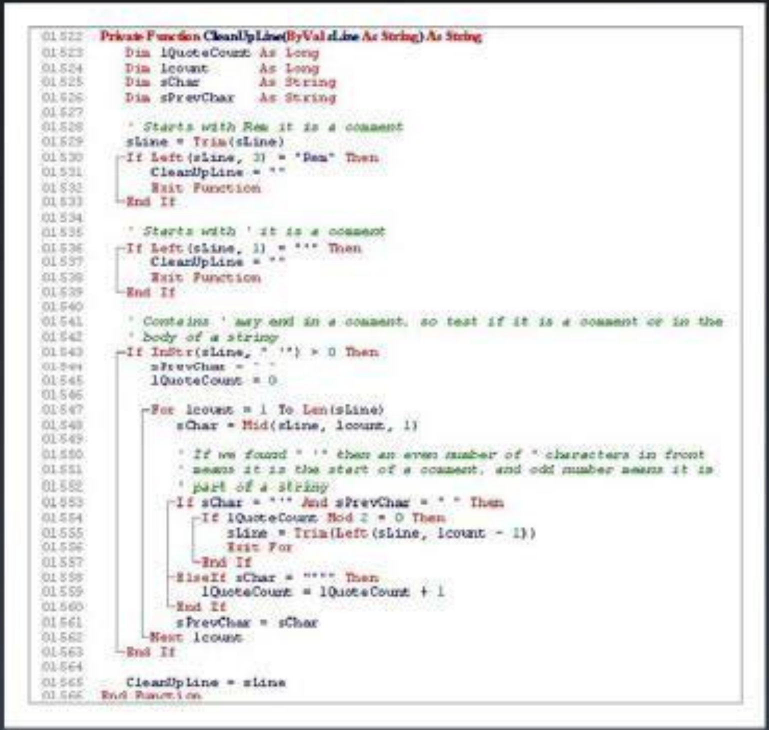
- **Buffer overflow attacks**
- **Active content**
- **Cross-site scripting**
- **Denial of service and SYN attacks**
- **SQL injection attacks**
- **Malicious bots**

Other application-level attacks include:

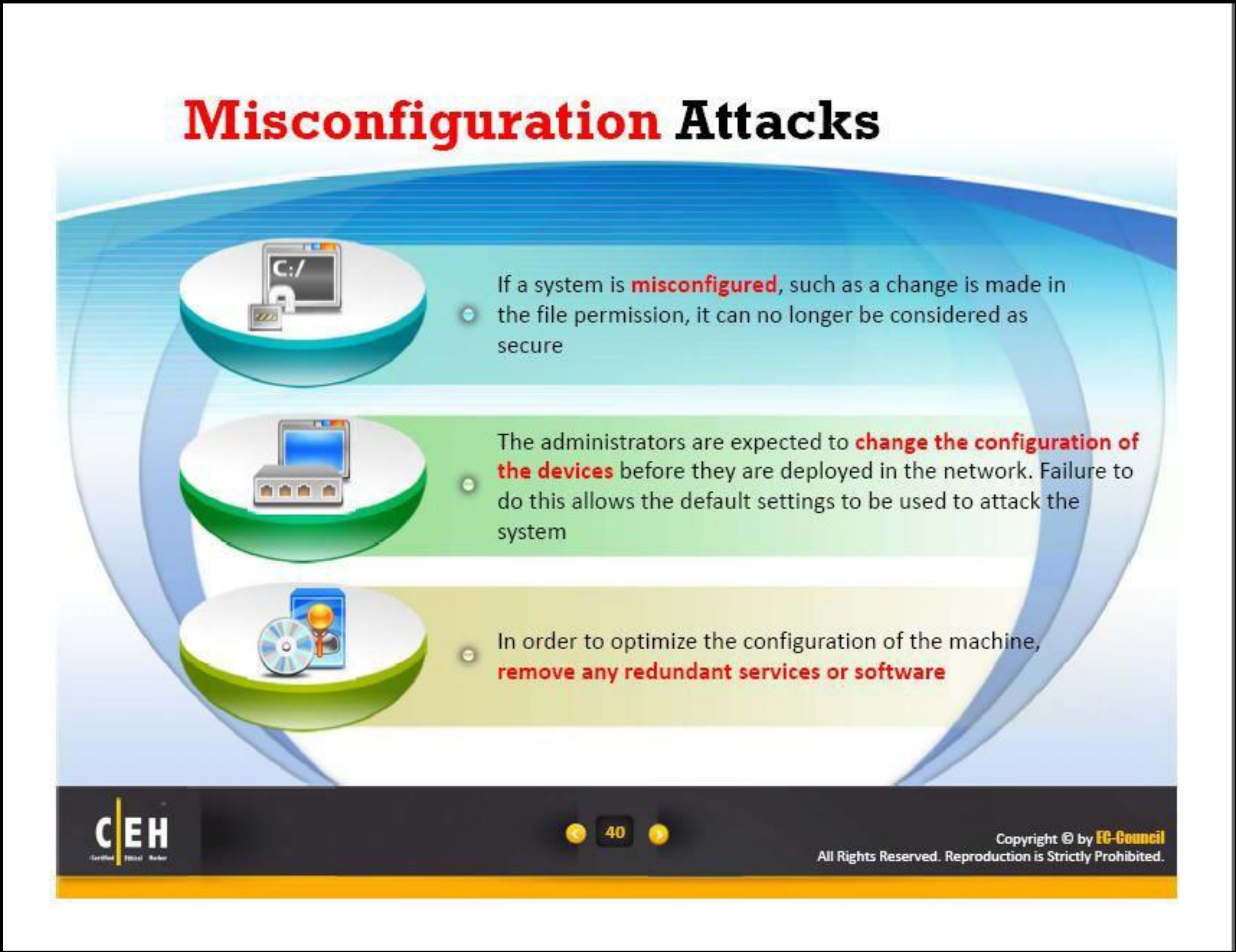
- **Phishing**
- **Session hijacking**
- **Man-in-the-middle attack**
- **Parameter/Form Tampering**
- **Directory traversal attacks**

Shrink Wrap Code Attacks

- Why reinvent the wheel when you can buy off-the-shelf "**libraries**" and code?
- When you install an OS/Application, it comes with tons of sample scripts to make the life of an administrator easy
- The problem is "**not fine tuning**" or customizing these scripts
- This will lead to default code or shrink wrap code attacks

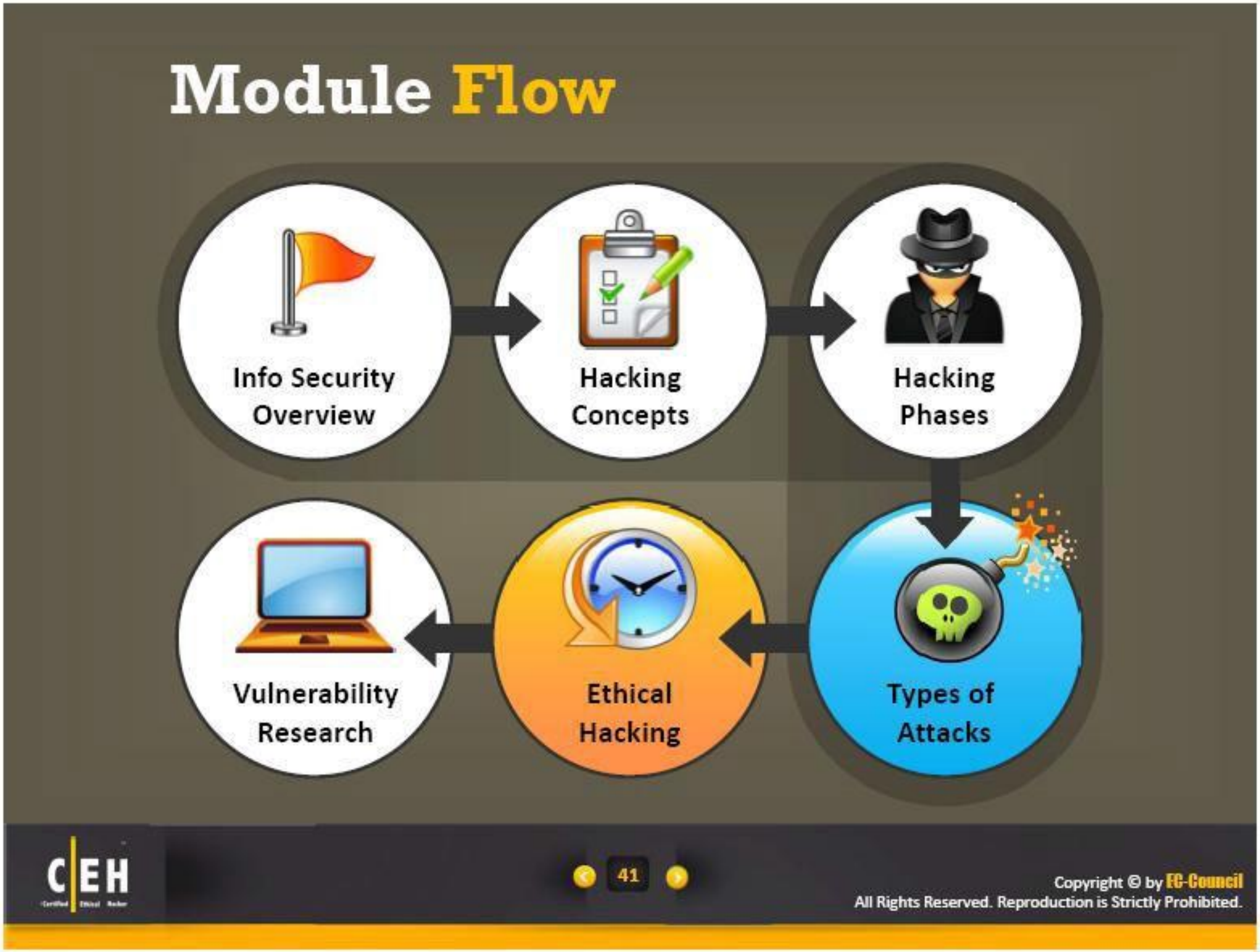


```
Private Function CleanUpLine(ByVal sLine As String) As String
    Dim lQuoteCount As Long
    Dim lcount      As Long
    Dim sChar       As String
    Dim sPrevChar   As String

    ' Starts with Rem it is a comment
    sLine = Trim(sLine)
   If Left(sLine, 3) = "Rem" Then
        CleanUpLine = ""
        Exit Function
   End If

    ' Starts with ' it is a comment
   If Left(sLine, 1) = "'" Then
        CleanUpLine = ""
        Exit Function
   End If

    ' Contains ' may end in a comment, so test if it is a comment or in the
    ' body of a string
   If InStr(sLine, " '") > 0 Then
        sPrevChar = " "
        lQuoteCount = 0

      For lcount = 1 To Len(sLine)
            sChar = Mid(sLine, lcount, 1)

            ' If we found " '" then an even number of " characters in front
            ' means it is the start of a comment, and odd number means it is
            ' part of a string
          If sChar = "'" And sPrevChar = " " Then
              If lQuoteCount Mod 2 = 0 Then
                    sLine = Trim(Left(sLine, lcount - 1))
                    Exit For
              End If
          ElseIf sChar = """" Then
                lQuoteCount = lQuoteCount + 1
          End If
            sPrevChar = sChar
      Next lcount
   End If

    CleanUpLine = sLine
End Function
```



Misconfiguration Attacks

- If a system is **misconfigured**, such as a change is made in the file permission, it can no longer be considered as secure
- The administrators are expected to **change the configuration of the devices** before they are deployed in the network. Failure to do this allows the default settings to be used to attack the system
- In order to optimize the configuration of the machine, **remove any redundant services or software**



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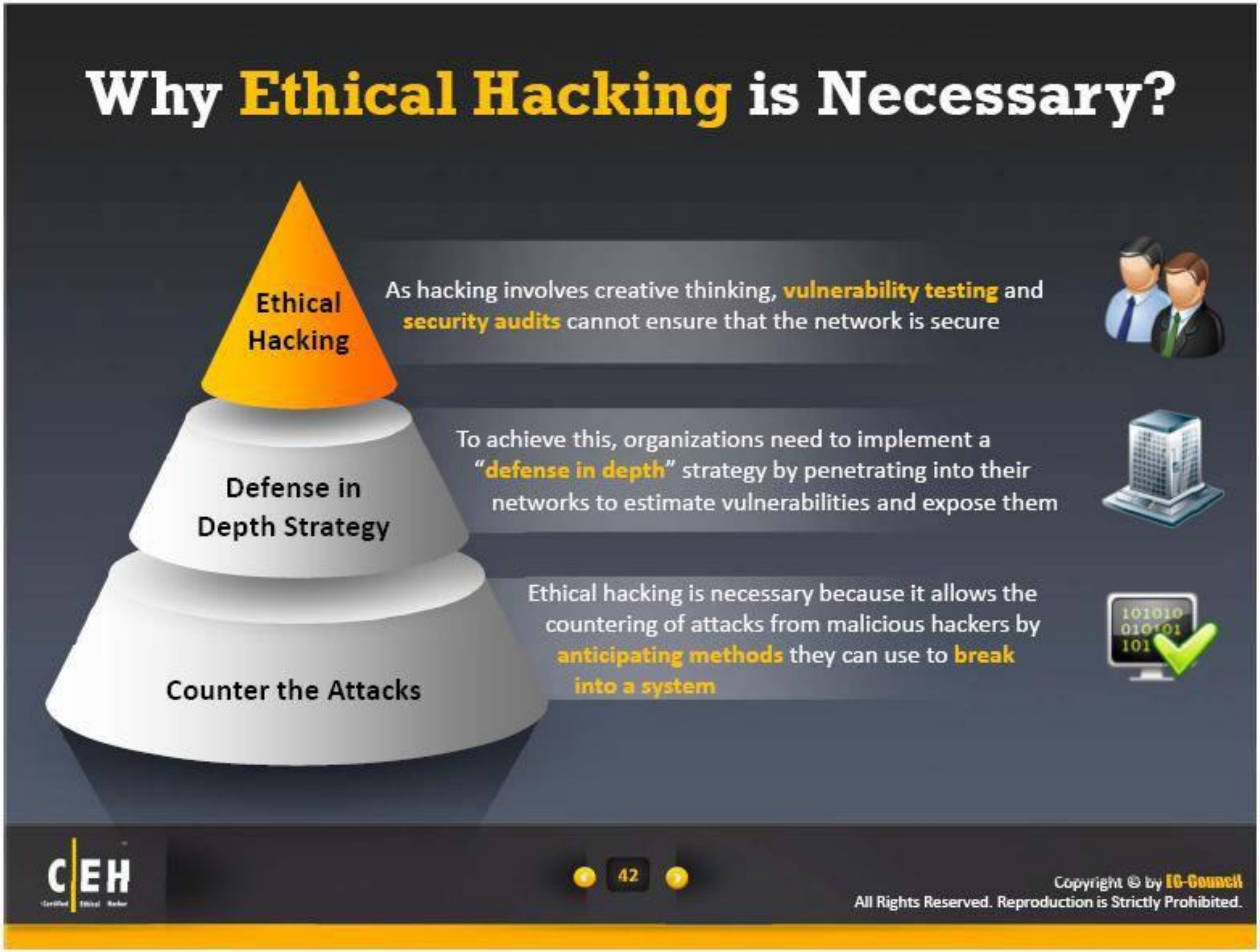


Why Ethical Hacking is Necessary?

Ethical Hacking

As hacking involves creative thinking, **vulnerability testing** and **security audits** cannot ensure that the network is secure

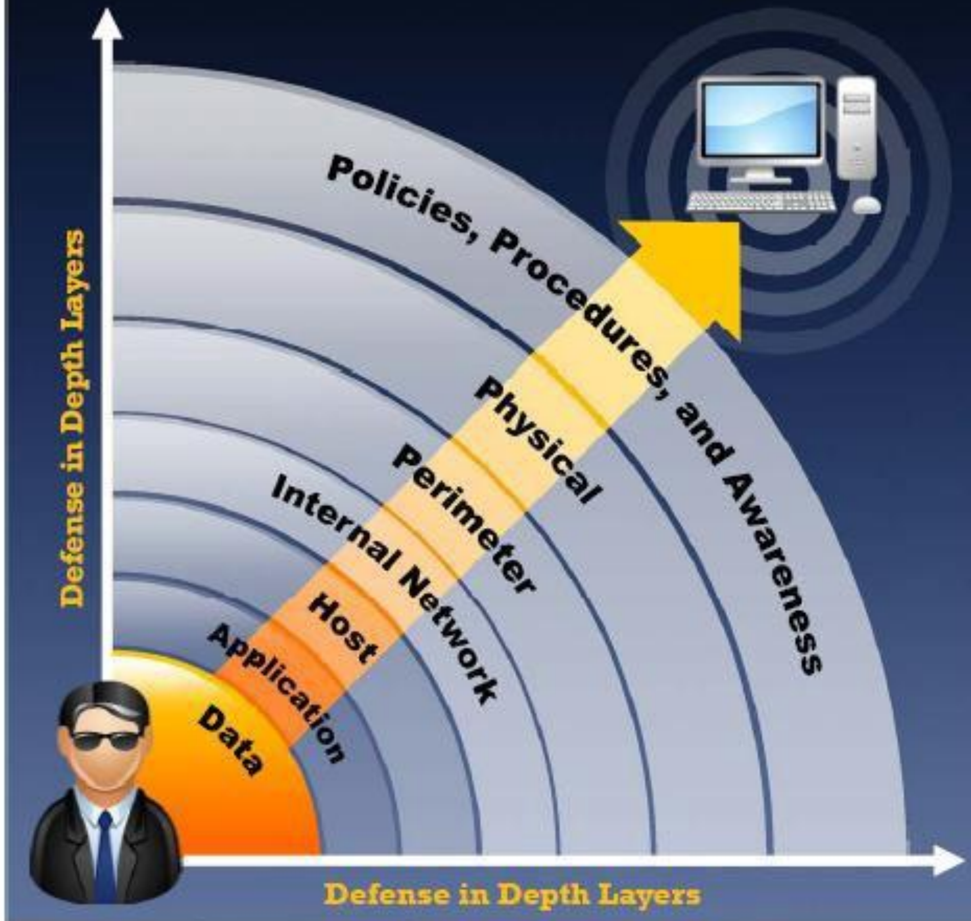
Defense in Depth Strategy

To achieve this, organizations need to implement a "**defense in depth**" strategy by penetrating into their networks to estimate vulnerabilities and expose them

Counter the Attacks

Ethical hacking is necessary because it allows the countering of attacks from malicious hackers by **anticipating methods** they can use to **break into a system**

Defense in Depth



- Defense in depth is a security strategy in which several **protection layers** are placed throughout an information system
- It helps to **prevent direct attacks** against an information system and data because a break in one layer only leads the attacker to the next layer

Scope and Limitations of Ethical Hacking

✓ Scope

Ethical hacking is a crucial component of **risk assessment, auditing**, **counterfraud**, **best practices**, and **good governance**

✓ Scope

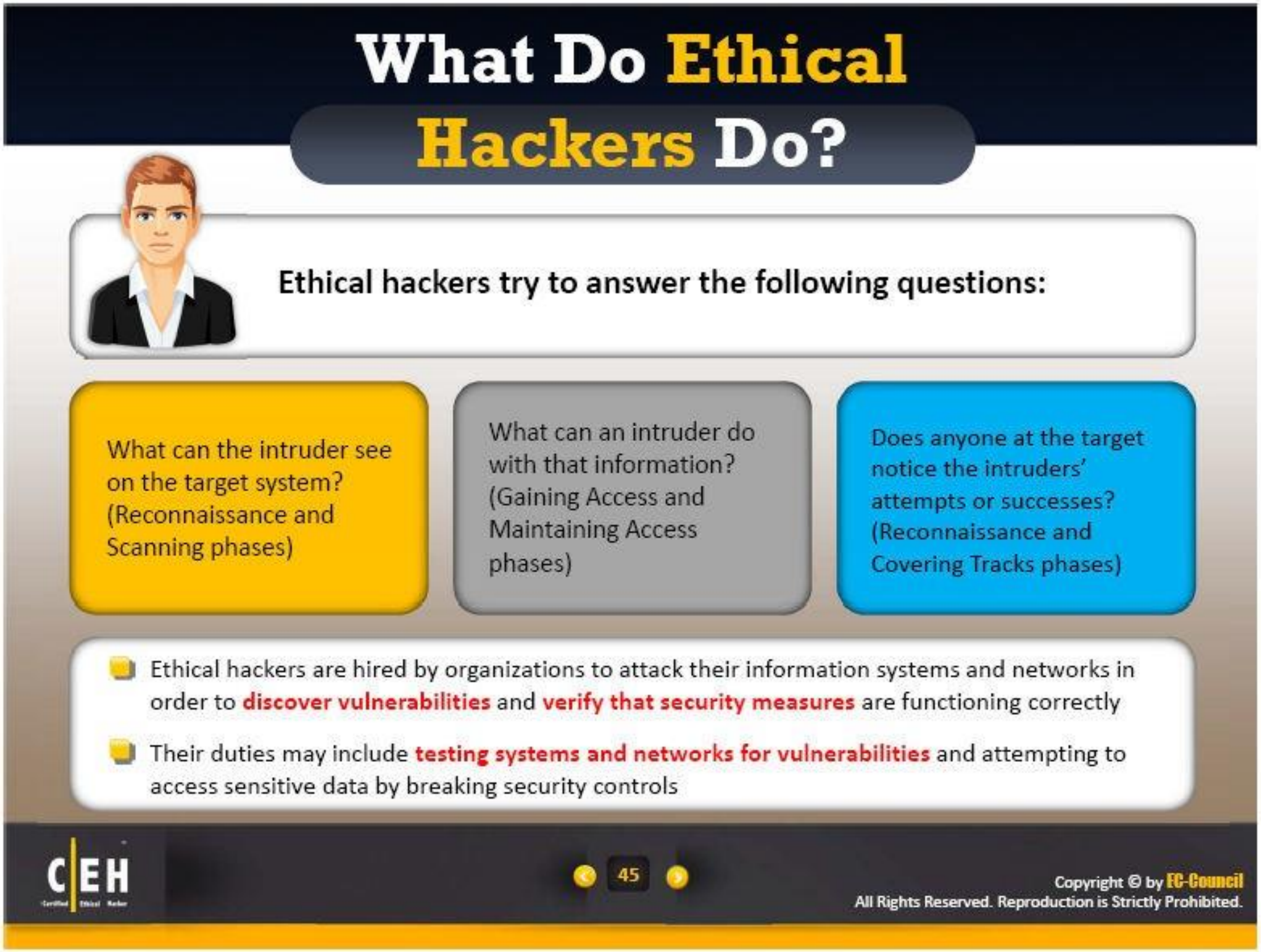
It is used to **identify risks** and highlight the **remedial actions**, and also reduces information and communications technology (ICT) costs by resolving those vulnerabilities

✗ Limitations

However, unless the businesses first know what it is at that they are looking for and why they are **hiring an outside vendor to hack systems** in the first place, chances are there would not be much to gain from the experience

✗ Limitations

An ethical hacker thus can only help the organization to better **understand their security system**, but it is up to the organization to **place the right guards** on the network



What Do Ethical Hackers Do?

Ethical hackers try to answer the following questions:

- What can the intruder see on the target system? (Reconnaissance and Scanning phases)
- What can an intruder do with that information? (Gaining Access and Maintaining Access phases)
- Does anyone at the target notice the intruders' attempts or successes? (Reconnaissance and Covering Tracks phases)

- Ethical hackers are hired by organizations to attack their information systems and networks in order to **discover vulnerabilities** and **verify that security measures** are functioning correctly
- Their duties may include **testing systems and networks for vulnerabilities** and attempting to access sensitive data by breaking security controls

Skills of an Ethical Hacker

Platform Knowledge

Has in-depth knowledge of target platforms, such as Windows, Unix, and Linux

Network Knowledge

Has exemplary knowledge of networking and related hardware and software

Computer Expert

Should be a computer expert adept at technical domains

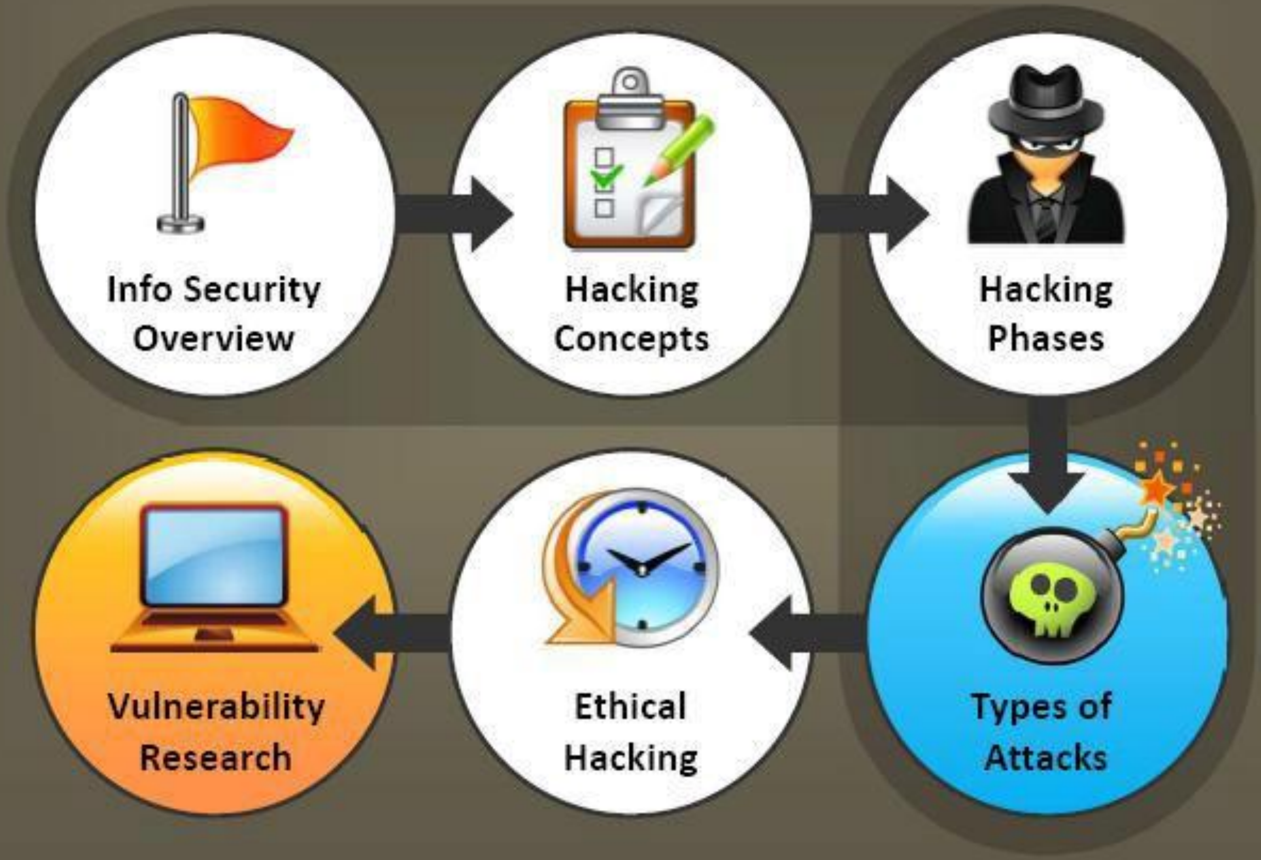
Security Knowledge

Has knowledge of security areas and related issues

Technical knowledge

Has "high technical" knowledge to launch the sophisticated attacks

Module **Flow**



Info Security Overview

Hacking Concepts

Hacking Phases

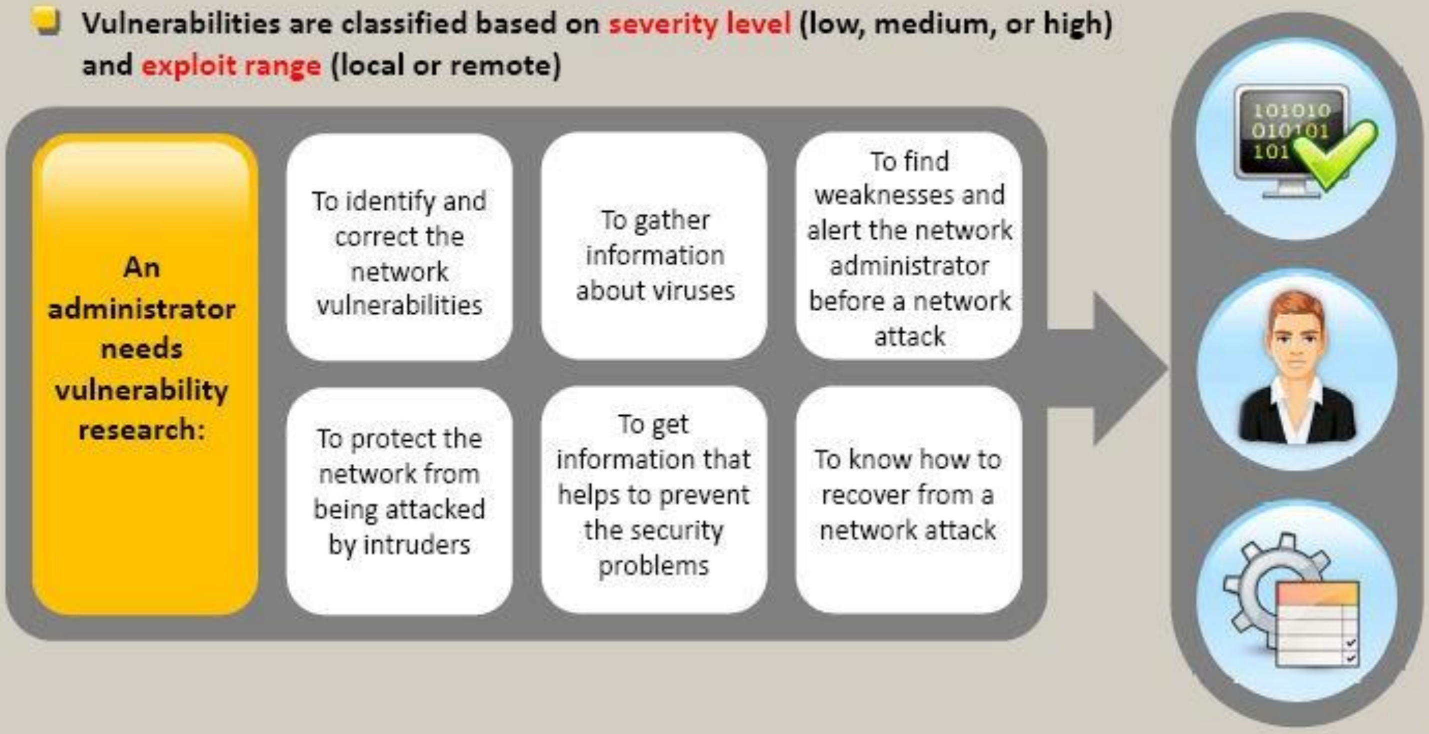
Types of Attacks

Ethical Hacking

Vulnerability Research

Vulnerability Research

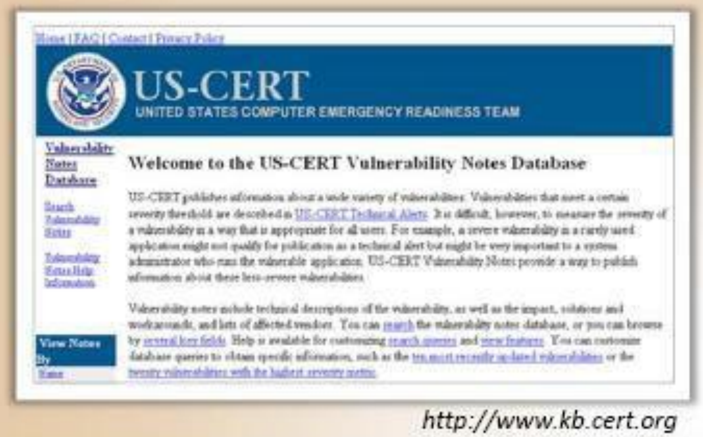
- The process of discovering vulnerabilities and design flaws that will open an operating system and its applications to attack or misuse
- Vulnerabilities are classified based on severity level (low, medium, or high) and exploit range (local or remote)



An administrator needs vulnerability research:

- To identify and correct the network vulnerabilities
- To gather information about viruses
- To find weaknesses and alert the network administrator before a network attack
- To protect the network from being attacked by intruders
- To get information that helps to prevent the security problems
- To know how to recover from a network attack

Vulnerability Research Websites


Home | FAQ | Contact | Privacy Policy
US-CERT
UNITED STATES COMPUTER EMERGENCY READINESS TEAM
Vulnerability Notes Database
Search Vulnerability Notes
Vulnerability Notes Help Information
View Notes By
Name

Welcome to the US-CERT Vulnerability Notes Database

US-CERT publishes information about a wide variety of vulnerabilities. Vulnerabilities that meet a certain severity threshold are described in US-CERT Technical Alerts. It is difficult, however, to measure the severity of a vulnerability in a way that is appropriate for all users. For example, a severe vulnerability in a rarely used application might not qualify for publication as a technical alert but might be very important to a system administrator who runs the vulnerable application. US-CERT Vulnerability Notes provide a way to publish information about these less-severe vulnerabilities.

Vulnerability notes include technical descriptions of the vulnerability, as well as the impact, solutions and workarounds, and lists of affected vendors. You can search the vulnerability notes database, or you can browse by several key fields. Help is available for customizing search queries and view features. You can customize database queries to obtain specific information, such as the ten most recently updated vulnerabilities or the twenty vulnerabilities with the highest severity metric.

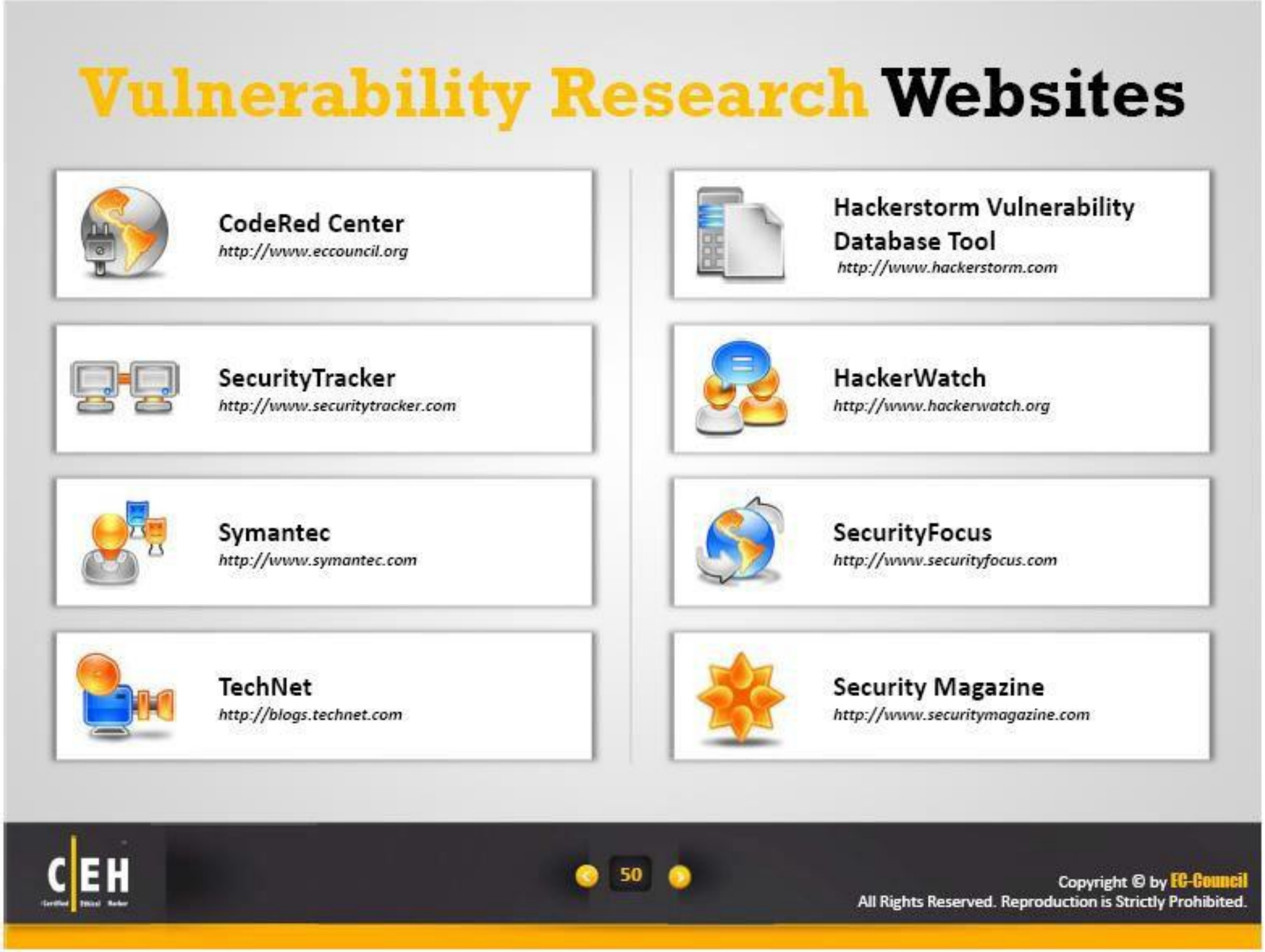
http://www.kb.cert.org

NIST
National Vulnerability Database
automating vulnerability management, security measurement, and compliance checking
Mission and Overview
Resource Status
Search Results (Refine Search)

http://nvd.nist.gov

http://www.secunia.com

http://www.securiteam.com



Vulnerability Research Websites

CodeRed Center
http://www.eccouncil.org

SecurityTracker
http://www.securitytracker.com

Symantec
http://www.symantec.com

TechNet
http://blogs.technet.com

Hackerstorm Vulnerability Database Tool
http://www.hackerstorm.com

HackerWatch
http://www.hackerwatch.org

SecurityFocus
http://www.securityfocus.com

Security Magazine
http://www.securitymagazine.com

Vulnerability Research Websites

SC Magazine
http://www.scmagazine.com

Computerworld
http://www.computerworld.com

Techworld
http://www.techworld.com

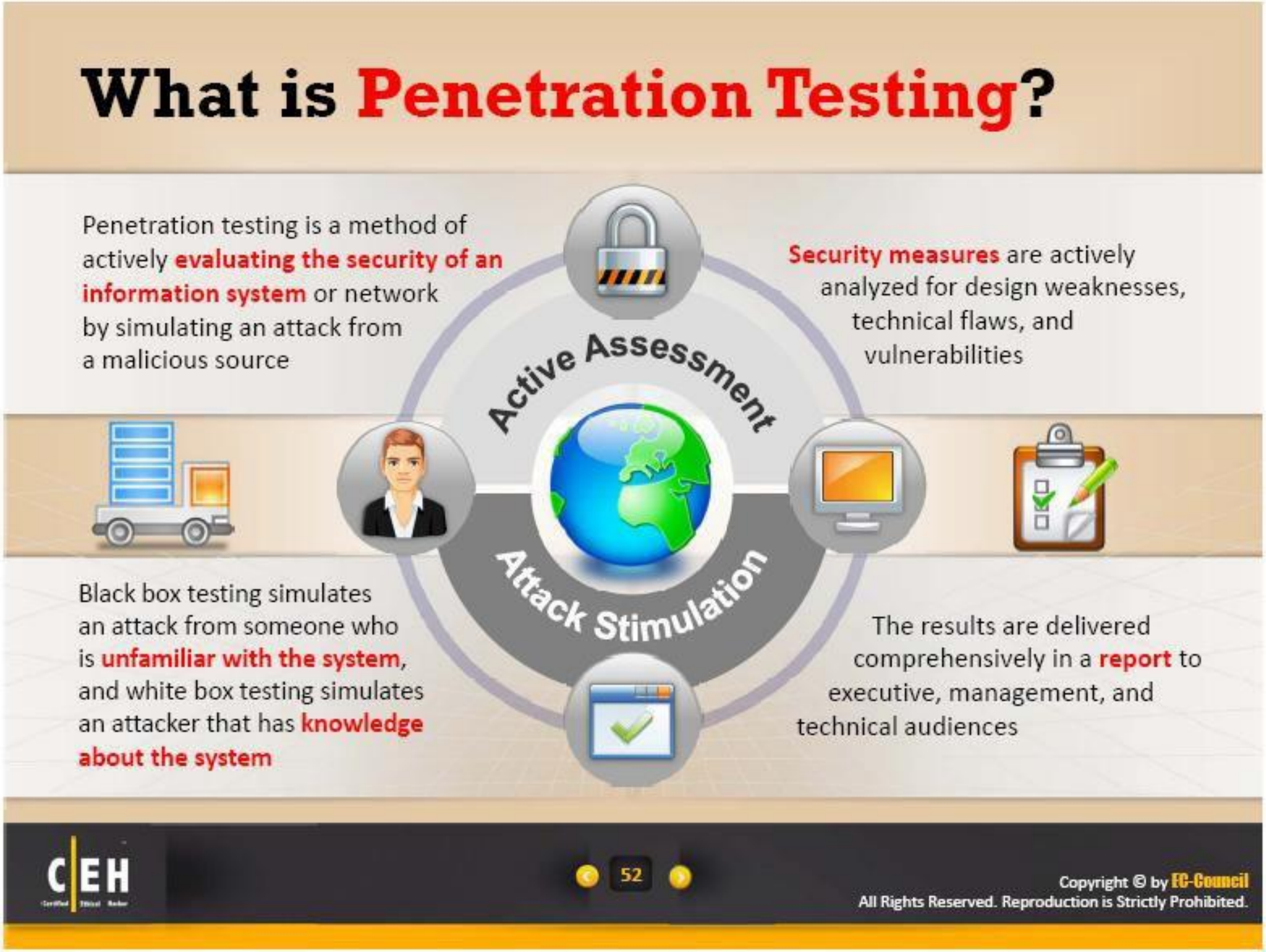
HackerJournals
http://www.hackerjournals.com

Help Net Security
http://www.net-security.org/

CNET Blogs
http://news.cnet.com

Security Watch
http://securitywatch.eweek.com

WindowsSecurity Blogs
http://blogs.windowsecurity.com



What is **Penetration Testing**?

Penetration testing is a method of actively **evaluating the security of an information system** or network by simulating an attack from a malicious source

Security measures are actively analyzed for design weaknesses, technical flaws, and vulnerabilities

Black box testing simulates an attack from someone who is **unfamiliar with the system**, and white box testing simulates an attacker that has **knowledge about the system**

The results are delivered comprehensively in a **report** to executive, management, and technical audiences

Why Penetration Testing?

Identify the threats facing an organization's information assets

Reduce an organization's IT security costs and provide a better return on security investment (ROSI) by identifying and resolving vulnerabilities and weaknesses

Provide an organization with assurance - a thorough and comprehensive assessment of organizational security covering policy, procedure, design, and implementation

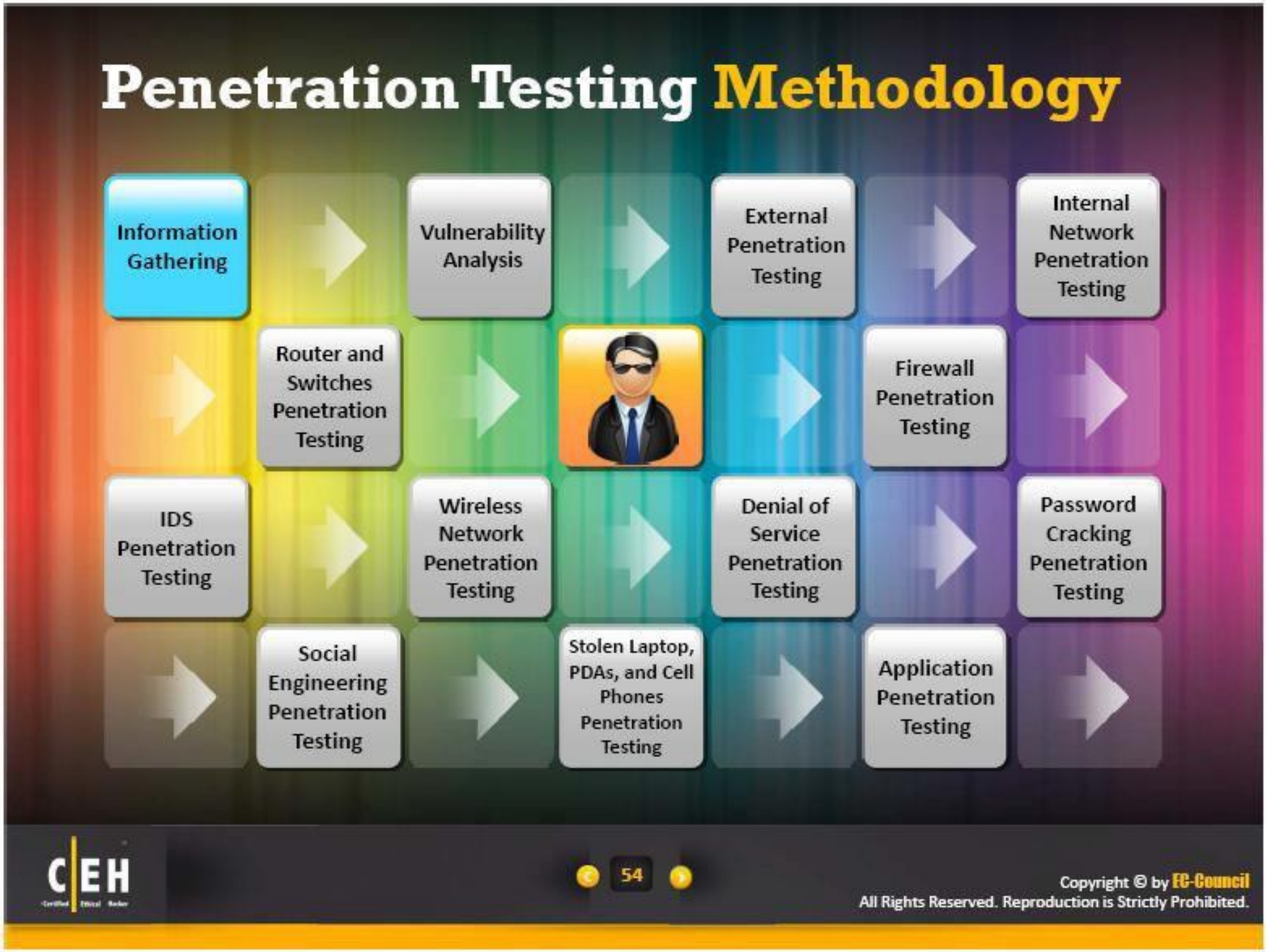
Gain and maintain certification to an industry regulation (BS7799, HIPAA etc.)

Adopt best practices by conforming to legal and industry regulations

Focus on high severity vulnerabilities and emphasize application-level security issues to development teams and management

Provide a comprehensive approach of preparation steps that can be taken to prevent upcoming exploitation

Evaluate the efficiency of network security devices such as firewalls, routers, and web servers



Penetration Testing Methodology

Information Gathering

Vulnerability Analysis

External Penetration Testing

Internal Network Penetration Testing

Router and Switches Penetration Testing

Firewall Penetration Testing

IDS Penetration Testing

Wireless Network Penetration Testing

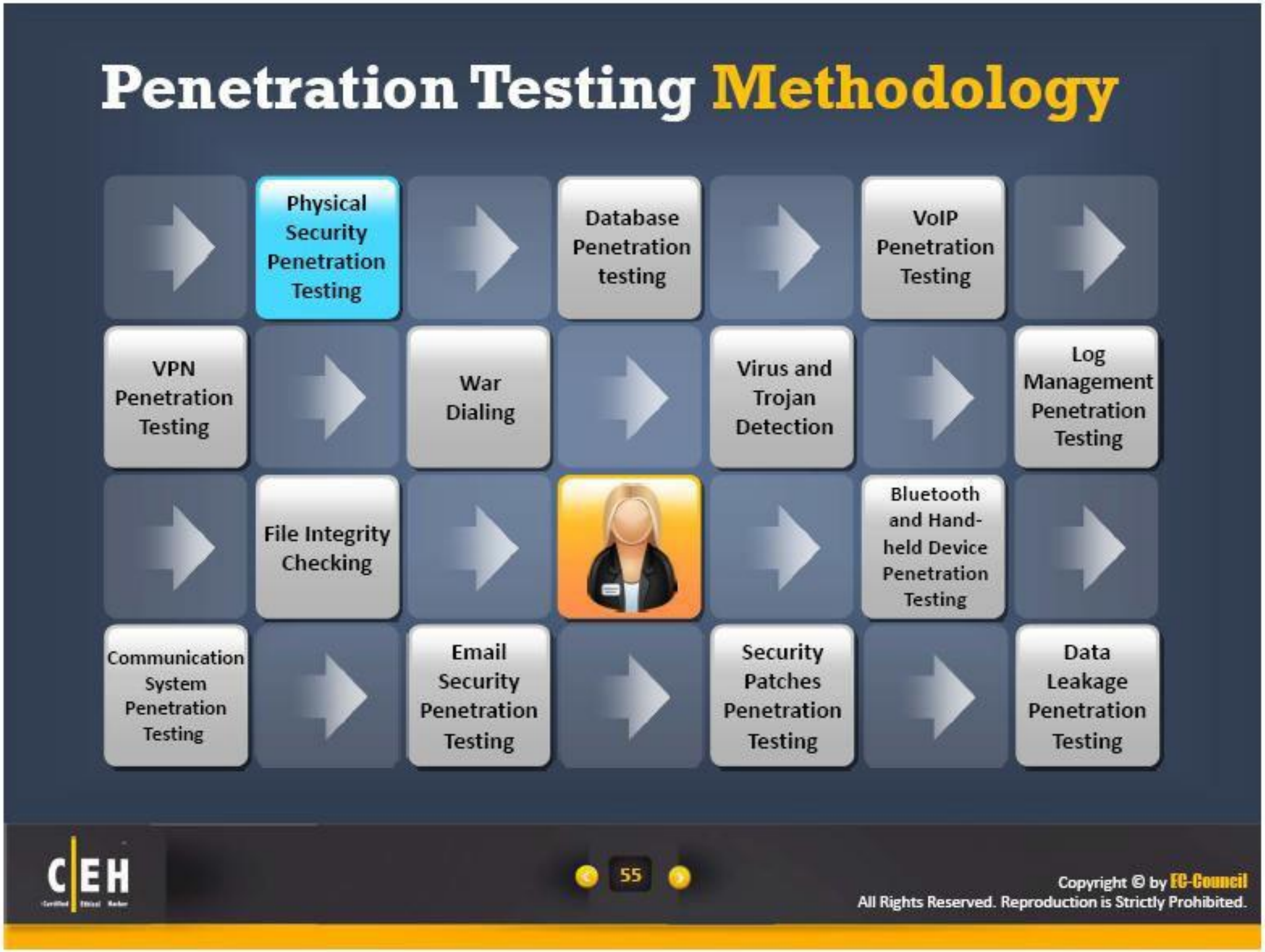
Denial of Service Penetration Testing

Password Cracking Penetration Testing

Social Engineering Penetration Testing

Stolen Laptop, PDAs, and Cell Phones Penetration Testing

Application Penetration Testing



Penetration Testing Methodology

Physical Security Penetration Testing

Database Penetration testing

VoIP Penetration Testing

VPN Penetration Testing

War Dialing

Virus and Trojan Detection

Log Management Penetration Testing

File Integrity Checking

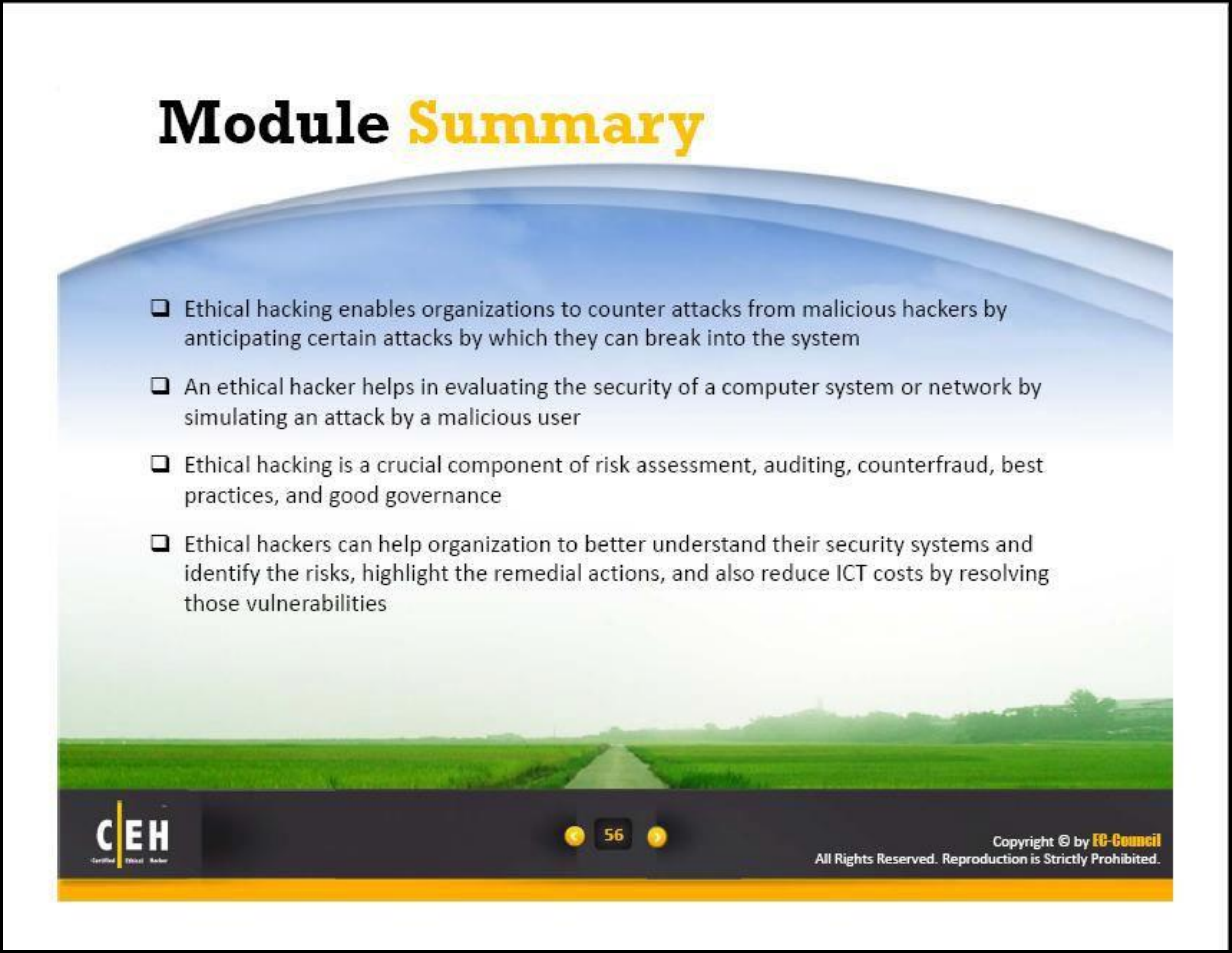
Bluetooth and Hand-held Device Penetration Testing

Communication System Penetration Testing

Email Security Penetration Testing

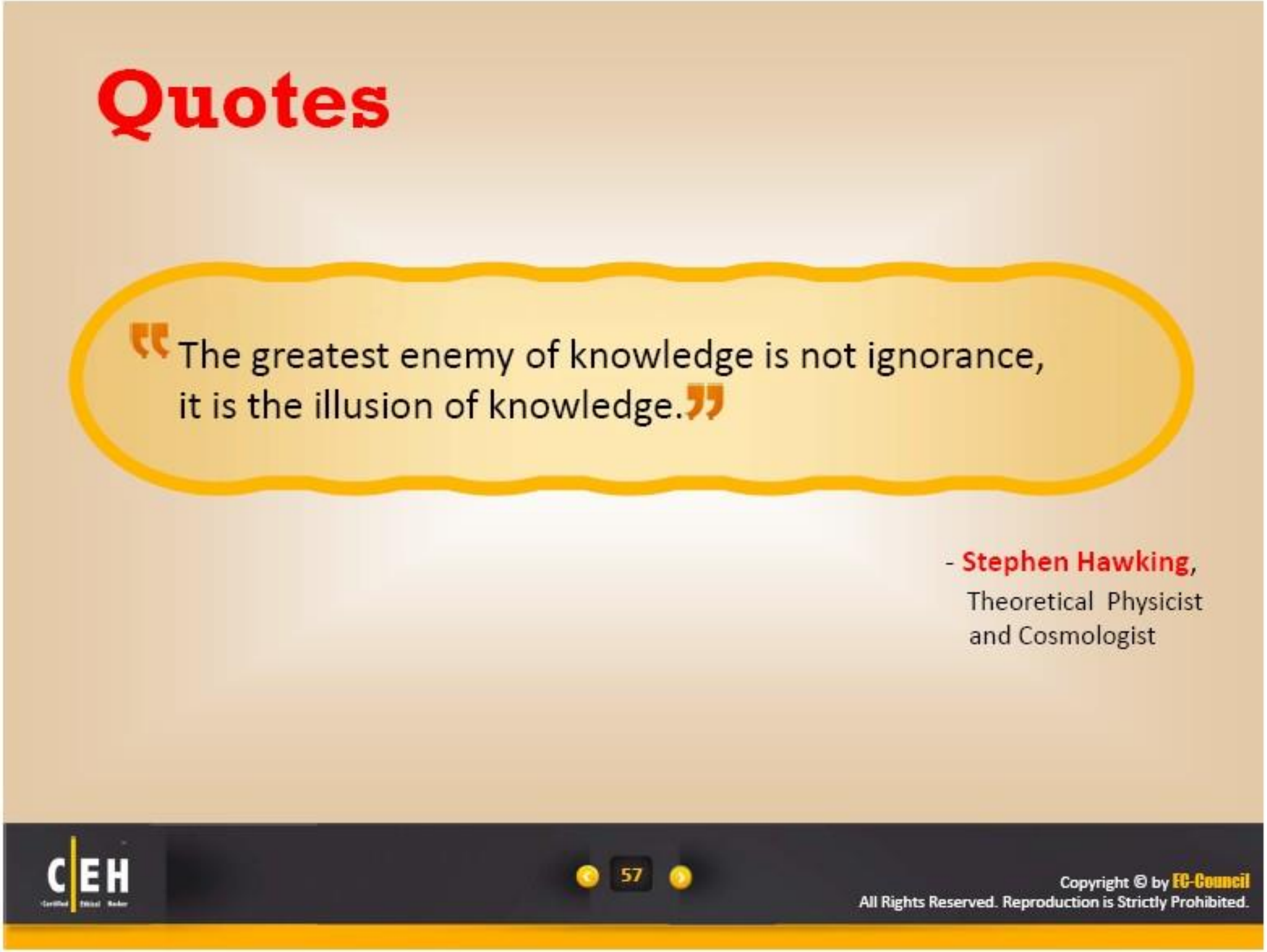
Security Patches Penetration Testing

Data Leakage Penetration Testing



Module Summary

- ❑ Ethical hacking enables organizations to counter attacks from malicious hackers by anticipating certain attacks by which they can break into the system
- ❑ An ethical hacker helps in evaluating the security of a computer system or network by simulating an attack by a malicious user
- ❑ Ethical hacking is a crucial component of risk assessment, auditing, counterfraud, best practices, and good governance
- ❑ Ethical hackers can help organization to better understand their security systems and identify the risks, highlight the remedial actions, and also reduce ICT costs by resolving those vulnerabilities



Quotes

> “The greatest enemy of knowledge is not ignorance, it is the illusion of knowledge.”

- **Stephen Hawking**,
Theoretical Physicist
and Cosmologist