

**COMPUTER SYSTEM &
PLATFORM TECHNOLOGY**

ANALYTICS

COMPUTER SYSTEM & PLATFORM TECHNOLOGY

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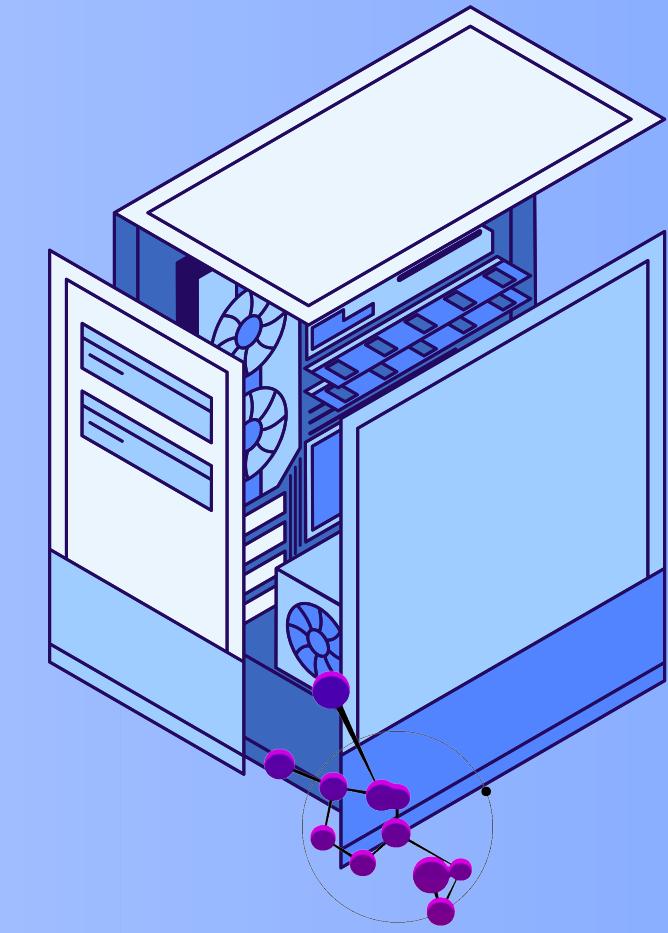
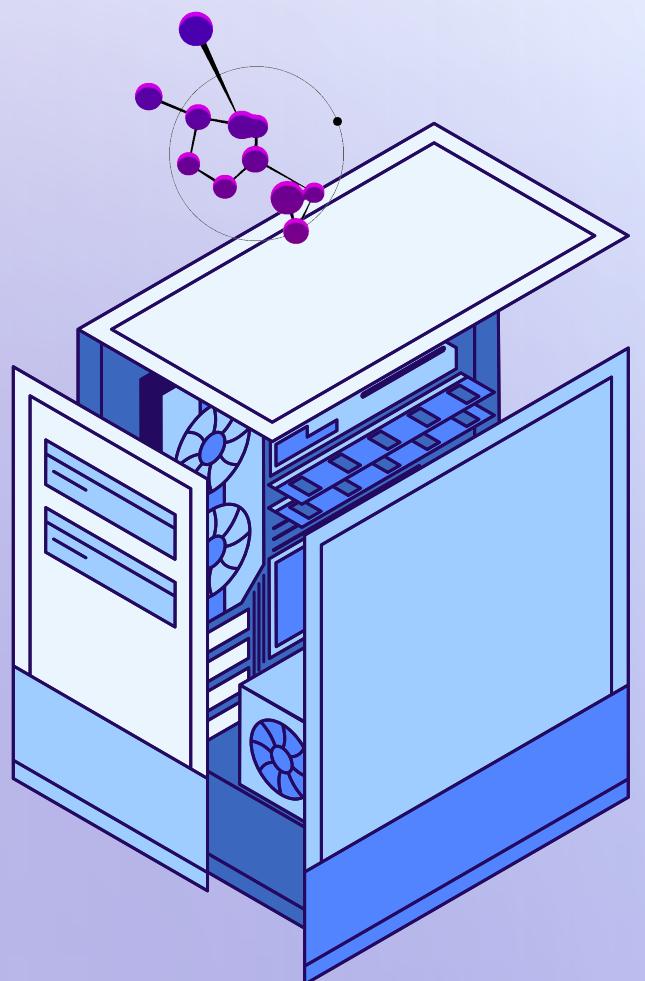
OBJECTIVES:

- Understand the Fundamentals of Computer System Analysis
- Identify the Different Types of Analytics
- Recognize the Key Components of a Computer System to Analyze
- Evaluate System Performance Using Metrics and Tools
- Assess Security and Risk Factors in Computer Systems
- Analyze the Cost and Efficiency of Computer Systems
- Explore Future Trends in System Analysis

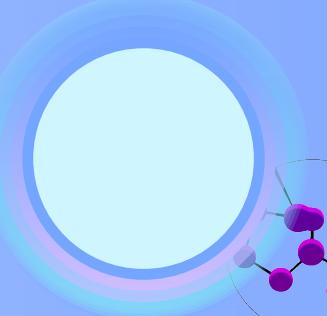
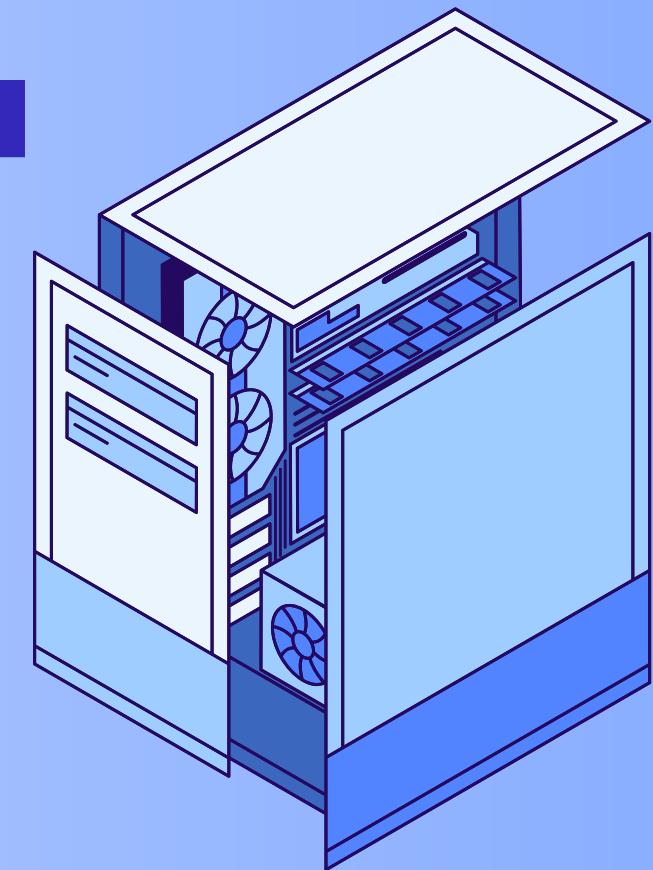
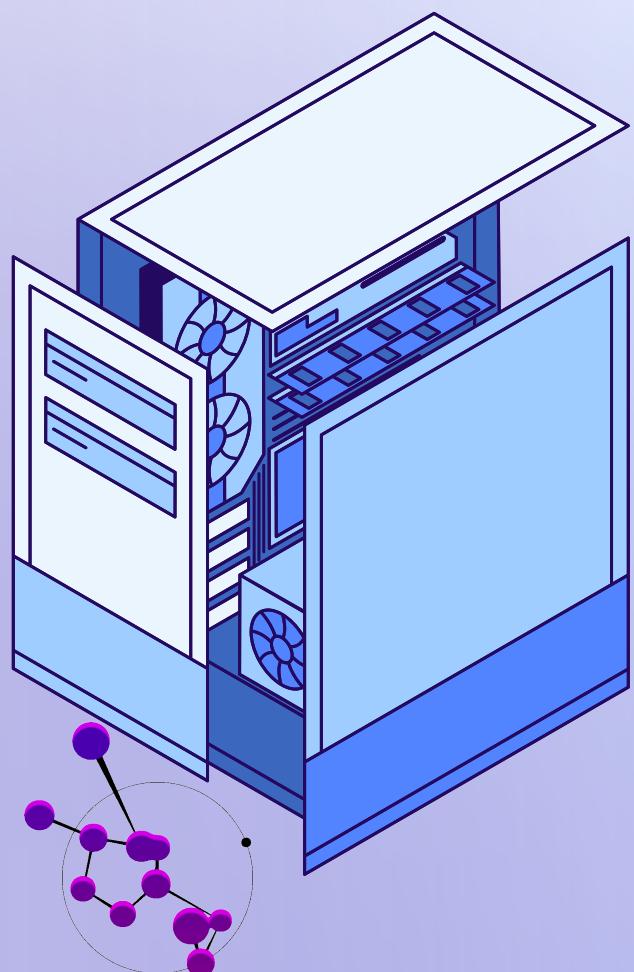


INTRODUCTION TO COMPUTER SYSTEM ANALYSIS

Computer System Analysis is the process of evaluating the components, performance, and overall efficiency of a computer system. This includes examining both hardware (CPU, RAM, storage, etc.) and software (operating system, applications, network settings) to ensure optimal functionality.



WHY ANALYZE COMPUTER SYSTEM?



- **Performance optimization:** By learning to analyze computer systems, you can identify bottlenecks and inefficiencies, allowing you to make targeted improvements that boost overall performance.
- **Troubleshooting:** When issues arise, the ability to analyze computer systems provides valuable insights into the root causes, enabling faster and more effective problem resolution.
- **Capacity planning:** Understanding how to analyze computer systems helps predict future needs, allowing you to plan for upgrades or expansions before resources become strained.
- **Security monitoring:** Regular efforts to analyze computer systems can reveal potential vulnerabilities or unusual activities that might indicate a security breach.
- **Resource allocation:** By knowing how to analyze computer systems, you can make informed decisions about where to allocate computing power, storage, and other resources for maximum efficiency.

KEY COMPONENTS OF COMPUTER SYSTEM

TO ANALYZE

Hardware Analysis

Hardware Analysis

1. CPU Performance

- The Central Processing Unit (CPU) executes instructions and determines system speed.
- Key Factors to Analyze:
 - Clock Speed (GHz): Higher speed = faster processing.
 - Core & Thread Count: More cores improve multitasking and performance.
 - CPU Utilization (%): High usage may indicate overload.
 - Thermal Performance: Overheating can slow down or damage the CPU.

Hardware Analysis

2. Memory Usage (RAM)

- Random Access Memory (RAM) temporarily stores active program data.
- Key Metrics to Monitor:
 - Total RAM Installed: Determines system capacity for multitasking.
 - Usage Percentage: Consistently high usage may require an upgrade.
 - Swap Memory Usage: Excessive swap usage indicates RAM shortage.

Hardware Analysis

3. Storage Capacity and Speed

- Hard Drives (HDDs) vs. Solid State Drives (SSDs): SSDs are faster, more reliable, and use less power.
- Factors to Analyze:
 - Total Storage & Available Space: Low free space can slow down the system.
 - Read/Write Speed: Faster speeds improve file access and load times.
 - Health Status: Tools like CrystalDiskInfo check disk health.

Hardware Analysis

4. Graphics Processing Capabilities (GPU)

- Graphics Processing Unit (GPU) handles visual and AI-based computing tasks.
- Key Metrics:
 - VRAM (Video Memory): Higher VRAM improves graphical performance.
 - Clock Speed (MHz): Determines processing power.
 - Temperature & Utilization: Overheating can lead to performance drops.

Software Analysis

Software Analysis

1. Operating System Health

- Ensure the OS runs efficiently without unnecessary background processes.
- Check for system errors, crashes, and resource-hungry services.

2. Application Performance

- Identify slow or unresponsive applications that may consume excessive CPU/RAM.
- Monitor resource usage of each application.

Software Analysis

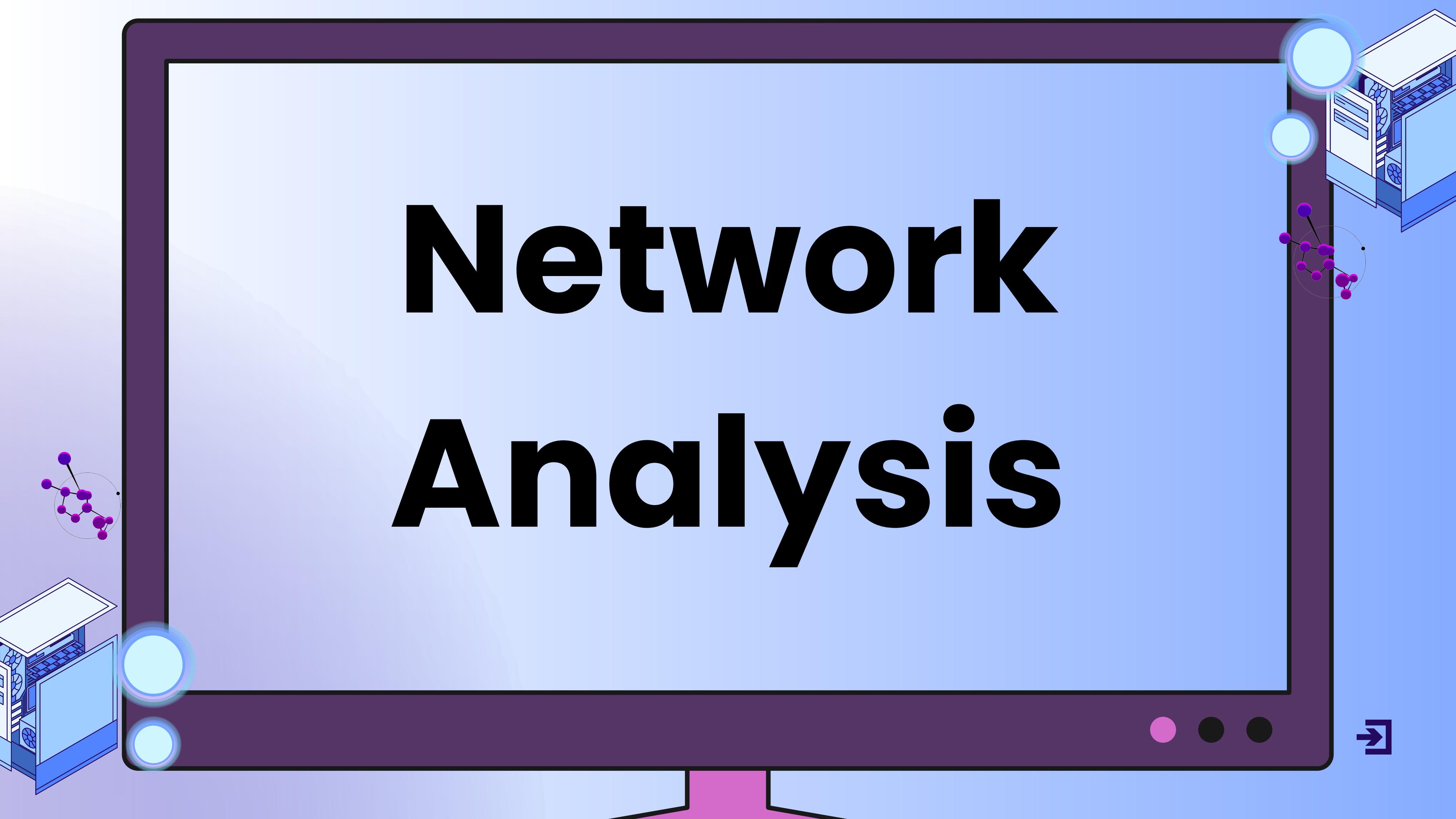
3. Software Conflicts

- Incompatible or corrupted software can cause system crashes.
- Check error logs and system diagnostics to detect conflicts.

4. Update and Patch Status

- Outdated software is a security risk and may cause performance issues.
- Ensure applications and the OS have the latest updates and security patches.

Network Analysis



Network Analysis

1. Bandwidth Utilization

- Measure network speed and data consumption.
- Identify which applications or devices are consuming the most bandwidth.

2. Latency Issues

- High latency leads to slow connections and lag in online activities.
- Ping tests and traceroute can help locate latency bottlenecks.

Network Analysis

3. Packet Loss

- Lost data packets indicate unstable connections and potential network issues.
- High packet loss may be caused by hardware failure or congestion.

4. Network Security

- Check for unauthorized devices on the network.
- Scan for potential vulnerabilities, open ports, and firewall misconfigurations.



PERFORMANCE METRICS AND TOOLS FOR ANALYSIS



What is Analytics

- What is Analytics? Analytics is the process of collecting, processing, and analyzing data to gain insights and make informed decisions. In computer systems, analytics helps track performance, identify issues, and improve efficiency. Importance of Analytics in Computing Helps in monitoring system performance (CPU, RAM, storage, network) Detects errors, crashes, and bottlenecks that slow down operations Aids in predicting future system needs

Types of analytics

Types of Analytics Analytics is generally categorized into four main types, each serving a different purpose in analyzing data:

- 1. Descriptive Analytics** (What happened?) Focuses on summarizing past data to understand trends and patterns. Example: Checking system logs to see CPU usage over the past week. Tools: Task Manager, Activity Monitor, system logs.
- 2. Diagnostic Analytics** (Why did it happen?) Identifies the root cause of problems by analyzing patterns and anomalies. Example: Investigating why a computer is running slow by checking for high memory usage or software conflicts. Tools: Event Viewer (Windows), Performance Monitor, debugging tools.
- 3. Predictive Analytics** (What might happen in the future?) Uses historical data and AI to forecast potential issues or trends. Example: Predicting when a hard drive will fail based on disk health reports. Tools: Machine learning models, AI-based monitoring (e.g., predictive maintenance software).
- 4. Prescriptive Analytics** (What should be done?) Provides recommendations on how to fix or optimize a system based on analyzed data. Example: Suggesting system upgrades or adjustments to improve performance and prevent failures. Tools: AI-driven optimizers, automated system tuning software.

SECURITY AND RISK ANALYSIS

A. Identifying System Vulnerabilities

- Common Security Threats
- Importance of System Patches and Updates

B. Security Analysis Tools

- Antivirus and Endpoint Protection Software
- Log Monitoring
- Network Security Scanning

A. Identifying System Vulnerabilities

Common Security Threats

- Common security threats, such as malware, unauthorized access, and data breaches, pose significant risks to systems. Malware, including viruses, worms, and ransomware, can compromise systems through various channels, causing data loss or system disruptions. Unauthorized access often results from weak passwords or phishing, allowing attackers to steal or manipulate data. Data breaches occur when sensitive information is accessed or disclosed without authorization, leading to loss of trust and financial consequences.



A. Identifying System Vulnerabilities

Importance of System Patches and Updates

- To mitigate these risks, regular system patches and updates are crucial as they fix vulnerabilities, enhance system performance, and ensure compliance with security standards. Neglecting updates can leave systems vulnerable to known threats and increase the likelihood of cyberattacks.financial consequences.

B. Security Analysis Tools

Antivirus and Endpoint Protection Software

- Antivirus software detects and removes malware from devices, while endpoint protection offers more comprehensive security by monitoring and responding to threats in real time across all devices connected to a network. It includes additional features like firewalls, intrusion detection, and advanced techniques such as behavior analysis and machine learning to protect against emerging malware threats.

B. Security Analysis Tools

Log Monitoring

- Security Information and Event Management (SIEM) tools like Splunk aggregate and analyze logs from various sources to detect suspicious activities and potential threats in real time. These platforms enable security teams to quickly identify and respond to security incidents, making them crucial for monitoring and securing complex IT environments.

B. Security Analysis Tools

Network Security Scanning

- Nmap is a network scanning tool that helps administrators discover hosts and services on a network, identifying vulnerable open ports. Nessus, a vulnerability scanning tool, checks for known vulnerabilities and misconfigurations in systems, allowing organizations to address potential security risks before they can be exploited by attackers.

COST AND EFFICIENCY ANALYSIS

A. Evaluating System Costs

- Upgrading Hardware vs. Maintaining Old Systems
- Cost-Benefit Analysis of Cloud vs. On-Premises Solutions

B. Energy Efficiency in Computing

- Power Consumption of Components
- Sustainable Computing Practices

A. EVALUATING SYSTEM COSTS

- **Upgrading Hardware vs. Maintaining Old Systems**

- Upgrading hardware involves replacing outdated components with newer, more efficient models to improve system performance and longevity. This can reduce downtime and enhance overall productivity but comes with upfront costs for new equipment and installation. On the other hand, maintaining old systems may be cheaper initially but can lead to inefficiencies, higher maintenance costs, and security vulnerabilities due to outdated components, making it less suitable for supporting modern applications.

- **Cost-Benefit Analysis of Cloud vs. On-Premises Solutions**

- Cloud solutions offer flexibility and scalability, with businesses paying only for what they use while outsourcing hardware, security, and maintenance to the provider. However, ongoing subscription fees and data privacy concerns can be drawbacks. In contrast, on-premises solutions provide full control over data and security but involve higher upfront costs and ongoing expenses for maintenance, upgrades, and personnel, offering less flexibility compared to cloud services.

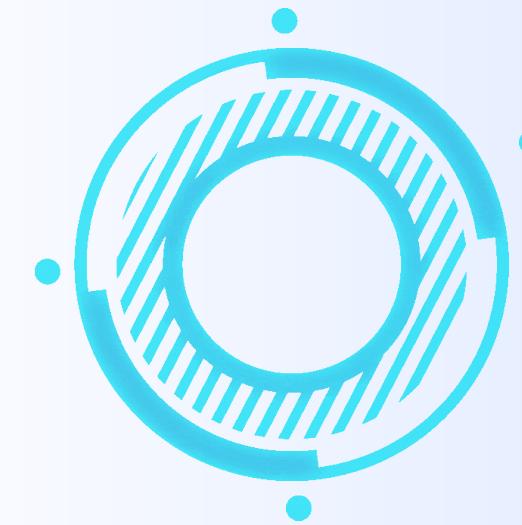
B. ENERGY EFFICIENCY IN COMPUTING

- **Power Consumption of Components**

- The power consumption of computing components, such as processors, storage devices, and network equipment, significantly impacts operational costs. These components consume energy based on their performance, cooling needs, and usage patterns. By opting for energy-efficient hardware, such as low-power processors and solid-state drives (SSDs), organizations can reduce their energy costs and support broader sustainability goals.

- **Sustainable Computing Practices**

- Sustainable computing practices focus on minimizing the environmental impact of IT operations. This includes adopting energy-efficient devices, virtualizing servers, and improving data center cooling to reduce energy use. Other practices, like recycling old hardware and reducing e-waste, also contribute to sustainability efforts. Many organizations are now prioritizing these strategies to lower their carbon footprint and fulfill corporate social responsibility objectives.



FUTURE TRENDS IN SYSTEM ANALYSIS



EMERGING TECHNOLOGIES & AUTOMATION

AI & Machine Learning

Predictive Maintenance:

- Description: Uses historical data to forecast and prevent potential system failures.
- Example: Splunk IT Service Intelligence employs machine learning to predict downtimes before they occur.

Anomaly Detection:

- Description: Automatically identifies unusual patterns in system performance that may indicate problems.
- Example: IBM Watson Analytics detects irregularities in performance metrics to alert administrators.

EMERGING TECHNOLOGIES & AUTOMATION

AI & Machine Learning

Self-Healing Systems:

- Description: Systems automatically resolve issues without human intervention, maintaining optimal performance.
- Example: Kubernetes restarts failed containers and scales resources automatically using its Horizontal Pod Autoscaler.

Automated Tuning:

- Description: Dynamically adjusts system parameters based on workload demands in real time.
- Example: Dynatrace's Davis engine fine-tunes settings to optimize resource allocation during peak usage.

CLOUD, EDGE, & IOT INTEGRATION

Cloud Computing:

- Description: Centralizes performance monitoring on scalable, cloud-based platforms for real-time insights.
- Example: AWS CloudWatch provides comprehensive monitoring for distributed applications hosted on the cloud.

Edge Computing:

- Description: Processes data locally to reduce latency and improve real-time decision-making.
- Example: Cisco's edge computing solutions process critical data at the source, ensuring faster responses.

IoT Integration:

- Description: Connects smart devices to continuously collect performance data across environments.
- Example: Siemens MindSphere uses IoT sensors in industrial equipment to monitor operational health and optimize performance.



ENHANCED SECURITY & BIG DATA ANALYTICS

Advanced Security Measures:

- Description: Leverages AI to monitor and detect threats in real time, ensuring data integrity and system safety.
- Example: Darktrace's Enterprise Immune System continuously scans network traffic to identify and respond to potential breaches.

Big Data & Real-Time Analytics:

- Description: Analyzes vast amounts of performance data to uncover trends and facilitate informed decision-making.
- Example: Apache Spark processes large datasets quickly, while Tableau and Power BI transform these insights into actionable dashboards.
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Data-Driven Optimization:

- Description: Uses real-time analytics to adjust system configurations dynamically, improving efficiency and reliability.
- Example: Integrated dashboards in Power BI enable IT teams to immediately address performance issues as they arise.



CONCLUSION

Summary:

- Future system analysis is evolving with technologies like AI, automation, cloud-edge integration, IoT, and big data analytics.
- These advancements lead to proactive maintenance, enhanced security, and real-time performance optimization.
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THANK YOU!