

# MULTIMODAL AI FOR NETWORK OPERATION CENTERS

B.Tech (AIDS - ME)  
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INTRODUCTION TO COMPUTER NETWORKS

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# Introduction

What is a NOC?

- Centralized command center for monitoring IT & network infrastructure
- Tracks performance, availability, security
- Ensures continuous uptime and reliability
- Operates 24/7 with dedicated network engineers

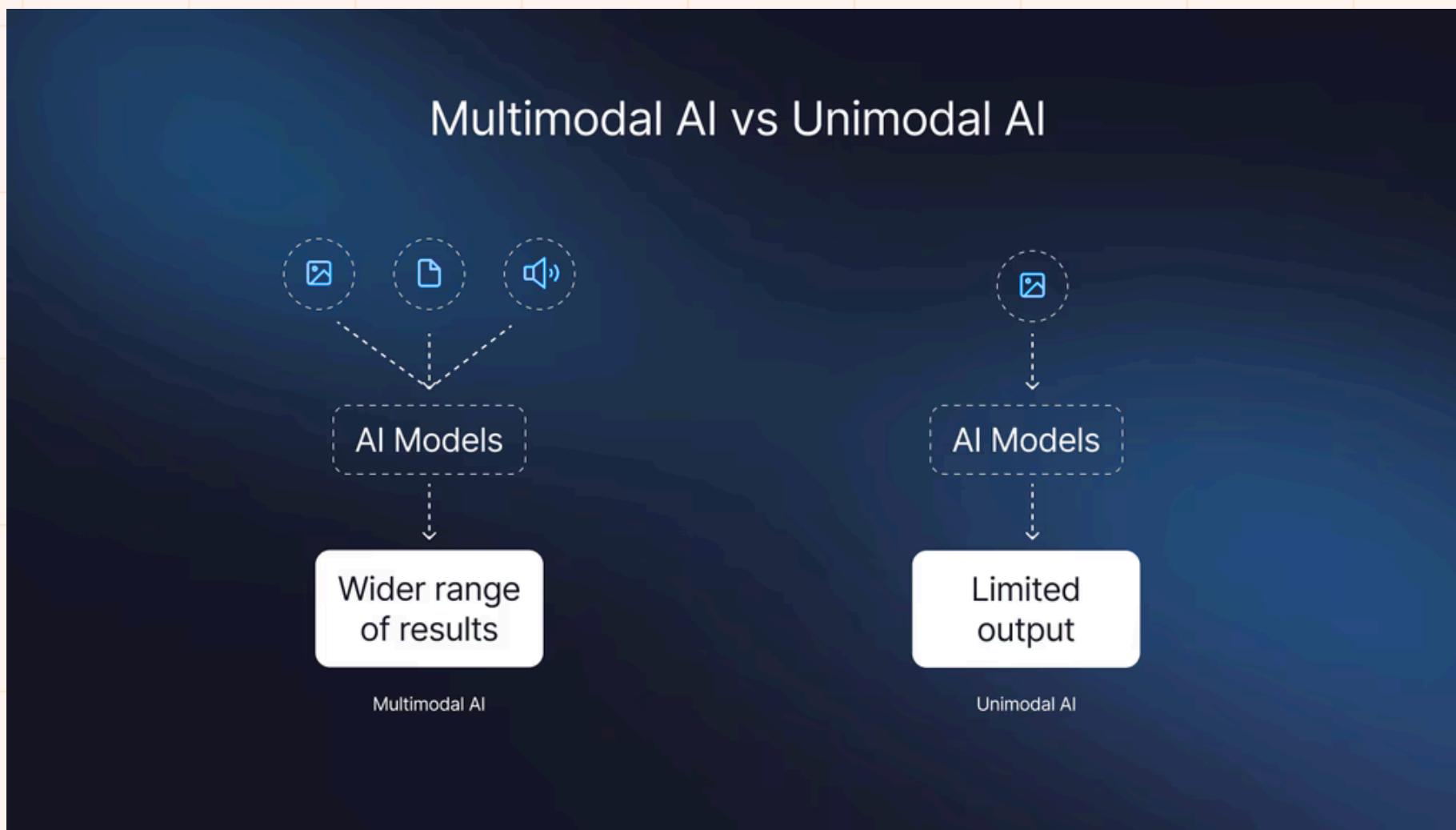
## Challenges in Traditional NOCs

- Alert overload causing fatigue
- Disconnected, fragmented tools
- Manual log and event correlation
- Slow root-cause analysis
- Heavy reliance on human expertise
- Delays increase downtime

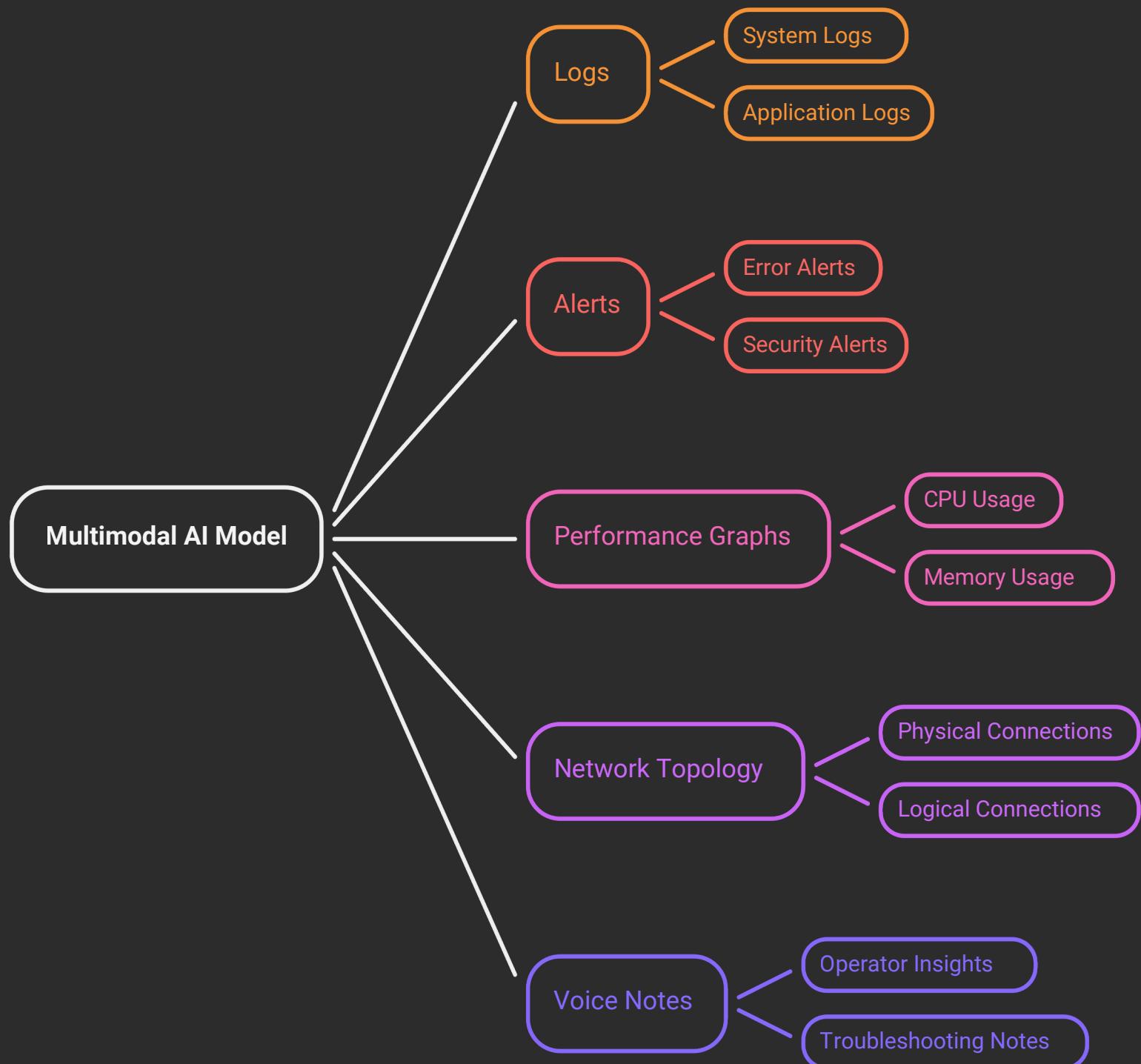


# What is Multimodal AI?

- AI that processes multiple data types together
- Inputs: logs (text), metrics (numeric), topology maps (visual), alerts (event streams), audio notes
- Learns cross-modal correlations
- Produces unified, context-rich insights



# Multimodal AI Model for System Analysis





# Why Multimodal AI is Needed in NOCs

- Network issues span multiple data sources simultaneously
- Text logs or graphs alone insufficient
- Multimodal fusion enables complete awareness
- Detects hidden patterns and dependencies

## How AI Helps NOC Teams

- Real-time anomaly detection
- Predictive alerts before failures
- AI log summarization & explanations
- Automatic incident classification
- Prioritizes critical tickets
- Context-aware diagnosis recommendations



# Benefits of Using Multimodal AI in NOCs

- Faster root-cause analysis and reduced downtime
- Handles incomplete or missing data effectively
- Filters noise to reduce false positives
- Prioritizes issues by business impact
- Enhances operator decision-making

## Impact on Network Operations

- More reliable network performance
- Smoother operations with fewer manual tasks
- Better SLA achievement
- Enhanced productivity of NOC teams
- Boosts overall network resilience

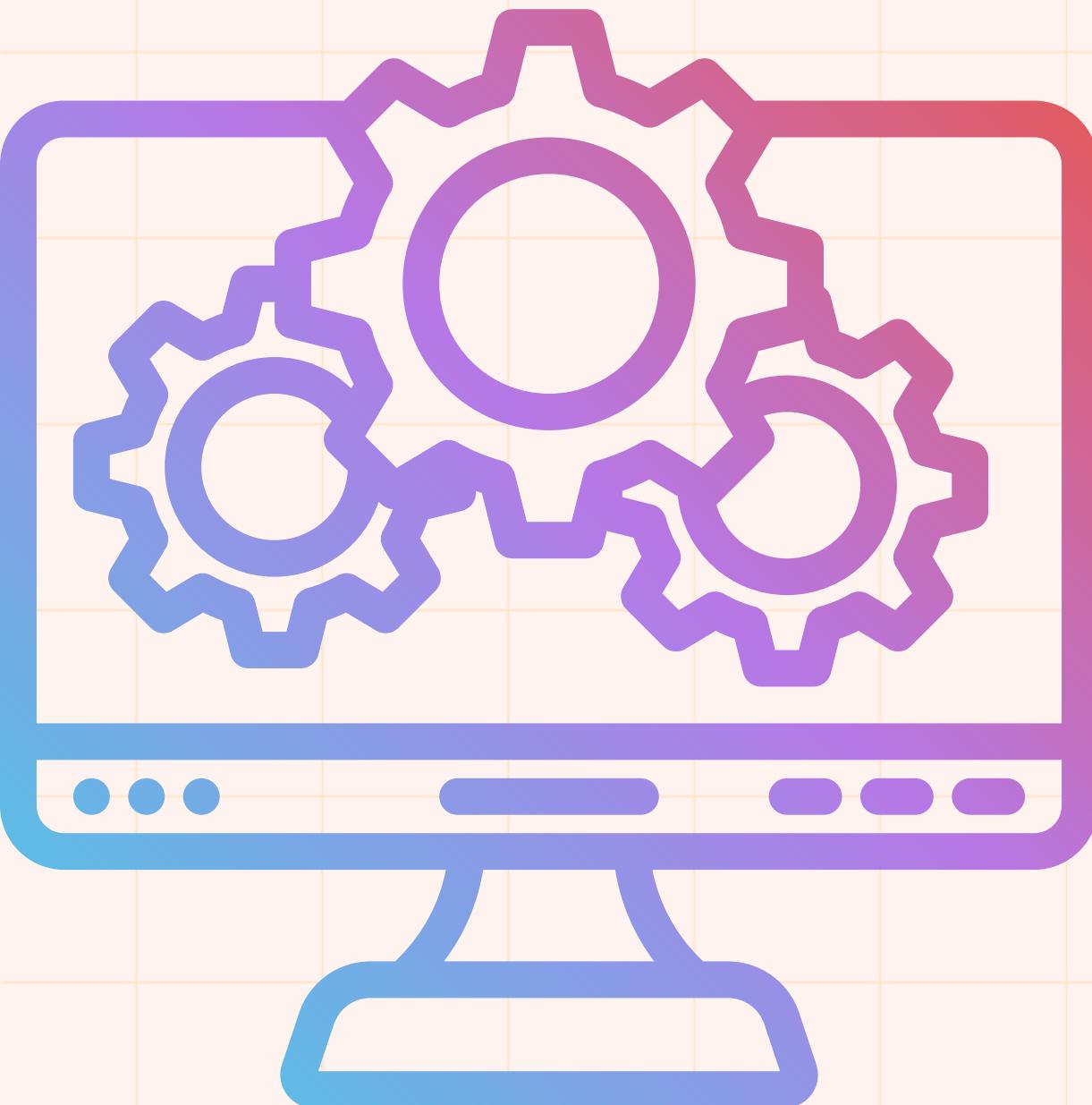


# Transformer-Based Multimodal Fusion

- Modern deep learning architecture
- Designed to handle multiple data types together
- Uses attention mechanisms to understand relationships
- Ideal for NOC environments with mixed inputs
- Scalable for large networks and real-time diagnosis



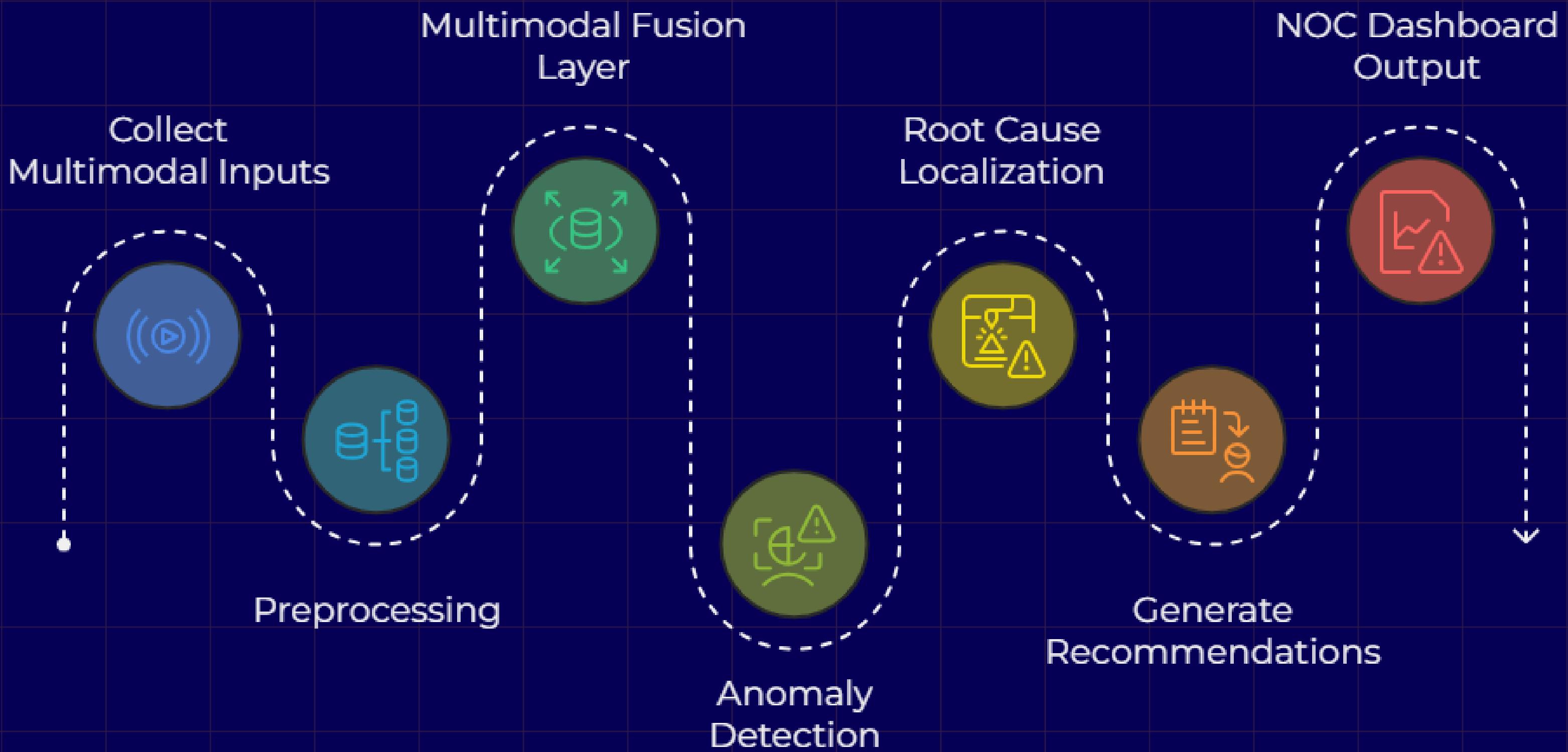
# Cloud Outage Prediction Using Multimodal AI



## Common Cloud Failure Issues

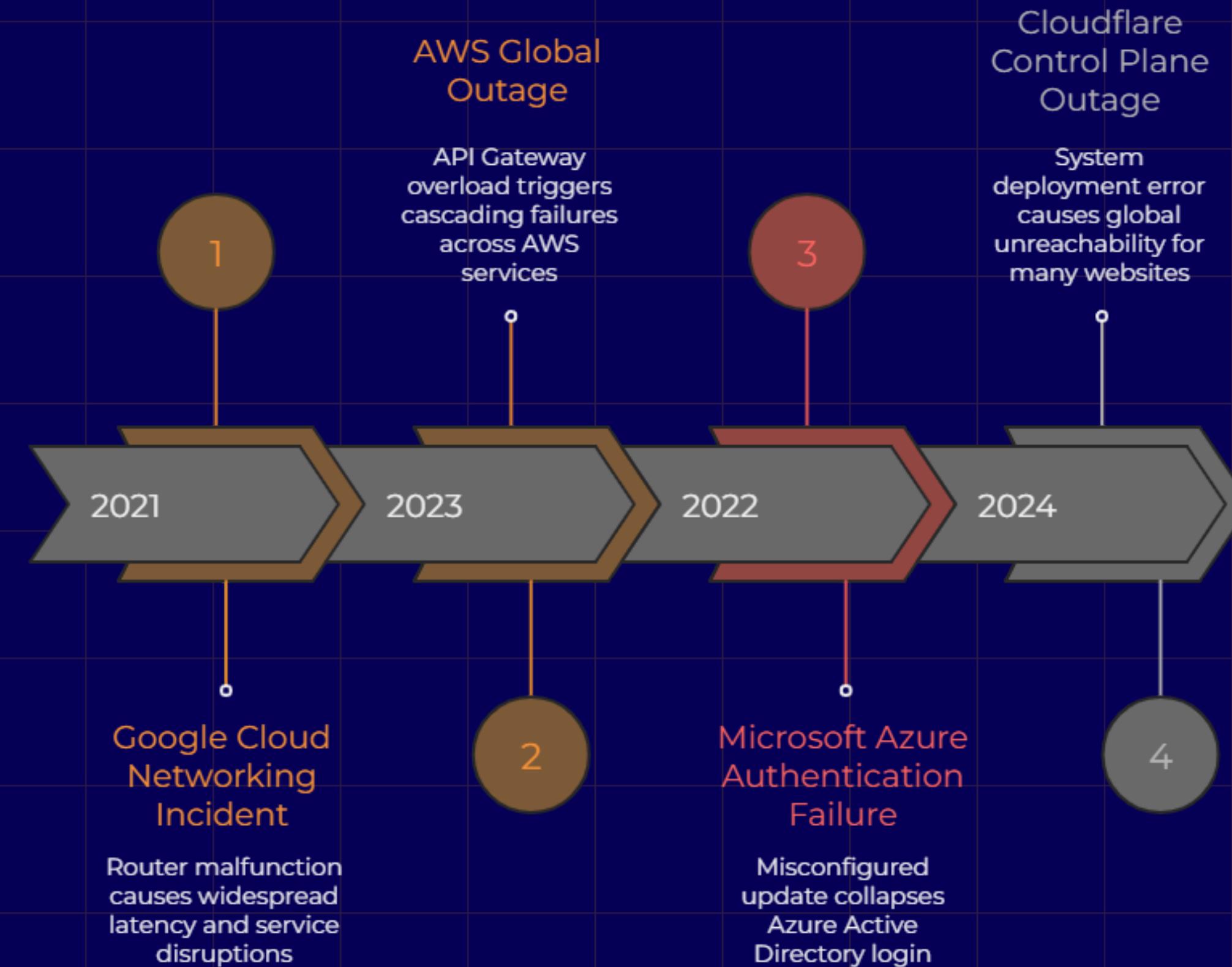
- Latency spikes due to network congestion
- VM instance crashes
- Storage read/write failures
- Cooling/temperature problems in data centers
- Load balancing misconfigurations
- API gateway throttling
- Multi-region sync failure
- Sudden traffic surge / DDoS-like events

# How Multimodal Transformer Models Solve This



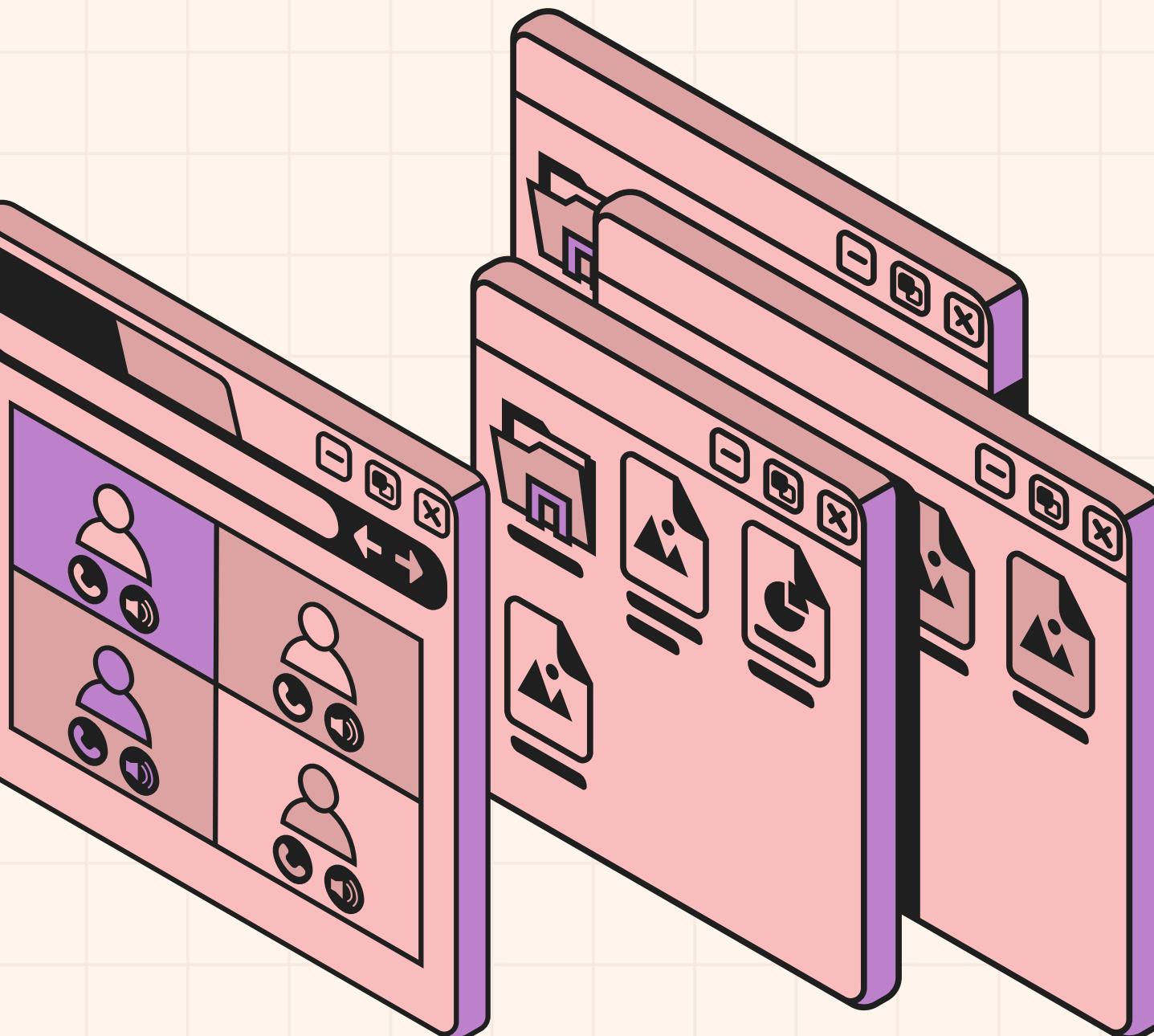
# REAL Recent Cloud Outage Incidents

These real-world incidents show that cloud outages continue to occur frequently, affecting millions of users. This makes AI-driven predictive diagnosis essential for modern Network Operations Centers



# BROAD APPLICATIONS OF MULTIMODAL AI IN NOCS

- Large-scale enterprise network monitoring
- Cloud & data center observability
- Predictive maintenance of routers & switches
- Automated incident detection
- SLA monitoring & compliance tracking
- Intelligent alert correlation
- Root cause analysis across network layers
- Real-time traffic anomaly detection



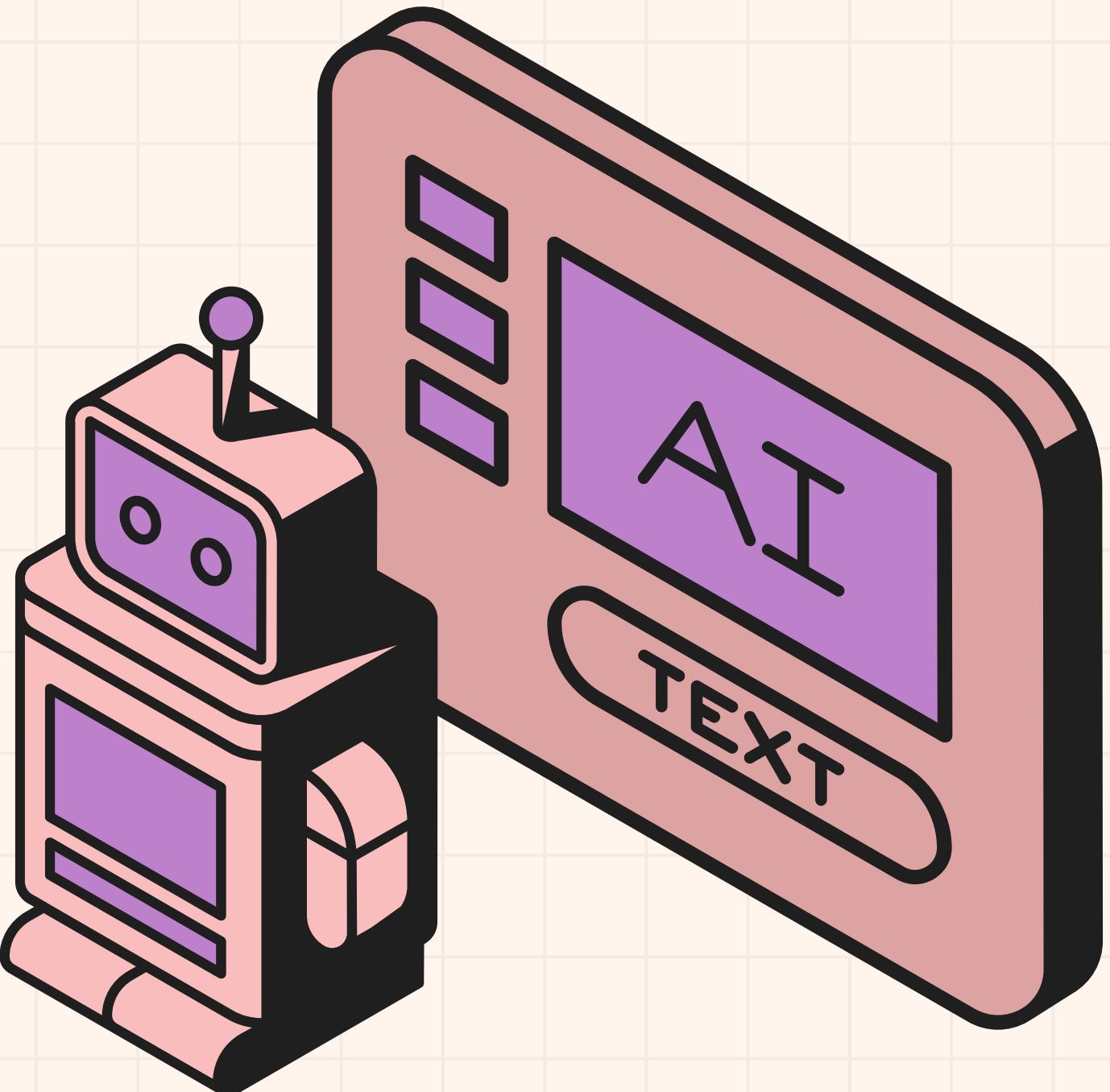
# REAL PRODUCTS, PLATFORMS

- Cisco ThousandEyes – AI-driven network visibility
- IBM Watson AIOps – Event correlation & diagnosis
- Juniper Mist AI – AI-powered network assurance
- Dynatrace Davis AI – Full-stack observability
- HPE Aruba AIOps – Predictive network insights
- Splunk Observability Cloud – Logs + metrics + traces
- ServiceNow AIOps – Automated incident management



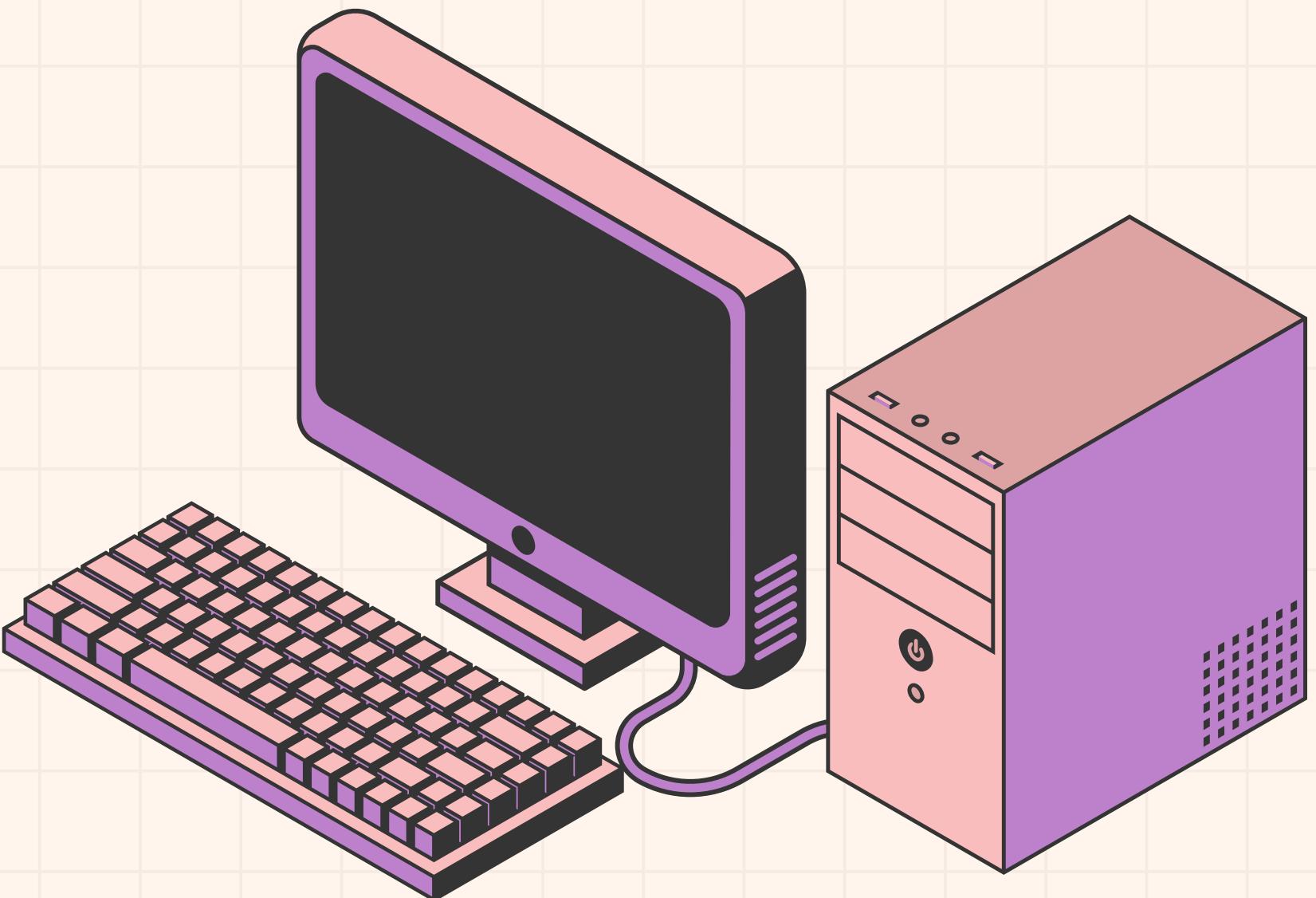
# HOW THESE PRODUCTS USE MULTIMODAL AI

- Combine logs, metrics, alerts & topology data
- Correlate events across devices
- Detect anomalies automatically
- Identify probable root causes
- Prioritize incidents by business impact
- Provide explainable alerts to operators
- Reduce manual NOC workload



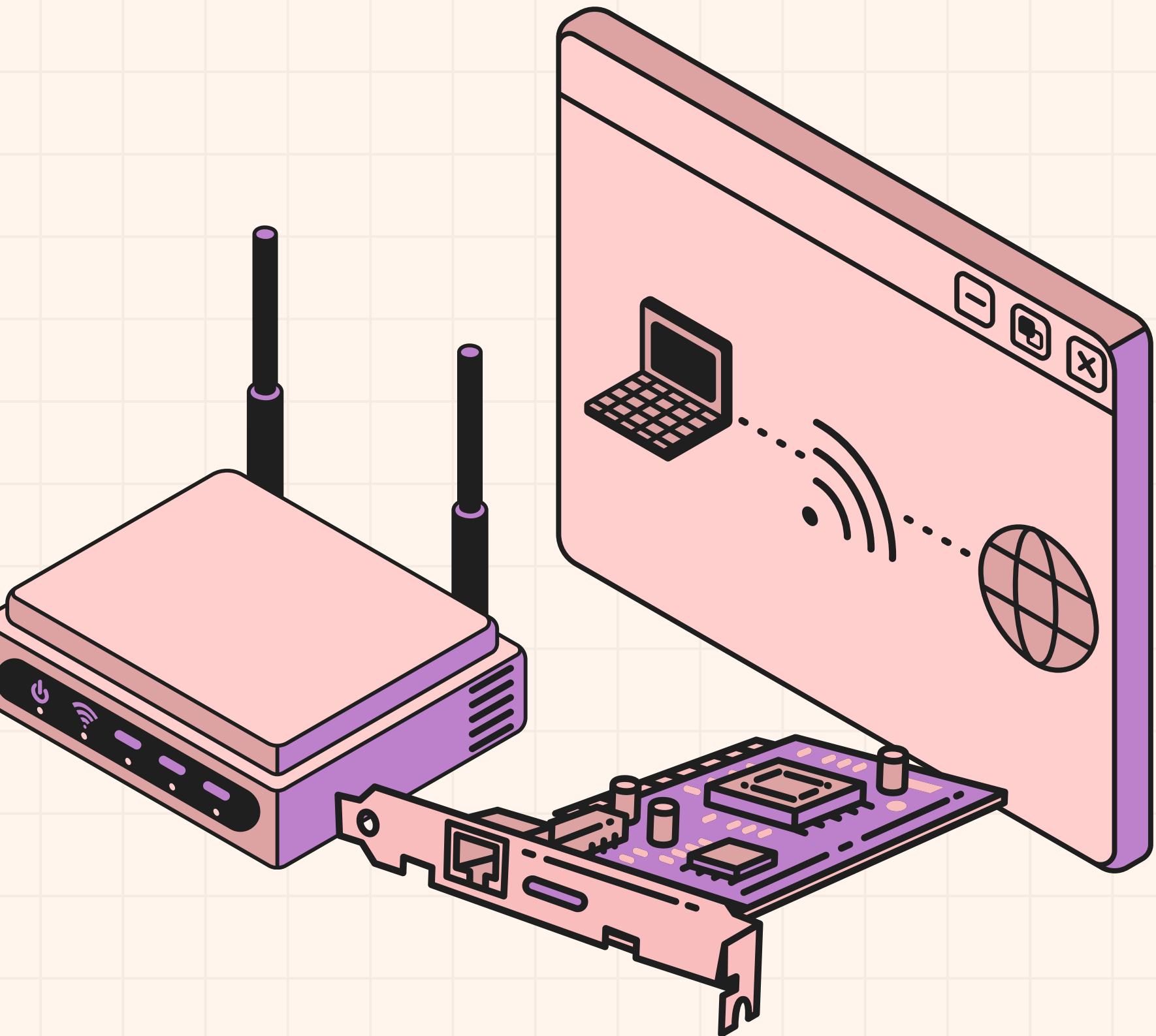
# REAL-WORLD INCIDENT EXAMPLE

- **Case: Facebook Global Outage (2021)**
  - BGP routing misconfiguration
  - Global traffic disruption
  - Multiple services affected
  - Manual diagnosis took hours
- **With Multimodal AI:**
  - Early anomaly detection
  - Topology-aware fault localization
  - Faster root-cause identification
  - Reduced downtime



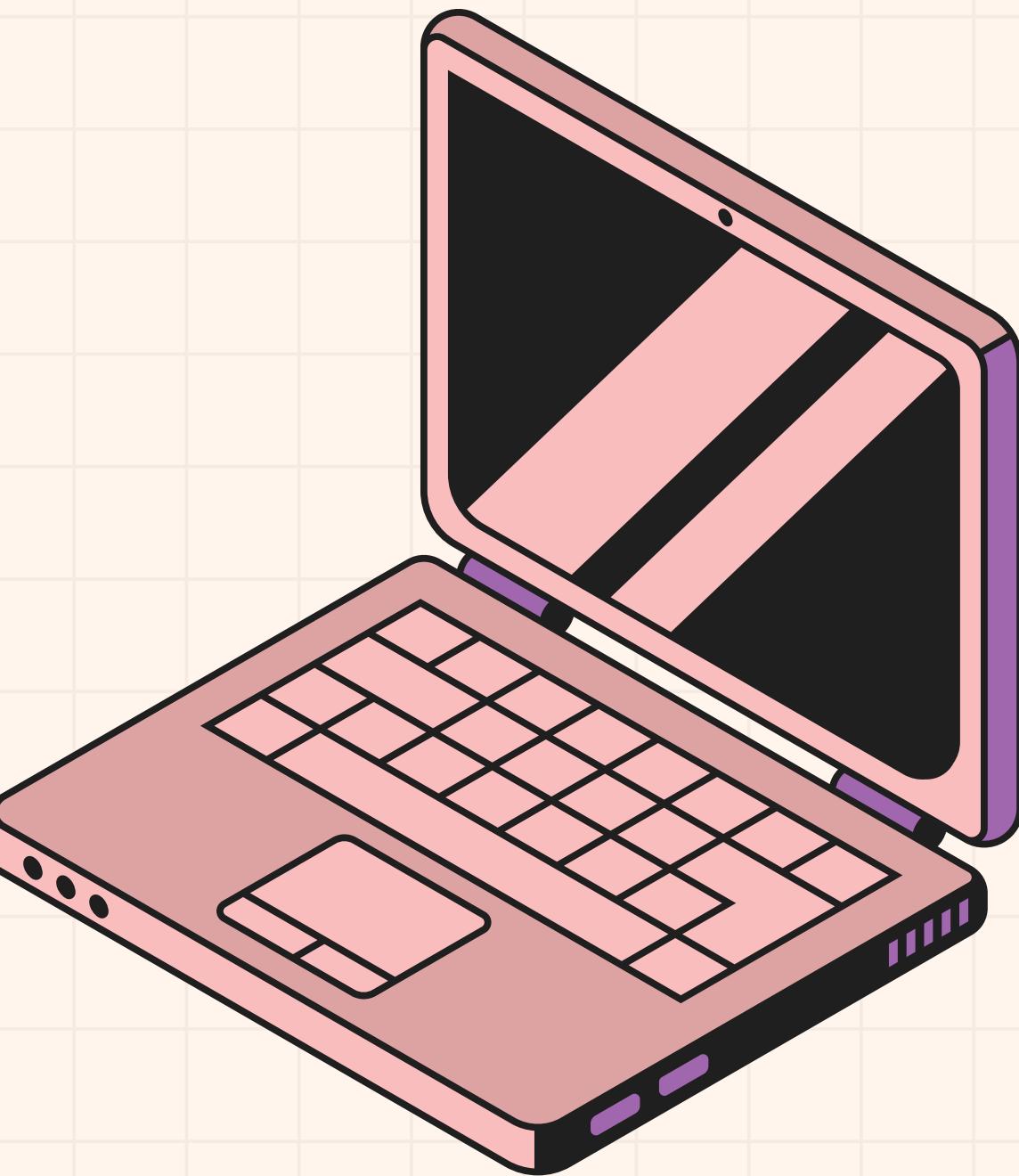
# FUTURE SCOPE OF MULTIMODAL AI IN NOCS

- Fully autonomous NOCs
- Self-healing networks
- AI copilots for NOC engineers
- Zero-touch network operations
- Proactive outage prevention
- Unified monitoring for cloud + edge + on-prem
- AI-driven decision support systems



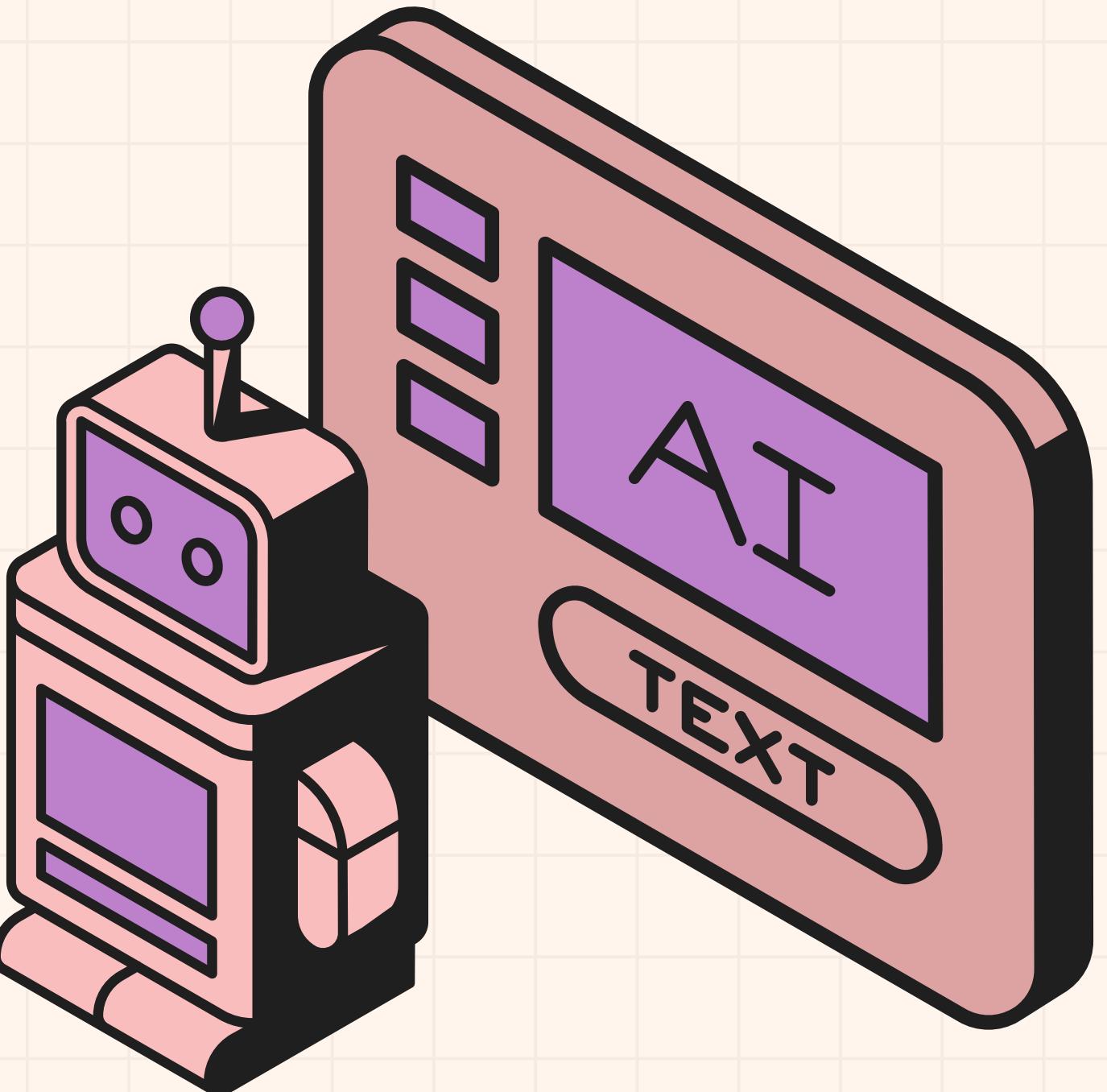
# FINAL TAKEAWAY

- Modern networks are complex & data-rich
- Traditional NOCs struggle with alert overload
- Multimodal AI brings context-aware intelligence
- Already adopted by industry leaders
- Essential for future network reliability



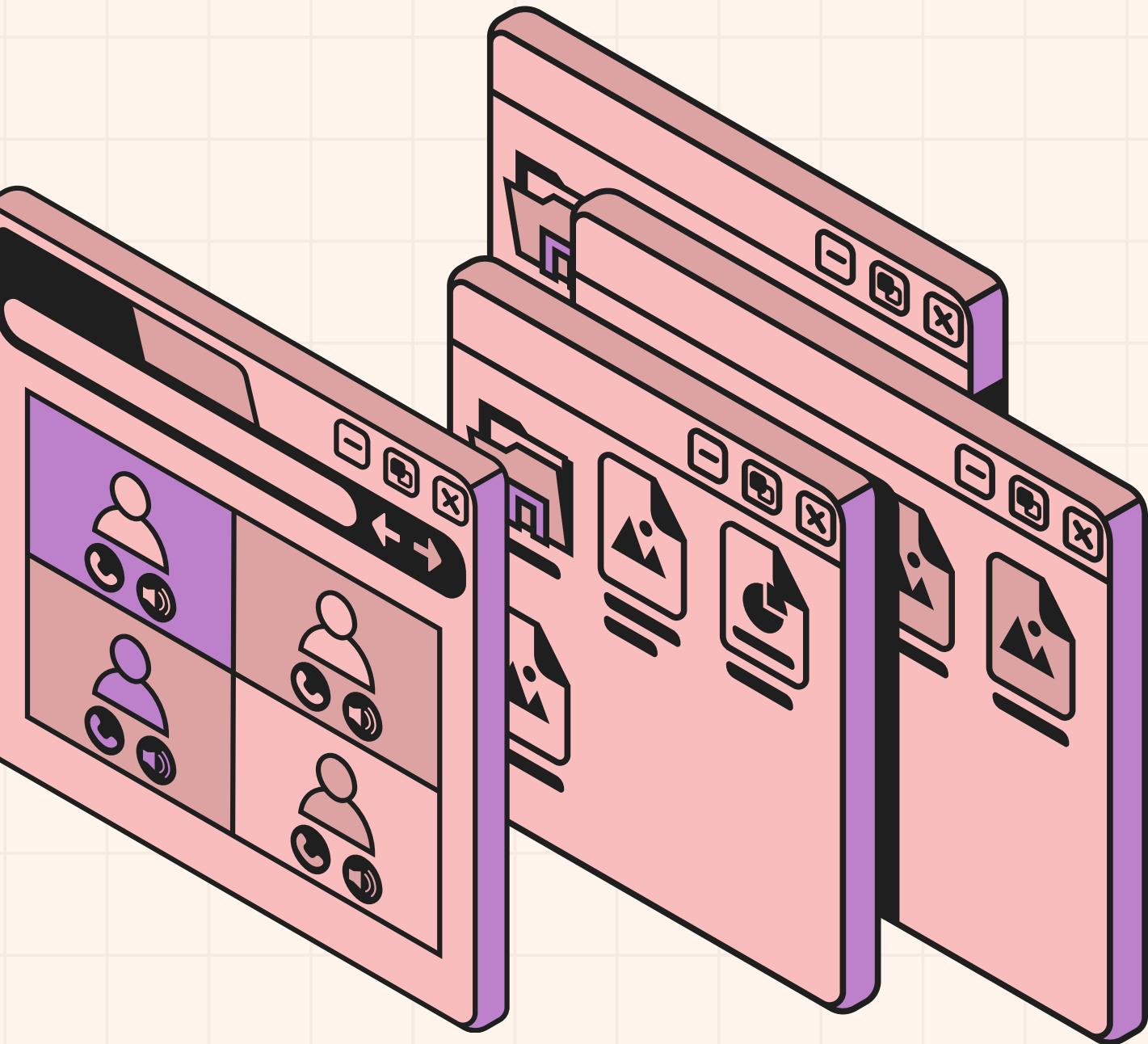
# PROTOTYPE IMPLEMENTATION & DEMO

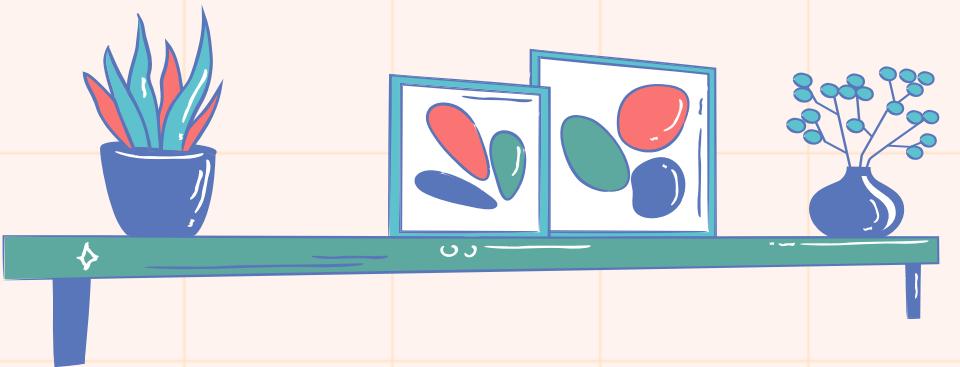
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# REFERENCE

- Cisco Systems, ThousandEyes Network Intelligence Platform - Official Documentation.
- IBM Corporation, Watson AIOps - Overview and Technical Documentation.
- Juniper Networks, Mist AI for Network Assurance - Product Documentation.
- Dynatrace, Davis AI and Full-Stack Observability - Official Resources.
- ServiceNow, AIOps for IT Operations Management - Documentation and Whitepapers.





# Thank You

