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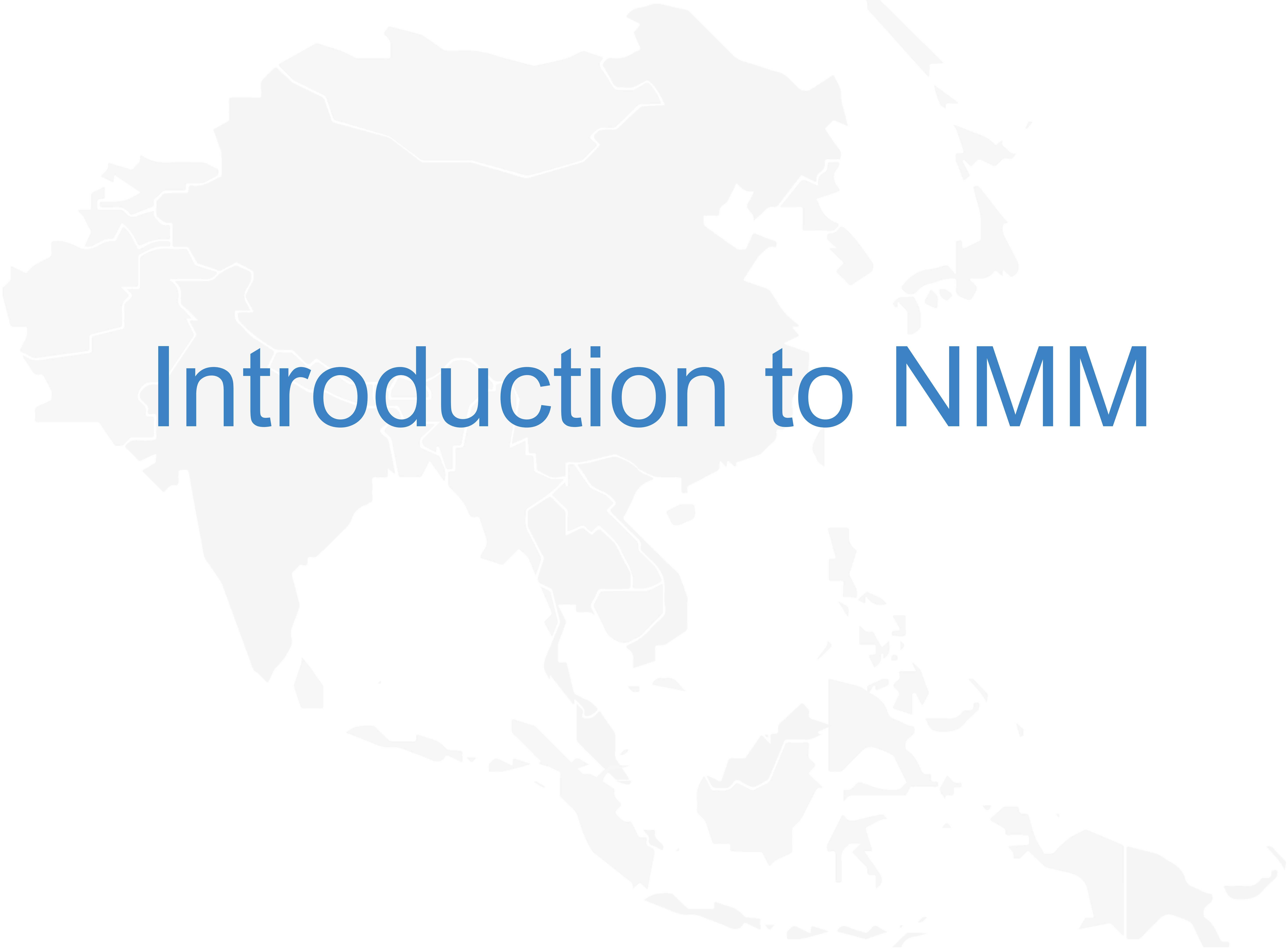

Introduction to NMM

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Basics of Network Monitoring

- Network have evolved from being a flat to a complex network with lot more technologies:
  - Cloud
  - Wireless
  - Remote Users and VPN
  - Mobile Devices
  - IoT
  - VOIP
- Simple networks don’t meet the requirements of modern infrastructure anymore

Basics of Network Monitoring

- In spite of all the evolution that has occurred, one factor that has been constant is the need for network monitoring
- For effective monitoring solution it’s critical to understand the
  - Major network components → Router, Switch, Firewall, Load Balancer, Server & Services
  - Protocols → SNMP, ICMP, gRPC, Netflow
  - Monitoring Tools → LibreNMS, Nagios, Cacti etc

Network Monitoring and Management

- Monitoring
  - Constantly checks/scans the status of a network
  - Collect statistics and performance metrics
  - Checking for error conditions notifies the network administrator for slow or failing components
- Network Monitoring involves
  - What we should be looking for → Throughput, Latency, Packet loss, Bandwidth
  - How to find it → Ping, SNMP Trap, SNMP Poll, API
  - Where and how to store the values → Cloud, On-prem, RRD, Time Series Data
  - What thresholds indicate a problem situation → Performance metrics
  - How to notify → Email, SMS, Webhook

Network Monitoring and Management

- Management
  - The processes, tools and applications used to administer, operate and maintain a network infrastructure
- Network Management involves
  - Administration → Tracking network resources
  - Operation → Network functions well
  - Maintenance → Upgrades and fixes to network resources
  - Provisioning → Network resource configuration

Every Network is different

And

No single system will solve all your problems

Or

Meet all your requirements

Network Monitoring

WHY do we Monitor

- Track resource utilization and get historical data
- Establish a baseline (what’s normal for the network)
- Understand the performance matrices and do capacity planning
- Helps network and systems administrators identify possible issues before they affect business continuity
- Find the root cause of problems when something goes wrong in the network
- Track configuration changes
- Identify security threats

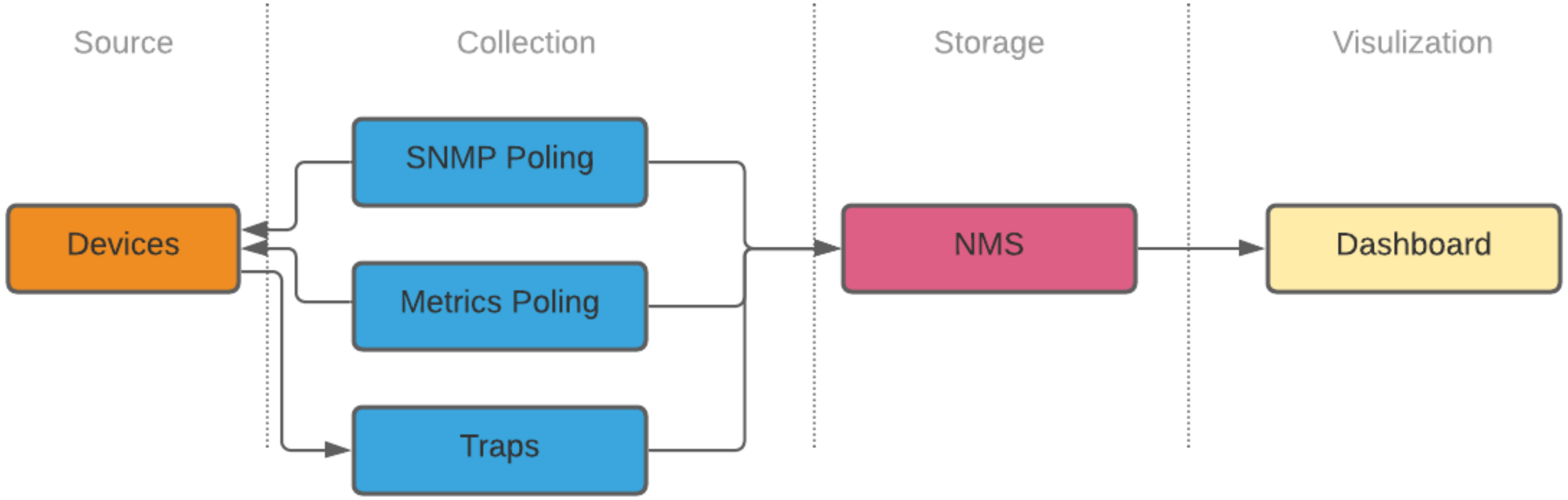
WHAT do we Monitor

- All the resources vs Critical resources
  - Hardware → Network Devices & Servers
  - Services → DNS, DHCP, HTTP/HTTPS, SMTP
  - Application → On-prem and Cloud
- Underlay vs Overlay
  - IGP (OSPF, ISIS)
  - OMP
  - EVPN & VXLAN

Availability	Reliability	Capacity	Performance
Uptime	Jitter, Latency, RTT	Traffic, Port Utilization	CPU, Memory, Disk, Processes

HOW to Monitor

- Commonly used technologies:
  - Ping
  - SNMP
    - SNMP Trap
    - SNMP Poll
  - Syslog
  - CDP/LLDP
  - Netflow
  - API



- There are tools which leverages these features to monitor network

Title of course/ webinar

Network Management

WHY do we Manage

- Maximum efficiency and improve IT productivity
- Security and Threat detection
- Network upgrade and visibility

WHAT do we Manage

- Network resources (routers, switches, Firewall, Load Balancer)
- Systems (Servers, Applications)
- Power system devices
- Customer Premises Equipment (CPE)
- Storage

HOW to Manage

- Agent based – reside on mange network/system element
- Most common protocol is SNMP SET
- Few new protocols include NETCONF and RESTCONF

	SNMP	NETCONF	SOAP	RESTCONF
Standard	IETF	IETF	W3C	IETF
Resources	OIDs	Paths		URLs
Data Models	Defined in MIBs	YANG		YANG
Management Operations	SNMP	NETCONF	XML	HTTP Operations
Encoding	BER	XML	XML	XML, JSON
Transport Stack	UDP	SSH TCP	SSL HTTP TCP	SSL HTTP TCP

Network Monitoring and Management best practices

- Baseline network behaviour
- Escalation matrix
- Layered breakdowns
- Implement High Availability with failover options
- Capacity planning and growth

OOB (Out Of Band)

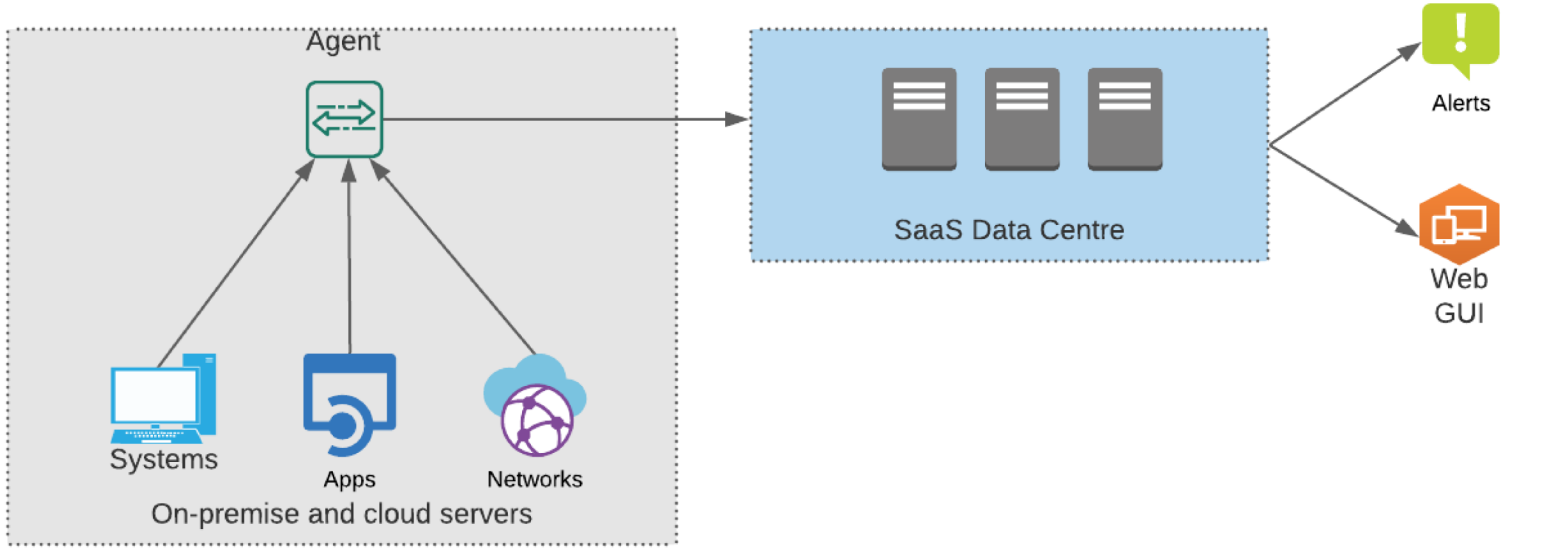
- Out-of-band management uses a completely separate network that’s dedicated strictly to managing infrastructure.
- If we need to reboot a router, collect data for regulatory compliance, or adjust QoS settings due to traffic changes, OOB makes it possible - even if our production network is down.
- Reasons to have out-of-band management:
  - Restore uptime fast from anywhere
  - Get unified control of our network

Techniques and Tools

- Agent-based and Agentless Monitoring
- Internal and External Monitoring
- Centralized vs Decentralized Network Management

SaaS based Monitoring and Management

- SaaS based monitoring and management tools
- Scalability, accessibility, upgradability, resilience and pay-as-you-go pricing options
- Work for both on-prem and cloud infrastructure
- Few SaaS based Monitoring tools
  - LogicMonitor
  - New Relic
  - Auvik
  - StatusCake



Tools

- Few Network Monitoring & Management tools

Tool	Function	Link
Icinga	Availability, Performance, Monitoring	https://icinga.com/
Nagios	Availability, Performance, Monitoring	https://www.nagios.org/
LibreNMS	Availability, Capacity, Discovery, Performance, Monitoring	https://www.librenms.org/
Zabbix	Availability, Capacity, Discovery, Performance, Monitoring	https://www.zabbix.com/
Smokeping	Availability, Latency, Monitoring	https://oss.oetiker.ch/smokeping/
Nfsen/Nfdump	Traffic Analysis, Monitoring, Flow Collection	http://nfsen.sourceforge.net/ https://github.com/phaag/nfdump
AS-Stats	Traffic Analysis, Monitoring, Flow Collection	https://github.com/manuelkasper/AS-Stats
Rancid	Backup, Monitoring, Management	https://shrubbery.net/rancid/
Oxidized	Backup, Monitoring, Management	https://github.com/ytti/oxidized
RT/OSTicket	Ticketing System	https://osticket.com/
NetDisco	Discovery, Inventory, IPAM	http://netdisco.org/
Syslog-ng	Log Management	https://github.com/syslog-ng/syslog-ng
Graylog	Log Management	https://www.graylog.org/products/open-source
Netdot	Documentation	https://github.com/cvicente/Netdot/
Nipap	IPAM	https://spritelink.github.io/NIPAP/

Network Monitoring and Management – What Next?

	Legacy Way	Modern Way
Network Monitoring	SNMP Get SNMP Trap RRD	API (Webhook) Model Driven Telemetry (gRPC) Time Series Database (TSD)
Network Management	SNMP Set	NetConf RestConf OpenConfig

Thank You!