

## ATOM: Assurance, Automation, Monitoring, and Orchestration for Multi-Vendor Networks

### Introduction

Worldwide network operation teams and product owners face intense demands to turn on differentiated services faster while keeping the network stable and automatically recovering from failures to ensure SLAs. Further complicating matters, operators are burdened with legacy infrastructure, broken processes, limited visibility, and shrinking budgets.

Anuta ATOM uniquely addresses these pain points and delivers a modular, extensible, cloud-native software platform that enables enterprises and service providers to rapidly design and provision network services, onboard server infrastructure, collect real-time telemetry, display deep network analytics, ensure compliance, and provide service assurance for multi-vendor physical and virtual infrastructure. The self-optimization and self-healing platform empowers networking teams to deliver services faster, eliminate human errors, avoid security violations, reduce OpEx, and meet SLAs with exceptionally high availability.

### Product Overview

As a highly scalable, vendor-agnostic platform, ATOM combines the best of model-driven architecture with the latest technologies in microservices for Cross-domain Automation encompassing Configuration and Compliance management, Device and service lifecycle automation, and Assurance.

Equipped with the AVA co-pilot, an AI-powered Operator Assistant, EMS / FCAPS functionalities, and No-Code/Low-Code Workflow Automation, ATOM opens exciting new opportunities to transform today’s sluggish networks into intelligent and responsive networks of the future.

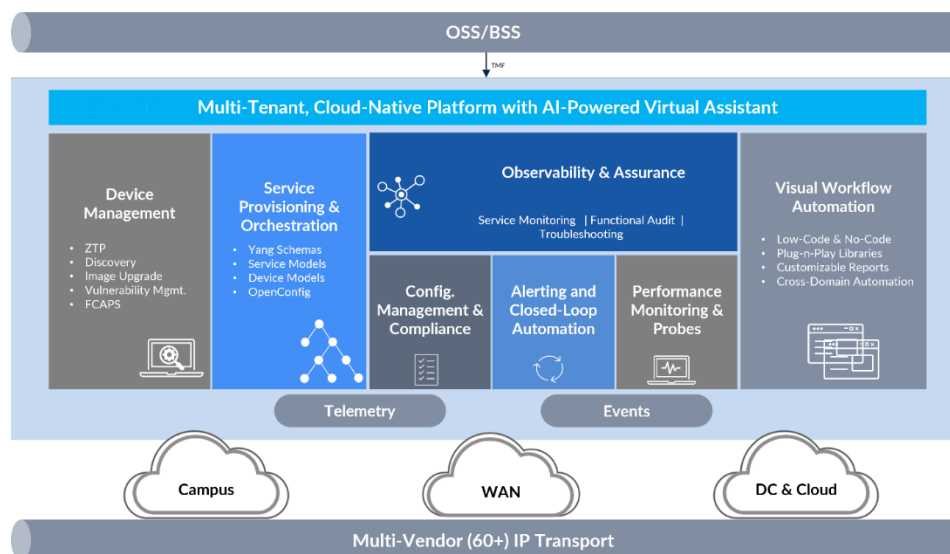


Figure 1. Anuta ATOM – Network Lifecycle Automation

Anuta ATOM fosters Collaboration infrastructure with ATOM SDK for Device, Service Model, and Custom App development using a sophisticated description language, query interface, and other productivity tools. Being containerized and microservices-based, ATOM gives many advantages– such as greater flexibility and deployment options in Small, Medium, or Very large-scale networks in private, public, and hybrid cloud environments.

## Features and Benefits

Features	Benefits
Broadest industry coverage across 60+ vendors, 250+ platforms with 200+ out-of-box use cases	Accelerates service deployment and eliminates manual processes with BPMN 2.0 -based Low-Code Automation
Massively scalable visual workflow automation	Standardizes MOPs, integrates with other IT systems (Service Now, JIRA, Infoblox, etc.), automates ZTP, software upgrades, and troubleshooting workflows.
Cross-Domain Automation for legacy and modern controllers/systems	Single Pane of Glass Experience- Eliminate silos between systems and domains to cut inefficiencies, automate workflows and swiftly address issues
Simplified workflow creation- Co-pilot, Heatmaps, Planner, Form, and Adaptor builder	AI-powered Workflow Optimization and Reporting, onboarding, repetitive coding, and troubleshooting
Streaming Telemetry and AIOps-powered Analytics	Massively scalable collection framework with ML capabilities to predict SLA violations
Alerting and Closed-Loop Automation	Allows IT administration to get workflow insights & perform course-corrections automatically to ensure a higher & consistent QoS
Cloud-Native Architecture	Deployment flexibility on any cloud infrastructure - AWS, Azure, GCP, etc.
Microservices-based architecture (Dockerized) with High Resiliency, Multi-Tenancy, and Auto-Scale	Efficient scalability and reliability
Horizontally scalable to 1 million+ devices	Investment protection for the future demands of IoT and other massive scalability requirements

Service Monitoring, Audit with Assurance	Ensure the best service status, traffic optimization and SLA for Eline, Elan, and IP VPN services with Vulnerability Management and monitoring
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## Supported Platforms

Anuta ATOM is validated with 200+ platforms from 60+ vendors. For the complete list, visit: <https://www.anutanetworks.com/managed-devices/>

Vendor	Physical	Virtual	SDN
<b>Cisco</b>	ASR 1-9K, ISR, CSR, Nexus 1-9K, Cat 2k-4K, ASA, FWSM, ACE, WSA, NCS- 5050; WLC 5500	vASA, Virtual WSA, CSR1000v, vWAAS	APIC, DNAC vManage, Meraki, ThousandEyes, Umbrella, Webex, NDFC/NDO, ISE
<b>Juniper</b>	MX-80, 104, 150, 204, 240, 480, 960; PTX-10003, 10K8, 10K16; ACX-710, 2100, 5000; QFX-10K, 5120; EX-4200, 8200, 9200, 4600, ISG, SRX	vSRX, vGW, vMX	Paragon Insights, Paragon Pathfinder, Paragon Planner, Paragon Active Assurance, Contrail
<b>Fortinet</b>	Fortigate 3140, 1000 series, 200D, 100D	Virtual Firewall	
<b>F5</b>	BIG-IP LTM, GTM, 3600, VIPRION 2400	vLTM	BIG-IQ
<b>HP</b>	5800, 5900, 6000, 7500, 12500, 10500.		HP DCN, HCG
<b>Amazon</b>		EC2, VPC	
<b>A10</b>		vThunder	
<b>Alcatel Lucent- Nokia</b>	7950, 7550, 7705		Nuage VSP
<b>Arista</b>	7000, 7500		
<b>ATT</b>		Vyatta 5400,5600	
<b>Brocade</b>	VDX 6700, 6900, 8770, Fast Iron, Big Iron	SteelApp	
<b>Checkpoint</b>	Provider-1, Secure GW, 4K, 12K, 13K	R77 Virtual GW	
<b>Citrix</b>	NetScaler MPX, SDX	VPX	

<b>Ericsson</b>	SSR 8000		
<b>Huawei</b>	NE40E-X8, NE40E-X3		
<b>Palo Alto Networks</b>	PA Series	VM Series	
<b>Radware</b>	5412XL	ADC-VX	
<b>Riverbed</b>	Stingray, Steelhead Physical	Steelhead Virtual	
<b>VMware</b>		vShield Edge GW, dVS, vCenter	NSX*

### Scalability & Deployment Spec.

	SMB (< 1K Devices)	Small (5K Devices)	Medium (50K Devices)	Auto Scale (50K – 1M+ Devices)
<b>Deployment Type</b>	Embedded, Multi-Node	Distributed Agents, Multi-Node, Resilient-HA	Distributed Agents, Multi-Node, Resilient-HA	Distributed Agents, Multi-Node, Resilient-HA
<b>Software Distribution</b>	Virtual Machine or Docker			
<b>Self-Healing &amp; Resilient, HA</b>	No	Yes	Yes	Yes
<b>Multi-Tenancy, RBAC/NACM</b>	Yes	Yes	Yes	Yes
<b>Disaster Recovery</b>	No	Yes	Yes	Yes
<b>Cloud Ready</b>	Private Cloud, Public Cloud - AWS, Google Cloud Platform, Microsoft Azure			
<b>Total System Footprint</b>	128GB RAM 16 vCPUs 1200GB SSD	488 GB RAM 100 vCPUs >4 TB SSD	704 GB RAM 172 vCPUs >6 TB SSD	Varies per the Performance and Throughput requirements
<b>Other Deployment Requirements</b>		Logging, Messaging, Time-Series DB		
<b>Throughput &amp; Metrics</b>		KPIs can be tuned. The system will scale as required to meet the KPIs.		

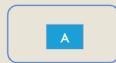
## ATOM Footprint

### Minimal

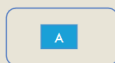
- Single Kubernetes cluster
- K8s **Master node**\* – 3 x (4vCPU, 32GB RAM and 300GB SSD)
- K8s **Worker node**\* – 1 x (4vCPU, 32GB RAM and 300GB SSD)
- For each remote site - 1 Atom **Agent VM** (4vCPU, 8GB RAM and 50GB SSD)



K8s cluster



Remote site One



Remote site Two

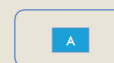
- **\*Master Node** – Master nodes will act as worker node also (Shared Master)
- **\*Worker Node** – At least 1 Worker Node is needed, one additional Worker Node will help as buffer
- Total IPs : 4 IPs + 3 VIPs = 7 IPs

### Fully Resilient HA

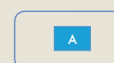
- Resilient Kubernetes Cluster
- K8s **Master node**\* – 3 x (4vCPU, 8GB RAM and 50GB SSD)
- K8s **Worker node**\* – 9 x (4vCPU, 32GB RAM and 300GB SSD)
- For each remote site - 1 Atom **Agent VM** (4vCPU, 8GB RAM and 50GB SSD)



K8s cluster



Remote site One



Remote site Two

- **\*Master Node** – These are dedicated Masters
- **\*Worker Node** - 9 Worker Nodes gives ideal resiliency in single site also by spreading those across 3 Esxi's/Servers in that site. ATOM can still function with 8 or 7 worker nodes based on number of sites ATOM is deployed on and resiliency aspects needed.
- Total IPs : 12 IPs + 3 VIPs = 15 IPs

## Detailed Features list

### Network Services:

- ❖ IETF YANG models, OpenConfig models
- ❖ IP/MPLS backbone - L2 VPN, L3 VPNs
- ❖ 5G Network Slice Creation
- ❖ Multi-Cloud Interconnect
- ❖ Application Delivery in Private Cloud
- ❖ FWaaS, LBaaS
- ❖ CPE: Physical, Virtual, and Hybrid
- ❖ Segmentation in Campus Networks
- ❖ Data Center Interconnect
- ❖ NaaS architecture - E2E Service Management Domain
- ❖ TMF API Gateway

### Methods of Procedures:

- ❖ Software Image Mgmt (SWIM/SMU)
- ❖ Troubleshooting Workflows
- ❖ Config Migrations
- ❖ Pre-and-Post Checks for Services
- ❖ 200+ Out of Box workflows

### Network Functions:

- ❖ VLAN, VXLAN, Virtual Port Group
- ❖ Firewall, NAT- Physical & Virtual
- ❖ Load Balancer- Physical & Virtual
- ❖ WAN Optimizer- Physical & Virtual
- ❖ VRF
- ❖ Virtual Router
- ❖ Web Security, Proxy
- ❖ MPLS L3 VPN, IPsec VPN, DMVPN
- ❖ RIP, OSPF, IS-IS, BGP
- ❖ STP, VPC, MC-LAG
- ❖ EtherChannel

### Telemetry & Service Assurance:

- ❖ Service Assurance(ASA)

### Service Orchestration:

- ❖ Service Design
- ❖ Service Deletion
- ❖ Service Provisioning
- ❖ Support for TOSCA and YANG models
- ❖ Aligned with open standards - OpenConfig, RedFish, O-RAN, IETF YANG, Swagger OpenAPI, IETF NACM, etc.

### Workflow Automation:

- ❖ BPMN 2.0 compatible
- ❖ Open API Integration
- ❖ Bring your own scripts & Ansible Playbooks
- ❖ Extensible Reporting
- ❖ Predictive Analytics for ETA
- ❖ Workflow Insights

### Compliance Management:

- ❖ Compliance checks & Remediation
- ❖ Service, CLI & YANG Compliance
- ❖ Extensible Reporting

### Cross-domain Use Cases:

- ❖ Site Deployment - Cisco Meraki
- ❖ Site Deployment - Cisco SD-Access
- ❖ Campus, WAN Segmentation & Policy Automation
- ❖ Traffic Policy on SD-Wan Fabric
- ❖ Provisioning Cisco NSO VPN Services
- ❖ Uniform Policy across Campus & DC
- ❖ Multi-Cloud On-Ramp & Assurance
- ❖ Cisco SD-Access & ACI Integration

### Analytics:

- ❖ Device Reports
- ❖ Query operational data

### Closed-Loop Assurance:

- ❖ Compliance Validation
- ❖ Service Validation
- ❖ DSL for custom KPIs and actions
- ❖ Y1731, RFC 2544 OAM
- ❖ Monitor BGP neighbor flapping
- ❖ Monitor WAN interface for Jitter, Packet loss, Utilization.
- ❖ Automatic config backup per KPI
- ❖ Map L1, L2 failures to service outages

### AIOps:

- ❖ Dynamic Baselining & Thresholding.
- ❖ Anomaly Detection
- ❖ RCA, Event Correlation

### System:

- ❖ Cloud-Native
- ❖ VM or Docker Image
- ❖ Scalable Server & Agent Model
- ❖ RBAC & Multi-Tenancy
- ❖ Kubernetes-based Cluster Management
- ❖ Multi-Site & DR
- ❖ Java SDK
- ❖ API Gateway & Load Balancing
- ❖ Application Tracing

### Server Lifecycle Manager:

- ❖ Model-driven Collection
- ❖ Protocol Buffers (gRPC)
- ❖ Syslog, sFlow, NetFlow, SNMP / Traps
- ❖ Interface Counters
- ❖ Built-In Time Series DB
- ❖ Integrates with InfluxDB, ELK Stack
- ❖ Sensors – BGP, Interface
- ❖ Query time series DB for past events and KPIs
- ❖ Integration with Grafana
- ❖ Roll-Down Sampling
- ❖ Vulnerability Management

- ❖ Time Series DB
- ❖ Top-10 anomalies in each time range
- ❖ Troubled Devices
- ❖ Tenant-specific alarms

### AVA - ATOM Virtual Assistant:

- ❖ Co-pilot
- ❖ Guided Troubleshooting
- ❖ Doc Assistant
- ❖ Operator Assistant

- ❖ Multi-Vendor (DELL, Super Micro).
- ❖ Red Fish Support
- ❖ Flexible Reporting per Site, City, Region
- ❖ ZTP - High Performance (300 Server ZTPs / hour)
- ❖ OS Upgrades
- ❖ Inventory

### Out-of-box Integration:

- ❖ Ticketing tools- ServiceNow, JIRA
- ❖ Automation- Ansible, Terraform
- ❖ DNS- Infoblox,
- ❖ IPAM- Netbox
- ❖ Notifications- Webex, Zoom, Slack, MS Teams, Email
- ❖ Cloud- Oracle, GCP, Azure
- ❖ CI/CD- GitHub, GitLab, Jenkins