Solution Profile

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Nokia

Unified Inventory

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Introduction

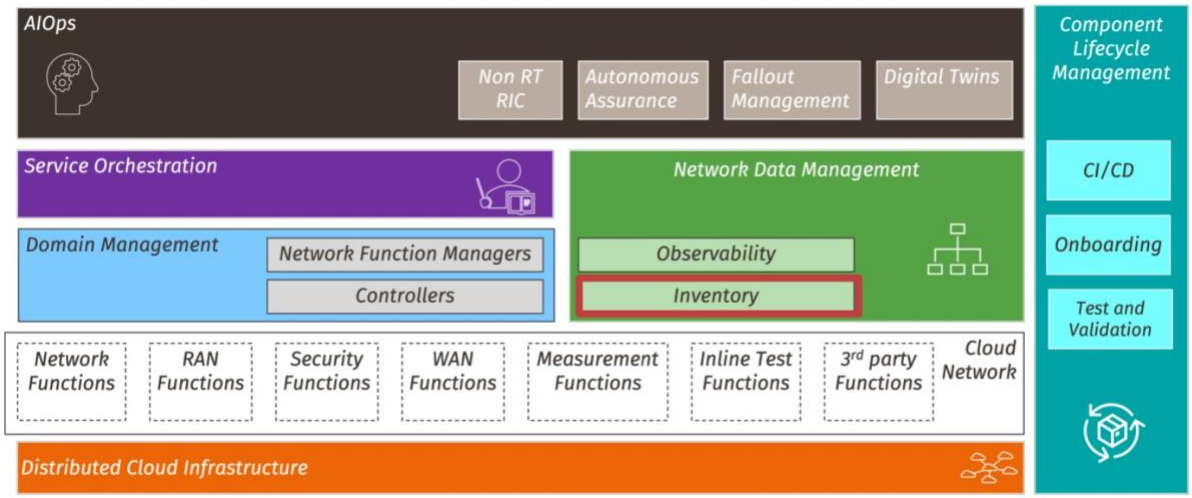
This updated solution profile on Nokia **Unified Inventory** gives an assessment of the product against Appledore's Inventory Management Market Outlook (Nov 2022) which provides additional analysis of key players in inventory, their solutions, company, and market impact, with a uniquely Appledore Research perspective. Unified Inventory is now a stand-alone product, a change from its original positioning. It is integrated with Nokia's Digital Operations Center (Assurance Center, Orchestration Center, and Unified Inventory). For existing customers it is also integrated with FlowOne.

Communications service providers are pressured to grow (and accelerate) revenue from new services and reduce operating expenses with automation. In response, Appledore sees operators increasingly committing to resolving historical limitations their current inventory management systems placed on them. Appledore believes **accurate inventory** is the pillar around which automation will flow.

Widespread operational efficiency and automation are only possible with accurate and timely knowledge of what the network can provide (inventory) and guarantee (assurance). Without an accurate view of the "what and where" of the network, implementing automation and removing human intervention (and inefficiency) is all but impossible. A modern inventory is thus essential to network automation efforts; Whilst the adoption of new 5G use cases has been slower than anticipated, Appledore expects strong operator interest in new inventory solutions, like Nokia Unified Inventory, driven by the demands of dynamic 5G network slicing and cloud services at scale.

Inventory is a core element of **Network Data Management** (NDM). NDM, including inventory, is central to Appledore's **Network Automation Software** (NAS) taxonomy (Figure 1). Inventory provides fundamental knowledge of what and where the network is with a record of all the components (geographic, physical, logical, and service) plus knowledge of all the dependencies and topological relationships between them.

Figure 1 Appledore Network Automation Software Taxonomy



Source: Appledore Research

About Nokia

Nokia Corporation is one of the three top mobile infrastructure suppliers worldwide. Its business is divided into Mobile Networks, Network Infrastructure, Cloud and Network Services, and Nokia Technologies. Nokia aims to have a "best-of-breed" portfolio to enable customers to digitize their fixed, mobile, and cloud networking assets and become B2B innovation leaders.

Unified Inventory enables network orchestration and assurance, with the opportunity to drive closed-loop automation. Unified Inventory is part of Nokia's Digital Operations Center solution. Launched in 2020, it is designed to consolidate digital service enablement efforts for 5G monetization. It is fully cloud-native and includes Nokia's Unified Inventory, Orchestration Center, and Assurance Center. The consolidation allowed Nokia to position Unified Inventory as a core component of a network-wide and cross-domain solution, giving Nokia customers a clear path toward digital transformation. Initially, Nokia Unified Inventory was not a standalone product, and was designed exclusively for tight integration with other Nokia Digital Operations products. However, reflecting its success in enabling transformation in existing OSS environments it is now available as a standalone product.

Nokia's Digital Operations software reports within its Cloud and Network Services (CNS) division reported EUR 3.22 B (-4% y/y) in full-year revenue, with an increased margin of 7.9%. Nokia is expecting -2% to +3% growth in CNS in 2024, which aligns with Appledore's forecast of flat growth in the short term for Network Automation Software.

Customer traction

A **North American Wireless Provider** is seeking to provide a programmable network on a large 5G network with an SA core. Unified Inventory (as part of Digital Operations Center) is managing 5G slice orchestration and assurance, including AIOps-based slice observability and SLA management. Unified Inventory coexists with a legacy inventory solution and provides dynamic discovery and reconciliation into that solution, to enable existing OSS systems. Unified inventory is supporting the unique requirements of dynamic slicing at scale, that the legacy could not support. The system is supporting several slices currently, including Gaming, Content Distribution, Pop up events and Stadiums. It is anticipated that the system will ultimately manage many different slice types. Some of these slices will be semi-static, and nationally available such as for video collaboration. Other slices will be created on demand. In all cases Nokia Unified Inventory is being used to identify conflicting demands of slices for network resources and support the continued optimization of these slices based on network policy.

At another **North American CSP** Unified Inventory (as part of Digital Operations Center) is supporting the management of end to end, dynamic, network slices, similar in intent to the other North American operator described above.

At **Telstra**, Unified Inventory is deployed with Orchestration Center to provide dynamic, composite service orchestration. Existing service creation was siloed across network domains with diverse tools and separate domain-specific GUIs. This created complexity and inefficiencies. Nokia's Orchestration

solution enabled a complete service lifecycle experience for a multi-tenant deployment on AWS. Leveraging intent-based APIs and ODA for simplified integration, the solution significantly reduced cost of maintaining siloed, customised orchestrators. Telstra is now able to set-up of new orchestration domains or entities in less than 48 hours.

Year	Customer	Product	Description	Use Cases
2024	North American Wireless Provider	Unified Inventory as part of Digital Operations Center	See above	Dynamic Network Slicing for multi-vendor, multi-domain network
2024	North American CSP	Unified Inventory as part of Digital Operations Center	See above	Dynamic Network Slicing for multi-vendor, multi-domain network
2024	Telstra, Australia	Unified Inventory as part of Orchestration Center	Dynamic, composite service orchestration (Project 2:)	Dynamic, composite service orchestration
2024	Perfectum, Uzbekistan	Unified Inventory as part of Orchestration Center	Nokia selected by Perfectum to build nationwide 5G standalone network in Uzbekistan	5G service orchestration
2023	stc, Saudi-Arabia	Unified Inventory as part of Orchestration Center	stc selects Nokia Orchestration software to deliver 5G slicing and strengthen monetization efforts	Various use cases including slice and IP-VPN orchestration
2023	ACUD / Orange Egypt	Unified Inventory as part of FlowOne	Nokia AVA software selected to support Orange and ACUD for building smart capital city in Egypt	Fully automated OSS/BSS for smart capital city project in Egypt
2022	Telstra, Australia	Unified Inventory as part of Orchestration Center	Nokia deploys Orchestration Center software for Telstra (Project 1)	Wholesale and NaaS use case
2022	Bharti Airtel, India.	Unified Inventory as part of FlowOne	Large scale deployment for mobile service with high transaction rates	Mobile services fulfillment
2021	Lightstorm, India & Indonesia	Unified Inventory as part of Digital	Lightstorm chose Nokia's Digital Operations software.	Reduced service order and fulfilment times, automated assurance for full service lifecycle

		Operations Center		support deployed on AWS Cloud
2021	Telenor, Norway.	Unified Inventory as part of Digital Operations Center	Telenor deployed 5G-Vertical Innovation Infrastructure supporting customized network slicing for enterprise customers.	Network Slicing, zero-touch orchestration, automation and assurance.

Partnerships

Nokia has extensive partnerships spanning technology, systems integration, VARs, distributors, and service providers for its Digital Operations portfolio as highlighted in Figure 3.

Figure 2 Nokia Digital Operations Partners

Source: Nokia

Nokia Unified Inventory

Overview

Nokia Unified Inventory was launched in 2020 and was initially an embedded part of the Nokia Digital Operations portfolio, including FlowOne and Digital Operations Center. It directly benefits from Nokia's prior experience in inventory systems. For customers, it creates an inventory framework product supporting a variety of use cases. The most popular include end-to-end slicing, data quality management, cloud and virtual dynamic resources, hybrid networks, stitching of

multiple network domains and technologies, discovery, and reconciliation of a wide variety of network components from the physical layer up to containerized abstracted network elements.

Figure 3 Nokia Digital Operations Center Architecture

Source: Nokia

For Nokia, an inventory system with near real-time observability and discovery is a differentiating capability. This facilitates real-time orchestration and order fulfilment for most resources. This avoids batch processing and allows the operator to apply resources in a more dynamic environment.

Enabling operator services requires service orchestration, fulfilment, and assurance. Initial development of Unified Inventory focused on using available data sources to create a federated inventory system integrated into the Digital Operations Center workflows.

Strategy

Since its launch, Nokia has implemented a revamped architecture for Unified Inventory, resulting in a 40% reduction in resource needs for the current product.

Nokia has now made Unified Inventory a stand-alone product to support customers that wish to use other orchestration and assurance solutions. This needs an inventory solution that can scale to deliver dynamic on-demand networking use cases. Unified inventory has been designed for horizontal scaling, though in current projects this scaling is still not being used. As a stand-alone product Nokia has created a wider portfolio of interfaces require integration with systems beyond TMF interfaces.

Nokia is now seeing increased demand for non-traditional inventory use cases.

- The importance of Unified Inventory in supporting AI has been recognized with a new UI aimed at allowing a data scientist to explore the data.
- Supporting improved data quality and accuracy is something we cover in our Automation and Data Accuracy report.

- Supporting the planning and capacity management process.
- Knowledge graph – supporting event/best action decision making “Something happened, what do I do”.

Unified Inventory has been built on a modern graph database which provides flexibility and performance beyond that provided by traditional SQL databases. This foundation is now enabling new AI/analytics applications to be created by customers. Unified Inventory’s graph database is exposed to data scientists with a new UI, enabling new insights from the inventory to be explored.

Nokia positions Unified Inventory as a trusted end-to-end inventory for service orchestration and decision-making processes. Unified Inventory is not a replacement for technology domain inventory or traditional inventory except where it’s a Nokia-only use case. Nokia has traction in fulfilment use cases, particularly where it has solid underlying domain knowledge, including fixed access, IP and optical networks, and network slicing.

The near real-time nature of Unified Inventory gives operators a complete inventory picture and allows for correcting individual inventory data errors, producing higher-quality inventory data over time.

A Deeper Look

In 2022, Appledore surveyed key inventory vendors to understand their inventory approach and solution architecture. The following summarizes Nokia’s responses to the survey.

Managing physical inventory (inside plant and outside plant).

Resource intent, such as setting up a site, is not in scope. Physical modelling is dependent on customer use cases. Base modelling uses TMF models.

Physical Data Quality Management.

Unified Inventory uses a “network as master” to compare with the inventory. The default behavior is auto-updates, but you can implement updated rules with Drools. The system relies on the underlying inventory systems being accurate with manual reconfiguration. Access to real-time network data allows Unified Inventory to notify other underlying inventory of data errors requiring correction.

Managing logical inventory (circuit, packet, SDN controller based) - Inventory as truth or network as truth.

Unified Inventory provides a federated inventory to support fulfilment, orchestration, and assurance with a real-time topology.

Unified Inventory abstracts underlying inventories and does not seek to replicate objects. For example, hundreds of objects in the domain manager can become 15 objects in Unified Inventory. TMF inventory models were used as the base modeling for Unified Inventory.

Managing Cloud and Virtual Network Inventory.

Unified Inventory is being used to model cloud and virtualized networks, including IMS, packet core, and 5G slicing use cases.

Managing service and customer inventory.

Models service intent to drive Nokia's orchestration engine. Base modeling based on TMF models.

Federation and data discovery/reconciliation with existing systems and third parties.

Nokia believes that near real-time event-based discovery is a unique selling proposition.

Relationship with observability frameworks and streamed data sources.

A unified inventory state is maintained from data from assurance or observability systems. Unified Inventory can use real-time discovery from the main domain managers - event-scoped discovery, with an immediate pull of information without relying on batch discovery.

Management of inventory through time.

Unified Inventory provides a topology of the current network topology and the historical topology, enabling network exploration through topology.

Appledore Analysis

Competition

In Inventory, Nokia Unified Inventory competes with other end-to-end federated inventories like **Ciena Blue Planet, Netcracker** and **Amdocs**. By making its product stand-alone Nokia now directly competes with these products.

In competing, Nokia must keep pace by cost-effectively maintaining and extending their current inventory products in service orchestration and assurance. Enterprise customers are also looking for more dynamic solutions that offer automation savings.

In the future, we anticipate increased competition in inventory from new entrants from enterprise IT players like **ServiceNow**. To succeed against these players, Nokia must articulate the value of its Unified Inventory solution within the broader context of its Digital Operations Center story, where automation plays a significant role in driving down costs and simplifying operations.

Real-time performance and scaling for new 5G dynamic uses cases appears to be the sweet spot for Unified Inventory. The industry is still in a transitionary phase to fully achieving these new cases. Nokia will be best placed to succeed against incumbent inventory solutions by making its product simple to implement and coexist with existing systems, supporting the new use cases as they grow, and ultimately seeking to replace this legacy.

Nokia has the benefit of designing its inventory from first principles. It does not have a legacy that needs to be maintained, unlike some of its key competitors.

SWOT analysis

Below is a brief SWOT assessment of Nokia's Unified Inventory solution. This analysis is specific to profiled products and does not reflect a SWOT analysis of the broader company.

Strengths
Large installed CSP base upgrading to 5G.
Significant presence in enterprise markets gives opportunity beyond wireless CSPs.
As a leader in new 5G use cases Nokia can bring practical experience of inventory requirements to support dynamic on demand new services.
Alliances with cloud providers, including AWS, GCP, and Azure.
Alliances with major system integration providers, enables deployment scale and vendor independence.
Ability to improve data quality through order and fulfilment actions. Now with special focus on data quality management.
Strong domain expertise in transport, including IP, optical, mobile, 5G network slicing, and fixed wireless access.
Cloud Native horizontally scaled architecture enables scaling of solution as 5G network slicing use cases become successful.

Weaknesses
Perceived as a traditional NEP and not vendor neutral.
Key messaging tied to adoption of 5G network slicing. Increasingly sceptical market for monetization of new 5G use cases.
Opportunities
Having a federated near real-time inventory platform that improves data accuracy lends itself well to Nokia's overarching AVA strategy to harvest valuable insights from greater data availability.
Knowledge graph, with AI support, provides the opportunity to go beyond simply inventory replacement and instead enable dynamic operational processes that grow and flex with network and service change.
Unified Inventory enables a far more agile service delivery model for CSPs.
Unified Inventory acts as foundation and starting point for CSPs to adopt 5G advanced dynamic services.
Threats
Enterprise IT inventory solutions as an alternative transformation approach.
Vendors currently supporting unified inventory products with integrated service orchestration and assurance could be a threat to Nokia's inventory.
CSP inertia and limited levels of service innovation could hold back CSP modernization. This could impact demand and limit the differentiation of new agile service orchestration solutions from existing fulfilment solutions, enabled by Unified Inventory. Favors incumbent solutions

Summary

Nokia Unified Inventory supports the drive toward increased automation and service enablement for dynamic on-demand services. Unified Inventory is tightly integrated with Nokia's Digital Operations Center, allowing customers with Nokia networks to fully modernize and federate their inventory. With an underlying graph database, Nokia Unified Inventory, has an architecture that can both scale and deliver new inventory use cases, and automated/autonomous processes that rely on inventory.

Nokia has extended the applicability of Unified Inventory to:

- non-Nokia networks with FlowOne integration
- non-Nokia legacy OSS environments with a standalone offering

This complements its Digital Operations platform addressing existing Nokia networks and future 5G operations. This positioning expands Unified Inventory's role in Nokia's long-term plans by expanding its deployment footprint and putting it in play to become the de facto inventory system for dynamic on-demand 5G services.

Insight and analysis for telecom transformation.

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