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NFV MANO: Competitive Landscape Assessment

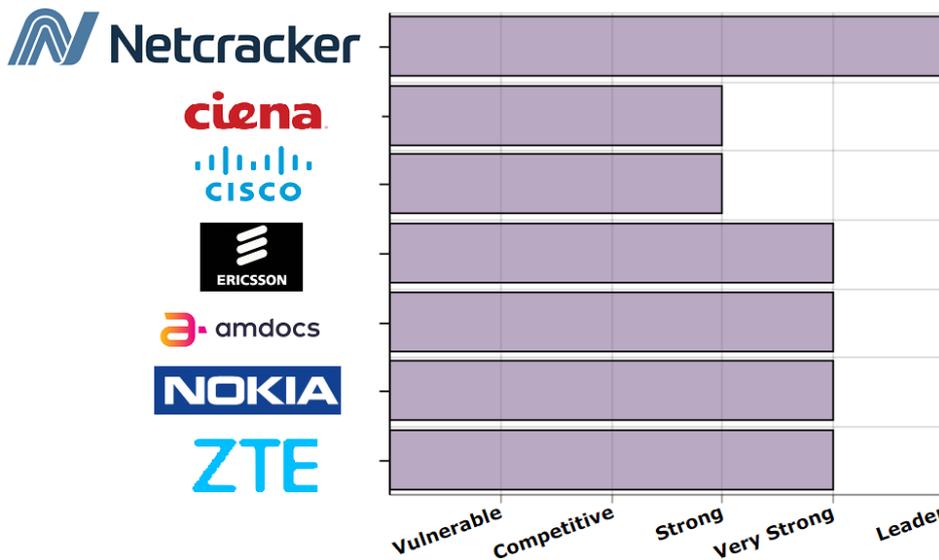
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COMPETITIVE LANDSCAPE ASSESSMENT - NFV MANO

REPORT SUMMARY

NFV MANO as originally defined has largely reached maturity, but many new demands are arising, among them support for cloudified network functions, network slicing, and end-to-end service orchestration.

PRODUCT CLASS SCORECARD



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MARKET OVERVIEW

Product Class

NFV MANO

Market Definition

NFV management and network orchestration (MANO) provides NFV with almost all of its agility, operational, and cost benefits, without which NFV becomes merely a 'vanilla' hardware-to-software replacement exposing carriers to the continued risk of vendor lock-in. NFV MANO as a term was first coined by ETSI and includes three major building blocks: the NFV orchestrator (NFVO), the virtual network function manager (VNFM), and the virtualized infrastructure manager (VIM). Within GlobalData's market segmentation, the VIM is covered as part of NFV infrastructure (NFVI).

This core functionality has largely matured, moving the industry's attention to both lower-level resource orchestration and higher-level service orchestration. Telcos are also increasingly looking at cloud network function orchestration in addition to virtual and physical network functions. Network slicing is also a central area of development.

Rated Competitors

- Amdocs
- Ciena
- Cisco
- Ericsson
- Netcracker
- Nokia
- ZTE

Additional Competitors

- ADVA
- Cloudify
- EnterpriseWeb
- HPE
- Huawei
- Inmanta
- Mavenir Systems
- Rift.io
- Ubiquite

Changes Since Last Update

- **September 2020:** Scoring criteria for this assessment have been revised to deemphasize functions that have been largely commoditized, and to place more emphasis on service lifecycle management. Scores for many criteria have also been recentered to reflect industry advancements since the previous report; this change may be reflected in overall lower category rankings.
- **June 2020:** The MEF Forum announced that seven telcos and Bloomberg LLC were deploying its LSO Sonata APIs to enable data service ordering and fulfilment across operators.
- **April 2020:** Netcracker deployed its full stack of BSS, OSS, and orchestration applications on Amazon Web Services, including T-Mobile Netherlands as the BSS launch customer. In March, it made a similar announcement with Google Cloud, though without a launch customer.
- **February 2020:** Amdocs introduced its Slice Orchestrator, which is designed to help slice creation and lifecycle management across multiple network functions and domain controllers.
- **January 2020:** SES announced a network transformation to create an open network automation and service orchestration platform using Microsoft Azure and Amdocs' NFV SD-WAN solution powered by ONAP.
- **January 2020:** ZTE announced it would deploy network equipment and NFV MANO in a large portion of China Mobile's network.
- **December 2019:** ETSI announced it will add cloud-native applications to network function virtualization deployment in its OSM release SEVEN, and facilitate the deployment of edge and 5G technology.
- **October 2019:** Telefonica Spain selected Cisco's Crosswork Network Automation suite to improve operational insight and network health via machine learning and automated network orchestration.

MARKET ASSESSMENT

NFV MANO has largely reached maturity on the core aspects of management and orchestration as defined by ETSI. Support for many core areas comes down to standards compliance and implementation of open APIs, especially those defined by ETSI and TM Forum. In the meantime, though, new challenges have arisen in both the technical and commercial arenas.

On the technical side, the industry is now working on end-to-end service orchestration, including lifecycle features like service creation, testing, onboarding, and assurance. This area also requires integration with a consolidated, real-time resource inventory. Three separate industry efforts address parts of this challenge: ETSI's Zero-Touch Network and Service Management (ZSM), TM Forum's Zero-Touch Orchestration, Operation, and Management (ZOOM), and MEF's Lifecycle Service Orchestration (LSO). The industry also continues to work on hybrid orchestration of virtual, cloudified, and physical network functions, network slicing, and network capabilities hosted in the public cloud.

The other technical challenge currently facing MANO is the lower-level management of the resource layer across various domain controllers and element management systems. This sometimes involves expanding the NFVO's ability to communicate with more diverse resources than originally envisioned in the ETSI specifications.

On the commercial side, telcos have largely found that NFV has not allowed them to avoid vendor lock-in as originally promised: to this day, many deployments are still siloed, single vendor deployments. The desire to achieve the dream of modular, multivendor infrastructure has spurred telco interest in cloud-native architecture. Containers and microservices occupy fewer resources and spin up more quickly than VMs, but are also inherently more modular.

Informing all of this development is the drive toward 5G, specifically the dynamic creation and management of network slices. While most of the specifications for this functionality are still being elaborated, it is clear that slice creation and management will rely on NFV, and that network services, functions, and slices will need to be orchestrated in parallel. Help in designing slices and services will grow more important, so elements like component libraries, templates, and visual design environments will become competitive differentiators.

License management is also an essential commercial component: systems must record actual usage as functions scale in, scale out, move around the network, fail, and are replaced. Because MANO suites are getting better at true multivendor management, the need for separately purchased, independent VNF managers (VNFMs) is growing less clear. Nevertheless, the market continues to offer them, and most MANO suites now have independently scalable VNFMs.

MARKET DRIVERS

- **APIs are the Answer:** A year ago, interface standards were immature and perceived as holding the industry back in its progress toward virtualization. Now APIs have progressed to the point that many questions about integration capabilities can be answered with information about API support. ETSI's APIs are most important, followed by those of TM Forum.
- **5G Over All:** As telcos implement 5G RAN and plan their transitions from non-standalone to standalone networks, MANO requirements are driven by 5G's architectural features, especially network slicing, edge computing, and capability exposure.
- **VNFs Are Proliferating:** VNFs are the prime vehicle of new network function delivery. Increasingly, VNFs are available not only for core carrier network functions, but for IoT functions as well. Vendors compete across not only the quality of VNF support, but the quantity.
- **CNFs Join VNFs:** NFV MANO is currently predicated on the management of complex VNFs running on virtual machines (VMs), but the use of cloudified network functions running in container-based execution environments is paving the way for bare-metal CNFs. Orchestration suites will need to accommodate all three functions.

BUYING CRITERIA

- **Functional Support:** While the depth of a vendor's MANO portfolio is important, so too is the range of adjacent features and advanced use cases it supports. These areas include functions such as policy, security, and VNF license management, but also advanced capabilities like network slicing, edge computing, and hybrid physical/virtual management.
- **Integration & Interworking:** MANO, of course, is only one part of a carrier's complete NFV installation. In order to support commercial NFV-based service rollouts, it is therefore imperative that vendors support a high degree of interface flexibility and proven multi-vendor interworking to avoid vendor lock-in and enable MANO solutions to integrate into existing carrier environments. Vendor scores are currently grouped very tightly in this area, suggesting a high level of maturity.

- **Deployability:** The ease with which a vendor's MANO offering can be deployed into an existing carrier environment is assessed based on support for industry standards as well as supporting partner ecosystems and cloud capabilities.
- **VNF & Service Support:** MANO's end goal is to orchestrate an assorted portfolio of VNFs from multiple vendors across a distributed network infrastructure into a commercial network service. The greater the diversity of VNFs already onboarding, the more likely a vendor will be able to assist a telco in multivendor NFV deployments.
- **Lifecycle Management:** The ability of a vendor to support the entire service lifecycle from initial VNF onboarding to integration and deployment as part of a complex hybrid network service is an important indicator of its NFV maturity.
- **Production Experience:** Notwithstanding the progress of open APIs and industry standards, experience with a variety of services, use cases, and other vendors is still vital to a vendor's maturity and familiarity with the diversity of telco infrastructures.

VENDOR RECOMMENDATIONS

- **Prioritize API Compliance:** ETSI's APIs now cover most common southbound integration scenarios, and TM Forum's the northbound, but different vendors have prioritized different APIs to develop. As telcos keep their vendor options open, they will increasingly communicate their MANO needs in terms of API support.
- **Demonstrate Hybrid Orchestration:** Although CNFs are the current focus of network modernization, functions already moved to VMs will remain on them for a while- not to mention the stubborn persistence of physical functions. To enable end-to-end services, vendors will need to orchestrate the full range of physical, virtual, or containerized network functions.
- **Maintain Visibility in NFV MANO Interoperability Testing:** Even if a vendor believes that only carrier-specific interoperability or internal NFV ecosystem validation and verification is a true test of interoperability, it should still participate in public interoperability testing. NFV MANO portfolios need to demonstrate in public that they can perform.

BUYER RECOMMENDATIONS

- **Demand Full Lifecycle Capabilities:** The main level of MANO completion is now service orchestration, along with service creation and deployment capabilities. Telcos should evaluate a vendor's ability to support the full lifecycle, and to automate as much of it as possible.
- **Open Source NFV MANO Isn't Free:** Even if an open source-based NFV MANO solution is being considered, someone has to make it work in every operator's specific context; operators must be prepared for significant integration costs. This support may come as part of a vendor or systems integrator package, but it will certainly not be "free".
- **Assess MANO Suppliers for Support:** Carriers should recognize that NFV is a major organizational and business process disruption. Carriers should therefore assess NFV MANO vendors for their transformational support and decide which, if any, of their existing OSS and network infrastructure vendors are equipped to do this.

RATED COMPETITORS

Product Name	Amdocs NFV Powered by ONAP
Buying Criteria Rating	<ul style="list-style-type: none"> • Functional Support: Very Strong • Integration and Interworking: Very Strong • Deployability: Very Strong • VNF & Service Support: Strong • Lifecycle Management: Strong • Production Experience: Very Strong
Product Scores	Very Strong
Strengths	<ul style="list-style-type: none"> • Amdocs is a leader in ONAP as well as some of its largest deployments. • Amdocs has deep experience in integrating orchestration and monetization software. • Amdocs Service Design and Create (SDC) is a sophisticated and proven offline design environment. • Amdocs is strong in service orchestration, driving that subject in the ETSI ZSM, TMF ZOOM, and MEF LSO projects. • Amdocs has a strong portfolio of off-the-shelf virtualized use cases.
Limitations	<ul style="list-style-type: none"> • While Amdocs orchestrates some very large and complex projects, it does not have as broad a deployment footprint as some of its competitors. • Amdocs' partner ecosystem does not support as rich an array of enterprise services as some of its competitors. • Amdocs does not participate in public multi-vendor interoperability testing efforts like ETSI Plugtests or EANTC.
Product Name	Ciena Blue Planet
Buying Criteria Rating	<ul style="list-style-type: none"> • Functional Support: Competitive • Integration and Interworking: Competitive • Deployability: Strong • VNF & Service Support: Competitive • Lifecycle Management: Competitive • Production Experience: Competitive
Product Scores	Strong

Strengths	<ul style="list-style-type: none"> Blue Planet has strong integrated real-time inventory and route optimization and analysis capabilities Since its October 2019 acquisition of Centina, Ciena has integrated its assurance assets into Blue Planet. Blue Planet analytics incorporate machine learning and predefined data resource adapters.
Limitations	<ul style="list-style-type: none"> Blue Planet's contract base is heavily biased toward optical and transport projects, with few examples of end-to-end, multidomain service orchestration. Ciena does not have its own license management functionality, lags category leaders in applying a lifecycle approach, and has limited service creation abilities. Ciena's onboarded VNF count is at the lower end of vendors in this class.

Product Name	Cisco Network Services Orchestrator (NSO) and Elastic Services Controller (ESC)
Buying Criteria Rating	<ul style="list-style-type: none"> Functional Support: Competitive Integration and Interworking: Competitive Deployability: Competitive VNF & Service Support: Competitive Lifecycle Management: Competitive Production Experience: Strong
Product Scores	Strong
Strengths	<ul style="list-style-type: none"> Cisco Orchestration is a part of Rakuten Mobile's cloud platform, currently the world's most prominent next-generation telecoms network project. Cisco has done extensive work in full-lifecycle network security. Cisco has a full portfolio of NFV MANO and supporting next-generation EMS products including a generic VNF manager.
Limitations	<ul style="list-style-type: none"> Cisco does not surround its orchestration with the full-lifecycle support of category leaders, making it better suited for best-of-breed deployments. Cisco has weak support for integration with the telco's monetization layer. Cisco does not disclose the number of live VNF manager or NFV orchestrator deployments. While well suited for greenfield deployments, Cisco has less support for complicated legacy telco infrastructure transformation than some of its more telco-centric competition.

Product Name	Ericsson Dynamic Orchestration
Buying Criteria Rating	<ul style="list-style-type: none"> • Functional Support: Strong • Integration and Interworking: Strong • Deployability: Strong • VNF & Service Support: Strong • Lifecycle Management: Very Strong • Production Experience: Strong
Product Scores	Very Strong
Strengths	<ul style="list-style-type: none"> • Ericsson's Dynamic Orchestration has strong service creation and onboarding functionality. • Ericsson has added abilities to orchestrate both VM- and container-based network functions. • Ericsson has strong API support and participates in industry interoperability activities.
Limitations	<ul style="list-style-type: none"> • Ericsson's integration with third-party OSS lags its peer group. • Ericsson is managing fewer third-party VNFs in live deployments than its peers. • Ericsson is not far along in operating an open NFV/VNF partner ecosystem.
Product Name	Netcracker Hybrid Operations Management (HOM)
Buying Criteria Rating	<ul style="list-style-type: none"> • Functional Support: Leader • Integration and Interworking: Very Strong • Deployability: Very Strong • VNF & Service Support: Very Strong • Lifecycle Management: Very Strong • Production Experience: Very Strong
Product Scores	Leader
Strengths	<ul style="list-style-type: none"> • Netcracker has onboarded more than 330 third-party VNFs including IoT functions. • HOM includes strong lifecycle management capabilities for both VNFs and VNF licenses. • Netcracker is supporting complex multi-VNF, hybrid physical/virtual network services. • HOM has an advanced cloud-native, microservice-based architecture. • Netcracker has already made substantial progress in orchestrating cloud-native network functions.

- Limitations**
- While its deployments are diverse, Netcracker has fewer overall orchestration contracts than some of its competitors.
 - HOM does not yet enable telcos to manage the balance of network slice cost and performance as granularly as some MANO suites from network equipment providers.

Product Name **Nokia CloudBand**

- Buying Criteria Rating**
- Functional Support: Strong
 - Integration and Interworking: Strong
 - Deployability: Strong
 - VNF & Service Support: Very Strong
 - Lifecycle Management: Strong
 - Production Experience: Leader

Product Scores **Very Strong**

- Strengths**
- Nokia was one of the first vendors to implement dedicated security orchestration, and remains strong in the area.
 - Nokia has solid hybrid physical/virtual service capabilities.
 - CloudBand orchestrates a very diverse set of services in production.

- Limitations**
- Nokia's support for edge orchestration is so far largely limited to its own solutions.
 - CloudBand's integration with multivendor OSS and SDN/WAN controllers largely relies on per-project work with open APIs rather than connectors and experience from other projects.
 - Nokia's solutions are used in fewer multivendor NFV implementations than some competing portfolios.

Product Name **ZTE CloudStudio**

Current Perspective **Very Strong**

- Buying Criteria Rating**
- Functional Support: Strong
 - Integration and Interworking: Very Strong
 - Deployability: Strong
 - VNF & Service Support: Very Strong
 - Lifecycle Management: Strong
 - Production Experience: Leader

Product Scores **Very Strong****Strengths**

- CloudStudio has strong network slice support informed by early deployments of the technology in China.
- CloudStudio has been deployed with extensive third-party NFVI and OSSs, and also with operators' homegrown OSS/BSSs.
- ZTE supports a wide variety of VNFs and is orchestrating complex, large-scale services in production.

Limitations

- ZTE has fewer out-of-the-box virtualized use cases than many of its peers.
- ZTE's partner ecosystem is not as open and developed as some others, although its four Open SDN/NFV Labs act in a similar role.
- While it is currently strengthening its assurance functionality, ZTE's capabilities are more basic as of now than some of its competitors.