

# Oracle Unified Operations

## Cross-Domain Service Orchestration

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## INTRODUCTION

This profile is one of many in a series that accompanies our research stream on [Cross-Domain Service Orchestration](#).

Two of the key strands of Appledore's research are the need for **innovation and automation** – and that there are right and wrong ways to approach each. Innovation is not only about technology, but also about of *commercial* innovation. Myriad new revenue opportunities, from IoT, to private 5G, to “digital services” depend on new business models and the ability to quickly and inexpensively combine communications capabilities with those of industrial and commercial verticals. For example, CSPs must be able to sell “as-a-Service” and also to increasingly consume external capabilities “as-a-Service”, based on business need. In our recent research on [Telco as a Platform](#), we looked at the opportunity from the disaggregation of telco, outlining how telco in the future will increasingly be built from ecosystems of platforms, each providing disaggregated components of network.

**Cross Domain Service Orchestration** is the single process that will create these new, end-to-end services and unlock incremental revenues. To accomplish this, orchestration must facilitate the agile combination of pre-existing “services” from within a telco *and from many external partners*. In this way, pre-built, pre-tested and loosely coupled building blocks become the basis of rapid innovation. By way of example, we are already seeing this model generate market success in the **revitalized enterprise market**, with SDWAN, public cloud, broadband “underlay”, private enterprise resources and on-demand cloud-based network functionality chained together, dynamically. While built from the same “building blocks”, each of these customers' environments are unique, and in fact change dynamically. The market for private 5G, “network slices” and servicing IoT consortia all promise similar opportunity with similar operational needs.

The common thread across all of these is that we cannot anticipate future services. Corollary to that, there will be many combinations and permutations of services that must be created and managed. Much of this innovation may occur outside our industry's control – by innovative enterprises and System Integrators in healthcare, automotive, advanced manufacturing, etc. Operational platforms must prioritize easy, fast and cheap innovation.

Simultaneously, new network technologies promise flexibility and efficiency one the one hand, and vastly greater complexity on the other. Both demand automation to first rein in cost, and then to achieve the cost improvements possible through cloud native and configurable, smart technologies such as 5G, SDN, SDWAN and others.

These concepts are becoming widespread, and endorsed by standards, although the face of each “standard” looks different. The MEF (Legato and Sonata), TMF (APIs, Open Digital Ecosystem), and 3GPP (network slicing) are all working on implementations that focus on re-usable components, customized services, and integration with components in the outside world. This is true progress, and like most progress, is slightly messy if you look too closely and take each too literally. Yet we observe clear direction.

The cross-domain orchestration market is embryonic, and like all new markets, many suppliers are competing, and following different playbooks. NEPs come from one perspective, traditional “OSS” ISVs from another, the IT heavyweights from a third, and finally, there are several new disruptive entrants with unique propositions. Over time the market will work out what works, and what is popular. The critical take-away is that understanding the market may be more about “what are your needs and abilities as a CSP?” than about “which vendor does it best and cheapest?”. Why? Because there is not one answer or one approach (so far) that fits the needs of all. We strongly encourage interested readers to read our major Market Outlook Report, which dives into this market and forms a foundation within which this and other profiles are best read.

In this profile we look at how **Oracle**, with its *Unified Operations* suite, proposes to deliver these capabilities, and in particular how they “close the loop” across domains. Appledore will cover individual domains (e.g.: cloud native orchestration for datacenters and edge), SDN, and SDWAN in related but separate research tracks.

## ORACLE UNIFIED OPERATIONS

Oracle is neither a transport nor a radio NEP, and therefore has always focused on what was the “end-to-end fulfilment” market, and is now evolving into the cross-domain orchestration market. Consequently, their focus has always been consistent with the focus of this profile series and the underlying market outlook report on CDSO.

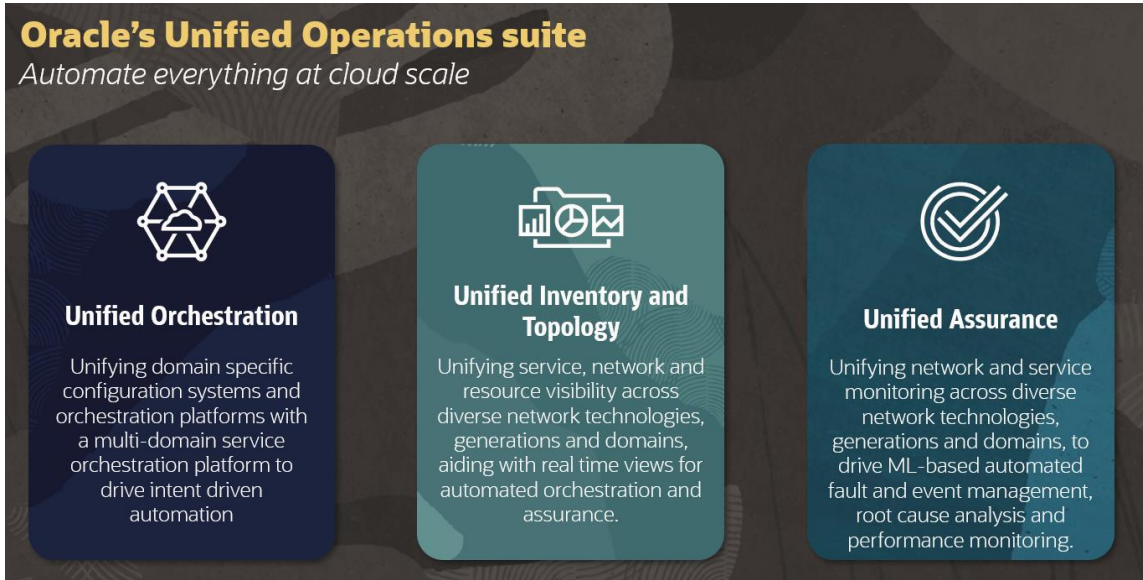
Oracle has long advocated a layered, standards-based approach to orchestration. In it they documented among the cleanest layering we have seen, explicitly separating and loosely coupling lower layer functionality and domains from the “end-to-end” or “cross domain logic. This is very consistent with Appledore’s perspective on CDSO as not just a source of automation, but a key enabler of innovation, both internally and, when exposed, by third parties. Oracle has recently acquired **Federos** with the explicit goal of “closing the loop” end-to-end. This has resulted in a broadened portfolio and capabilities, but also a re-branding of their portfolio. The overall suite is branded “*Unified Operations*”, and includes three solution components:

- Unified Orchestration
- Unified Assurance
- Unified Inventory and Topology

The diagram below illustrates the major components in Oracle’s *Unified Operations* (“UOps”) suite. All components are modular and may be deployed independently and with the inevitable 3<sup>rd</sup> party incumbent products or alternate choices made by SPs. The *Unified Orchestration* (UO) component is, in essence, a re-branded “Service and Network Orchestration”, “SNO”. *Unified Assurance* (“UA”) is the re-branded Federos portfolio, but with a roadmap to both integrate it with orchestration and inventory, and to invest in readiness to enable end-to-end, cross-domain, loop closure and automated healing/scaling. The *Unified Inventory and Topology* (“UIT”) component possibly requires the largest “asterisk” in that while it may contain actual inventory details, in dynamic cloud-native (and other self-managing domain) networks, it refers to abstracted services (e.g.: a dynamically managed transport/IP flow, SDWAN, or CNF) “as a Service” with the actual service

details maintained within that active domain manager. This is consistent with loose coupling, CAP theory, and intent based networking. By way of contrast a traditional, end-to-end detailed inventory is not – given the constantly changing self-management of modern technology, such a solution simply could not be both complete and up to date at once.

**Figure 1: Oracle Unified Operations suite – major components**



Source: Oracle

Oracle provides some combination of its UOps suite to enable service orchestration and closed-loop automation, across multiple domains. The newly acquired UA assets are essential to Oracle’s ability to effect the loop closure on its own, as well as closing the loop on others’ orchestrators for SP clients. Leveraging open APIs and model-driven templates, Oracle UOps integrates with Oracle or third-party SDN controllers, elements/network management systems, and orchestration platforms – which in turn communicate directly to network elements (PNFs, VNFs, CNFs). This enables it to manage and orchestrate services comprised of physical and virtual resources. UOps eliminates silos by abstracting the complexity of underlying domains and enabling network operators to support end-to-end, lifecycle service orchestration. It furthermore enables agile innovation internally, and when exposed to the outside world via APIs, innovation by third parties, where Appledore envisions much innovation occurring.

## Positioning and Strategy

Oracle has long been a significant player, as an ISV, in the OSS and network software markets. To distinguish themselves from “pure” ISVs and OSS vendors, Oracle touts its first-hand experience as a vendor of SBCs, PCRFs, and other physical and virtualized (CNF, VNF) network elements. While Oracle has always been in the fulfilment (and now orchestration) and inventory markets, they have not participated in the assurance market. Given that solutions must be multi-vendor, and that various SPs will have their own incumbent choices, or alternate choices, we see no problem with this position. Yet Oracle is not alone in having decided that with the advent of closed-loop

automation/operation, it is essential for them to have their own solution, and to bring their own special sauce and focus to the table. Enter Federos.

Oracle Unified Operations suite (“UOps”) is positioned as an open, vendor-agnostic closed-loop orchestration platform that automates service design and delivery, end-to-end across complex multi-vendor physical and virtual domains, eliminating management silos, accelerating service fulfillment, and dramatically simplifying operations. UOps is built on a cloud-native microservices- and container-based architecture that makes possible CI/CD upgrades, simplifies ongoing modifications and enables consumption in a true SaaS model from the public cloud. UOps may be deployed on public cloud, or in cloudified CSP datacenters.

Some vendors, principally NEPS, emphasize pre-integration to their own equipment, and pre-built templates for specific network services and actions. Oracle, on the other hand, emphasizes the “multis” – multi-vendor (as an independent ISV), multi-domain, and as part of the “how”, multi-layered. Therefore they document strict layering and adherence to standards as a way of making this practical.

## ARCHITECTURE AND CAPABILITIES

The top-level positioning for the Unified Operations suite is shown above. Since it is in fact modular, and since some integration is in process, we will simply note that UA acts as a source of end-to-end data (alarms, performance etc.), unification/federation of data, correlation, and root cause analysis. In the end, this delivers the core intelligence that orchestration can act on to modify a services to heal or scale it, or to effect a workflow for those actions that demand more mundane actions – such as a technician dispatch to refill a diesel generator.

Below we look therefore, at the architecture and capabilities of each independently.

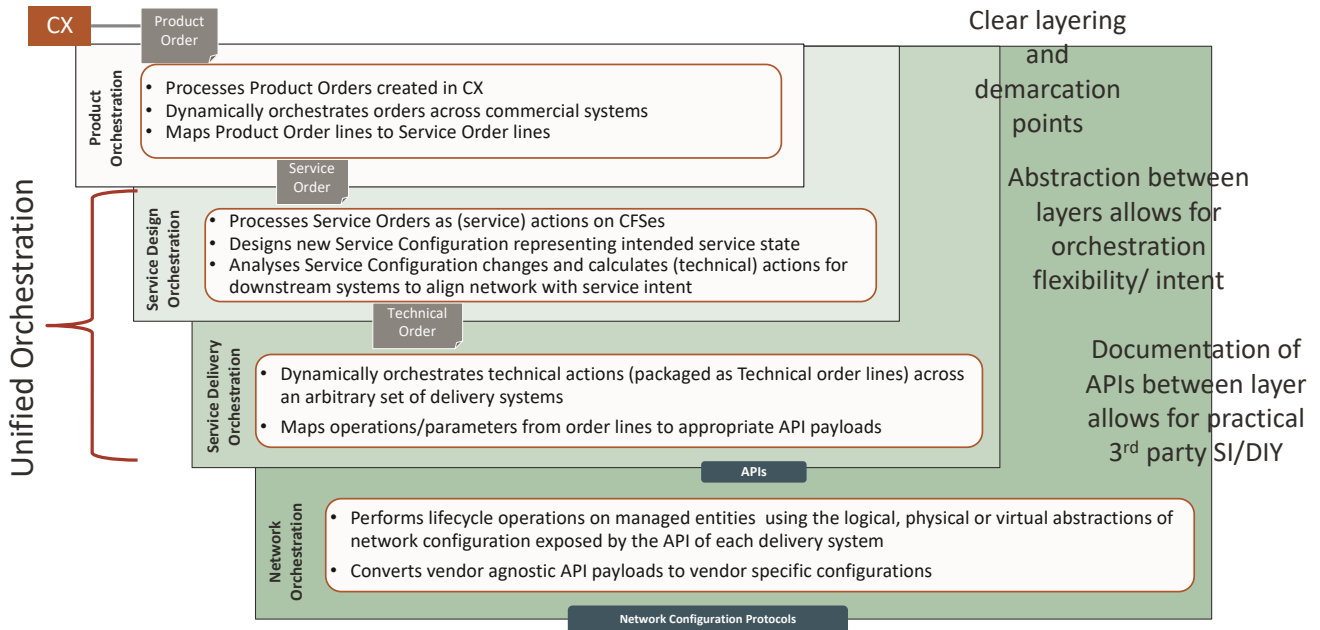
### Unified Orchestration

Oracle’s SNO/MDSO features the following architectural principles, which are consistent with their market position and market message. Unified Orchestration is:

1. Layered, with clear demarcation points between layers.
2. Corollary: Consistent with the TMForum’s “Product-Service-resource” hierarchy common to many catalog structures.
3. API-driven with documented interfaces between layers to adjacent processes.
4. Model- and data-driven, with topology, configuration and operational data embedded in models/reference data (not bespoke in workflows).
5. Based on loose coupling and abstraction between layers.

The diagram below may appear complex but in that complexity is demonstrated the implementation of many claimed capabilities. It also illustrates clearly how Oracle views layering, and the layers that they have engineered in support for.

Figure 2: Oracle Unified Orchestration Layering

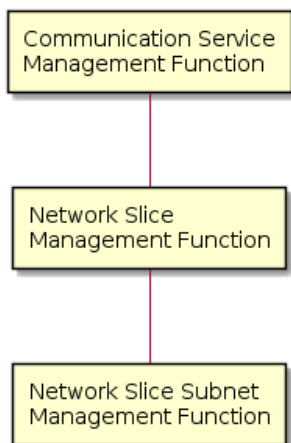


Source: Oracle with overlay comments from Appledore Research

Through its strict layering, loose coupling, APIs and model-driven approach to logic, Oracle has engineered in support for what we call “the multi’s”. Specifically, it provides a natural path to support multiple technology domains, multiple vendors, multiple orchestration vendors, and multiple services. All of these “multis” are both a fact of life in telecom, and a fact of evolution: as time progresses even focused network operators must add new technologies, new vendors and new service capabilities to its environment. Only a modular, loosely-coupled, API driven and model-driven approach can accommodate both this variety and future changes without deep modifications and re-integration.

**3GPP Slice Management Functions (TR28-801)**

**TMF Abstraction**



CFS: Communications Service

Interpret Service Order

- Service Order Management
- Design CFS instance in terms of a Network Slice RFS

RFS: Network Slice

Design Network Slice RFS instance as a set of RFS instances

- Core Network Slice Subnets
- RAN Slice Subnets
- Transport Slice Subnets

RFS: Network Slice Subnet

Design each Core/RAN NSS instance:

- Identify appropriate Network Service Descriptor
- Allocate identifiers

Design Transport NSS

- Connectivity instances amongst RAN/Data Centers

### Intent Based Operation and Effective Automation

Since the advent of NFV, Telco Cloud and SDN, CSPs have been very conservative on their path toward automation, as we discussed in the market overview section above. Contrasting this with Oracle's capabilities (and others' as well) reveals a gap between solution capability, and implementation reality. Oracle has confirmed that unified Orchestration accepts an "order" (whether internal or customer facing) for the future state intent, and passes that abstracted intent either to orchestration methods in UO, or to automated domain controllers. The state of Oracle's *customers'* network automation software stacks today is such that few fully automated domain controllers are capable of accepting such intent, and therefore today, the implementation details for stateful designs are worked out by UO.

As to the "how", our critical inquiry was satisfied by Oracle's answers to very pointed questions, specifically that a) "SLA level" parameters are passed in the order; b) no detailed workflows must be custom written to find an implementation, and c) this process is accomplished primarily by cascading rules. This is entirely consistent with our evaluation of the current telecom state of the art (intent), covered in our [Market Outlook Report on Intent](#).

Another stumbling block has been the "closing of the loop" between assurance and orchestration. Which brings us to Oracle's new Unified Assurance offering, and to the glue between them, Unified Inventory and Topology.

### Unified Assurance (& notes on unified inventory)

While this profile's topic is CDSO, we believe that Oracle's investment in Unified Assurance is highly relevant as a building block toward more automated, self-managing end-to-end life-cycle orchestration. We will therefore include their Unified Assurance ("UA") in this context.

In Oracle's naming scheme, the term "Unified" applies to their focus on an end-to-end view of networks and services, from workloads, to routers, to radios, to infrastructure (datacenters, glass, ...) and even to diesel fuel. UA provides a single end-to-end view, root cause analysis, and correlation. In the end, this process delivers the intelligence required to automate healing, scaling or other remediations (e.g.: physical repair).

In this context "automation" takes several forms. At its most basic, it automates the identification of a root cause. Next, one form of automation might be the automated dispatch of a technician and tracking of the result. Another might be automated healing of an SDN flow, CNF or underlying workflow, via orchestration.

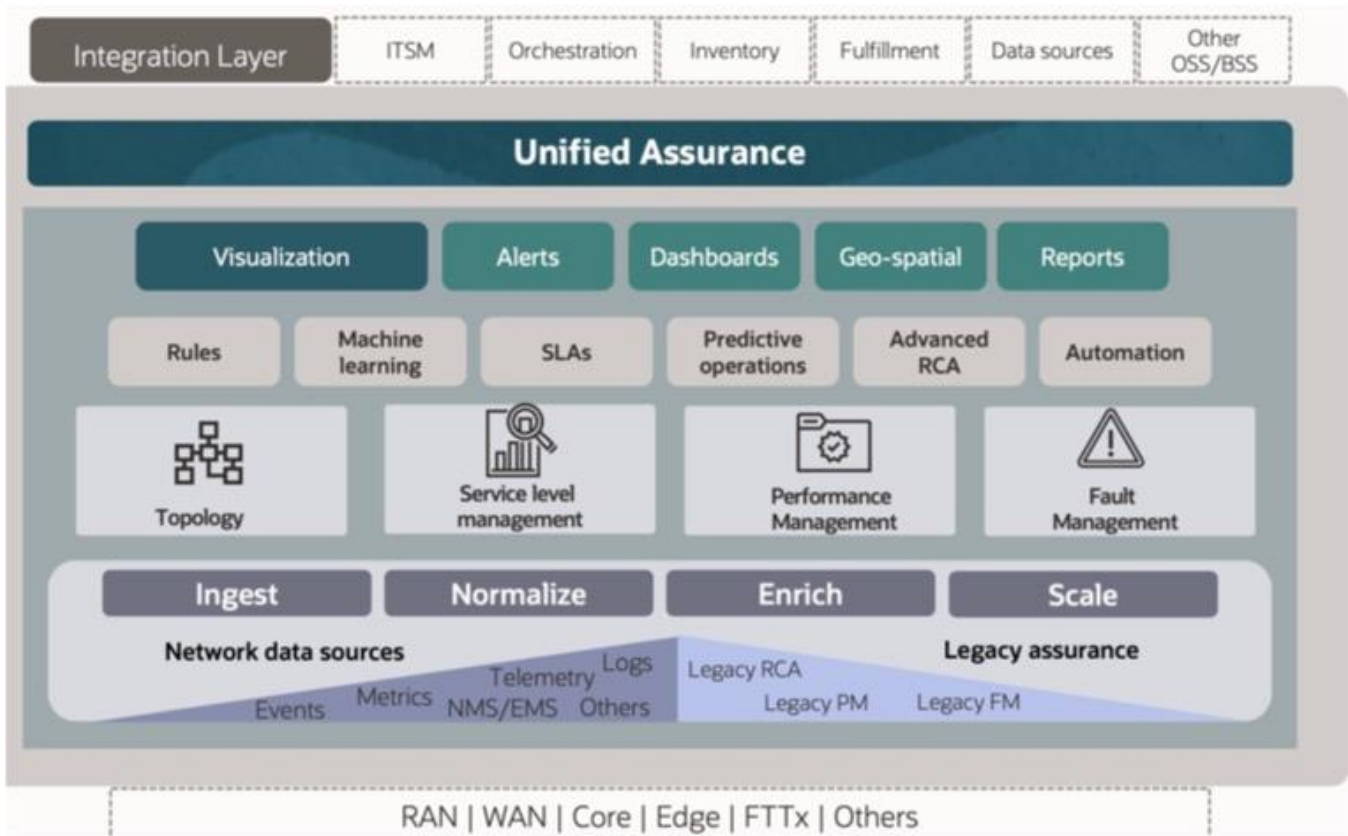
We feel that it is worthwhile to note what Oracle means by the term "end-to-end inventory". This may at first sound monolithic, like inventories of the past, but this is not the case. Unified Inventory, which Oracle believes is the "glue" that effectively links assurance to orchestration together contains essential physical resource data (locations, physical resources...) but also features what is a service-level dependency graph such that a cloud manager may abstract the details of a CNF, yet its SLA data is revealed in real-time such that any underlying failure may be inferred to dependent services, and vice-versa. This is consistent with Appledore's inventory recommendations.



Unified Assurance may collect data (faults, performance data) directly, or often onboards data from other sources, such as existing assurance solutions. In Appledore's NAS taxonomy the data collection devices are part of Network Data management, while the UA functions including RCA and ML, are part of AIOps. We will focus on UA in its use as part of AIOps, to close the loop and effect automation.

The diagram below is a functional representation of Unified Assurance, illustrating the major categories of inputs, client/outputs, and actions, including SLA management, performance management, and fault management, with dependencies assisted by known topology dependencies.

**Figure 3: Oracle Unified Assurance, logical view**

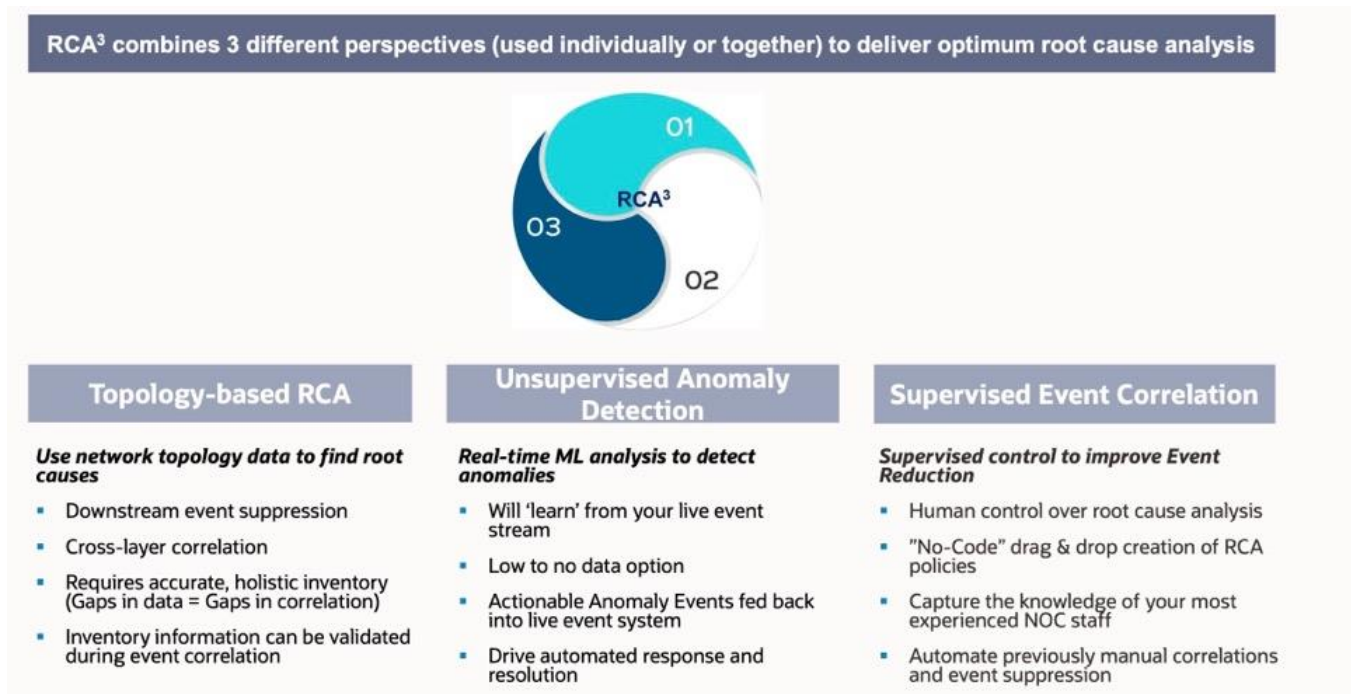


Source: Oracle

The key to automation is often knowing what to fix. Is it a performance problem or simply a scale issue? Must an entire CNF be re-created or can we identify an offending workload? Or maybe it's not a workload at all, but a datacenter SDN flow. Understanding the root cause, and learning (ML) correlations and causations are essential to effective healing and scaling. And to do so without an undue overhead load, means focusing down to the smallest unit that may be repaired. This is the essence of cloud-native, and the same principles apply to SDN flows, modular RANs and myriad other network services and functions.

In Unified Assurance, Oracle has three processes that can be applied to understand the underlying root cause, and to therefore focus on the real problem, at its simplest. They call this “RCA<sup>3</sup>”. This approach is illustrated in the diagram below.

Figure 4: Oracle Unified Assurance's "RCA3"



Source: Oracle

The “3” RCA methods employed are:

1. **Topology based**, which while widely used, remains almost vice-free when the dependency data is known.
2. **Unsupervised Machine Learning** of anomalies, and the correlations/causations behind them.
3. **Supervised Event Correlation** in which humans can help create associations, dependencies and resolution scripts that can then be replicated automatically by UA. This 3<sup>rd</sup> method is particularly useful when the experience and wisdom of a few engineers and technicians must be preserved and applied more widely (“scaled”).

Tying this back to automation, these are the methods that take data (“this service is performing poorly”) and reduce it to an atomic root cause that deliver the intelligence needed by orchestration to effect resolution.

### Open Interfaces and Standards

Oracle is delivering more than an IT-friendly toolkit. They emphasize the library of templates they have built for 5G network segments and 3GPP standardized slice management. Oracle try to walk that fine line between being “IT and therefore open” and having “NEP credentials” through their software-led NF businesses, including policy, SBCs and more.

Appledore believes this is very consistent with Cross-Domain Service Orchestration, since network slices are likely to be at the heart of many enterprise private networks and customized services, especially in the growth areas of IoT. Oracle also supports TMF Service Catalog (TMF 633), Service Inventory (TMF 638), Resource Inventory (TMF 639), Activation and Configuration (TMF 640), Service Ordering (TMF 641), and Service Qualification (TMF 645). These interfaces provide the integration points for service and ordering parameters.

## MARKET IMPACT

### Competition and Market

Oracle UOps, and its Unified Orchestration component in particular, competes with a wide range of competitors, large and small. These range from the major NEPs (**Ericsson, Nokia, Huawei** ...), to other large IT firms (**HPE, IBM, ...**) to telecom ISVs (**Amdocs, Blue Planet, Netcracker**<sup>1</sup>, ...) to the many specialists and innovators that are not only challenging, but in some cases establishing significant beachheads (**Itential, Inmanta, ...**).

As we discuss at length in our recent Market Outlook Report on the Cross-domain Service Orchestration market, we are seeing significant segmentation with players that offer different combinations of product strengths and delivery/services strengths, such that choice is often a matching of a supplier's packaging and emphasis to a CSP's unique needs and aspirations.

### Cross Domain Orchestration: An embryonic market in transition

The cross-domain service orchestration market is embryonic but forecast to grow rapidly over the next 5 years. This is in part explained by the innate conservatism of CSPs, combined with the very real complexity of their network and operational environments. This creates an apparent paradox for those who scrutinize this market. On one hand, the vast majority of suppliers claim very advanced technology and capabilities that support automation, and the quality of responses over the past 2+ years has risen dramatically – from primarily workflow-based solutions to true, intent-based, closed-loop capable, solutions. Yet, on the other hand, the reality of commercial deployments does not yet demonstrate these levels of sophistication. We are clearly on a journey, and operators are proceeding cautiously. To be fair, such radical change is not only complex, but also labor-intensive, so this ought not be entirely surprising.

From the examples we have seen across all suppliers, many operators are testing technology before they turn on full automation and, so far, are orchestrating across only a limited set of domains. As further evidence, back in 2018 we noted that while many leading CSPs had big plans to transform their SDWAN businesses into dynamic, multi-service, on-domain powerhouses, in reality they initially had no automated cross-layer assurance, nor automated healing – to say nothing of

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<sup>1</sup> Both Blue Planet (Ciena) and Netcracker (NEC) are technically part of NEPs, but operate largely as autonomous ISVs.

proactive healing! The good news is that by the time we revisited in 2020, many of these omissions were implemented or in the process of being implemented. The bottom line is that we must treat these evolutions as works-in-progress and anticipate course and speed with confidence that the industry will in fact continue to progress.

The set of tables below provide evidence for Oracle’s progress in the CDSO market, specifically those deployments that meet Appledore’s criteria for modern, next-generation and cross-domain service orchestration. In addition to quantitative summaries of deployments, Appledore and Oracle selected featured deployments from among the orchestration and assurance customers, that best reflect their market success in true, cross-domain orchestration employing modern automation methods. Note that the scope of our CDSO report (and therefore these examples) omits in-domain orchestration (for example, those entirely in the IP, transport or cloud/datacenter domains).

**Table 1: Selected Deployment Examples: Oracle Unified Orchestration**

Customer	Problem	Approach to Problem	Implementation	Business Outcome
<b>Vodafone India Ltd. (VIL)</b>	Consolidation of operations across both technical domains and administrative domains (Vodafone and Idea Cellular). Challenges included assurance, visualization, alignment of RAN and core/back-haul.	Replace silos with a next-generation suite based on federated inventory, layering and service oriented, intent-based orchestration. Link to existing data where desirable.	Deployed a broad range of products within the UOps umbrella, including unified inventory, discovery and orchestration. Integration to existing data systems. Solution resulted from collaborative planning and engineering.	End-to-end visibility; modernized fulfilment and inventory. No data provided on levels of automation and degree of LCM achieved.
<b>Vodafone UK</b>	Inability of existing management infrastructure to support to launch of digital services, to innovate and disrupt, and have a single view of customers.	Need to replace ageing, bespoke OSS/BSS. Desire for a solution agnostic to segments, products and future technologies (agile, configurable), and to employ SOA and therefore re-use.	Deployed Oracle across the four-quadrants of B2B, B2C, across mobile and fixed.  Included UOps (OSM, ASAP and UIM) as well as BSS components that are out of the scope of this document.	Vodafone claims that, for the first time, it has a single bill, single view of the customer, can achieve new service launches without a new management platform, reduced time to market. In addition to mobile services, VFUK also deployed IPTV, IoT and broadband services on same platform – demonstrating its flexibility to support future services and domains.

Customer	Problem	Approach to Problem	Implementation	Business Outcome
<b>Tier-1 US cable MSO (Multi-Service Operator)</b>	This MSO had a familiar story; rapid growth accelerated by acquisitions; inconsistent systems which were bespoke, and built for a specific service and operating model. The brittle operating model, common to most older OSSes, constrained innovation, and meant that development and maintenance costs were high when changes were needed. New (enterprise ethernet-based) services demanded both innovation and very different processes – and therefore a more flexible solution.	Invest in a next-generation solution that is technology and service agnostic, and supports rapid innovation (service creation). Consolidate acquisitions on new platform.	MSO deployed UOps (UIM, OSM, ASAP) as well as BSS components to simplify, automate and speed to order-to-service process as well as provide a platform for unconstrained innovation. MSO does not appear to have automated full LCM as of yet. So far, MSO has consolidated all B2C service fulfilment on UOps, with ~ 30M on the system at this point in time.	MSO reports automation and speedup of the innovation and fulfilment processes, along with a 5-fold reduction in fulfilment fallout (5% to < 1%). They also report platform improvements such as single repositories for some critical data, and consistent tools that are expected to simplify their life and reduce maintenance/integration costs going forward.

All data: Oracle. Summaries: Appledore

**Table 2: Selected Deployment Examples: Oracle Unified Assurance**

Customer	Problem	Approach	Implementation	Business Outcome
<b>North American Tier-1; Enterprise Division</b>	<p>NA Tier-1 delivering business services (WAN, SDWAN&lt; security, ...) has limited cross-layer, cross-service correlation and visibility. Wants ability to quickly pinpoint root cause and end-to-end performance.</p> <p>Creating the appropriate topology from different data sources and visualizing the dependencies was a time consuming and laborious effort to</p> <p>Note: problem highly consistent with what Appledore reported on most CSPs in our 2018-19 SDWAN series of profiles.</p>	<p>Solution is a PoC / joint problem solving project.</p> <p>The solution dynamically ingests topology information from several different systems over a Kafka bus. This federated network topology enables operations to immediately determine and resolve the root cause of customer network issues.</p>	<p>Solution is a PoC / joint problem solving project, based on Unified Assurance with RCA3 and unified topology.</p>	<p>This program has proven in faster network analysis, with greater automation, increased operations productivity, and improved enterprise customer satisfaction.</p>
<b>EIRCOM NGSM Project</b>	<p>Network-centric operations, technology silos, high labor costs, slow resolution.</p> <p>Goal to apply this in particular to going forward services such as next generation access and IPTV.</p>	<p>End-to-end view across technologies. Service, rather than network (NOC) perspective. Automated RCAs.</p>	<p>Project-based predecessor to UA approach. Single global platform. Built on topology base. Data ingest from myriad systems.</p>	<p>Reduced annual Maintenance &amp; Support 40% annual reduction</p> <p>Reduce NOC headcount by &gt; 50%</p> <p>Improved MTTD by 34%</p> <p>Improved speed of delivery of Monitoring of New Services (e.g., IPTV) by 33%.</p> <p>ROI within 12 months</p>
<b>Digicel G (Global) Modernized NOC project</b>	<p>Network-centric operations, technology silos, high labor costs, slow resolution.</p>	<p>End-to-end view across technologies. Service, rather than network (NOC) perspective. One NOC/SOC for all global markets. Automated RCAs.</p>	<p>Project based predecessor to UA approach. Single global platform. Built on topology base. Data ingest from myriad systems.</p>	<p>5x labor reduction</p> <p>OSS/SW instance consolidation</p> <p>Faster TTR</p> <p>Better customer sat</p>

				Avoid needless truck rolls
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All data: Oracle. Summaries: Appledore

**Table 3: Market Evidence - deployment summaries for orchestration and assurance**

Solution Set	Aggregate Market Evidence
<b>Oracle Unified Orchestration / Unified Inventory and Topology</b>	Aggregate > 150 deployments ~50% as represented for service design, orchestration and network resource management. ~30% same, design and fulfilment only ~20% same, network engineering and resource management only
<b>Oracle Unified Assurance</b>	Aggregate > 40 deployments Few as represented, yet (brand new product, in POC/sales) Base (40) is primarily fault, some fault + performance Only a few unified assurance with RCA3 and topology

All data: Oracle. Summaries: Appledore

Source: Appledore Research, Oracle

As we can see from the data above, not all commercial orchestration deployments meet the requirements outlined in this report for being multi-domain and are employing the technical best practices discussed. To Oracle’s credit, we should note that Unified Orchestration (and before it SNO) is a relatively modern product, and has employed models, layering, abstraction and true orchestration for several years.

It is also worth noting that due to the newness of the Federos acquisition and the creation of the Unified Operations suite, it is implausible to have references for this solution. Therefore we must content ourselves with metrics for the individual Federos and SNO/UO deployments, and add in the “new knowledge” that Oracle is now bringing them together.

## APPLEDORE ANALYSIS

Oracle has been touting its layered, open, standards based orchestration approach for years. While they have had some success, like most orchestration players, the take up has been slow, outside of transport domain automation (which is another segment with dedicated products). One of the key findings of the underlying market outlook report and research program (on which this profile is based) is that the time for technology-agnostic CDSO appears to have arrived. Will this rising tide lift all boats, or will some ride higher in the water than others?

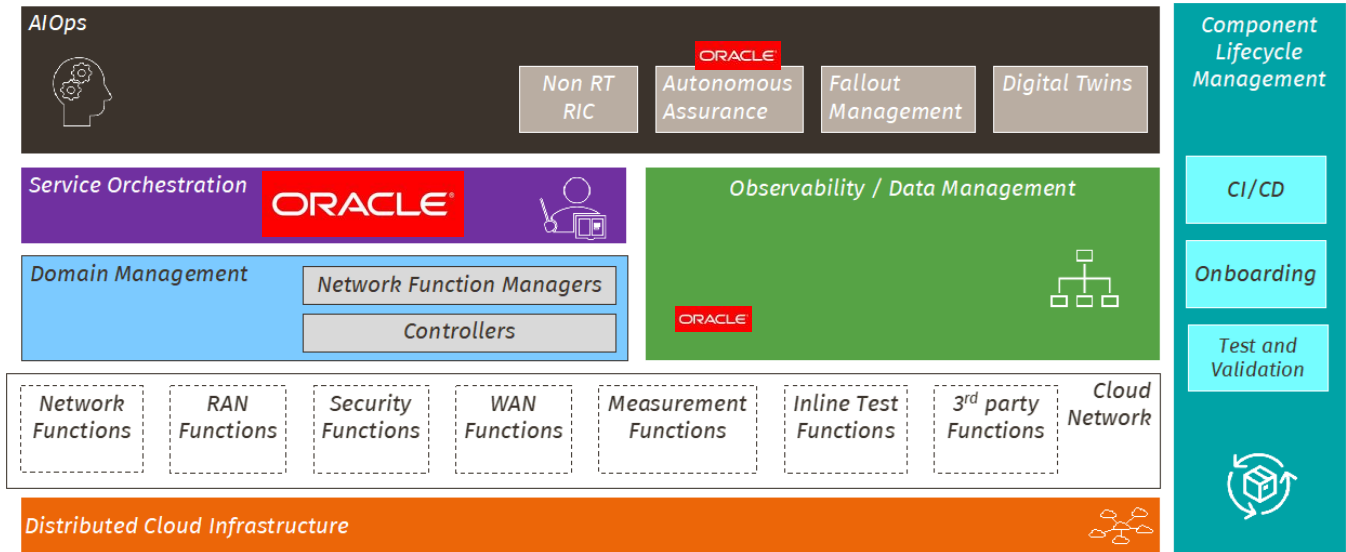
We find that UOps and UO (at least on paper) meet Appledore’s best practices for automation and agility, with a focus on efficient, practical closed loops. Intent, model based operation, loose coupling and other key elements are all part of the package. We also see Oracle making investments, such as its acquisition of Federos, to move this process forward in the wild.

## Oracle Unified Operations - Cross-Domain Service Orchestration

In terms of market success, the data speaks best for itself, but appears to be a solid performance, yet one punching under its weight – for now.

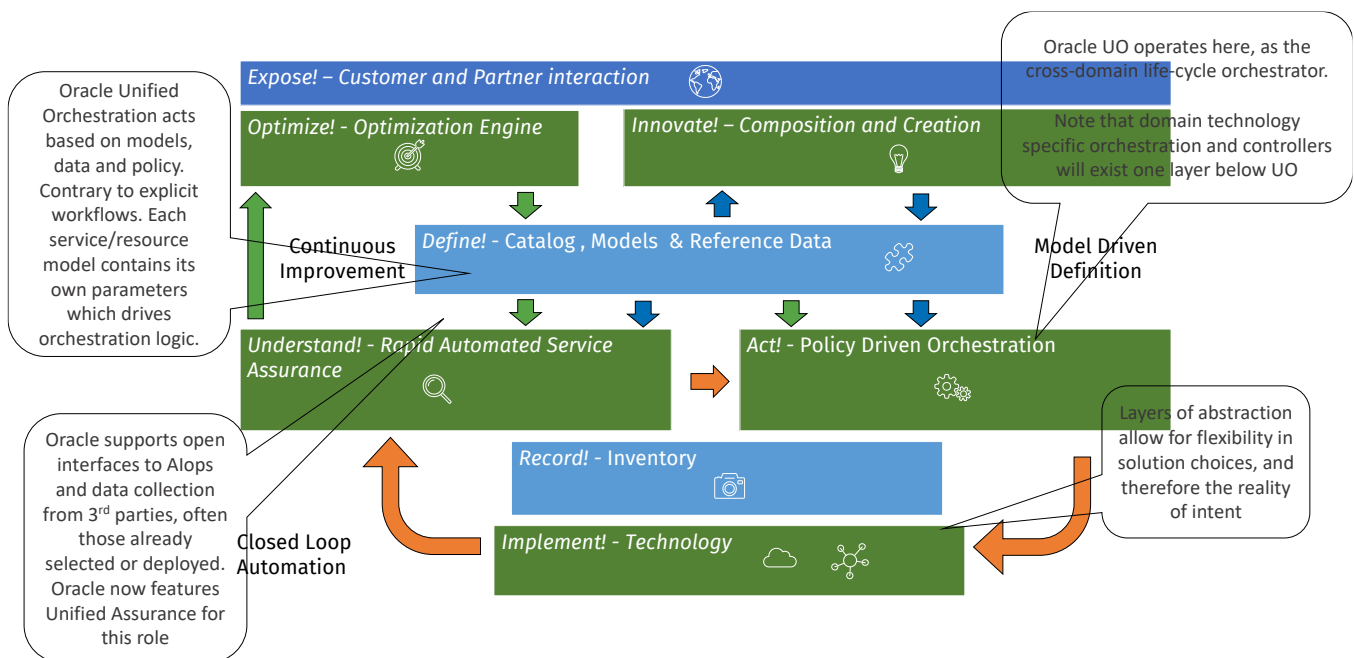
The diagrams below help view Oracle UOps in context. We overlay it on several of Appledore’s “normalized” functional and process taxonomies. We call out key design tenets, and provide context on what functions each product performs. Finally, we summarize with a SWOT.

**Figure 5: Oracle Unified Orchestration, Assurance and Inventory in the context of the Appledore NAS Taxonomy**



Source: Appledore Research

**Figure 6: Oracle UOps, overlaid on Appledore network automation functional diagram**





Source: Appledore Research

## SWOT analysis

Strengths	Opportunities
<ul style="list-style-type: none"> <li>Layered architecture</li> <li>Abstracted, “service oriented” view of lower layers</li> <li>Documentation of models, structures, APIs</li> <li>Focus on managing autonomous domains</li> <li>Model driven / intent (leverages APIs, abstraction and model-driven, above)</li> <li>Pre-built service templates and multi-party integration lab</li> <li>Focus on closed loop automation, including across domains. Commitment demonstrated with Federos acquisition and integration</li> </ul>	<ul style="list-style-type: none"> <li>Oracle UOps has an opportunity to grow with the market as it evolves from early proprietary and silo deployments to true platforms for innovation and growth</li> <li>Oracle also has the opportunity to differentiate itself from other ISVs (independent of big NEPs) with its high degree of open-ness, layering and documentation – freeing buyers to do their own development, integration and maintenance</li> <li>Opportunity, with Unified Assurance, to demonstrate effective closed loop operation, both with Oracle orchestration and with 3<sup>rd</sup> parties.</li> </ul>
Weaknesses	Threats
<ul style="list-style-type: none"> <li>Inconsistent messaging (previous to today’s leadership) and focus confused and therefore hurt Oracle’s market position</li> <li>Loose integration with NFs compared to NEPs may appear less turn-key and risky. Yet Oracle is also potentially more able to execute multi-vendor relationships politically.</li> <li>Limited proof points of full LCM automation, but it is early days and has more to do with customer’s journeys. Watch this space.</li> </ul>	<ul style="list-style-type: none"> <li>Oracle could get squeezed from NEPs that modernize and open their portfolios, if/when they provide similarly open, flexible solutions.</li> <li>Oracle could get squeezed by ISVs that shift from proprietary solutions to open-source based efforts, becoming less proprietary, less closed, and thereby reducing Oracle’s differentiation.</li> <li>A corporate philosophy – that all software would shift to SaaS, caused some historical inconsistency in Oracle’s OSS positioning, communication and perceived direction -- and today must play catch up. Appledore wish to emphasize that the current positioning is (finally) clear.</li> </ul>

## SUMMARY

Oracle's Unified Orchestration is now part a broader Unified Operations suite aimed squarely at taking closed-loop operation from theory to reality. In this solution, Oracle embraces standards, layering, an open architecture, documented APIs, lifecycle orchestration and intent-based orchestration. It checks all the boxes for an orchestration solution that can grow with a network operator's needs and keep complexity & integration costs in check.

This makes it a flexible and open platform, intended for innovation over time. Such platforms are always a near-term trade off, since they are inevitably slightly more complex to implement the first time, and typically the supplier has traded pre-integration (a NEP building in its own equipment and operational norms) for the tools necessary for CSPs or SIs to build logic over time.

Appledore believe that this tradeoff has been a problem for the industry over the past decades – stifling innovation and resulting in the “everyday high maintenance and SI costs” that have bedeviled OSS. While Oracle is not the only vendor to embrace these many characteristics, the fact that they embrace them as openly and with as much documentation suggests that they believe this is the moment when CSPs will make the leap from tactical, siloed solutions to a true flexible service innovation factory that can build the monetizable services of the future.



**Insight and analysis for telecom transformation.**

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