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Oracle Communications Unified Assurance – Charting the Path towards Autonomous Operations

An Oracle Position Paper

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Introduction

In today's dynamic landscape, managing complex communications networks demands a paradigm shift towards automation and autonomy. Oracle endeavours to provide a comprehensive solution that enables CSPs, MSPs, and large enterprises to achieve unprecedented levels of efficiency and reliability in their operations.

This position paper outlines the strategic vision of Oracle Communications Unified Assurance, presenting a route towards autonomous network management for CSPs, MSPs, and large enterprises. By leveraging cutting-edge automation technologies and adhering to industry best-practices and standards, Oracle seeks to empower organizations with the tools necessary to streamline their communications networks effectively. The paper outlines how we are leveraging, and in cases contributing to, key industry standards in this regard. These include the transition through automation ultimately to autonomous operations using increasingly intent-based techniques leveraging standards and best-practices from bodies including TM Forum, ETSI and others.

Oracle's approach is to pursue a product strategy that is broadly market focused and standards-aligned, yet customer influenced through in-depth and direct customer collaborations, product advisory boards and other mechanisms for mutual roadmap visibility and alignment.

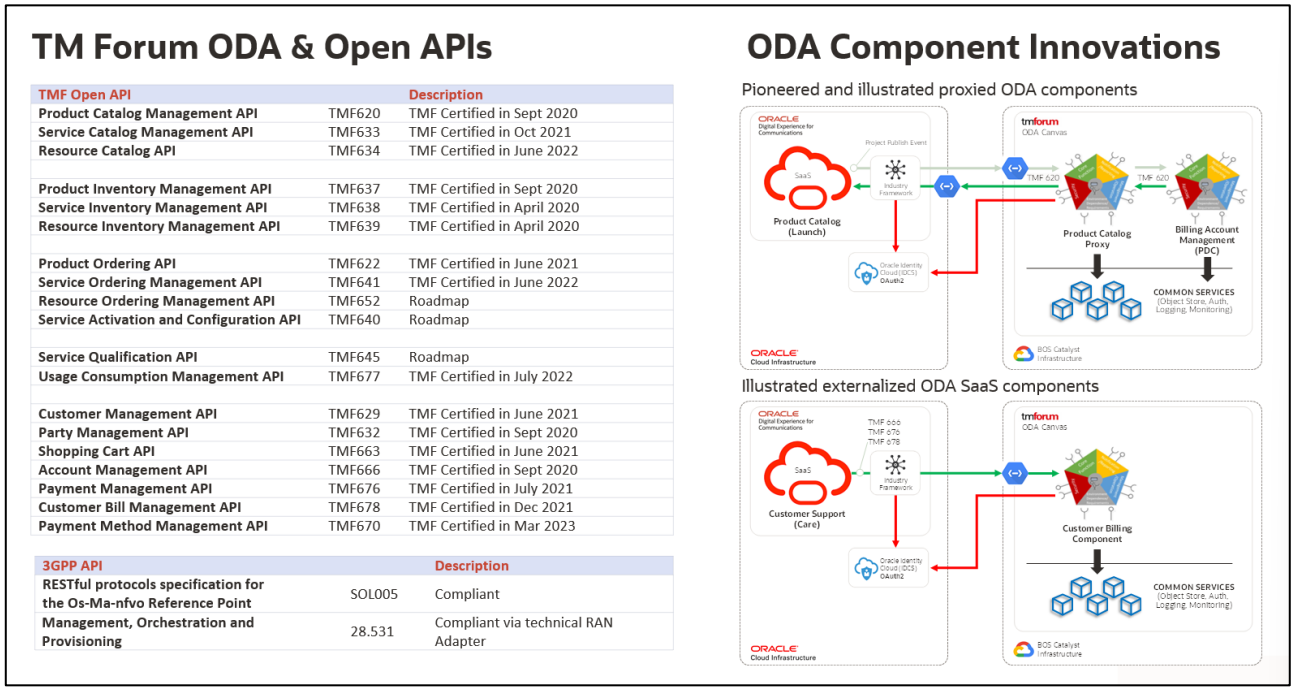
The Journey to Automation

The emergence of Autonomous Networks necessitates the presence of adaptive models capable of learning from dynamic changes. To achieve this, a clear distinction is required within the autonomous domains, forming a tangible fabric of interconnects that encompass business awareness, capabilities awareness, and intent-driven interactions. These fundamental principles serve as the building blocks for crucial transits, facilitating service knowledge and visibility into decision-making processes. Such an approach establishes an intelligent plane for autonomous operations, empowering the fulfilment of business goals within the context of the services offered.

Central to our approach is the gradual transition from automation to full-fledged autonomy. By embracing intent-based techniques and drawing from established industry standards, Oracle aims to facilitate a seamless migration towards autonomous network operations. Operational autonomy requires fabrics and platforms which exhibit the following key characteristics:

- **Application connectivity fabric:** TM Forum standards-based, real time OSS/BSS information integration across systems via an open, well documented service bus helps create the interconnecting application fabrics from which business, service, and resource functions and automations interoperate.
- **Messaging Standards:** Leverages standards-based TM Forum message formats for guaranteed plug-and-play workflows between applications enabling automations at each functional layer.
- **Human Workflows that promote collaboration:** Plug in a unified workflow engine to allow the construction of dependency-based workflows that operate across systems.
- **Automation systems that provide feedback:** Human and autonomous learning models rely on the success or failure of actions for autonomous models to improve.
- **Open pool of Machine Learning models that actively evolve:** CSPs must not rely on singular machine learning models but must continue to develop the models they leverage and should look for systems that employ their own plug-in architectures that can exploit the potential of machine learning.
- **Service models that connect to the business:** The journey to autonomous operations requires connectivity to service models to understand the business impact to operations. These serve as a reference dashboard for investment results along the journey.

Oracle prioritises addressing the requirements of CSPs to align with TM Forum standards, encompassing both Open APIs and the ODA component architecture, as outlined in the figure below. This enables interconnectivity with CSPs' business, service and resource operational fabrics leveraging standard TM Forum APIs.



TMF Open API		Description
Product Catalog Management API	TMF620	TMF Certified in Sept 2020
Service Catalog Management API	TMF633	TMF Certified in Oct 2021
Resource Catalog API	TMF634	TMF Certified in June 2022
Product Inventory Management API	TMF637	TMF Certified in Sept 2020
Service Inventory Management API	TMF638	TMF Certified in April 2020
Resource Inventory Management API	TMF639	TMF Certified in April 2020
Product Ordering API	TMF622	TMF Certified in June 2021
Service Ordering Management API	TMF641	TMF Certified in June 2022
Resource Ordering Management API	TMF652	Roadmap
Service Activation and Configuration API	TMF640	Roadmap
Service Qualification API	TMF645	Roadmap
Usage Consumption Management API	TMF677	TMF Certified in July 2022
Customer Management API	TMF629	TMF Certified in June 2021
Party Management API	TMF632	TMF Certified in Sept 2020
Shopping Cart API	TMF663	TMF Certified in June 2021
Account Management API	TMF666	TMF Certified in Sept 2020
Payment Management API	TMF676	TMF Certified in July 2021
Customer Bill Management API	TMF678	TMF Certified in Dec 2021
Payment Method Management API	TMF670	TMF Certified in Mar 2023

3GPP API		Description
RESTful protocols specification for the Os-Ma-nfvo Reference Point	SOL005	Compliant
Management, Orchestration and Provisioning	28.531	Compliant via technical RAN Adapter

Figure 1.Oracle TM Forum ODA and Open API support.

Leveraging Industry Standards

To ensure compatibility and interoperability Oracle actively contributes to, and adopts, key industry standards including those defined by the TM Forum, ETSI, 3GPP, Linux foundation, etc. This enables our customers to leverage industry best-practices and avail of contemporary innovations.

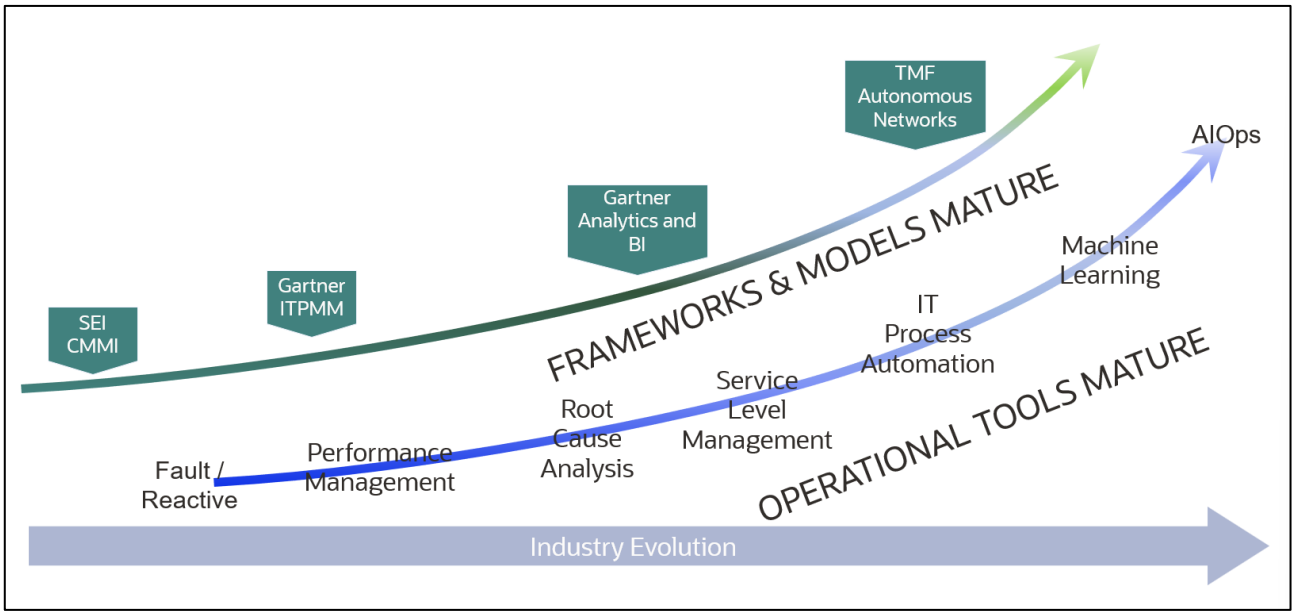


Figure 2. Frameworks and tools evolve on a parallel path [2,3,4].

Oracle works closely with key analyst firms and industry bodies that help guide the industry in addressing the challenges of managing evolving networks and technologies. The TM Forum Autonomous Operations Maturity

Model is a recent example for how customers can adopt, measure, and address new business opportunities while managing the complexity of their evolving networks.

Customer Centric Strategy Complements Industry Direction

Oracle recognizes the importance of customer collaboration in shaping our product strategy. We foster a customer-influenced approach through engagement platforms such as product advisory boards, promoting a symbiotic relationship that enhances mutual understanding and roadmap alignment.

Through Oracle Communications Unified Operations, CSPs, MSPs, and large enterprises can embark on an evolutionary journey towards a fully autonomous network management ecosystem. The convergence of automation and intent-based techniques paves the way for unprecedented operational efficiencies, reduced costs, and elevated user experiences.

Let us consider the TM Forum's Autonomous Operations journey in the table below, where we have taken the liberty to expand and elaborate on what those milestones look like.

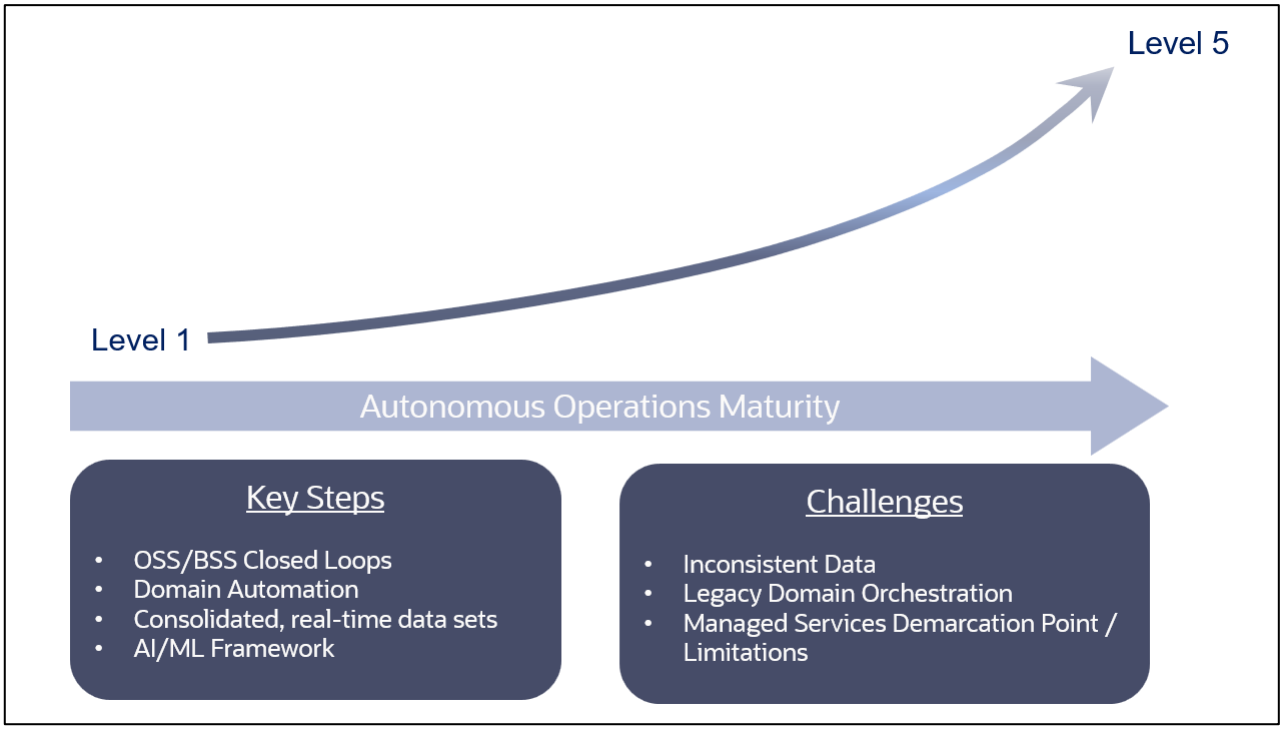


Figure 3. TM Forum's Autonomous Journey [1]

Levels	TM Forum Meaning to Unified Operations – across design, orchestration, assurance
Level 0 Manual Management	Operations reacts manually to perform interventions against some level of operational visibility. May include rudimentary fault management as an example.
Level 1 Assisted Management	Some levels of policies are deployed, some levels of ad-hoc automations are used, human interactions with the systems are significant. All aspects of the business are still self-serving.
Level 2 Partial Automation	Partial steps to larger automations that operate in the silos of various OSS/BSS systems. No interconnecting fabrics. Customer sentiment should start being introduced and developed further ahead. Weather, lightning, power, door alarms, and other factors should feed into the systems. Independent parts of the business start to move to self-fulfilling.
Level 3	Interconnecting Application Fabrics (Business, Service and Resource) are introduced to allow systems to progressively sense real-time changes across systems in the OSS/BSS fabric.

Conditional Autonomous Networking	Automations begin to interconnect with the fabric to understand change and impacts. Some optimization and adaption foundational to intent based understanding. Service Models and Business Impacts start to feed models. Analytics are fully in place and growing with the introduction of new learning models and ML technologies. Fabric interconnects start to further enable self-fulfilling.
Level 4 Highly Autonomous Networking	Cross domain automations are in place, business modelling feeds into the models, customer sentiment comes in fully from outside frameworks and is understood through autonomous analytics to feed customer and business aware networks. Decisions made by the systems now based on all factors and now evolve to full autonomy. Cross domain and fabrics start to enable more and more to self-fulfilling.
Level 5 Fully Autonomous Networking	Closed loop is achieved and maintained as new business structures and services are fed into the autonomous operations fabric. Systems are achieving almost full autonomy as you optimize self-assuring.

Table 1. Autonomous Operations. [1]

Automation Journey Steps with Oracle Unified Operations and Oracle Unified Assurance

The automation journey is essential for organizations seeking to enhance the efficiency and reliability of their operations. With Oracle Unified Operations and Oracle Unified Assurance, businesses can embark on a transformative path towards achieving seamless automation. The following outlines the steps of this automation journey.

1. Normalize data transformed into information (as it is in Unified Assurance). This is implicit as the journey to fully autonomous operations requires "normalization and transformation of inbound data into observability information" when it comes to fully autonomous operations.

   Examples needed to support autonomous operations include:

   - Common Event Format / Event Pool
   - Common Metrics Format / Metrics Pool
   - Common Messaging / Signalling Pool

2. Consolidate systems / consolidate schemas / fields. This is implicit as the journey to fully autonomous operations requires "single sources of truth" when it comes to fully autonomous operations. Oracle's Unified Assurance allows for the successful consolidation of all observability signals from infrastructure and can allow for your transformation by serving as a manager of managers as you consolidate and decommission your legacy fault, performance management, topology, flow, and other legacy tooling.
   - Consolidate fault, performance, topology into a single system.
   - Consolidate and rationalize event fields as you converge the systems into a single source of truth.
   - Unify Assurance (observability).
3. Journey to closed loop integrations with the "Master Sources of Truth" in Operations as you begin to develop your application interconnection fabrics across Business, Service and Resource.
   - Determine most expensive workflows and automate both the systems and the people.
   - Measure and communicate progress back to the business during the evolution.
4. Think about the two stages for information:
   - Hot fast and impactful stays in operations for high-speed analysis and action / automation.
   - Data lake analysis uses larger pools of information drawn over longer time periods for more delayed reflected analysis – needs to have feedback loop into Operations as "enrichment" and "automation assistance".

5. Oracle's Unified Assurance reference architecture is a foundational step in this journey.

Through a holistic approach to automation, organizations can harness the full potential of Oracle's integrated solutions to pave the way towards a more agile, intelligent, and future-ready operational landscape.

NOC Evolution Journey – Consolidation & Interconnection

Think of your applications interconnecting across a standard framework to serve to create exchanges of information between the applications to serve resources, services, and the business. These three areas of interchange are represented as virtual application fabrics within the service bus to allow for interconnectivity.

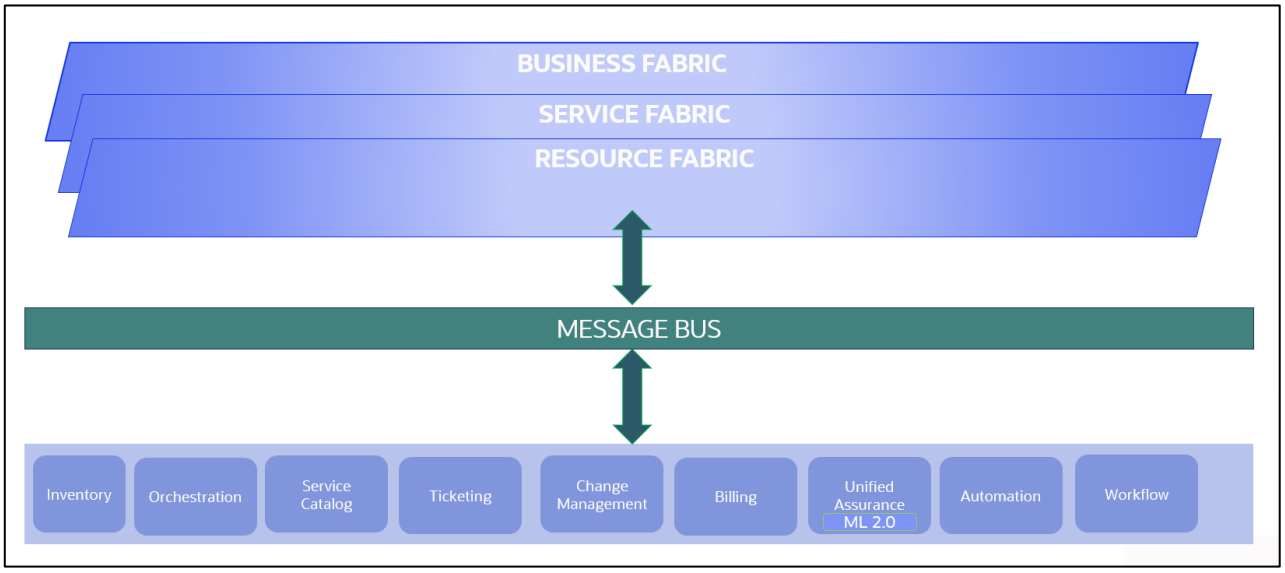


Figure 4. Virtual Service Fabrics within a common messaging standard and bus.

Virtual Service Fabrics Serve Virtual Function Workflows & Automations.

As these applications begin connecting and intercommunicating across these virtual service fabrics, consolidation and resource pooling become possible. Legacy systems are virtually consolidated as you move to more modern systems that allow for transformational scale and autonomy.

Unification of inventory, topology and assurance are pivotal to closed loop autonomous operations as we have seen across our customers in their journeys to autonomous operations. Oracle Unified Assurance can consolidate legacy observability systems into a single unified platform because of our unique scalable architecture which features a fully autonomous collection layer with smart analytics at the edge. Many customers have replaced legacy tools through consolidation (Unified Assurance acts as a manager of managers) and then retirement of legacy tools to lower OPEX and consolidate observability into a more modern, scalable, and unified platform.

Oracle's own Unified Operations applications are also engaged with the TM Forum messages and are plugging into the virtual service fabrics to enable future state operations.

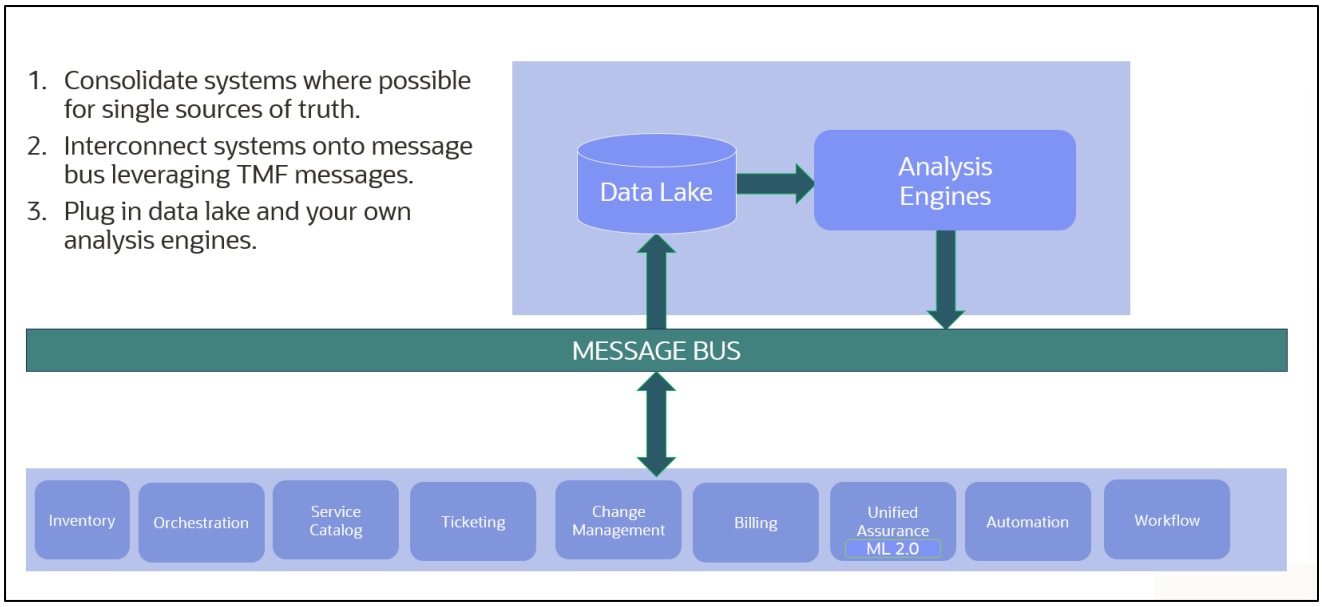


Figure 5. Network Operations evolution journey with application consolidation.

As the service bus continues to evolve, customers are increasingly integrating external data and diverse sources of information (e.g., Twitter customer sentiment, Down Detector results, Weather overlays etc.) into their data lakes, forming a crucial part of their autonomous operations journey.

However, the sheer scale of data housed in these data lakes, coupled with the time required for data extraction, transformation, and loading from operational systems, poses challenges. Additionally, there is a need for rapid access to certain information in real-time operations. As a result, any machine learning insights derived from the data lake can, at best, play a supportive and supplementary role in the lower tiers of operations, where swift response times are vital for achieving autonomous closed-loop operations.

To progress towards higher levels of autonomous operations, leveraging data lakes and external sources of information becomes essential. These resources have the potential to enrich, validate, and assist in optimizing operational processes, taking the organization closer to achieving its autonomous operations objectives.

NOC Evolution Journey – Maturity Level 2 to 3

Automation and Machine Learning are in place as part of the journey to autonomous operations.

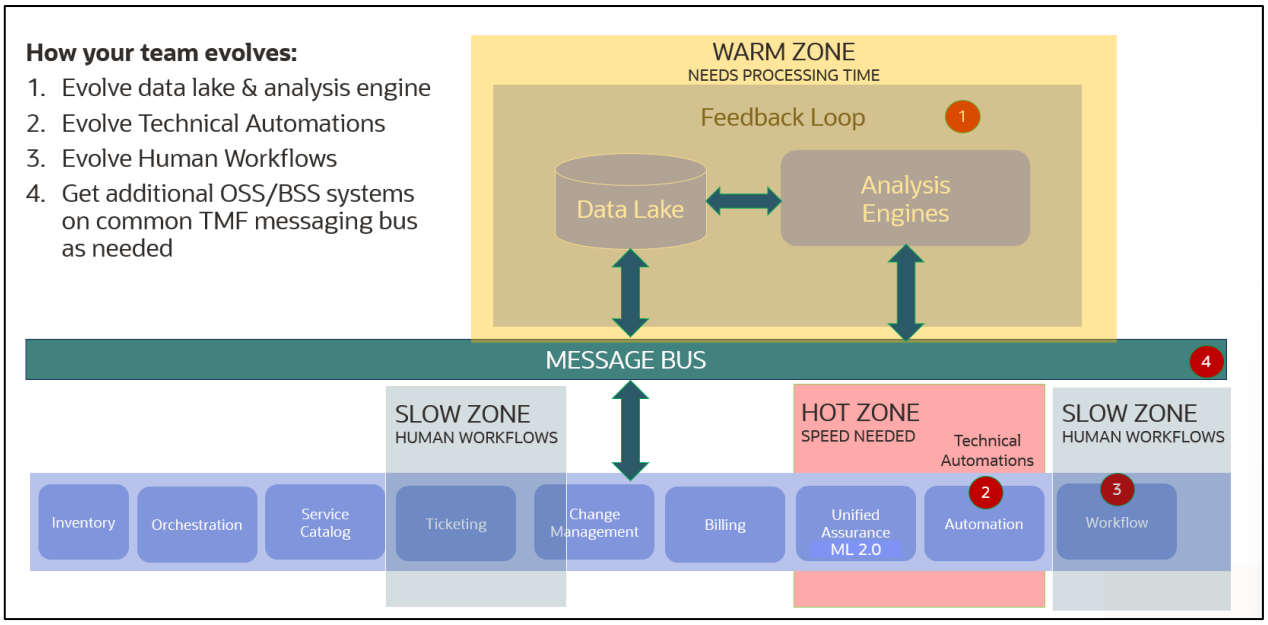


Figure 6. Operational Zones where Speed is important.

Here we begin to move from ad-hoc automations to standardized automation platforms that allow for interconnection onto the service bus and its virtual fabrics, and critically to the workflow engine. The workflow engine is meant to serve initially as an automation and human gateway as we move to complete closed loop automations (which itself is another journey). Humans are still required for functions like approvals of automation executions, as we begin to consolidate workflows into closed loop. Specific to assurance and observability, we sometimes see different automations platforms that serve in their specific domains, and workflow engines can help marshal and control their executions in controlled, planned, and disciplined workflows that formerly were human based but are now becoming measured and optimized.

For Oracle Unified Assurance, external data sources like power, door alarms, weather, lightning strikes, etc., can support, enrich, and guide which automations should be triggered or if truck rolls are necessary to customer premises, or to service points on the network. As weather systems move across your network, Unified Assurance can provide operations visibility to those weather patterns on a single screen which helps consolidate network operations screens from three to one consolidated view. This view initially serves for human operator visibility, but also allows for autonomous root cause analysis.

Unified Assurance continues its evolution as we move more intelligence to the edge; allowing the autonomous collection layer to perform smarter root cause analysis and availability checks across edge sections of your larger network. This “smarter edge” is vital as it is closer to the devices and can perform these assurance triages at the edge faster than at the core; making the edge smarter and allowing the core to evolve at its own speed.

Maturity Level 5: Smarter Observability at the Edge and Core

At Maturity Level 5, organizations harness the power of cutting-edge technologies to achieve real-time visibility and seamless integration of data from both the edge and core of their networks. The synergy between advanced analytics, machine learning, and sophisticated automation platforms empowers organizations to make informed decisions, predict potential challenges, and optimize performance across all levels.

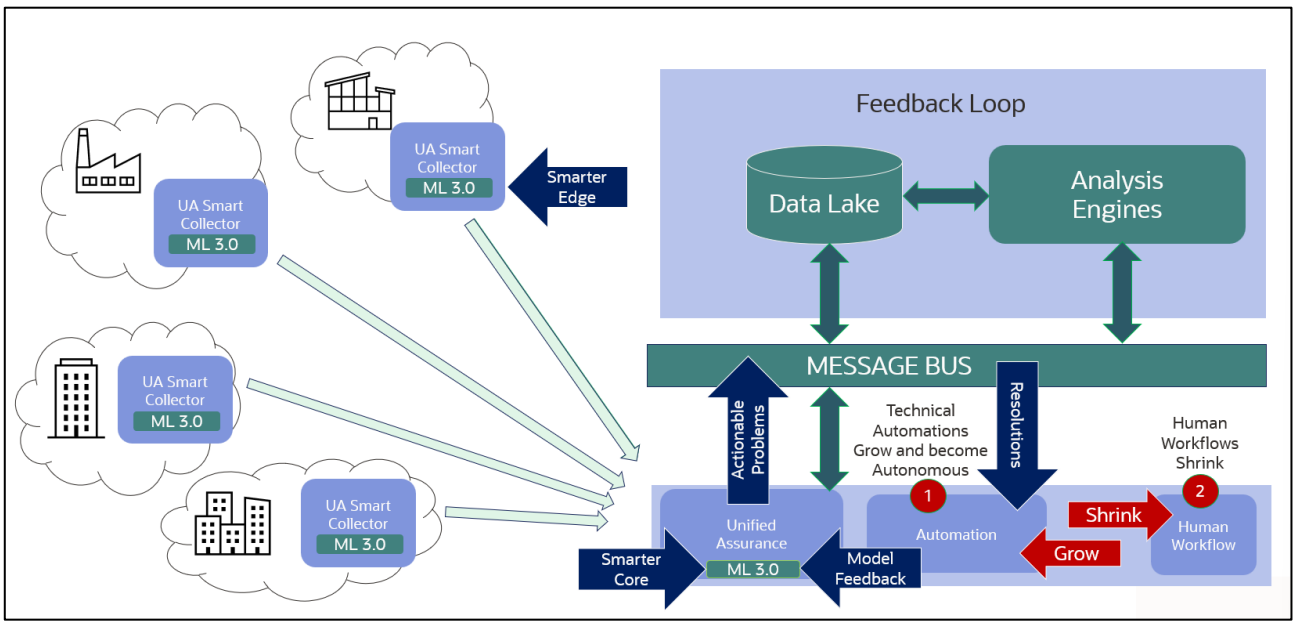


Figure 7. Unified Assurance Key to Autonomous Operations Feedback Loop.

To enable our customers reach Maturity Level 5 we have defined a vision of Unified Assurance ML 3.0 as described in the following section.

Oracle Unified Assurance Vision for ML 3.0

This vision begins by making the edge smarter – we are working to continue to evolve our Smarter Edge topological RCA and smarter availability detection at the edge along with additional potential new ML edge analysis engines. Our core ML engines continue to make become smarter by leveraging cross domain and cross signal analysis – the goal is to lessen the need to do any hard coding of rules or policies by providing re-enforcement learning to make the root causes highly actionable and laser targeted.

Pushing the actionable events on the bus drives your ability to evolve to closed loop while reducing human interactions and human workflows. Your data lake captures additional insights from your own analysis engines that can assist in learning customer sentiment, and other external factors.

Feedback loops re-enforce machine learning models across the entire Unified Operations suite and down to each of the unified operational areas and tools.

Customer Example: Verizon Managed Network Services

Verizon Business Services has been on a transformational journey towards autonomous operations that started with Unified Assurance. Five years ago, Verizon initiated SDN and orchestrating Virtual Network Services, which laid the foundation for autonomous network operations through their NaaS structure. However, fully automated networks with self-healing capabilities are still evolving and not prevalent across all Verizon customer networks today.

The business problem lies in the complexity of large enterprise networks, involving various technologies, vendors, and dynamic changes. Network topology plays a crucial role in triaging issues and enabling rapid, accurate automation. Verizon's solution involved bringing together network management applications, CMDB, and Unified Assurance's e2e topology engine to create a cohesive, fully stitched network model. The results include real-time rendering of network topology overlaid with fault, performance and recent network change information, clickable labels, and searchable views, empowering engineers to quickly diagnose problems and automate processes with AI/ML models. This enabled far faster RCA, sped issue resolution, and improved the overall experience for large enterprise customers.

As can be seen below, Verizon uses the Unified Assurance topology engine for near real time operations support. Verizon also populates this operational data into their data lake which might hold data for 18 months in contrast to the operational topology engine which maintains data for roughly 30 days.

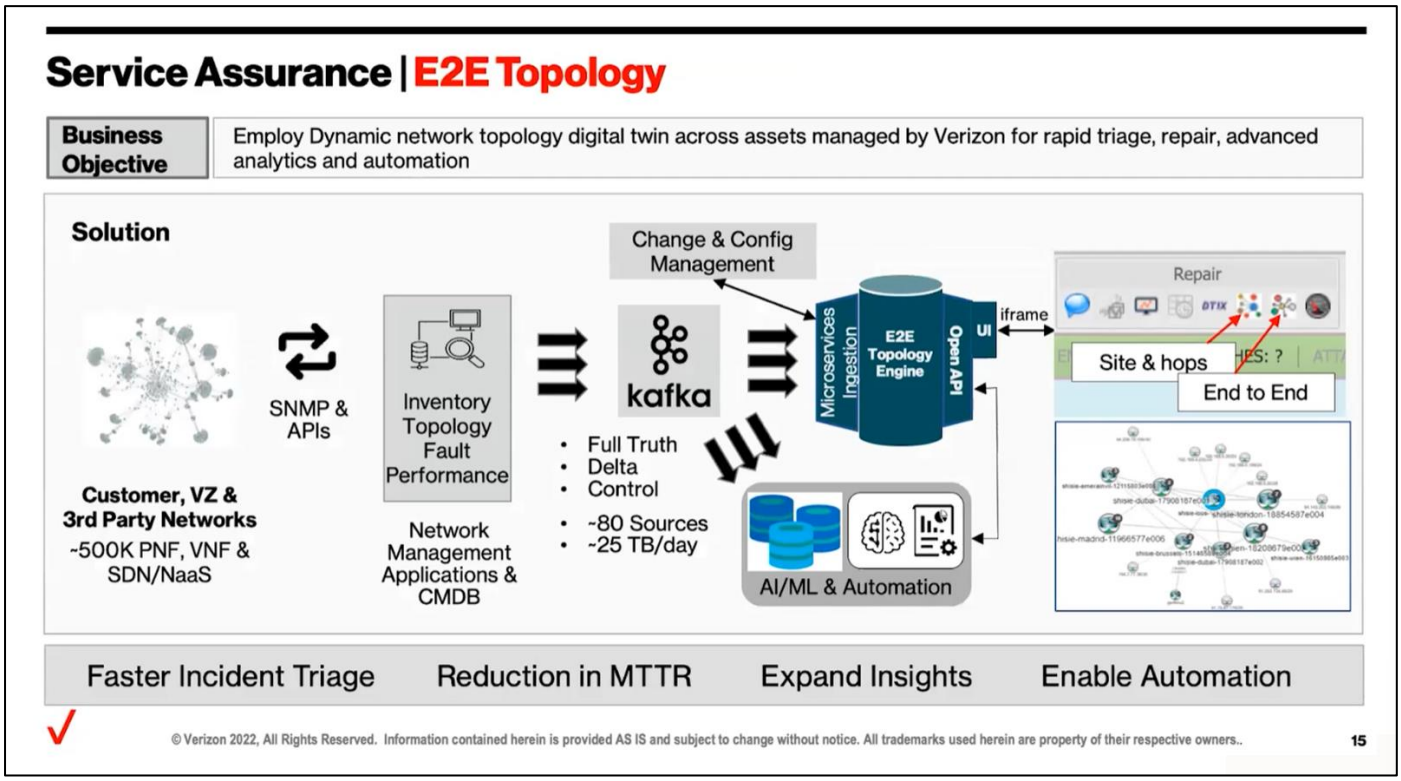


Figure 8. Verizon's Journey to Autonomous Operations – courtesy of Verizon [5].

Lessons learned from the project include the importance of using PoCs with production data, cataloging data sources, early vendor management for APIs, and planning for data volumes.

Verizon's journey towards Level 5 and fully autonomous operations is showing remarkable progress, marked by the successful consolidation of legacy tools. Specifically, Verizon is undertaking the replacement of many instances of a legacy observability platform, streamlining operations into a single, consolidated view. This significant achievement has led to improved Mean Time to Resolution (MTTR) and generated substantial business value for the company.

Conclusion

Autonomous Operations is an industry wide journey. We are finally seeing enabling technologies like Oracle Unified Assurance, accompanied by standards bodies that continuously evolve their frameworks & standards to keep up with new technologies, and supportive technologies like Machine Learning, better workflow, and automation platforms. This amalgamation sets the groundwork for implementing closed loop automations and establishes the necessary virtual fabrics needed to close the gap between Resources, Services, and the Business.

Oracle continues to help drive the progression of standards with industry bodies like TM Forum, ETSI, 3GPP, Linux foundation, and many others. A common mutual effort between our customers, standards bodies, and frameworks are required to work together to facilitate the adoption of common standards while avoiding market fragmentation.

In conclusion, this position paper highlights Oracle Communications Unified Assurance's commitment to driving autonomous network management. By embracing industry standards, prioritizing customer feedback, and capitalizing on new revenue opportunities, we position our partners at the vanguard of a transformative communications landscape. Together, we embark on a journey that unlocks the full potential of autonomous network management, empowering organizations to embrace the future with confidence and agility.

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Citations

1 ”Autonomous Networks: Business and Operational Drivers” TM Forum, April 2021

2 “CMMI® (Capability Maturity Model® Integration)” Carnegie Mellon University, Software Engineering Institute, November 2010

3 “Gartner IT Process Maturity Model”, Gartner Research, 2006

4 “2023 Gartner® Magic Quadrant™ for Analytics and Business Intelligence Platforms” Gartner, 2023

5 “Verizon case study: “Unified Topology – the foundation for operational automation of enterprise services”, DTW 2022, in the “From automated to autonomous operations” track

6 “Autonomous Operations Maturity Model v2.0.0”, TM Forum, June 2023

7 “Autonomous Networks, supporting tomorrow’s ICT business”, ETSI, 1st Edition, October 2020

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