

amdocs service & network automation

**Managing the Open Cloud Networks
of the future**



executive summary

- Operations Technology (OT¹) transformation is being driven by three key developments: the advent of 5G; the need for effective management of hybrid physical and virtual networks; and cloud-native deployments of network automation and management systems to reduce operator TCO and improve agility.
- While the journey to network modernization will vary from operator to operator, OT transformation is a necessary pre-requisite for a process that will change the relationship between network and IT as operators embark on the road to open cloud networks.
- Amdocs' vision for network automation and OT transformation recognizes the importance of managing hybrid networks on this journey, and automating end-to-end service orchestration spanning separate network domains, distributed infrastructure and heterogeneous environments. A key Amdocs objective is to help service providers modernize, consolidate and transform their operations systems to realize a modular, cloud-native management solution approach.

1. Operations technology (OT) is a term used to represent all operations and management support systems for services and networks, including operational support systems (OSS).

what is driving OT transformation?

Several factors are driving service providers to invest in transforming their OT and related management systems.

- As service providers look ahead to the disaggregated, distributed, modularized and ecosystem-powered networks of the future (such as 5G, IoT, SDN/NFV etc.), a new operations paradigm is taking hold, requiring different OT capabilities. The **advent of 5G** is ushering in new network architectures and new operational and business models, and many of the OT transformation decisions will be driven by changes in these areas. Additionally, service providers are under significant pressure to reduce opex, so automation will be key to the 5G era, starting with network and services operations.
- A high priority for service providers is to have comprehensive and unified systems that enable efficient and effective management of **hybrid networks** – spanning multiple dimensions: physical + virtual; on-premises + cloud; and legacy connectivity + new services. The move to the future-state network architecture will not happen instantly and a wide range of hybrid and cross-domain deployment scenarios will need to be supported through a step-wise journey.
- **Cloud-native** deployments of network automation and management systems – across all flavors of public, private and hybrid clouds – are becoming increasingly important to reduce TCO and improve agility. A key underpinning of modern network and OT architectures is the flexibility and agility to enable different operational and business models. Microservices architecture (distributed sub-functions of an application), container orchestration (e.g. w/ Kubernetes), dynamic/elastic resource management and more play a vital role here.

A deep understanding of the new software-centric, cloud-powered world of future networks is critical to success. Without this understanding, combined with the relevant skills and experience, service providers risk getting stuck in crystallizing a cohesive and aligned vision for future network architectures and supporting operations systems, and will be challenged in clearly mapping out the step-wise roadmap to get there.

The journey of network modernization and associated OT transformation will vary from operator to operator. It's a process of evolution that needs to be well thought through and must include both existing operational support systems and the introduction of new processes and agile operational structures that will change the relationship between network and IT. Whatever the challenges on the road to the open cloud networks of the future, and whichever approach a service provider chooses, OT transformation is recognized as a necessary pre-requisite for success.

amdocs' vision and approach for network automation and OT transformation

Manage and orchestrate hybrid networks

A key objective for Amdocs is to help service providers modernize, consolidate and transform their operational systems to realize a modular, cloud-native management solution approach. Amdocs has evolved its proven OT capabilities into a unified **Service & Network Automation solution** designed to manage and orchestrate hybrid networks, incorporating both traditional OT and the newer NFVO capabilities (see figure 1 below). This evolution is becoming even more critical now that many service providers are accelerating network transformation with 5G, SDN/NFV, SDWAN and more. These future networks are typically an evolution of existing infrastructure (e.g. LTE/4G mobile core + 5G NR), so in most cases the in-place technologies will co-exist for the foreseeable future.

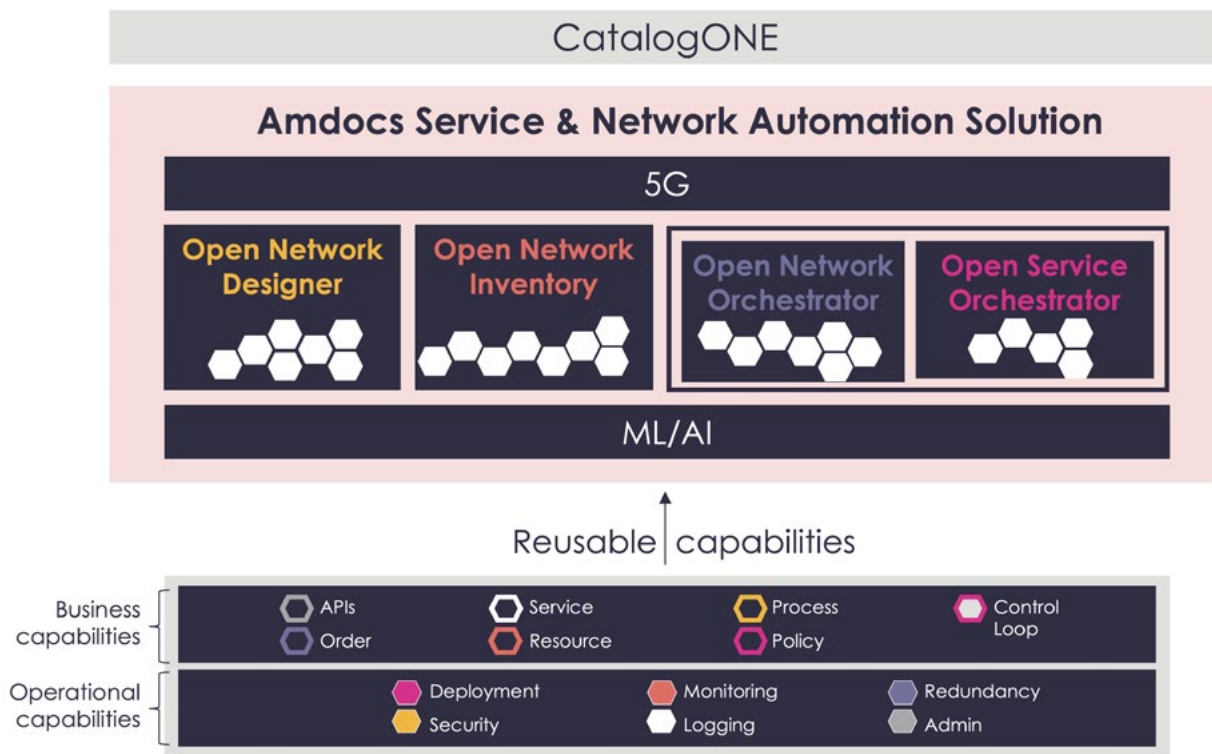


Fig. 1 – Amdocs' blueprint for hybrid OT architecture

Amdocs' unified solution provides a pragmatic and seamless path for service providers moving from physical through hybrid to open cloud networks. It offers a modular approach that encompasses traditional OT functions with a federation layer for hybrid management, plus NFV orchestration, edge orchestration and network-slicing management (specific to 5G). Key tenets of the Amdocs solution include:

- Cloud-native, public-cloud/private-cloud deployable, micro-services based, with shared foundations
- New network-ready capabilities covering, amongst others, 5G non-standalone (NSA) and standalone (SA), edge and IoT, and including multi-domain orchestration, master catalog, policy management and analytics
- End-to-end automation with AI/ML infused into key functions
- Pre-integrated with Amdocs Business Support System components, leveraging our unique position in the market with end-to-end business-to-network service management coverage

Realize and operate an open, programmable network

Amdocs is enabling service providers to realize and operate an **open programmable network** that helps accelerate service innovation and drive business growth. To this end, Amdocs provides a service lifecycle management solution that empowers service providers to rapidly define, launch, fulfil, operate and assure new offerings that combine organic capabilities (e.g. connectivity) with ecosystem elements. These elements

include SD-WAN, WAN acceleration/optimization, vCPE/VNFs, edge services, unified threat management (UTM), vertical IoT packages, and other network-as-a-service (NaaS) and infrastructure-as-a-service (IaaS) offerings.

Amdocs' solution capabilities cover the full end-to-end service lifecycle (see figure 2 below): service and offer design environment (seeded with base definitions and service modeling templates for fast-start), end-to-end orchestration, including integration/interoperability with relevant domain-specific orchestrators/controllers, and inventory functionality that serves as a logical centralized reference point for instantiated services and network resources. Existing OT and fulfilment systems can be incorporated in both 'side-by-side' and 'over-the-top' implementations through federation and loosely-coupled integration. Key aspects of the solution include:

- Additional enablers such as marketplace foundations, self-service portal and an open ecosystem of pre-integrated third party VNFs
- Alignment with standards where applicable to simplify integration with the ecosystem (e.g. MEF APIs, TMF APIs, ONAP APIs, TOSCA models, etc.)
- A continually enriched partner and service provider ecosystem ([extensive partner ecosystem](#)), and an increasing array of ecosystem services such as VNF certification and testing
- Incrementally expanded business software packages (e.g. SD-WAN, vCPE, etc.) via accelerated development aligned with customer projects (e.g. [Comcast](#), [Globe](#), [SES](#) and [Vodafone Ziggo](#)).

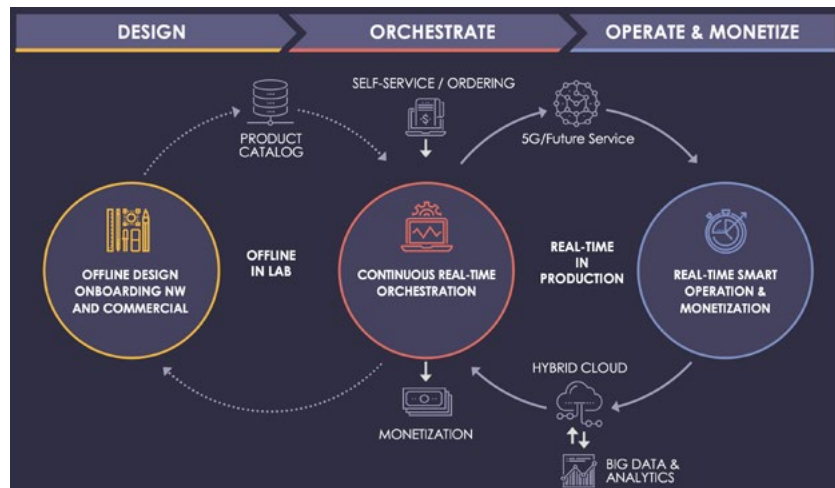


Fig.2 – End-to-end network service lifecycle management

Automate network operations

Amdocs helps service providers reduce operational costs with step-wise automation journeys, incrementally leading to closed-loop autonomous operations. Amdocs delivers tools, technology and best practices that enable service providers to achieve an end state of cloud-like operations - reducing costs while managing increased scale and complexity. This means automating existing network operations with the aim of evolving to the autonomous network of the future. Amdocs offers capabilities to support different automation stages according to the service provider's network evolution maturity:

- Human operations – modernize manually-supervised assurance systems
- Guided operations – capture and guide operations in line with industry or service provider best practices
- Automated operations – model and automate best practice operations
- Closed-loop operations – full lifecycle automation (create, fulfil, operate) through to autonomous operations

why Amdocs

Uniquely enabling and accelerating network monetization end-to-end

Amdocs provides a hybrid, cloud-native, service-aware management solution that connects customer-facing services domains, for example commerce and care functions, to the network domain (or multiple network domains and/or network clouds). The solution seamlessly supports end-to-end service lifecycle management (design, orchestrate/fulfill, operate) for a wide array of innovative services, including intelligent connectivity, value-added services (VAS), cloud applications, edge capabilities, IoT, QoS private/isolated networks (e.g. slice-based) and more.

Amdocs is uniquely positioned to provide network operations and management solutions that ensure a service provider's network is a true 'agile monetization platform' rather than a static infrastructure. 5G will accelerate this imperative even further. As service providers introduce a large variety of offerings, all of which will require end-to-end management across business and operational systems and the network, Amdocs will continue to drive differentiation by delivering capabilities that allow service providers to:

- Manage and operate a fully programmable network based on high-performing, resilient, modular and heterogeneous network capabilities, using software control to orchestrate the entire service lifecycle and operate it with policy-driven automation
- Evolve to a dynamic and agile service management approach on a distributed, virtualized and cloud architecture
- Adopt network and service management systems based on microservices architectures, DevOps, toolchains, and public/private/hybrid clouds
- Ensure seamless co-existing and synchronized operations support for the network evolution journey, leveraging existing investments for pragmatic step-wise transformation
- Implement design and fulfillment capabilities for all aspects of the service across hybrid network and system environments, modeling, fulfillment and repair processes, policies and SLAs, including business definitions

Driving the adoption of open cloud networks

In a bid to meet the needs of the connected digital society, service providers are looking to create an open, distributed, automated network leveraging the hybrid cloud to enable flexibility and agility as well as reduce opex. Amdocs is providing operators the management systems and tools to adopt open, modular network capabilities which remove the burden of vendor lock-in, and avoid the high costs and inflexibility associated with monolithic, proprietary network infrastructures.

To support this transition, Amdocs is committed to an open, standards-based approach in the OT, service management and NFV solutions portfolio. Service providers are looking to change the current model of single-vendor networks, and 5G provides a compelling

event for the move to a more open, flexible approach to building and managing future networks. Amdocs is continuing to drive our differentiation as the champion for open cloud networks by:

- Leveraging ONAP as a vendor-neutral, open community to support any type of service over any type of network using any type of network function
- Supporting customers who want to take ownership of their network orchestration and leverage the benefits of open systems by joining the customer's internal development and integration teams as a joint scrum team (for example, as performed at Bell Canada)
- Accelerating engagement in related open/standards forums such as MEF, TMF APIs, ETSI / MANO, LF Acumos, LF Edge, RH VCO, GSMA 3GPP, GSMA NEST, ORAN / OCS and TIP








Organization	Areas of Interest	Amdocs Involvement
	<ul style="list-style-type: none"> • Life-cycle Service Orchestration (LSO) • Service Assurance 	<ul style="list-style-type: none"> • Research on assurance • Drafting LSO Open API's
	<ul style="list-style-type: none"> • Multi-domain e2e Orchestration: OSS, NFV • Open API's 	<ul style="list-style-type: none"> • Drafting Open API's • Conducting PoC's
	<ul style="list-style-type: none"> • VNF onboarding, packaging, certification • Multi-domain e2e Orchestration: NFV, WAN • Experiential Network Intelligence (ENI) 	<ul style="list-style-type: none"> • Leading standardization of VNF on-boarding • Contributing to e2e orchestration topic • Promoting ONAP and PBO architecture
	<ul style="list-style-type: none"> • VNF/NS modeling • VNF packaging 	<ul style="list-style-type: none"> • NFV descriptors mapping to TOSCA/YAML
	<ul style="list-style-type: none"> • OSS/BSS • 5G and Network Slicing 	<ul style="list-style-type: none"> • 5G architecture, incl. network slicing • 3GPP BSS standards
	<ul style="list-style-type: none"> • VNF modeling, onboarding, certification • LCM and closed loop • Edge automation • Co-creation modules • 5G use-cases 	<ul style="list-style-type: none"> • SDC, AA&I • Involvement in development of additional modules per defined use cases • Collaboration with service provider partners (e.g. Bell)
	<ul style="list-style-type: none"> • Open tech. / interfaces for access, transport, core • RAN optimization • E2E 5G network automation 	<ul style="list-style-type: none"> • Disaggregated Cell Site Gateway (DCSG) integration • Participate in developing OAM and A1 • Participating in building an open source stack for 5G RAN • ONAP, MEC and ZSM interworking

Fig 3. – Enabling the realization of open cloud networks

New domain experts for service management and automation in the hybrid era

The new era of hybrid networks and systems spanning multiple dimensions: physical + virtual; on-premise + cloud; and legacy connectivity + new services, is creating unprecedented complexity in the management service lifecycles and automation of operational processes. Amdocs' solution encompasses the technology, people and knowledge to scale operations and address the complexities of this new world. We are continuing to differentiate ourselves by enabling step-wise and pragmatic evolution from current to future management and automation systems by:

- Incorporating service, customer and business insights (the data to which we have access in Amdocs systems) to drive service-aware assurance and network operations automation – a natural extension to Amdocs' proven BSS, OSS and NFV capabilities, utilizing our extensive experience and expertise in each domain
- Enabling scalable operations with real-time data collection and analysis, low manual touch and guided resolution
- Driving autonomous, closed-loop operations with proactive remediation actions, self-healing and intent-driven assurance
- Infusing skills, capabilities and experience from the new network domain into our service provider customers, moving them to the new paradigm of 'network + automation-coding' rather than just monitoring/administration

conclusion

Network technologies such as 5G, IoT, SDN/NFV and others, will drive new service and network architectures, new operational models and new business models. It follows that managing the open cloud networks of the future will require investment, not just in technology, but in the transformation of associated OT and processes. This transformation cannot be "once and done," but will be a step-wise automation journey that must enable efficient and effective management of hybrid networks.

Amdocs' vision and approach for OT transformation and management of hybrid networks is based on a unified, modular and cloud-based **Service & Network Automation solution** that incorporates traditional OT/OSS together with the newer NFVO capabilities.

With the combination of Amdocs' unique experience and expertise, and our hybrid-ready solutions, we can help ensure successful transformation for service providers, whatever stage they are at on the journey and at whatever pace they choose to take to realize the new era of open cloud networks.

For more information visit

www.amdocs.com/amdocstone/open-cloud-networks

about amdocs

Amdocs is a leading software and services provider to communications and media companies of all sizes, accelerating the industry's dynamic and continuous digital transformation. With a rich set of innovative solutions, long-term business relationships with 350 communications and media providers, and technology and distribution ties to 600 content creators, Amdocs delivers business improvements to drive growth.

Amdocs and its 25,000 employees serve customers in over 85 countries. Listed on the NASDAQ Global Select Market, Amdocs had revenue of \$4.1 billion in fiscal 2019.

For more information, visit Amdocs at www.amdocs.com

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