

ONAP release-3 'Casablanca' snapshot

ONAP is the de facto industry standard for NFV/SDN automation

ONAP's third code release, Casablanca was announced on 4th December, 2018 by LF Networking (LFN), which facilitates collaboration across the Linux Foundation's open networking projects. The Casablanca release enhances deployment capabilities across the open source networking stack, bringing additional support for cross-stack deployments across new and existing use cases such as 5G and cross-carrier VPN (CCVPN), as well as enhancements to cloud-native VPN. The goal of Casablanca is to consolidate the projects foundation while evolving to modularity and aligning to industry standards, i.e. MEF 3.0, ETSI NFV-SOL003, and others.

ONAP is becoming the de facto automation platform for carrier grade service provider networks. The community has expanded beyond technical concerns to collaborate with other open source projects such as [OPNFV](#), [CNCF](#), and [PND](#), as well as standards communities such as [ETSI](#), [MEF](#), and [TMForum](#).

The Casablanca cross-carrier blueprint has already been demonstrated by Vodafone and China Mobile who used it to connect their networks across regions. The second, 5G blueprint is still in its early stage and aims to extend orchestration and automation to the RAN. It is designed to optimize the network using analytics and also addresses network slicing.

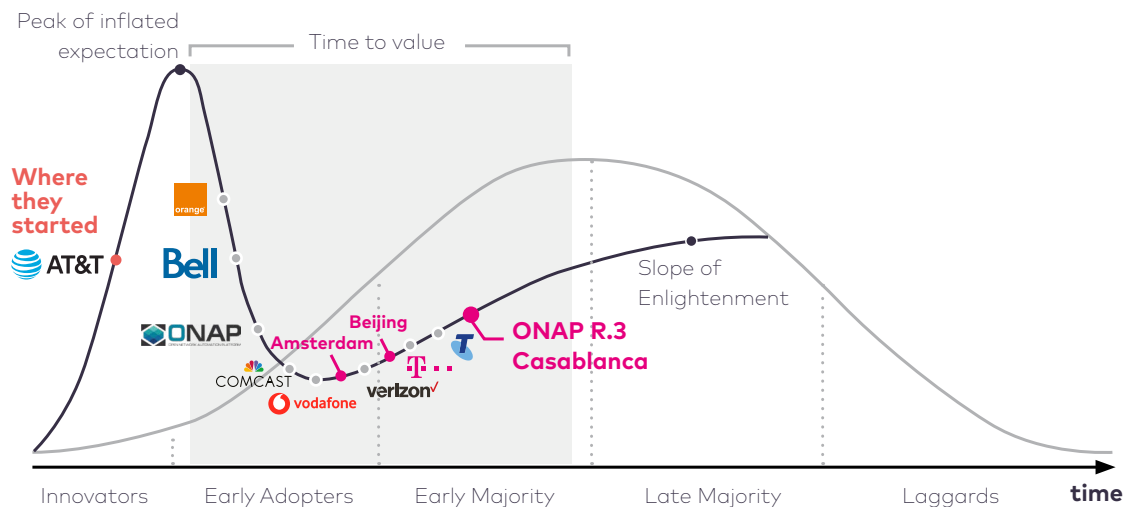


Fig 1. NFV Technology adoption life cycle and ONAP hype-cycle

ONAP Casablanca release – what's new?

Casablanca introduces new functionality with two use cases important to the evolution of networking: 5G, and Cross Domain and Cross Layer VPN (CCVFN).

5G use case

The 5G blueprint is a multi-release effort, with Casablanca introducing the first set of capabilities around PNF integration, edge automation, real-time analytics, network slicing, data modeling, homing, scaling, and network optimization. You can find more information on the [5G use case here](#).

Cross Domain and Cross Layer VPN (CCVFN) use case

CCVFN demonstrates how to provide enterprise services across operator networks with the use of MEF APIs. The joint CCVFN proof of concept created by Vodafone and China Mobile was successfully demonstrated at [ONS-EU in Sep 2018](#).

You can find more information on the [CCVFN use case here](#).

Casablanca also includes new features, architectural changes, deployability enhancements and bug fixes.

Highlights include:

- Run time has new lifecycle management functions in both the Service Orchestrator (SO) and its three controllers
- Expanded hardware platform awareness (HPA) to improve performance
- Geo-redundancy
- Support for ETSI NFV-SOL003 for VNFM compatibility
- MultiCloud enhancements
- Edge cloud onboarding.

Additionally, the design time environment includes two new dashboards to simplify design activities, and ONAP's service assurance capabilities boosted by policy engine updates.

ONAP Casablanca Architecture

(High-Level View with Projects)

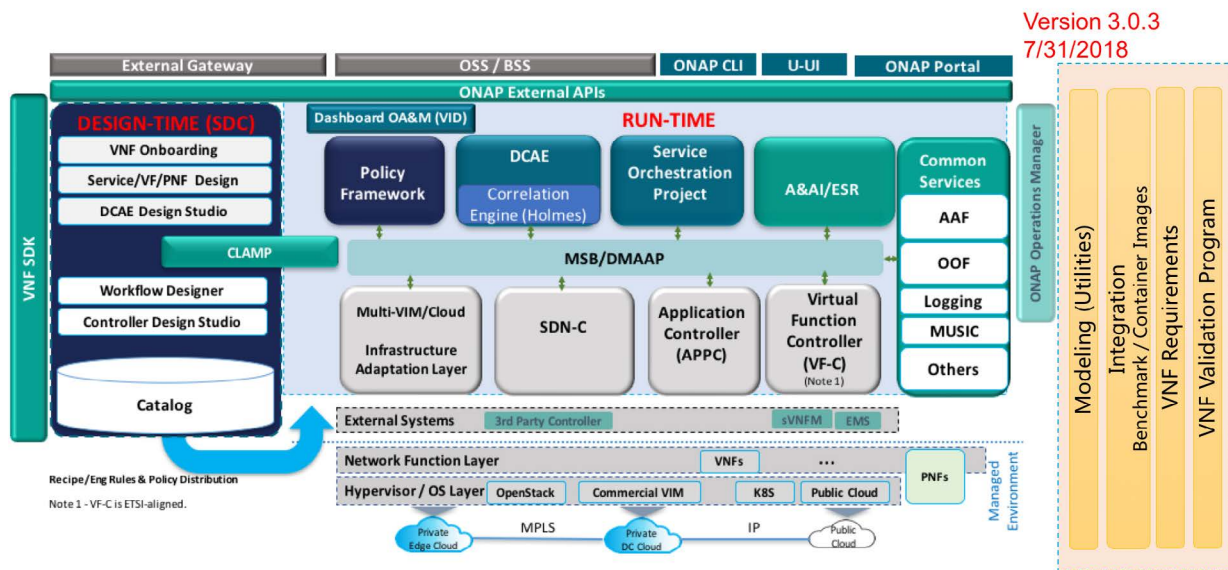


Figure 2. ONAP high level feature comparison

ONAP enhancements over multiple releases

BEIJING - Following the first, Amsterdam release in November 2017, the second ONAP release, **Beijing**, focused on accelerating deployment readiness with three new functional requirements – (1) change management, (2) hardware platform awareness and (3) auto scaling with manual trigger.

Beijing delivered deployability enhancements across seven dimensions:

1. **Usability** – Enhanced documentation/user guides, Beijing process maturity
2. **Security** – CII badging, vulnerability mitigation
3. **Manageability** – Kubernetes-based platform management
4. **Stability** – 72 hour soak with random transactions, all 30 projects participating
5. **Scalability** – Disruptive testing and parallel request processing – closed loop resilience (Multi-VIM/VFC)
6. **Performance** – Ecosystem testing scale out, criteria set up
7. **Resiliency – OOM, MUSIC** – multi-site scalability and HA, auto detection/recovery – all run time projects

CASABLANCA – The third ONAP release further enhances ONAP deployment and 5G readiness with 13 new functional requirements including two blueprints.

- The 5G blueprint has 5 use cases addressing Network Optimization (real time analytics and bulk analytics) and Zero Touch Orchestration/Automation to the RAN (PNF integration).
- The CCVPN blueprint addresses vCPE with Tosca VNF, virtual FW with hardware platform awareness (HPA) integration, automated scale out and extension of change management (4 Use Cases).

The table below is Amdocs' comparison of functionality in the first three releases of ONAP, as well as an early view of release 4, Dublin, due Q2 2019.

USE CASE	AMSTERDAM R.1	BEIJING R.2	CASABLANCA R.3	DUBLIN R.4
vFW (CL)	✓	✓	✓	✓
vDNS	✓	✓	✓	✓
VoLTE	✓	✓	✓	✓
vCPE (Residential Broadband)	✓	✓	✓	✓
Change Management		✓	✓	✓
Hardware Platform Awareness (HPA)		✓	✓	✓
Scaling		✓ (manual)	✓ (auto)	✓
Cross Domain & Cross Layer VPN (CCVPN)			✓	✓
Deployment of the hybrid 5G network			✓	✓
Centralized representation and consistent identification of cloud regions in ONAP			✓	✓
Edge Automation – Analytics as a Service Closer to Edges (PNDA based)				✓
BroadBand Service (BBS)				✓
OpenSource Access Manager (OSAM)				✓
k8s based cloud region support				✓

Figure 3. ONAP releases high level feature comparison from Amsterdam to Dublin

DUBLIN – LF Networking intends to have a minor release in early February 2019 to address some security and code enhancements. The first major release of 2019, **Dublin**, will follow in Q2. While the scope of the ONAP **Dublin** release is not yet finalized, the plan is to focus on the following architectural developments:

- **ONAP modularization**, to create smaller, reusable modules, enables technology swap-out by module, reduces the software footprint and allows integration of non-ONAP components
- **ETSI-NFV alignment**, including a VNFM plug-in to the service orchestrator, network service descriptor (NSD) onboarding and provision for nested and composite services
- **Service mesh, specifically Istio in ONAP Operations Manager (OOM)** to secure external access to an ONAP deployment. Istio includes – role-based-access-control (RBAC), certificates management and transport layer security (TLS)
- **Modeling alignment** will incorporate internal ONAP NSD representation as well as VNF descriptor Sol001 v2.5.1 onboarding, composition and disposition
- **Cloud Native VNFs** to support Helm chart-based deployment and lifecycle management (LCM)

Alla Goldner from Amdocs, who is a member of the ONAP Technical Steering Committee ([TSC](#)) and chair of the ONAP Use Case Subcommittee, explained that the TSC has identified several guiding principles for 2019:

1. Pursue continuous integration and continuous deployment (CI/CD) to ensure development issues are addressed quickly by leveraging increased automation
2. Security by design to re-enforce security awareness at each milestone of the release, not only at code freeze
3. 'Document as you code' to provide a dedicated focus on improving the documentation throughout the release cycle
4. End-to-end process automation to reduce manual steps when deploying a service, and also during scale-out and scale-in operations
5. ONAP footprint optimization to enhance container/ architecture/application resource optimization.



ONAP 5G journey

CSPs consider 5G to be a critical use case for ONAP. The [5G blueprint](#) is a multi-release effort, with **Casablanca** introducing some key capabilities around physical network function (PNF) integration and network optimization. Modeling and platform enhancements in **Casablanca** set the stage for full 5G support in later releases. Given that the operators involved with ONAP represent more than 60% of mobile subscribers and the fact that they are directly able to influence the roadmap, paves the way for ONAP to become a compelling management and orchestration platform for 5G use cases.

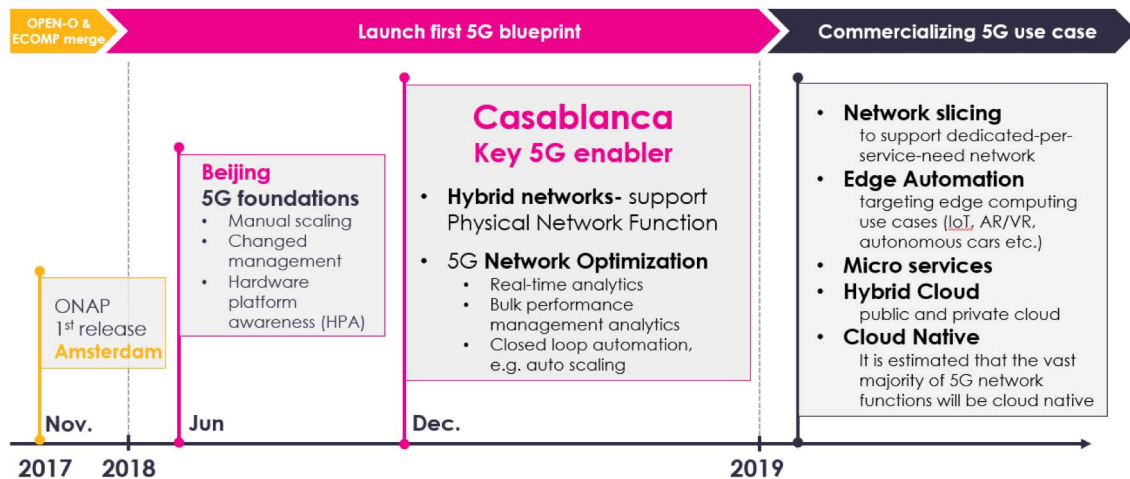


Figure 4. ONAP 5G journey to support fully automated network management and autonomous operations

As an open source network automation platform, ONAP is a key 5G enabler. The Casablanca release already provides support for the following:

- **Hybrid networks** with PNF support. With 5G, service providers need to deploy disaggregated 5G Radio Access Network (RAN) consisting of both virtual and physical network functions. This release supports lifecycle management of the physical network functions (PNFs), including PNF discovery and integration into the network management lifecycle (e.g. PNF software upgrades).
- **5G network optimization** including:
 - **High volume performance management (PM)** with real-time analytics delivered at frequent intervals (less than one minute) from a large number of edge locations
 - **Bulk performance management analytics** with batch processing of bulk PM data delivered less frequently for optimization purposes.
 - **Automatic scaling** of VNFs as a way to support the system's self-healing and self-scaling as part of closed loop autonomous operations, critical for 5G.

Plans for upcoming releases include: **Network slicing** to support dedicated-per-service-need network; extension of **closed loop** functionalities targeting **autonomous network operations**; support for **microservices**-based architecture by ONAP; support of ONAP orchestration and deployment on **hybrid public and private cloud** to allow functions placement and offload by leveraging distributed cloud capabilities for the critical 5G use cases, such as enterprise and edge automation; support for **cloud native functions (CNF)** - it is estimated that the vast majority of 5G network functions will be cloud native.

ONAP deployment update by service providers (Source: Linux Foundation)



- 1. POC & deployment** ONAP is a critical element of Cross Project transformation including AcumosAI, DANOS (NOS) and Akraino (Edge) & Kubernetes. Integration with Acumos, Control Loops use cases for mobility RAN operations
- 2. VNF Testing** (150+) Network on Demand, First Responder Network Authority, Open ROADM...
- 3. CI/CD – ONAP** Pulling from ONAP into internal environment. Change Mgmt, Adoption of CII Badging as Security Best practice internally



- 1. VoLTE Trials** ongoing in Zhejiang province with Amsterdam. CMCC built a release including NFVO, did customization & contribution to Beijing release
- 2. Beijing Release** now aligned with China Mobile's enterprise requirements. (NFVO+/GVNFM products will be used for China Mobile pilot test)
- 3. Cross Carrier ONAP** – Casablanca release for SOTN/SD-WAN including interconnection between ONAPs. (prototype pilot Vodafone, Huawei & CMCC)



- 1. Demonstrate a complete VNF lifecycle management:** create VNF Descriptor, Validate Package, On-Board and deploy commercial vMRF and vProbe
- 2. Demonstrate how to automate network operation tasks** for SD-WAN and SDN network connectivity
- 3. Opening first ONAP Open Lab** with 70+ users from operators VNF vendors and academics
- 4. Development of 3 external APIs** to ease integration with BSS (Order, Inventory, Catalog)



- 1. Network-Cloud integration** PoC of vCPE use case in CT lab
- 2. ONAP Maturity test:** build up auto test environment and contribute on ONAP S3P tests
- 3. Development and deployment:** add intelligence and automation for agile provisioning and onboarding, introduce SO MSB A&AI into practice, and engage in Service Model definition



- 1. Driving modularity and pluggability** of ONAP Components within Verizon SDN architecture. Contribute code with emphasis on SDC, SO, SDN-C, A/AI, DCAE and web scale evolution support
- 2. Striving for SO/VNFM ETSI MANO-compliant** interface to external VNFM's
- 3. CI/CD enabled ONAP Verizon developer test bed** and onboarding internal VNF's to validate platform and vendors to participate in the journey



1. Amsterdam Release in **production** since Q42017
2. Heavy focus on simplified deployment & OOM contribution
3. Expanding use cases across Carrier and Internal IT Data Center automation.



- 1. Lab:** Focus on SDC, A&AI, SO, DCAE. Vodafone sees ONAP as a crucial platform for standardization across various areas for Telco Cloud adoption
- 2. POC:** ONAP based TM Forum Catalyst projects – Blade Runner, Automating Network As A Service, 5G Intelligent Service Operations – for the first built on a common reference architecture of ONAP, TM Forum open-APIs and MEF-defined service payloads.
- 3. On-Boarding:** Focus on SDC, Compliance & Verification (On-Boarding) of Resources and Services – an industry standard for On-Boarding at various levels



- 1. Last Mile Enabler** Africa & Middle East
- 2. POCs with ONAP** by modifying community vFW blueprint to separate PG and vFW_SINC and vFW_SINC across two OpenStack regions connected by E-Line
- 3. Demonstrated at MEF** Athens meeting on 4/19



1. POC/Production to start delivering security services through SD-WAN by using ONAP Beijing release in Q3
2. Testbeds and POC Upgrading current lab environment into Beijing. Starting the selected use case testing. Increasing VNF onboarding testing for service modelling
3. Focus use cases vFirewall on vCPE/SD-WAN, Voltha (OSAM), Gi-Lan

Bell Canada – lessons learned from ONAP in production

Bell Canada leadership in bringing open source ONAP into production is enabling innovative new offerings to their customers faster and at lower cost. Bell has successfully implemented the first in production network automation use case to leverage ONAP. Bell is driving its network transformation by leveraging the ONAP-based network service orchestration (NSO) platform to introduce new services faster to its enterprise and consumer customers. This includes automating its data center tenant network provisioning on ONAP to automate internal operations of Bell's data centers. Bell is focused on providing its operations teams with tools to automate lifecycle management of both physical and virtual network functions, incident management and service assurance.

Bell's Network 3.0 transformation initiative includes technology, processes and people, with a strong emphasis on advancing its DevOps journey. This involves building the team and talent to support a cross-organizational DevOps model and creating a culture of continuous integration/continuous development (CI/CD). A tangible outcome of this approach is Bell's development of software that serves as the foundation for ONAP Operations Manager (OOM), which helps simplify deployments, reduce footprint and enable continuous delivery. The software has been contributed back to the open source ONAP community to help others embrace ONAP.

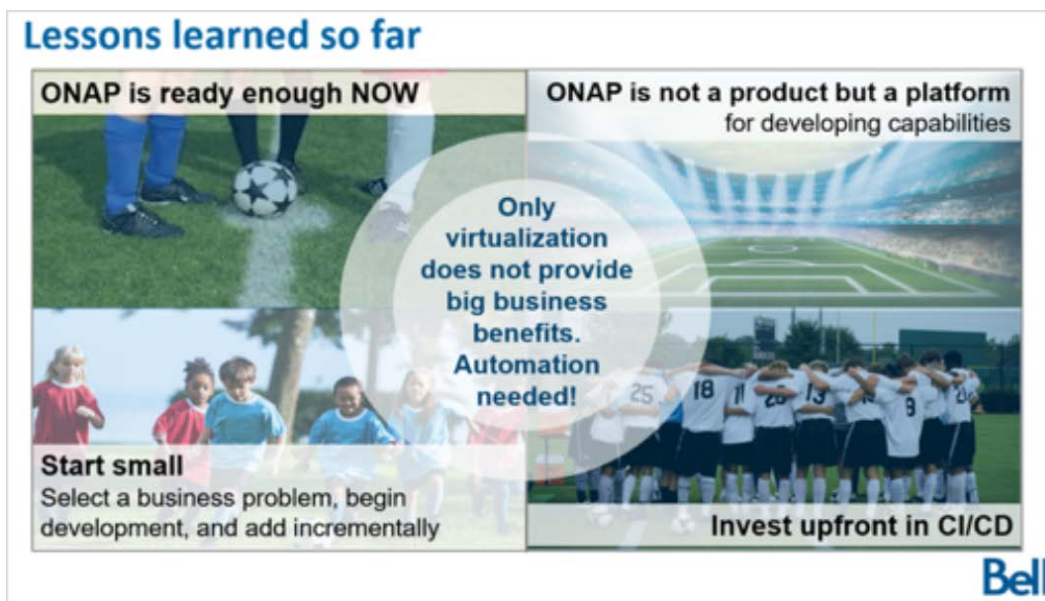


Figure 5. The experience & expectations of open-source NFV/SDN (ONAP) pioneers, source: Bell Canada

As Bell's strategic partner, Amdocs brought unparalleled ONAP expertise and DevOps scrum team agility and delivery capabilities with the goal of driving innovation faster and reducing the cost of building and operating the data center of the future.

Amdocs' contribution to ONAP

As a founding member and co-creator of ONAP, Amdocs remains strongly committed to its ongoing development. Amdocs is rated among the top three vendors contributing code to ONAP (see [ONAP's analytics page](#)). Amdocs chairs the ONAP Use Case Subcommittee which is doing vital work to develop and promote future-facing use cases like 5G and edge automation.

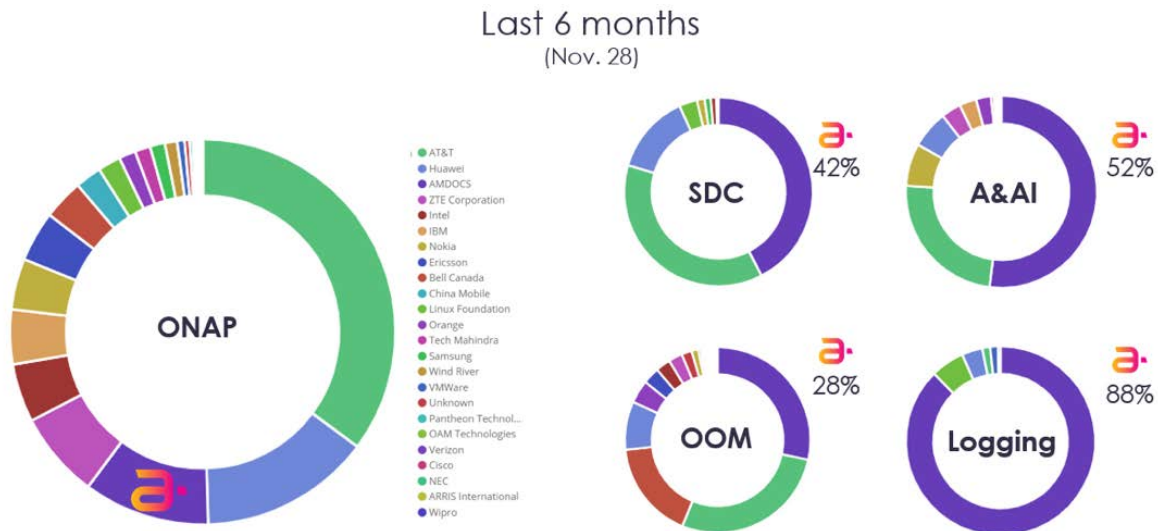


Figure 6: ONAP code contribution, source: [ONAP analytics page](#)

Amdocs brings unique expertise derived from working with ONAP's early adopters, including AT&T, Bell, Comcast and European carriers such as Orange, to help service providers drive value from virtualization. The [Amdocs NFV powered by ONAP](#) software and services solution lays the framework for additional carrier-grade enhancements as the ONAP code matures (read more on [Casablanca release platform maturity](#)).

ONAP on Microsoft Azure

Amdocs is collaborating with Microsoft to enable [ONAP on Microsoft Azure](#) and to accelerate the operator's' path to open source network virtualization via an integrated cloud platform. This new development enables operators to deliver virtual network services running on Azure, orchestrated and managed using ONAP. It is also further evidence of Amdocs and Microsoft's commitment to continue to innovate and promote open source networking solutions to accelerate the adoption of NFV.

ETSI and ONAP compliancy for VNF onboarding automation

Amdocs believes in the importance of gaining alignment across the standards bodies and is actively contributing to align service onboarding standardization [across ONAP and ETSI](#). As a leading member of the European Telecommunications Standards Institute (ETSI), Amdocs has taken a key role in progressing NFV in the market with the aim of converging on a common approach to describing VNFs, automation tool chains and integration strategy. Amdocs also takes a leading role in the Linux Foundation's newly created working group responsible for the standardization, validation, testing and compliance certification of VNF packages. Amdocs is driving industry collaboration by standardizing and templating systems to streamline and automate VNF onboarding, integration and lifecycle management processes based on both ETSI and ONAP NFV specifications.

Amdocs NFV powered by ONAP operationalizes ONAP

Open source brings unparalleled agility and innovation to the market. In such a dynamic environment, it is important that the industry is able to package open source contributions into a mature set of stable and hardened network operations capabilities to eliminate the complexity involved in deploying ONAP. This is precisely what Amdocs has achieved with its Amdocs NFV powered by ONAP software and services portfolio.

Unique and extensive experience with ONAP early adopters like AT&T, Bell Canada and Orange, puts Amdocs in a strong position to develop commercial products based on ONAP code as well as to provide expert services to accelerate NFV adoption. Amdocs' NFV services include strategic planning, implementation, operations and assurance, as well as integration to existing OSS and BSS systems, essential to commercializing virtual services.



Amdocs NFV Powered by ONAP



Packaged ONAP software and services pre-integrated for legacy hybrid network, complemented by expert services

Figure 7. Operationalizing ONAP

For service providers interested in testing and verifying virtual services on the ONAP open source platform, Amdocs offers a cloud-based environment complemented by pre-defined use cases, easy-to-use toolset, best practices support to fast track proofs of concepts, and use case validation that lowers barriers to entry for both vendors and CSPs..

Only Amdocs

Amdocs is in a unique position to help CSPs accelerate NFV/SDN service innovation, and reap the operational benefits of virtualization faster because only Amdocs:

- **Leads early ONAP adopters** AT&T, Bell and Orange, and so has unique insights to offer that will accelerate your NFV strategy
- Was **appointed by AT&T as their exclusive ONAP integrator**, gaining advanced experience and insights complemented by managed services to de-risk your deployment
- **Introduced the industry's first packaged ONAP software and services solution**, Amdocs NFV powered by ONAP, which is hardened carrier-grade software, fully pre-integrated for legacy hybrid network, and complemented by expert NFV services
- **Supports the industry's production environments for ONAP** which means that Amdocs can take you beyond PoCs to reap operational benefits today
- Developed the original code as **ONAP co-creator through ECOMP partnership with AT&T**, and knows how to help you maximize the benefits of ONAP today.

Find more information on:

[Amdocs NFV powered by ONAP](#)

www.amdocs.com

