

Niral Open Product Framework

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ABSTRACT

Mobile Network Operators have traditionally been dependent on a handful of vendors. This dependency made the upgrades slower, increased cost and hampered innovation. Adoption of open and disaggregated solution has enabled Cloud Service Providers to innovate rapidly. Operators understand the need for innovation and are increasingly evolving to transparency and disaggregation from conventional and proprietary strategies. Networks with 5 G are expected to be 10X denser than networks with 4G. More vendor equipment will be required for the denser network, contributing to an extra risk of vendor lock-in. Therefore, the purpose of this paper is to explore a potential solution to the problem described above. The idea of the Vendor Agnostic Open Product System was conceptualized by Niral Networks. The Niral Open Product Structure allows MNO's shift to operator controlled from vendor controlled, hence reducing the risk of vendor lock-in and fostering competition through better supplier, product, cost and solution management.

Keywords: 5G, Open Source, Curation, Disaggregation, White box, Niral Open Product Framework, Telecom Network Transformation, Vendor Agnostic

1. INTRODUCTION

1.1. Networking Landscape in Last Decade

The Networking landscape has changed rapidly in the last decade. Few of the notable factors that has emerged are:

- Open Source Offering became matured.
- Availability of Multiple White box ODM.
- Emergence of SDN and NFV.
- Industry realization of the risk of vendor lock-in.
- Industry movement towards Open Network Adoption.

Most Cloud Service Providers like AWS, Facebook, Google adopted open source and white box hardware solution pretty early. They have in-house R&D team that develops and contributes to many open source projects. Most of their data center runs on open, disaggregated software and hardware.

Mobile Network Operators have traditionally been dependent on a handful of vendors. This dependency made the upgrades slower, increased cost and hampered innovation.

Table 1: Dependency of Services on Vendors

	<i>Mobile Operators</i>	<i>Cloud Service Providers</i>
Dependency on Traditional OEMs	High	Low
In-house R&D	Limited	High
Adoption of Open Source	Low	High
Adoption of White box	Low	High
Adoption of SDN and NFV	Low	High

Source: McKinsey & Company, 2018

Adoption of open and disaggregated solution has enabled Cloud Service Providers to innovate rapidly.

1.2. Transformation of Mobile Networks Operators

MNOs' are familiar with the possibility of vendor lock-in and are increasingly shifting to openness and fragmentation from traditional and proprietary technology. To reduce the risk of vendor lock-in, several operators have established their own R&D division and have collaborated with open source groups or developed their own NOS (Niral Networks, 2020).

Table 2: CSP’s having Indigenous R&D Team

Operators with indigenous R&D team	AT&T, Verizon, Orange, NTT, Viettel, Jio
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Source: Niral Networks

In partnership with open-source initiatives, network providers such as AT&T have more frequently started to adopt the idea of disaggregated routing. AT&T acquired the Vyatta virtual router software from Brocade and announced plans to deploy 60,000 Disaggregated cell site routers (DCSG) in 2018 (Haranas, 2017). Rakuten and Telefonica have conducted field trials with disaggregated software and hardware in 2019 and have started deployment (iGR, 2020).

A list is given below of the few Open Source projects that operators contribute to.

The word “OPEN” in Telecom has various definitions depending on the methods employed by the provider to create the device.

In the telecom parlance OPEN means closed, customized software developed on the basis of open standard, with APIs interoperable in nature and integrated off-the-shelf White Box hardware to create an Open, Disaggregated Network Solution.




Such solutions are still Vendor Controlled, as Operators have little control over the proprietary software and its enrichment. The feature’s technology or innovation and, its technical support is totally vendor controlled. Vendors such as Altran, Metaswitch and IP Infusion are offering proprietary NOS, they share only their binary and therefore indirectly create a vendor lock-in.

Table 3: Contribution to Open Source Projects Made by Operators

Project / Community	Operator Contributors	Other Contributors
DANOS	AT&T	Niral
FRR	Orange	Cumulus, Niral, Vmware
O-RAN	AT&T, China Mobile, NTT, BT, Jio, Airtel, etc.	Ericsson, IBM, Intel, Altiostar, Mavenir, Parallel Wireless
ONOS	AT&T, China Unicom, NTT, Comcast, etc.	Google, Edgecore, Intel, Ciena, Broadcom, Delta
STRATUM	China Unicom, KPN, NTT, Turk Telecom	Big Switch, Cisco, Delta, Broadcom, Barefoot, Mellanox
DPDK	AT&T	Intel, ARM, Ericsson, F5, NXP
LF Networking	Deutsche Telecom, AT&T, Bell, Vodafone	Ericsson, Cisco, Huawei, Intel, Juniper, Red Hat, ZTE
LF Edge	NTT, AT&T	DELL, GE, HP, Samsung, Qualcomm
Open Compute	AT&T	Arista, ASUS, Alibaba, IBM
PRPLWRT	BT, Vodafone, Verizon, Deutsche Telecom	Intel, Broadcom, Qualcomm

Source: Niral Networks

OPEN can also means applications which are open-source and are based on open standards and APIs which are interoperable, where any person within the Enterprise, Open Source network, Open Innovation Group can contribute to Linux-like applications enrichment or support that can be compatible with any off-the-shelf White Box hardware. This approach is truly Vendor-Agnostic as it uses open source.

Open Source Components	Packaged Products (OEM)	Niral Product Frameworks
		
Collection of parts that do not fit together easily	Finished, closed products with full out-of-the box functionality	Customized open-source products are rapidly created by building upon Niral product frameworks.
Product creation involves major effort to integrate and test incompatible parts. No internal architecture to guide development and evolution	Internal interfaces are not published or accessible. Architecture and components are not modifiable. New features dependent on original vendor	Open internal and external interfaces. Architecture and components published and modifiable. Any vendor can add features
No Support	Full Support	Full Support + Customization from Niral

Source: Niral Networks

Fig. 1: Comparison of Frameworks

2. LITERATURE REVIEW

We are moving from traditional vendor controlled approach to vendor agnostic approach which will unlock new set of unchartered opportunities for the Mobile network operators. In vendor controlled approach, Mobile Network Operators are tied up with few vendors and thus it results in vendor lock in, prices of various equipment’s will eventually increases at a later stage by the vendors in the future and will result in less profits. Considering the present market condition, MNO’s are looking at some innovative solutions approach which will possible through vendor agnostic approach only. In vendor agnostic approach, company will have various set of vendor options to choose the best services according the requirements (Abbasi, 2019).

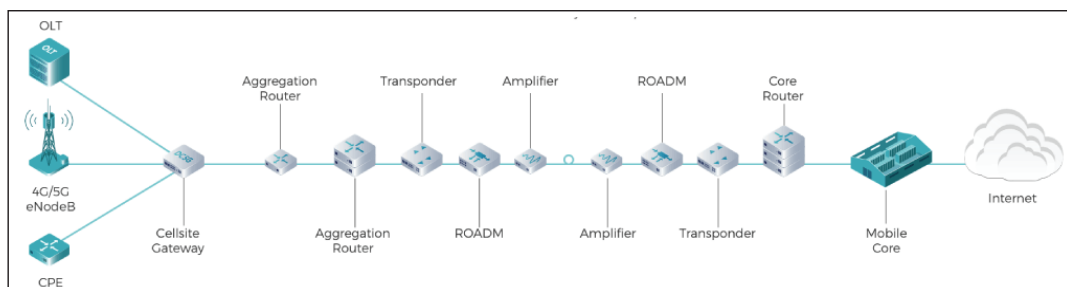
The Niral team conceived the idea of the Vendor-Agnostic Open Product Framework after several discussions with clients and open source ecosystems. The Product Structure helps MNO to shift to Operator Deliberated from Vendor Regulated to, reduce the possibility of lock-in of suppliers and encouraging competition by better managing their provider, product, cost and solution.

3. DISCUSSIONS AND FINDINGS

3.1. Conceptualization of the Niral Open Product Framework

The Niral Platforms are open source products designed with interoperable APIs and curated to be flexible, stable and compatible with features. An individual or group is can contribute to the enrichment or benefit of its apps. The development of a Disaggregated Networking Solution can be built into any off-the-shelf White Box hardware.

3.3. Niral Open Product Framework for Disaggregated Cell Site Gateway (DCSG)



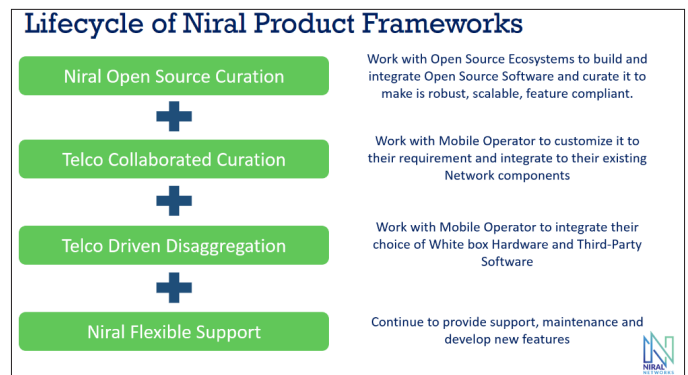
Source: Telecom Infra Project (TIP)

Fig. 3: DCSG

The Niral Open Product Framework is based on 4-principles:

- Open Source Software Curation – Working with Open Source Platforms to build, implement and curate Open Source Applications to be stable, flexible, usable and standard compliant.
- Telco Collaborated Customization – Act for the Telecom Provider to tailor it to their needs and incorporate it into their current elements of the network.
- Disaggregation for white box hardware and software according to the operator’s preference- Contract with MNO to merge their Third-Party Device option and White Box Hardware.
- Niral or other Third-Party Versatile Assistance – Continue assistance, repair and development of new features

3.2. Lifecycle of Niral Product Frameworks:

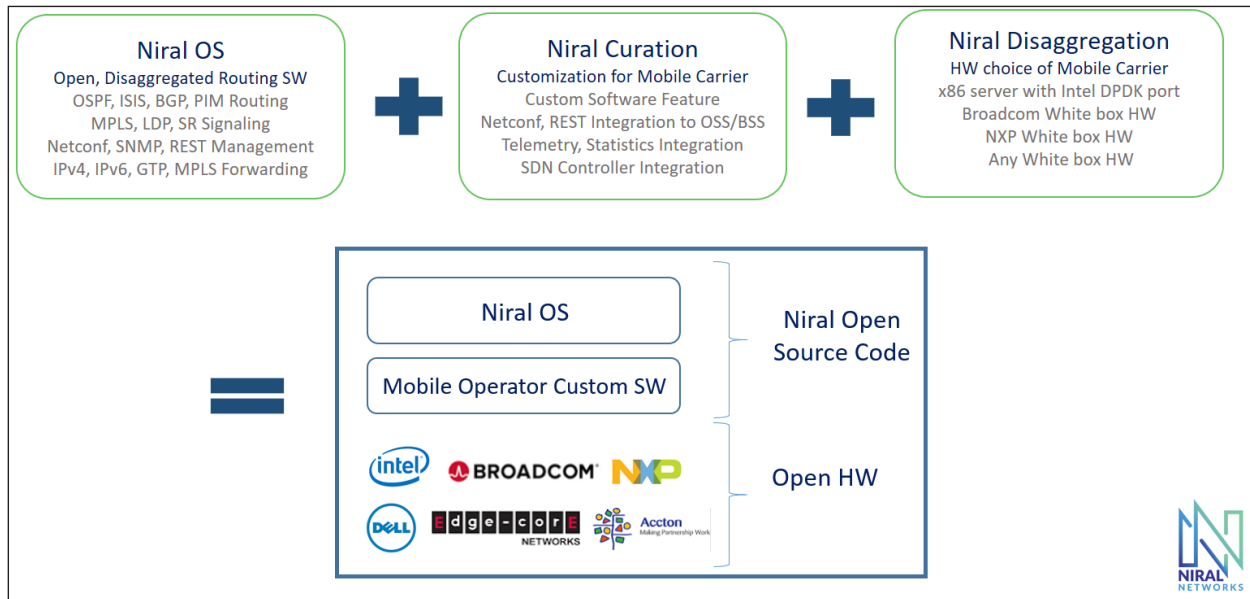


Source: Niral Networks

Fig. 2: Life Cycle of Niral Product Frameworks

Disaggregated Cells Site Gateway (DCSG) is deployed near the 4G/5G cell site and forwards cell site traffic towards the Core network. DCSG supports

IPv4, IPv6 routing protocols, MPLS Signaling. CSR forwards IPv4, IPv6 or MPLS packets towards the Core Networks.



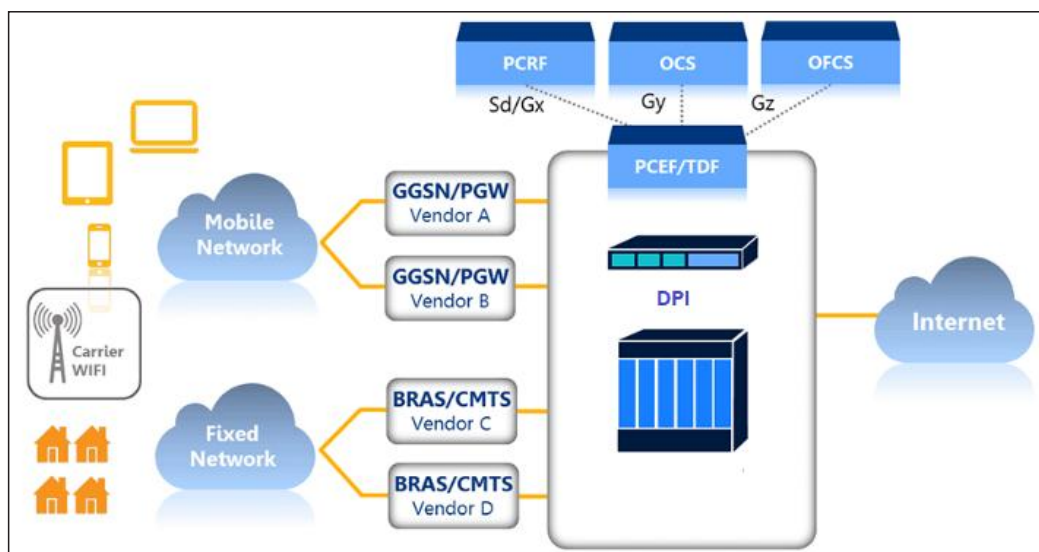
Source: Niral Networks

Fig. 4: NiralOS Curation Process

Niral’s DCSG NOS has been integrated to x86 Server with DPDK, Broadcom and NXP based white box HW. Niral

NOS can be integrated with any white box HW based on performance and scalability requirement.

3.4. Niral Open Product Framework for Deep Packet Inspection (DPI)

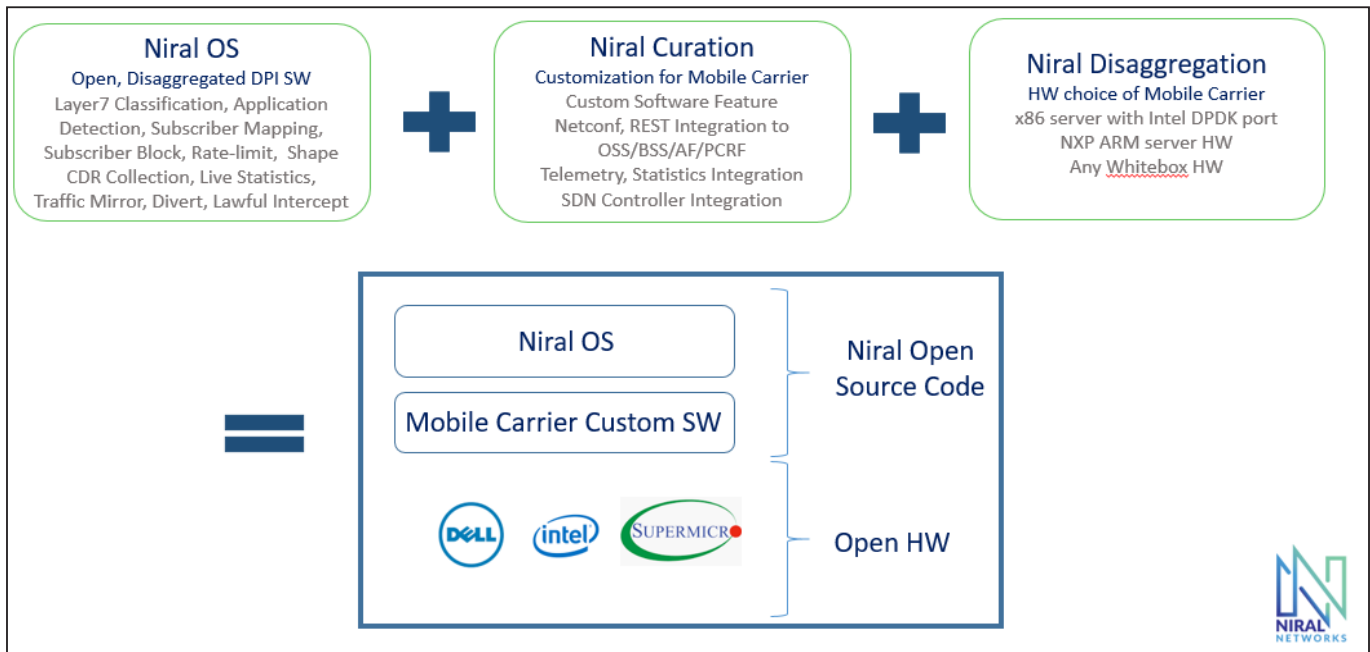


Source: Allot Communications

Fig. 5: DPI

DPI is deployed as a bump in the wire and is transparent to the network components in either side. In 5G, DPI can be deployed in the Edge and Core network. DPI parses all

traffic passing through it and detects the application used by mobile subscriber, applies policy and collects statistics for billing (NEAL, 2019).



Source: Niral Networks

Fig. 6: Niral Curation

DPI node can be deployed as a cluster in offline or inline mode. Niral’s DPI can be deployed as a VNF or integrated to an x86 or ARM based white box Server.

3.5. Benefits of Niral Open Product Framework

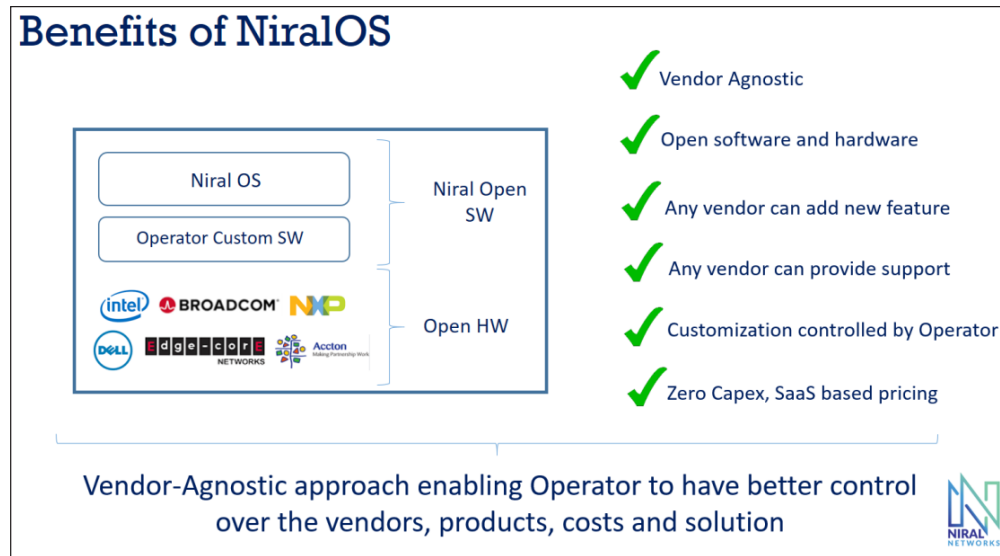
Niral Open Product Platform is created with input from the Open Source communities, Open Source Innovation Group within an enterprise, people who want to engage with Open source ecosystems.

- The roadmap for new feature conception is discussed in the community, and operators can work together to influence their roadmap.
- Operators can obtain support with flexibility from vendor of choice or from their own R&D team, mak-

ing the Niral Open Product Platform completely agnostic.

- Versatility in enriching functionality as every team can enrich the open source code, along with the operator’s own R&D team.
- The MNO is flexible for working with Niral Networks in order to construct its own customization related to north-bound integration, third-party app integration, contextual white box integration. The source code of the customizable part is the customer’s intellectual property.
- Cost-efficient pricing and flexibility. A Zero-CAPEX, SaaS-based pricing model.

(Source: Niral Networks)



Source: Niral Networks

Fig. 7: Benefits of NiralOS

4. CONCLUSION

Vendor-agnostic approach is the next big potential market for the entire telecom industry. It will definitely add values to product as different vendors will be able to contribute in project without having any kind of barriers. It will enable all the operators to have better control over the vendors, products, costs and solution thus Mobile Network Operators will have the leverage to select the best service provided by different vendors.

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