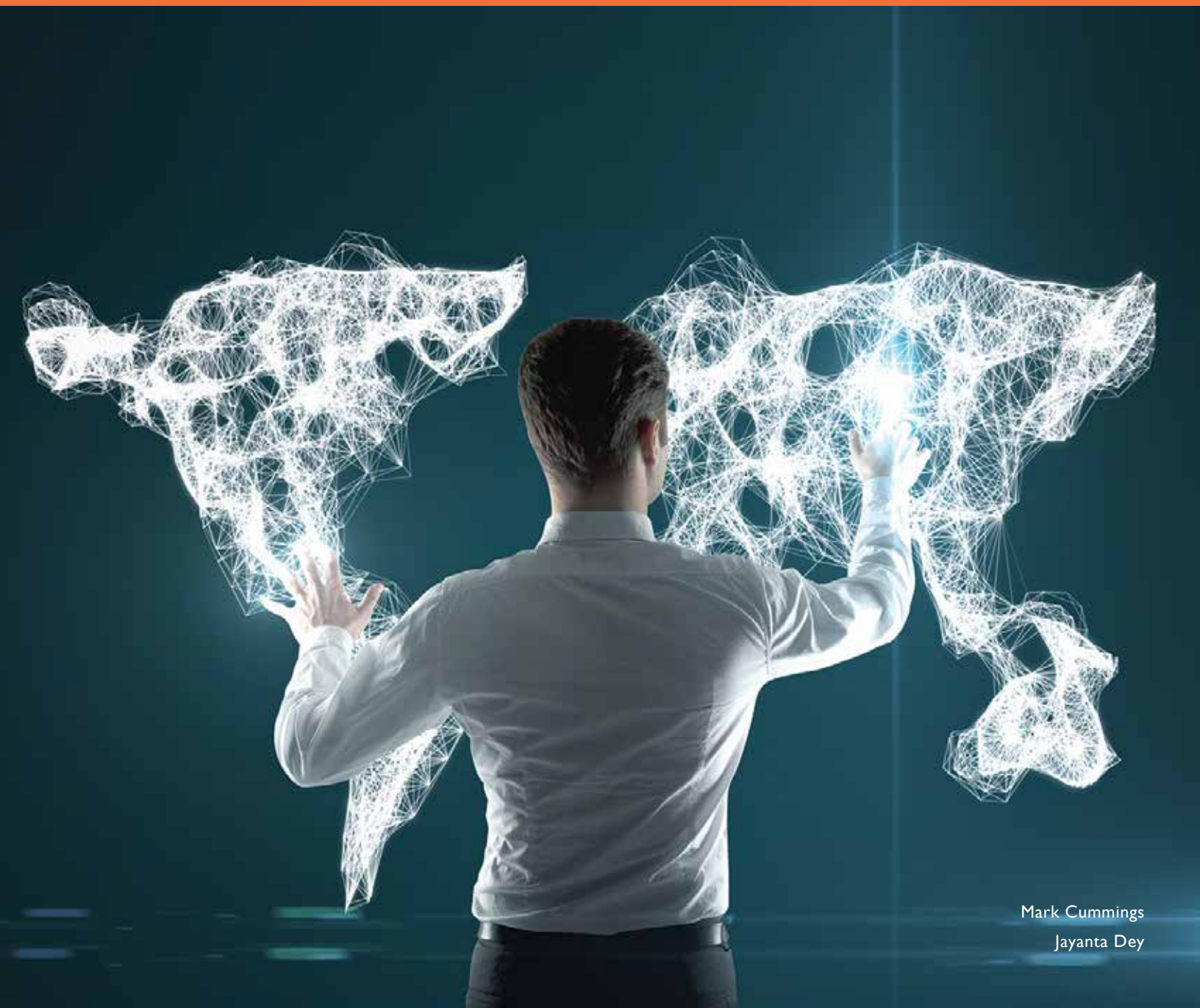
ORCHESTRAL NETWORKS

WIPRO
Applying Thought

CAPTURING THE PAYOFF FROM NETWORK VIRTUALIZATION



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ABSTRACT

Network Virtualization coupled with automated management is rapidly evolving into a game changer for next generation communication service providers due to growing market demand for flexible, agile and cost efficient multi-service support. However the possible gains are being eroded by existing management information silos, hampering flexibility and resulting in operational inefficiency. Our estimate* shows that even small Telcos could be paying upwards of a $400M Operations and Integration Tax every year.

This paper describes how the partners Wipro & Orchestral Networks combine innovative technology, world-class engineering and deployment services to provide a cost effective way to solve this problem and enable an on-ramp for rapid NFV implementation.

*Wipro & Orchestral Network estimate derived from Telcos Annual reports & Outsourcing Contracts.

ROADBLOCKS ON THE WAY

Telcos by their very nature have ageing assets spread over large geographies. The fragmented management and information systems, (refer illustration #1 below) held together by large numbers (both internal and external contractors) of engineers and technicians, whose annual cost for a small Telco is $400M per year, and for a large Telco goes up from there. The resulting network suffers problems in QoS that result in a degraded QoE for the end customer. To overcome these QoS/QoE challenges, more capital intensive resources are thrown at the network than would otherwise be needed, thereby increasing CAPEX. It also dramatically impedes the development and deployment of new services leading to diversion of revenue to OTT providers.

A few decades ago, these problems were manageable. The dramatic growth of wireless, internet and optical transport networks with their concomitant increases in complexity, and volatility has grossly exacerbated the problem. Combined with subscriber saturation it has created a serious financial problem. The financial problem can be seen documented in the Telco's financial reports going so far in some cases as reductions in dividends.

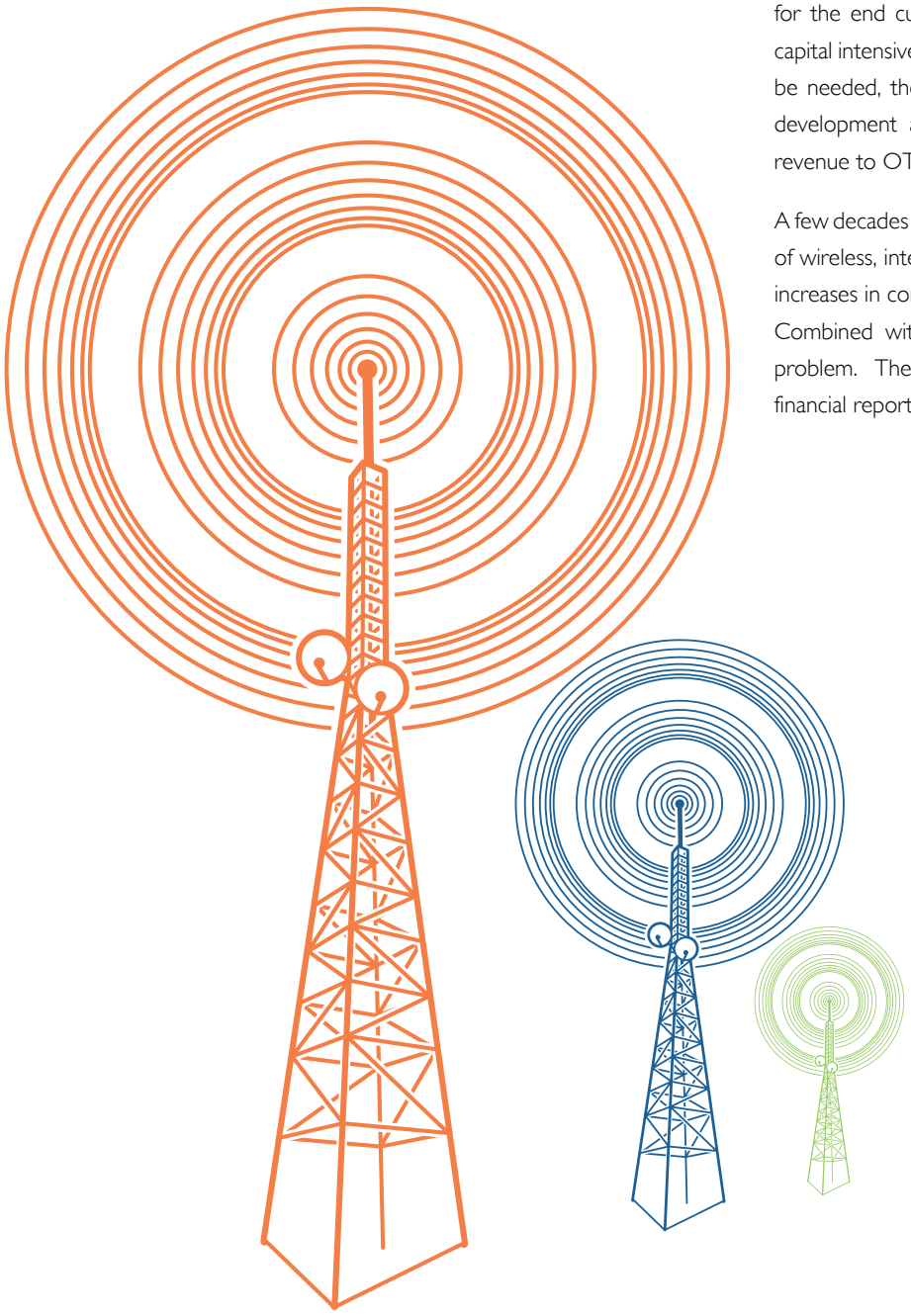
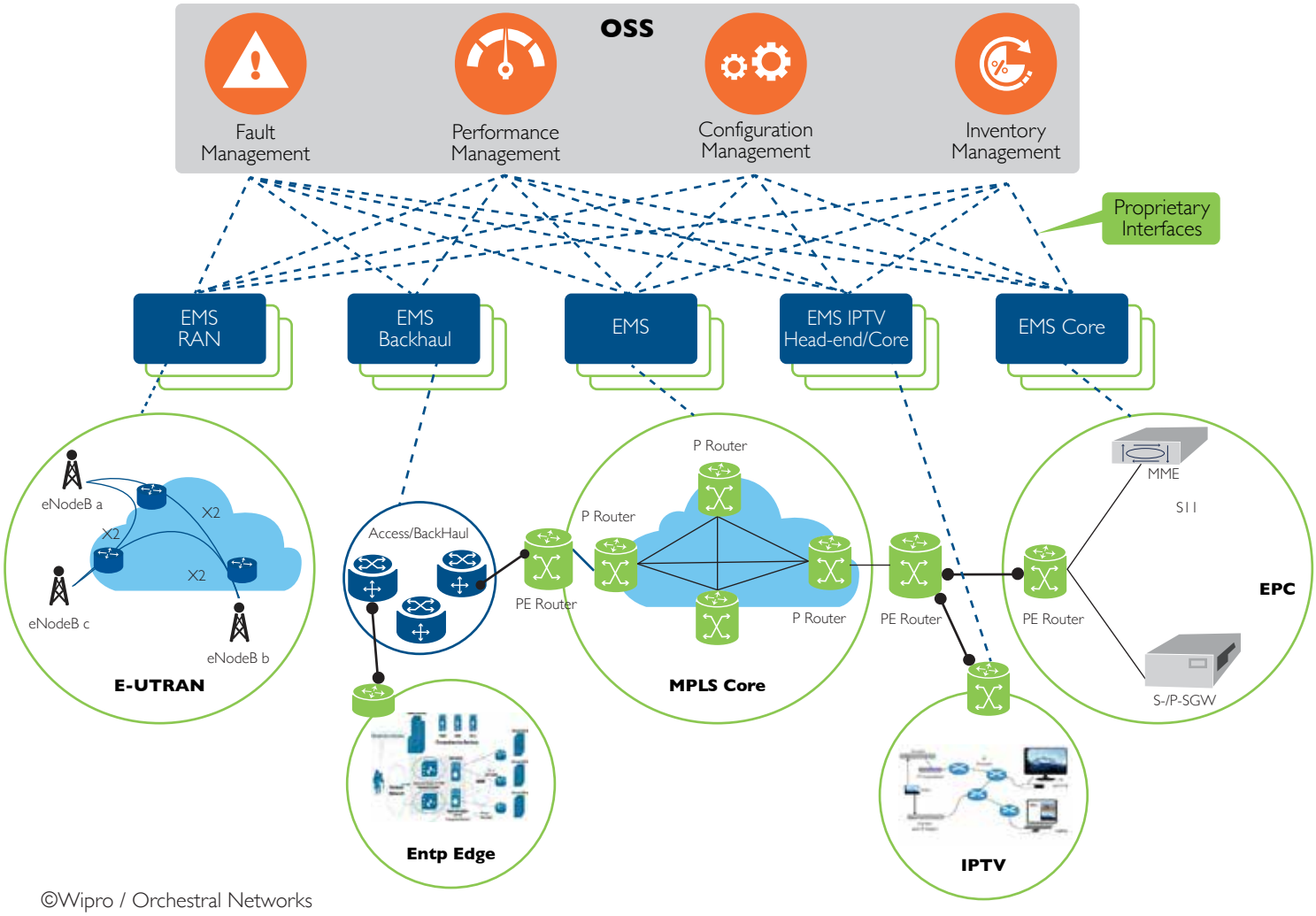


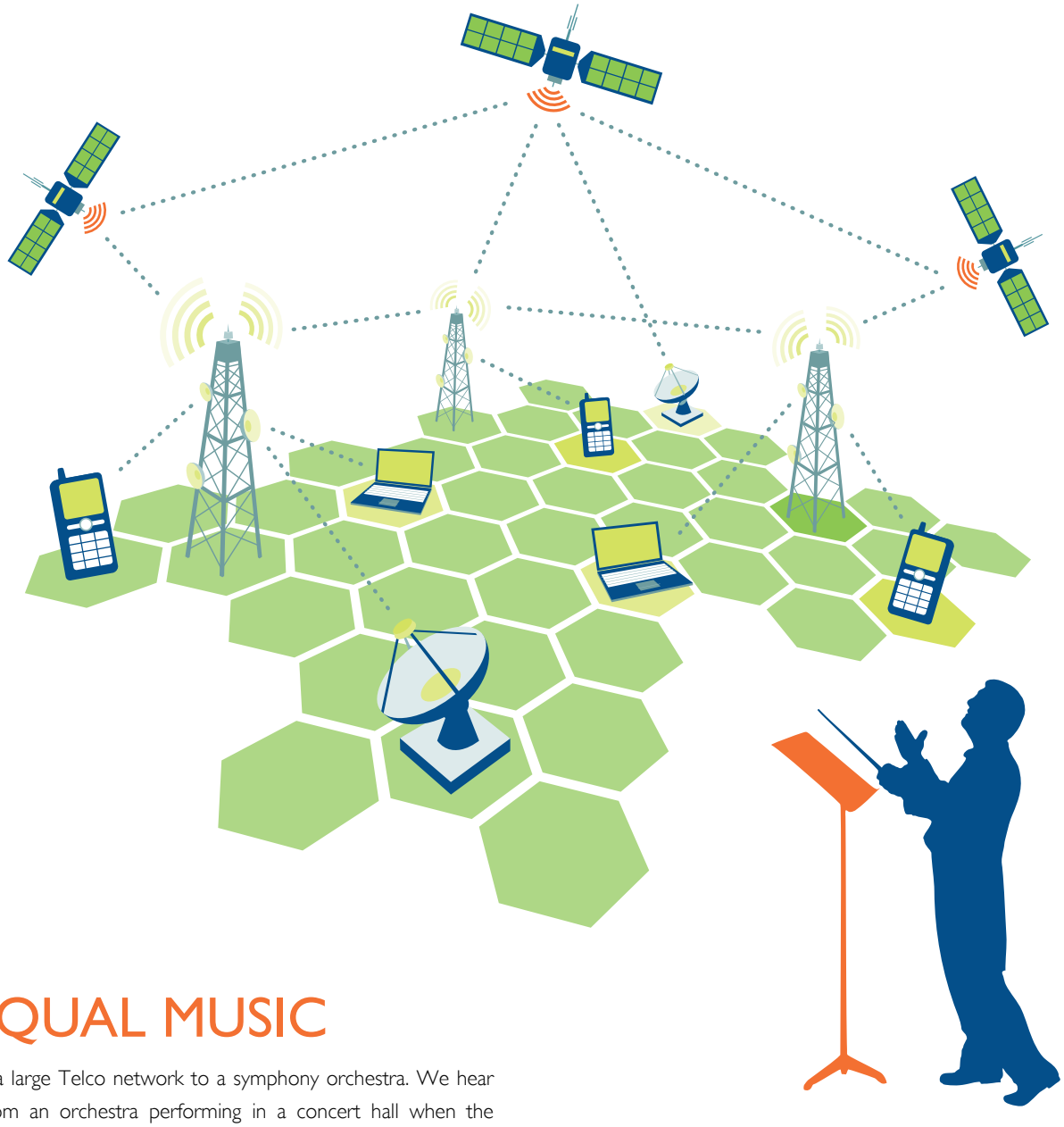
ILLUSTRATION #1: PROBLEM



NFV and SDN help address these challenges but the benefits of SDN/NFV can be truly realized only if we are take the following into consideration:

- NFV inherently promises financial and operational benefits hitherto not possible with legacy networks. But this is possible only if the communication service providers can overcome the current day proliferation of OSS and E/NMS systems managing silos of networks and creating further silos of mutually incompatible processed information.
- Taking a pragmatic view point that virtualization of Telco networks will happen in an evolutionary and step wise manner, NFV implementation itself can introduce additional management silos across network fragments.

In summary, the lack of end-to-end management capabilities cause inefficiencies reflected in higher OPEX and CAPEX in legacy components and acts as a roadblock to implementation of NFV/SDN.



AN EQUAL MUSIC

Let's compare a large Telco network to a symphony orchestra. We hear good music from an orchestra performing in a concert hall when the musicians can see each other and also when the conductor and each musician has a copy of the printed music on standard formatted pages that fit on a standard music stand.

Now imagine that we take the orchestra into a recording studio to play to a distributed group of millions of listeners. But let's imagine we do this the way that our large Telco/Cellular networks have evolved. Doing so, we place each musician in a separate recoding booth where they can't see or hear each other. Even though each musician may have the best new and evolving technology, there is no easy way to coordinate the performance of the group. The result is very poor quality of music, an expensive system to operate, and a very difficult time playing a new piece of music.

This is analogous to the situation Telcos face today as a result of layers of technology evolution, mergers & acquisitions, vendor's business models, changing customer requirements, regulatory actions and the fundamental nature of Telcos. Now instead of poor quality of music, we have poor quality of service. Instead of an expensive orchestra, we have high OPEX and CAPEX. Instead of a difficult time playing a new piece of music, we have a difficult time providing new services leaving the door open to Over The Top (OTT) providers diverting revenue growth away from communication service providers.

TECHNOLOGY & DELIVERY

The solution from Wipro and Orchestral Networks helps address the problem outlined in the previous section and meets the Telco's needs for end-to-end network coordination and optimization. It enables:

- Telcos to fully benefit from their sunken investments
- Vendors to continue to innovate and differentiate their products and value price
- Networks to deal effectively with rising scale, complexity and volatility

(i) TECHNOLOGY

Conventional technology doesn't provide a foundation that can meet the scale complexity and volatility of today's Telco networks. Telcos need an organically flexible, highly scalable and distributed data store and coordination process. The Orchestral Networks patent pending technology does that. Having been developed specifically in response to the needs of Telcos, it provides a data store that can change, not only parameter values, but parameter structures, in real time, without having to shut down for 'maintenance'. The data store can be completely centralized or fully distributed and can move from one to the other, again without stopping for 'maintenance'. In a 100 Million subscriber network, there are tens of thousands of network elements each of which can have thousands of parameters. Not all of the parameters are changing all the time, but some are, so the number of transactions per second can be quite high. Thus, the data store has to be able to store large amounts of data and be able to handle high transaction volumes. Finally, because of its key role in coordination of something people really depend on, it must have very significant security protections built in, from the ground up, and not added as an afterthought.

The process for using the data store must be able to provide organic coordination. Just as we can take control of certain functions in our bodies, if we choose to concentrate on them, while others are coordinated autonomously, network operators need to have control if they need it and if not, it must run in an automated fashion. The Orchestral Networks technology provides a one-of-its-kind solution to address this.

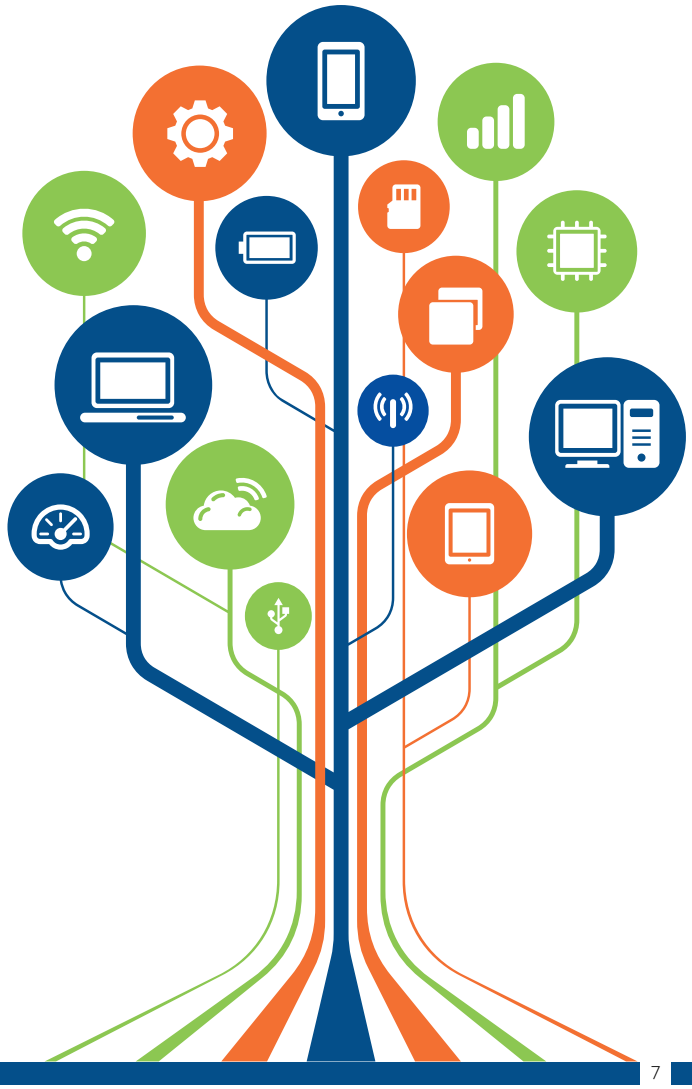
The technology has been demonstrated in three high profile public demonstrations under the auspices of TMF (Tele Management Forum) and NGMN (Next Generation Mobile Networks).

(ii) DELIVERY

But technology, by itself is not enough. All the participants in the Telco ecosystem have two sets of trust issues. The network operators fear that the major vendors will deliver products that are good for the vendors, but do not fully meet the needs of the operators. Based on this, the operators have pushed for detailed standards. The vendors fear that detailed standards will limit their ability to innovate, differentiate their products and value price. If one of the established vendors does try to develop a product to solve the problem, the other vendors fear that the product will advantage the vendor that releases the product and disadvantage all the others.

This set of trust issues requires a solution delivered by a small, independent company whose only business is delivering this solution. Such a company will be trusted by the operators, because the operators know that to be successful, it must be focused on fully meeting their needs. In a similar fashion the other vendors will trust such a company because the vendors know that to be successful, it must treat all the other vendors fairly. Orchestral Networks is configured to exactly fit this set of trust issues and the industry has recognized it as such. Solving this set of trust issues is necessary, but not sufficient. While the above addresses the first set of trust issues, there are another set that revolve around the ability of a small company, even with excellent technology, to develop a quality product, deliver it in a fashion that works well for the operators, and provide long term support. This is where Wipro comes in. Wipro with its reputation for quality engineering and its well-regarded worldwide delivery capability provides the whole ecosystem with confidence in delivery and support.

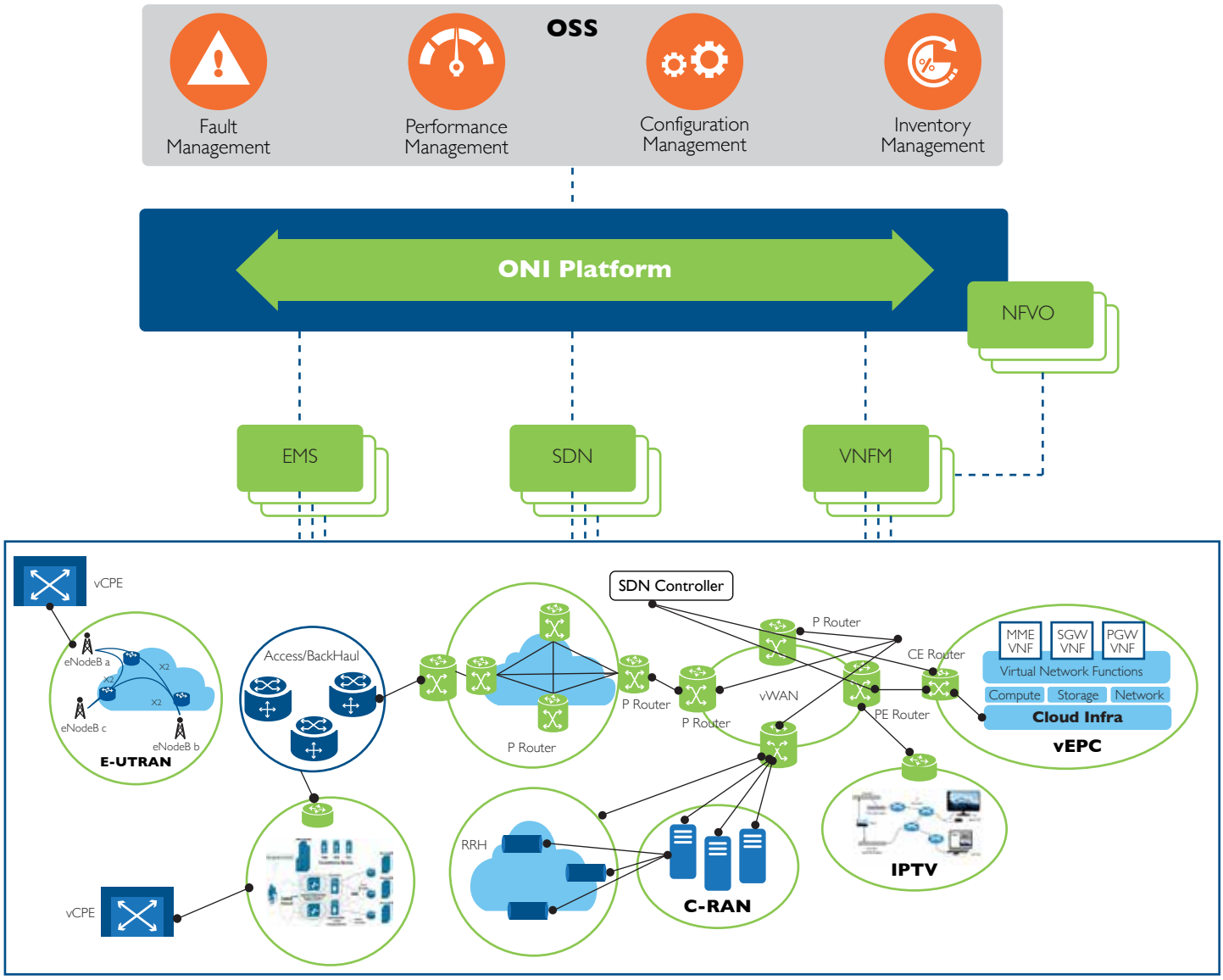
Thus, the partnership between Wipro and Orchestral Networks creates just exactly the solution that the industry needs at this time; i.e. the innovative technology required to solve the problem, and meet the trust needs of the whole ecosystem.



IMPLEMENTATION DETAILS

Now that we understand the full problem and have a general concept of the solution, we can dig a little deeper into the technology of the solution. The Wipro/ Orchestral Networks Solution is shown in Illustration #2. The Orchestral Network Platform (ON1) consists of a series of Local Virtualizers/Orchestrators one for each EMS or OSS and a single Conductor for the whole system.

ILLUSTRATION #2 SOLUTION: ORCHESTRAL NETWORKS / WIPRO FRAMEWORK



Each Local Virtualizer/Orchestrator provides adaptation and virtualization of the interface it is attached to. In doing so, it translates the information contained in the device it is associated with, into a consistent over-arching end-to-end information model. Some are calling this an Uber Model. This allows the OSSs and EMSs to improve their functionality. In addition, the Local Virtualizers/Orchestrators observe their neighbors and based on policies respond to specific events. Based on the policies selected, the response can be to alert a human operator, suggest actions, or take automated action. In this way, they provide local virtualization, adaptation, and coordination.

The Conductor communicates with the Local Virtualizers/Orchestrators, and based on policies, responds to specific events. The Conductor is responsible for global coordination and thus observes and responds to events on that basis. Again, based on the policies selected, the response can be to alert a human operator, suggest actions, or take automated action.

ON1 also provides an Open API based on 3GPPs and TM Forum's UIM (Umbrella Information Model) that allows third parties to easily connect. This can ease the interfacing of existing and future OSS/BSS systems, and allow Telcos to cost effectively take advantage of emerging specialized systems such as third party analytics and inventory systems. The Open API also eases development activities.

As NFV comes online it will focus on efficiency improvements in the network data centers. As such the NFV Orchestrator (NFVO in Illustration #2) will be concerned with having just the right amount of computing resource available at the right time. Because the NFVO has to be able to respond to sudden increases in load, it has to keep a significant reserve of resources active that can be called into action as demand spikes. Because ON1 has visibility into the end-to-end network, it has knowledge of impending changes in load (what is coming). By coordinating with the NFVO as illustrated, ON1 can allow the NFVO to maintain a smaller active resource reserve, therefore further improving data center efficiency.

CONCLUSION

Together, Wipro and Orchestral Networks provide patent pending technology using advanced software and virtualization that provides end-to-end management and coordination. This solves the current $400M+ per year problem, enhances current QoE and speeds new product introduction while removing the existing roadblock to NFV/SDN. It does so, by virtualizing the proprietary interfaces of various network components, collecting the operations data from them and converting it into a single comprehensive view (Information Model) of the network. The result is that the existing OSSs/BSSs are enhanced, holes that exist in automated network functioning due to lack of end-to-end operational data are filled in, and an open API allows operators and third party providers to bring their special expertise to bear on problems of coordination, optimization, and end-to-end orchestration.

As an overlay to the existing network, it maximizes the benefit from sunken investments in OSS/BSS and EMS systems while preserving and enhancing the benefits from the migration to NFV. Coming from this unique partnership, it is delivered in a way that is trusted by all parts of the ecosystem.

ABOUT ORCHESTRAL NETWORKS, INC.

Orchestral Networks develops pioneering network virtualization platforms that enable converged operations for next generation mobile networks, transforming data center operations and economics for mobile operators. Uniquely capable of meeting the 3GPP standards, the Orchestral Networks patented network abstraction layer simplifies management of new and existing products by providing network operators with a single integrated control plane for global network resources.

ABOUT THE AUTHORS

Mark Cummings, Ph.D. is the CTO of Orchestral Networks, and inventor of the company's patent pending technology. Mark has actively participated in 3GPP SA5, NGMN NGCOR, TMF, and IEEE 802.

Before founding Orchestral Networks, Mark was the principal inventor on the first patent granted on SDR, created the first successful SDR semiconductor start-up, Morphics (acquired by Infineon now owned by Intel); and a successful multimode multiband antenna company, SkyCross. He has over 200 publications, three granted and three in process patents, holds an MBA in Communications Management from Wharton and a Ph.D. in Information Systems from Tohoku Imperial University in Japan.

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Jayanta Dey is currently Vice President and CTO for Wipro's Media and Telecom & Product Engineering Services.

Jayanta has more than 25 years' experience in the communication industry. His area of specialty includes fault tolerant operating system, distributed systems, network and service management, SDN/NFV and wireless technologies. Jayanta has earlier held various roles in Wipro as the Head of Consulting, Solutions & Practice Unit for the Telecom Equipment Vendor business. Earlier to this, he was the Global Head of Sales for Telecom Equipment Vendor Business and responsible for building strategic partnerships with telecom clients globally. He was also the Business Head for Wipro's Wireless Network services. Jayanta has represented Wipro in various industry forums like OSS/J, LTE Small Cell, TM Forum.

Jayanta holds a BE (Hons) Electronics Engineering from BITS Pilani and a MBA from North Eastern University Boston. He is currently based in Bangalore, INDIA.

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