



Cloud Evolved Service Innovation and Intelligence

A data-first approach to creating dynamic services and improving network performance

INTRODUCTION

The dynamic capabilities of cloud-based, virtualized networks holds significant promise for service providers including:

- Rapid service creation and improved service agility
- Reduced cost and capacity barriers for launching new services, allowing for greater service experimentation and personalization
- New public, private, hybrid and edge cloud deployment options enabling best quality of experience
- Improved operational efficiencies

The benefits of cloud-based services for consumers and enterprises are numerous – from enabling the Internet of Things (IoT) to reach mass market scale, to supporting smart cities and workplaces, to delivering Fixed Wireless Access (FWA) and enhanced mobile broadband (eMBB) to smart homes.

UNIQUE DATA-FIRST APPROACH TO NETWORKS AND CLOUD

By establishing a modern, centralized, cloud-based data and analytics architecture, service providers can take full advantage of new automation, artificial intelligence and machine learning capabilities.

In particular, they can eliminate data silos and introduce contextual insights such as quality of experience and application scoring indicators across their data lakes. They can also expand how much data they can work with to optimize networks and create personalized, experience-based services. For example, the new cloud-based Network Data Analytics Function (NWDAF) in 5G networks will provide more intelligent service assurance automation by analyzing slice and network function traffic loads and service experiences.

Sandvine's cloudified Service Innovation and Intelligence portfolio takes a unique 'data-first' approach to helping service providers improve network performance, grow their businesses, and lower total cost of ownership. It has the following unique capabilities (see **Figure 1** on following page):

- First Service Innovation and Intelligence portfolio for core, cloud, and edge
- Quick access to the industry's best real-time data
- Predictive and contextual insights and closed-loop inline actions
- Unique out-of-the-box network and cloud software modules that solve specific customer use cases and are backed by return on investment (ROI) business models

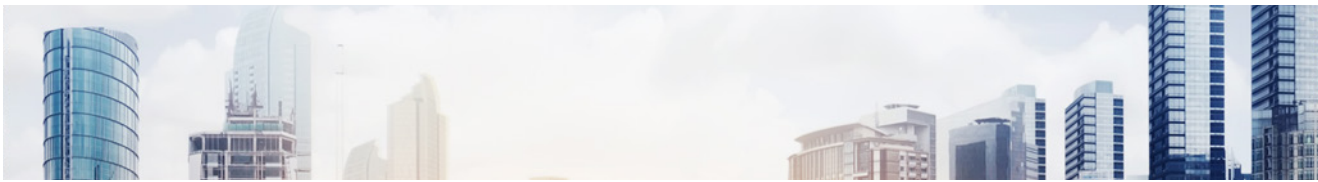
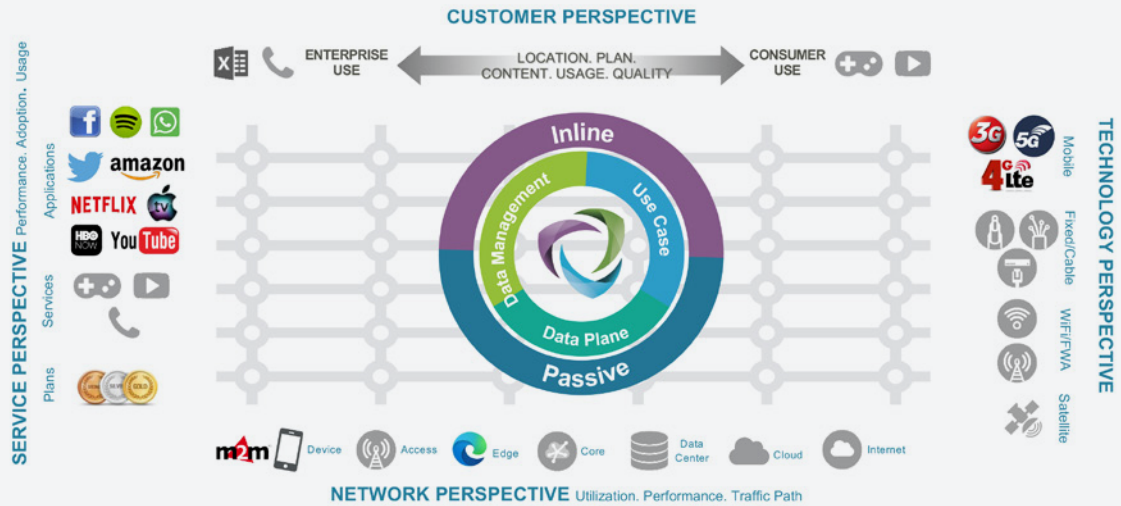


Figure 1

Sandvine's unique 'data-first' approach to Service Innovation and Intelligence



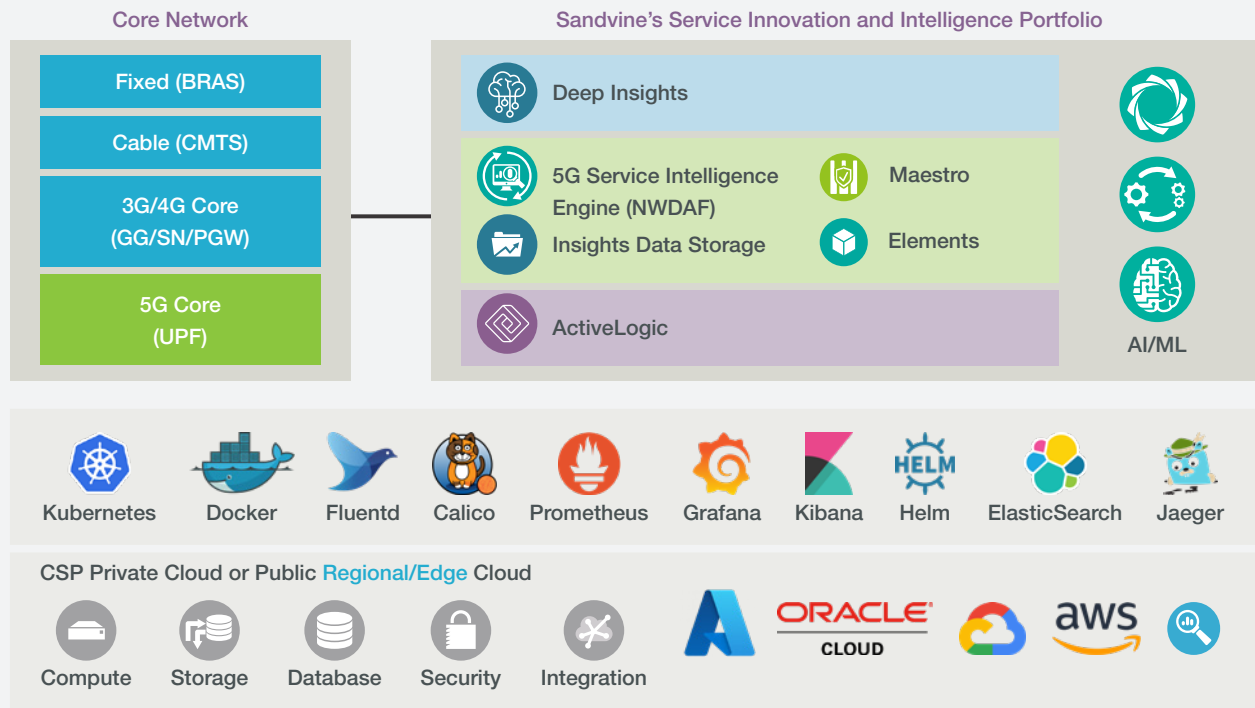
ENABLING ADVANCED NETWORK AND BUSINESS MODELS

The portfolio includes all the key elements required to see, optimize, monetize and secure over 95% of all voice, data and video traffic transiting any access network, using any cloud deployment model. This includes industry-leading real-time sample rates of 250 milliseconds, and correlation of user, device, service and network details on every session.







Based on this data, inline actions are taken to improve service quality of experience and network performance. This helps service providers personalize services and customize network slices to meet consumer and enterprise requirements (see Figure 2).

Figure 2

Sandvine's Cloudified Service Innovation and Intelligence Portfolio



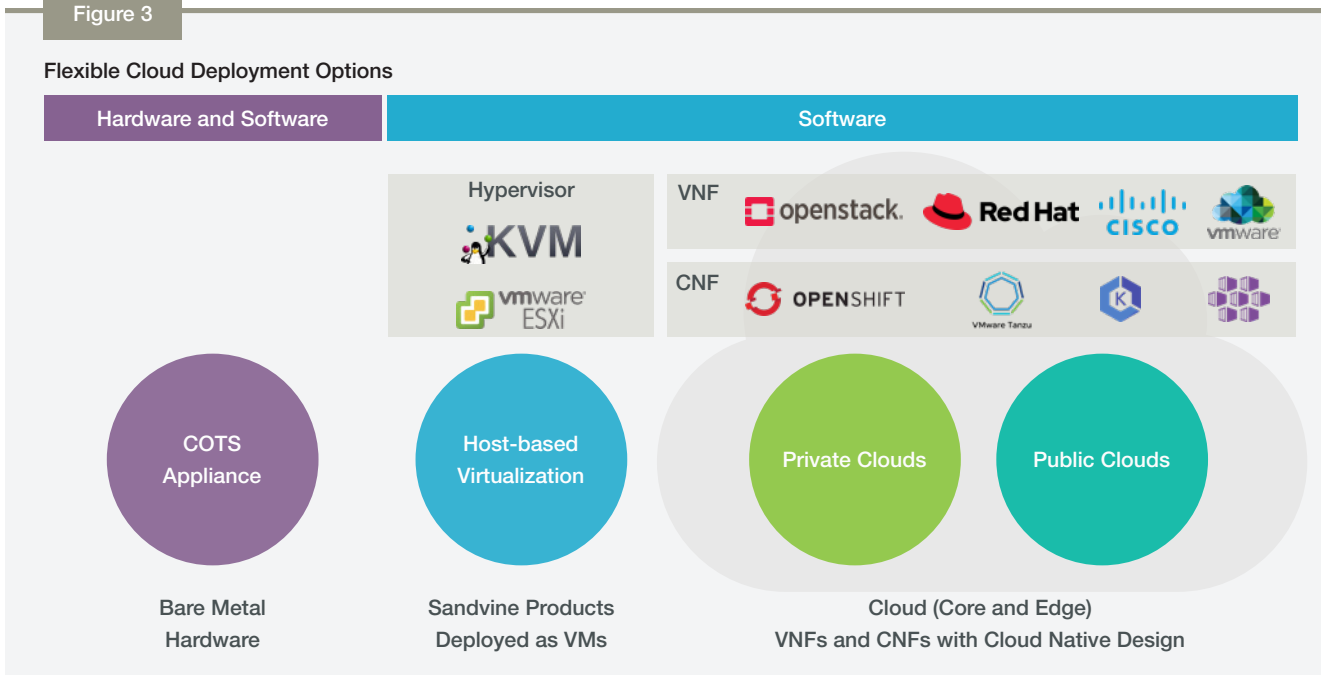


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ActiveLogic
 Hyperscale Data Plane for next generation networks producing the 'best data' for analytics and closed-loop inline actions
- 
Deep Insights
 Business analytics visualization platform powered by contextual network and service intelligence
- 
Maestro Policy Engine
 Next generation control plane for automated networks providing highly contextual data for policy and charging
- 
Elements
 Operation and maintenance along with proactive system health monitoring
- 
Insights Data Storage
 Highly scalable network and service intelligence storage module with built-in machine learning and AI models
- 
Service Intelligence Engine (NWDAF)
 Enriched 3GPP-compliant NWDAF provides closed-loop automation and machine learning for 5G networks

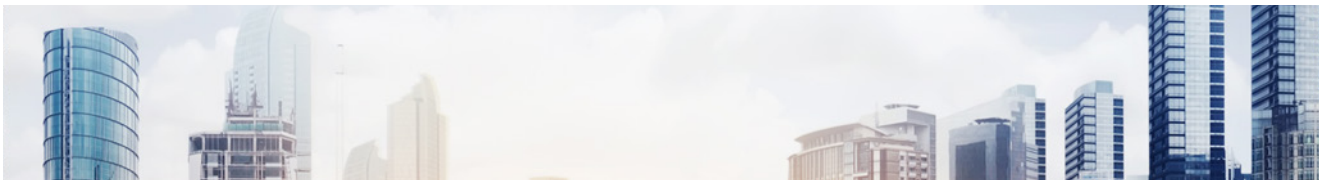
FLEXIBLE CLOUD DEPLOYMENT OPTIONS

The portfolio is offered as cloud native network functions (CNFs) and Virtual Network Functions (VNFs) in public, private, and hybrid cloud environments for maximum deployment flexibility as shown in Figure 3. This ensures that service providers can build and run reliable and flexible multi-vendor networks and network slices.

Figure 3



Sandvine's cloud-based CNFs and VNFs consist of a collection of orchestration templates, Network Services Descriptors, and images developed for automated deployment and lifecycle management in cloud environments.



CLOUD NATIVE SERVICE DESIGN

Cloud native solutions are especially appealing to service providers for cost optimization. Mobile networks are predominantly access and edge networks, with the costs being heavily influenced by the number of base stations deployed and their necessary aggregation. In 5G, network slicing adds another dimension of cost and complexity. At the same time, increased competition is placing pressure on revenues, making it imperative to bring down the costs associated with each user.

The hyperscale infrastructure model offers significant promise to operate massive network infrastructure with lower costs, due primarily to the automation of most operations and deployments, while maintaining high availability and scalability. Additionally, the improved flexibility is expected to bring services to market faster and at lower costs.

Sandvine follows the design principles laid out by the Cloud Native Computing Foundation (CNCF) for CNFs to deliver the dynamic scaling, resiliency, and high availability required for cloud-based networks including:

- **Compatibility:** Built as micro-services orchestrated with Kubernetes with support for CNI-compatible network plug-ins
- **Statelessness:** Manage state by decoupling application and data storage logic
- **Security:** Use security and network policy to isolate containers from one another and from the host
- **Scalability:** Support horizontal scaling across multiple machines
- **Observability:** Externalize internal states in a way that supports metrics, tracing, and logging
- **Installation and Upgradeability:** Use standard, in-band deployment tools such as Helm charts
- **Resilience:** No single point of failure and auto-recovery without service impacts

Cloud Native Services

Sandvine's Service Innovation and Intelligence portfolio uses the Red Hat Open Shift Kubernetes container platform with full-stack automated operations to manage hybrid cloud, multi-cloud and edge deployments. The cloud native platform includes monitoring, tracing, and logging tools such as Prometheus, Grafana, Jaeger, and Elasticsearch. It also includes a distributed tracing module, a unified logging module with log aggregation and processing, along with tools to collect, slice and dice Kubernetes metrics. Using tools such as Helm, the deployment and management of the Kubernetes clusters is streamlined, while Calico is used for Kubernetes workloads to communicate seamlessly and securely.

VIRTUAL NETWORK FUNCTIONS

The portfolio is also available as VNFs for OpenStack environments. Sandvine's Network Function Virtualization (NFV) architecture is compatible with deployments that comply with the NFV architecture defined by ETSI. Each component of Sandvine's Service Innovation and Intelligence Portfolio is represented by VNFs that consist of a VNF Descriptor and VNF Image, and includes the following: ActiveLogic VNF, Maestro Policy Engine VNF, Insights Data Storage VNF, Deep Insights VNF and Elements VNF. Cloud orchestration packages with VNF and NS Descriptors and meta-information are released for every validated Network Function Virtualization orchestration solution (see **Figure 4** on the following page).

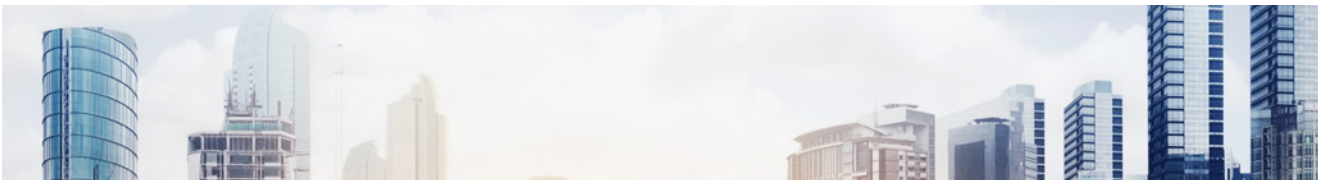
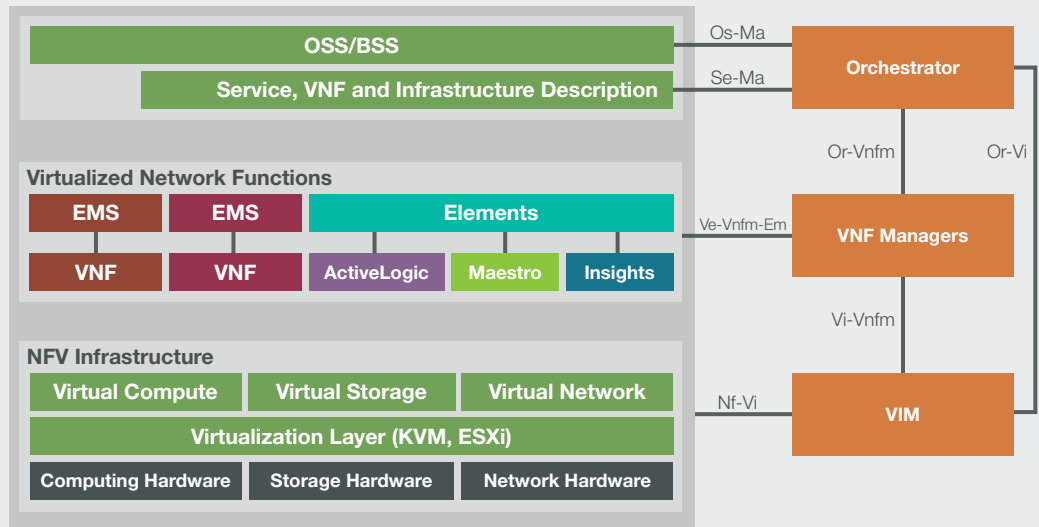


Figure 4

Sandvine's VNFs in an OpenStack Environment



PUBLIC CLOUD

Public cloud deployments on hyperscale Infrastructure-as-a-Service such as Amazon Web Services (AWS), Google Cloud Platform and Microsoft Azure are an essential part of many service providers' plans for next-generation networks including 5G.

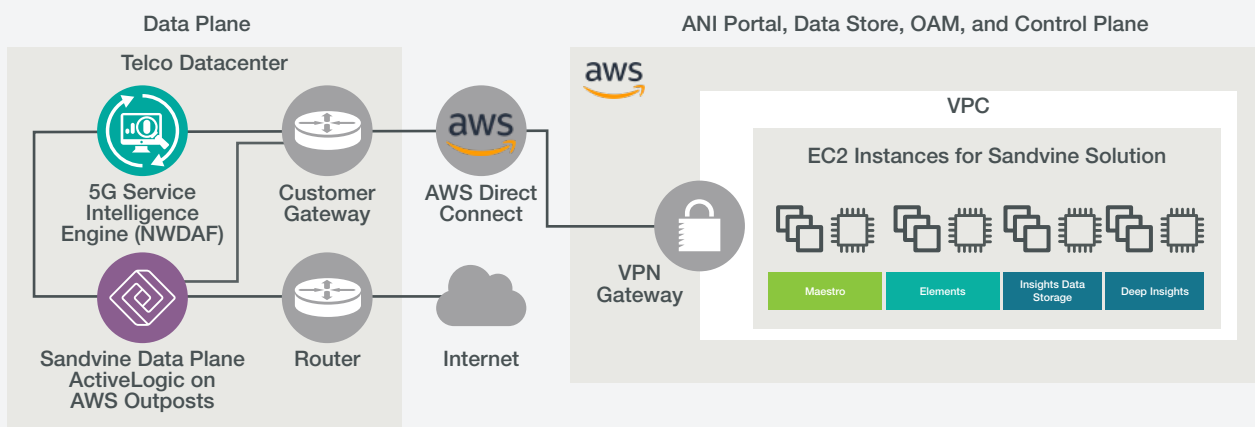
Sandvine's architecture is fully compatible with hyperscale cloud deployments. Moreover, to simplify installation and management in cloud environments, the portfolio:

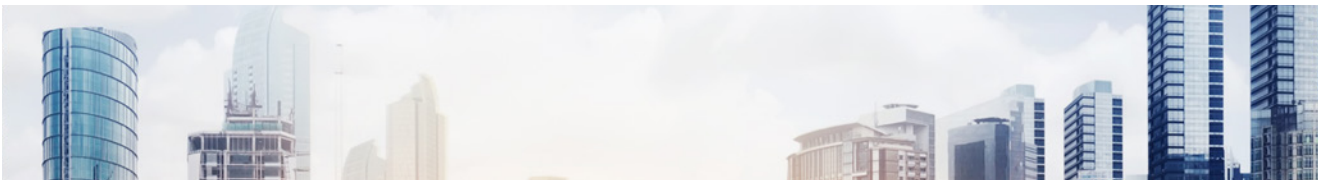
- Supports single-click deployment of cloud services
- Uses common orchestration tools (e.g., Terraform) to support cross-platform deployments and eliminate platform dependencies
- Provides robust user, network, and instance security

Sandvine's cloud architecture supports a range of deployment options in a public cloud environment. **Figure 5** shows one example of how Sandvine's Active Network Intelligence (ANI) Portal, datastore, OAM, and control plane elements can be deployed in the public cloud on AWS EC2 instances, while the ActiveLogic data plane element is deployed in the service provider's datacenter on AWS Outposts.

Figure 5

Public Cloud Deployment on AWS





CONCLUSION

A cloud-based, 'data-first' approach will be critical to improve network performance and deliver immersive experiences for consumers and customized network slices for advanced industry 4.0 applications, public health and safety networks, and autonomous vehicles. Sandvine's Service Innovation and Intelligence portfolio, available in any cloud deployment model and in any access network, is helping service providers successfully transform their business models to capture trillions of dollars in Cloud, 5G and digital service opportunities.

ABOUT SANDVINE

Sandvine's market-leading, cloud-based Application and Network Intelligence portfolio helps customers deliver high-quality application experiences and grow revenues. Our ability to classify over 95% of traffic across mobile and fixed networks by user, application, device, location and other parameters creates uniquely rich, real-time data. We then apply machine learning-based contextual insights to improve performance and enhance digital services. For more information, visit <http://www.sandvine.com> or follow Sandvine on Twitter @Sandvine.



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