SANDVINE

MAESTRO

KEY BENEFITS

- Designed to integrate with analytics – such as QoE, behavior, and congestion – to drive policy in automated and orchestrated networks

- Built for virtualization and 5G with services-based interfaces

- Delivers a consistent user experience from a single point of policy across mobile, cable, DSL, FTTx, WiFi, and satellite networks

- Timely and flexible integration with existing policy and enforcement infrastructure via standards-based support

- Offers the ability to alter AVPs, IEs, and other values in real-time, allowing for true DevOps deployments and multi-vendor integrations without requiring major system upgrades

- Broad support for use cases across Analytics, Network Optimization, Revenue Generation, Revenue Assurance, and Regulatory Compliance

- Leverages SandScript, Sandvine's DevOps language, to link business objects to the concept of any set of conditions to any set of actions in real-time

Maestro Automation Engine

Universal Policy Control for Closed-Loop Automated Networks

Network operators – especially ones with multiple access technologies – face a number of obstacles relating to implementing network-wide policy control. It is not uncommon for these operators to have a different policy control solution in each access type: mobile networks have a PCRF, cable networks use a PCMM Server, WiFi network controllers have some policy functions, satellite networks use a variety of interfaces, and traffic prioritization in DSL networks is now an established practice.

Single-access operators also tend to have issues ensuring network-wide policy control and usage-based billing due to multi-access vendor deployment strategy. Each of these systems can force a different type of policy and/or counting method, making it difficult to establish a common understanding for how these functions work across the network. Although standards have solved some of these issues, there is still room for improvement when it comes to policy control within multi-vendor networks.

When combined with Sandvine's Policy Control Enforcement Function (PCEF), the Maestro Automation Engine unlocks the potential for a number of compelling use cases. Specifically, the PCRF and PCEF are able to complete transactions at the same level of granularity, creating more opportunity for service innovation, without lag from control plane communication and multi-vendor policy differences.
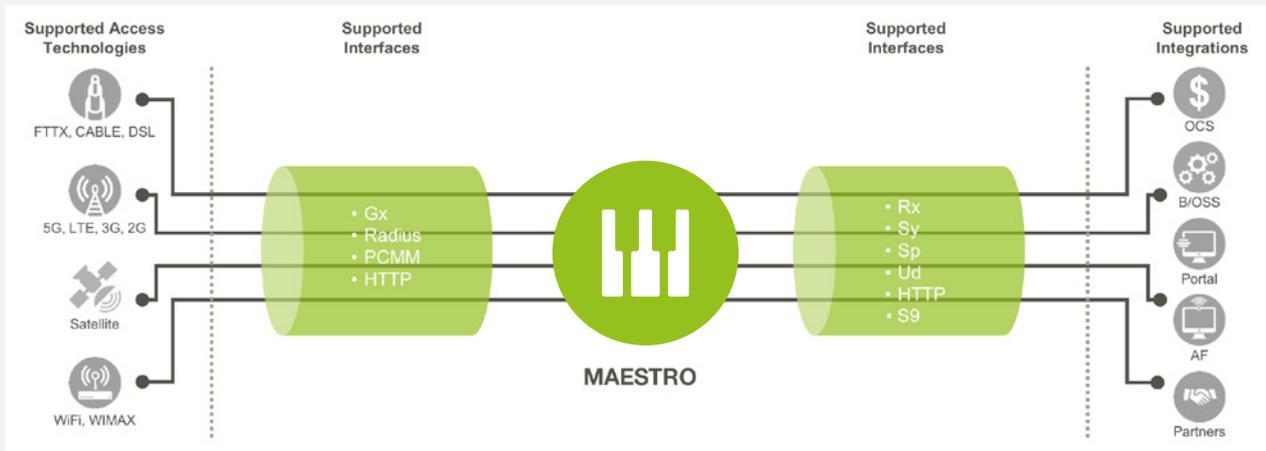
MAESTRO AUTOMATION ENGINE

The Automation Engine brings universal policy control and the power of automation to the control plane of any fixed, mobile, or converged network. Operators can use this automation for subscriber session management to deliver a consistent user experience across the entire network.

It is a 3GPP standards-compliant PCRF, including Radius COA, and a DOCSIS PCMM Server; plus, it has tight ties to the analytics engines that drive policy decisions in automated networks. The Automation Engine can be integrated with a vast number of vendors within the management and OSS layer due to multiple service-based interfaces. This uniquely enables a wide range of valuable use cases to be deployed consistently across all access technologies (see Figure 1 on following page).

Within the Automation Engine, there is built-in quota counting capabilities, which can perform all quota functions, entitlement, and QoS functions within the same element. By leveraging these capabilities, network operators can benefit from simplified deployments and troubleshooting processes, as well as the ability to launch feature-rich and complex plans with speed and ease.

Figure 1

Sandvine's
Automation turns
insight into action
in closed-loop
automated networks

## UNIVERSAL POLICY CONTROL WITH MAESTRO

In its universal policy control persona, the Automation Engine is the bridge between network analytics and user plane enforcement, and it is absolutely critical for network automation. The concept of turning insight into action is not a new idea, but having the right data and tools that drive the shift from insight to action in an automated fashion is a transformational change for network operators.

To successfully deliver universal policy control, an automation engine must simultaneously digest information from multiple network data sources to determine where to deploy the desired policies. These integral network points (see Figure 2) include, but are not limited to:

- Data plane enrichment from intelligent PCEFs, like those offered in Sandvine's application-aware PCEFs.

- Multiple policy enforcement points, providing QoS, network access and counting abilities, PCEF, PGW, CMTS, DSLAM, Intelligent Application Aware PCEF, etc.

- Application servers offering signaling for voice and video-based applications.

- Multiple B/OSS systems for entitlement, billing, usage and subscriber awareness.

- Signaling to communication systems for interacting with users, via portals, provider applications, SMS, email, and other notification channels.

- Feed information into and out of the engine via common APIs that flexibly integrate with non-standards compliant elements.

Figure 2

Universal policy control across multiple access networks, with standards-based interfaces
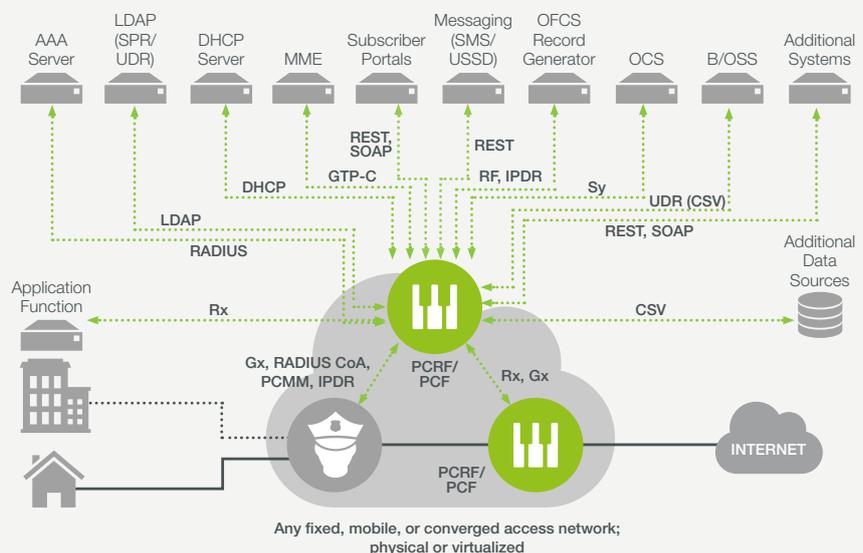
Standards-based interfaces accellerate service deployment and drastically reduce the time to revenue for new services

Sandvine's Maestro Automation Engine meets and exceeds these network requirements with key capabilities:

- Extensive standards support across all technologies
- Flexible and configurable service-based interfaces for API access into the Automation Engine from outside systems
- Service-based interface for communicating and signaling with external elements' APIs
- Ability to take multiple input conditions to determine the most appropriate policy action, based on all conditions via the Rule Engine
- Interoperability with best in-class analytics systems for reporting to drive informed, automated policy decisions

The Potential of Unified Policy Control

In Sandvine's Active Network Intelligence architecture, Maestro operates in the control plane, but integrates tightly with the data plane, and interacts with the B/OSS plane and remote enforcement points using industry standards.

This unification across the control and data planes delivers many benefits:

- **Simplicity:** Network operators define a policy once, and it is seamlessly and consistently applied across control and data planes
- **Efficiency:** Easily create and deploy policy changes through automation or standards-based interfaces
- **Velocity:** Policy decisions and actions are made faster by using a combination of many conditions and actions and by making these decisions concurrently
- **Consistency:** If using the Sandvine enforcement elements in conjunction with Maestro, the control and data planes have a common model of network policy control, and so they have an equivalent understanding of what the business policy means and how it is implemented
- **Universality:** Network policy control is completely agnostic of access technologies and vendors within the network

RULE ENGINE

The Rule Engine is the brain of the platform, and the foundation of all of policy control solutions. It realizes business objectives by linking any set of conditions to any set of actions, in real-time.

Information about measured conditions and provisioned subscriber entitlements flows into the Rule Engine, and charging updates, management actions, and business intelligence data emerge.

SandScript and DevOps

The Rule Engine is driven by a highly configurable DevOps policy language called SandScript. SandScript is much more than a simple rules system: SandScript lets operators programmatically define and associate an infinite set of policy statements – subscriber, account, location, usage, application signaling, tier, bandwidth, congestion or group of subscribers – any of which can affect a particular entity, such as a subscriber/account/location, in a specific context.

Changes made within the flexible SandScript 'instructions' become immediately active, enabling network-wide policy updates without the need to upgrade software throughout the network. Instead, all that is needed is a simple policy push of the new SandScript rules. This flexibility and agility make SandScript the perfect tool for DevOps environments that are becoming increasingly common in network operators.

ACCOUNT AWARENESS AND ENRICHMENT

One of the most important functions delivered by Maestro in an automated network is the association of network traffic and entitlement to a specific user, user group, group of devices, and/or account.

This function has become increasingly important as many mobile operators now report Average Revenue per Account (ARPA) rather than Average Revenue per User (ARPU); ARPA reporting has fundamentally changed the way that a policy system needs to associate traffic for policy and charging.

Additional enrichment data – applications, groups of applications, user behavior, or network congestion – is sent from Sandvine's data plane element to the Automation Engine for real-time decisioning. Another benefit of having Sandvine as the PCEF is the contextual network intelligence delivered to analytics engines, which feeds back into the Automation Engine. With this context, the network has the intelligence needed to make better decisions in real-time and drive automation without requiring significant processing power to attempt real-time correlation of data from disparate data sources.

SCALABILITY

Maestro delivers the scalability your network needs for today and tomorrow:

- Horizontal Scalability: Scales up and down as needed using the Sandvine Signaling Controller, or any third-party load balancer or diameter routing agent (DRA).
- Geographic Scalability: Supports geographic failover to ensure service continuation, even if an entire data center goes down.
- Sandvine Maestro Automation Engine 21.10 and greater will support full active/active cluster deployment with virtually unlimited horizontal scaling within a single cluster.

MAESTRO AUTOMATION STANDARDS SUPPORT

Industry standards and interfaces are important guidelines that ensure efficiency, ease multi-vendor interoperability, and contribute to predictable costs and deployment timelines.

|	
Diameter Client	Generic Diameter client interface
Diameter Server	Generic Diameter server interface
3GPP Gx	Collect usage data from and signal enforcement to PCEFs
3GPP Rx	Accept QoS requests from Application Functions (AFs)
3GPP Sy	Receive usage notifications from an online charging system (OCS) to signal alerts and enforcements
3GPP S9	Send and receive enforcement and QoS to and from foreign networks
PCMM / COPS	Signal to CMTS units to set QoS gates
IPDR	Collect IP Detail Records and IP usage records from CMTS units to gain subscriber location, IP address, and data usage per service class
LDAP	Request subscriber profile information from LDAP servers; also used within the Sp and Ud reference points
Data Record Logs	Create arbitrary, configurable-format records (e.g., UDRs, EDRs)
RADIUS Client	Send change of authorization (CoA), disconnect, and arbitrary RADIUS messages to RADIUS endpoints
HTTP/REST	Interact with third-party systems for exchange of information and to trigger events:
	• **as a client:** allows Maestro to signal to other systems
	• **as a server:** allows other systems to signal Maestro to perform policy actions
BGP/SNMP	Allows for learning subnets from the network, to be used for PCMM routing
Text Input	Allows CSV text input (file or streaming) to push additional information into Maestro

RAPID INNOVATION WITH SERVICEDESIGNER

Take advantage of market opportunities and remain competitive with Sandvine's ServiceDesigner. This true drag and drop UML feature allow operators to build policies and push changes quickly for today's ever-changing markets and use cases. Specifically, plan components can be added without the complexity of learning SandScript, but by leveraging a set of policy wizards, simple configuration drop-down boxes, and a logical hierarchy to organize plans (see Figure 3).

ServiceDesigner can define, modify, and deploy services to the network in minutes, leading to a number of important benefits:

- **Shortened Time to Market:** rapidly innovate and immediately reap the revenue rewards
- **Reduced Implementation Costs:** quickly define and introduce a unique range of high-value services that are access-agnostic, and deploy them network wide
- **Increased Competitive Agility:** respond to competitive threats, differentiate in the marketplace, and dictate the playing field
- **New Revenue Streams:** introduce a range of stand-alone services and service bolt-ons to target mass market segments and high-value niches

Figure 3

ServiceDesigner includes a drag-and-drop user interface that makes it easy to define, configure, and edit services. The user simply chooses pre-defined service features and defines the logic (e.g., if true, if false, always) that links them together.
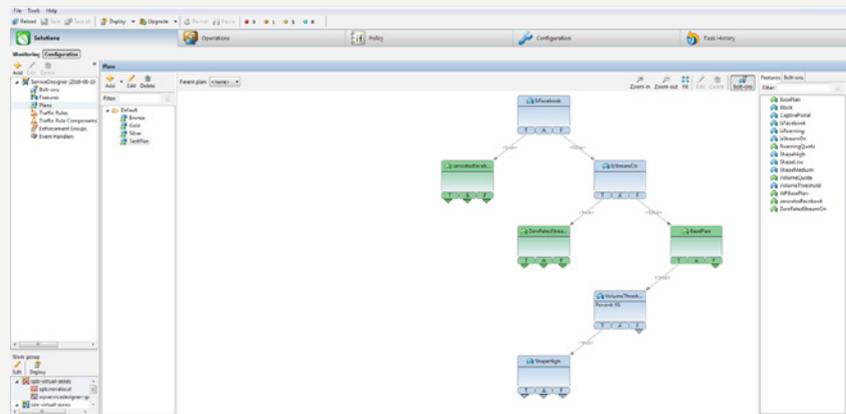
Maestro is 5G Ready today, and can be deployed without a forklift upgrade to support all of a network operator's access networks

5G READY – TODAY

Sandvine's Automation Engine isn't just for the networks of today, solving the use case problems of converged or multi-vendor networks— it looks to the future. Not only will it deliver on the PCF functions of 5G, but it will also enable a true service-based architecture that can dynamically adjust to network conditions through closed-loop automation. Unlike other solutions that require multiple policy controller instances to support 3G/4G/5G, Sandvine offers network operators a seamless 4G to 5G policy co-existence with no forklift upgrade.

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ABOUT SANDVINE

Sandvine helps organizations run world-class networks with Active Network Intelligence, leveraging machine learning analytics and closed-loop automation to identify and adapt to network behavior in real-time. With Sandvine, organizations have the power of a highly automated platform from a single vendor that delivers a deep understanding of their network data to drive faster, better decisions. For more information, visit **sandvine.com** or follow Sandvine on Twitter at **@Sandvine**.

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