

FlowEngine™

Intelligent Traffic Distribution System

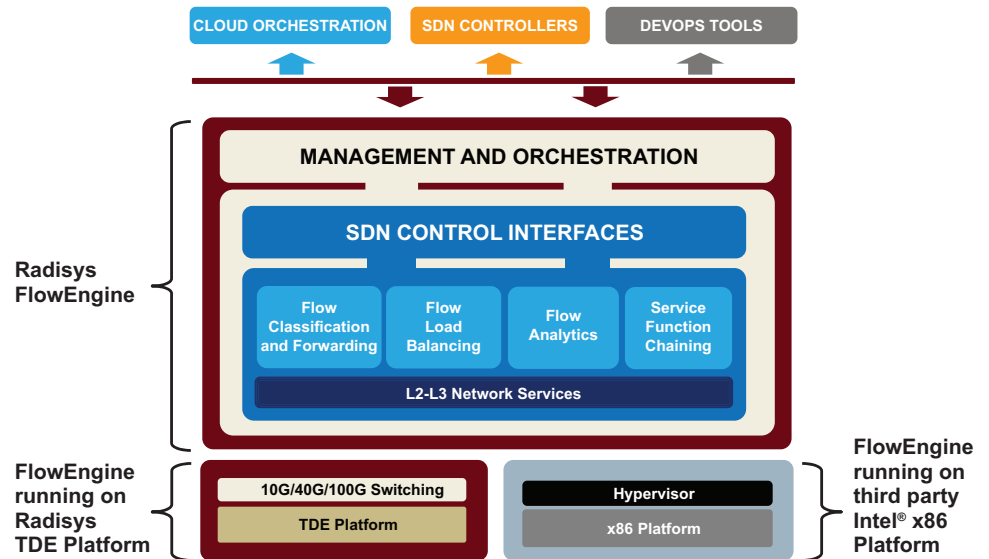
INTRODUCTION

FlowEngine is a high-performance OpenFlow-compliant data plane software application that enables communication service providers (CSPs) to rapidly deliver new services and applications in a scalable, SDN-enabled network while reducing network complexity and CapEx costs. It is designed to operate in both data center and telecommunications environments that demand high flexibility, scalability and guaranteed performance.

FlowEngine delivers a high-speed flow classification and intelligent load balancing engine for distributing millions of flows to the required physical or virtual services, improving resource availability and business continuity. The FlowEngine software architecture features a flexible data path that can evolve with changing network needs. It integrates OpenFlow standards to enable simple-to-complex application use cases without long cycles of software development.

FEATURE HIGHLIGHTS

- **Intelligent traffic management capabilities**
- **Robust traffic forwarding engine with millions of flow entries**
- **Standards-based OpenFlow interface**
- **Service function chaining for advanced VNF awareness**
- **Flexible protocol parsing, classification, and encapsulation support**
- **Element management API for custom network integration**



Flexible and Adaptable SDN Forwarding Plane

FlowEngine™ offers robust support of OpenFlow standards to run flexible pipeline with multiple levels of programmatic control to the applications to enable a broad range of applications/use cases. FlowEngine also supports Open vSwitch (OVS) as its programmatic OpenFlow interface to the external SDN Controller and OVSDB management interface to perform management and configuration operations on the OVS instance. With OVS as its building block, FlowEngine allows greater flexibility for implementation of SDN architecture—adaptable forwarding path, prompt access to new OpenFlow features, dynamic network analytics, and various sets of tools.

High-performance SDN (OpenFlow) Data Plane Functions

FlowEngine can process tens of millions of active flow entries for large-scale SDN networks to implement more flow rules with processing pipeline of variably sized tables. It offers a high rate of flow modifications/deletion/additions-per-second to keep pace with application demands in large service provider or enterprise networks. FlowEngine enables full line-rate (10G/40G/100G) forwarding performance for any scale of OpenFlow deployment. It can perform non-blocking line-rate performance of handling packet flows at wire speed on all ports to provide throughput of up to 1.2 Tbps of bandwidth.

Intelligent Flow Processing with Multiple Match/Action Tables

FlowEngine provides a range of table widths and depths tuned to match the diverse requirements for capacity at different stages of the packet flow pipeline. It optimizes flow pipelining with one to more than ten tables with the flexibility to deliver on quantity and size of match action tables required for various sets of traffic forwarding engines and processing functions to ensure proper connectivity, security, availability, and quality of flows. These functions may include simple forwarding, classification, QoS, filtering, load balancing, and network visibility/analytics.



Flexible Platform Options

Radisys FlowEngine software can run on a variety of purpose-built Traffic Distribution Engine (TDE) platforms and general x86 COTS server options. The TDE platforms include:

- **TDE-1000**, providing the highest performance flow forwarding and load balancing with intelligent use of specialized network processors
- **TDE-500**, combining network processor module and Intel x86 CPU module
- **TDE-200**, offering a cost effective SDN data plane switch at a fraction of the cost

FlowEngine Functional Highlights

KEY FUNCTIONS	DESCRIPTION
L2 and L3 Network Services	Access Control List (ACL) Network Address Translation (NAT) IPv4/IPv6 forwarding IPv4/IPv6 dynamic routing suite Bi-directional Forwarding Detection (BFD) VLANs, VLAN trunks (IEEE802.1q), LACP (IEEE 802.3ad) Virtual Router Redundancy Protocol (VRRP) Equal Cost Multi-Path (ECMP) flow forwarding
Network Virtualization	VXLAN gateway service NVGRE gateway service
Flexible Protocol Parsing	GRE, IP-in-IP, L2TPv2, GTP-C and GTP-U, IPSec, EoMPLS, 6rd, DSLite, 6to4, VxLAN, NVGRE
Load Balancing	Stateless and stateful load balancing Static and dynamic load balancing methods
Data Analytics	Network sFlow Netflow
Quality of Service (QoS)	Classification based on Class of Service (CoS) (IEEE802.1p) Ingres classification/policing based on QoS ACL ACL mapping (and marking) to ToS/DSCP Priority queue Rate limiting
Service Function Chaining (SFC)	Service Function Forwarder and Classifier (SFF) for service chaining as defined by IETF SFC working group Network Service Header (NSH) support to realize packet-based service function paths
SDN Control Element	OpenFlow 1.3, 1.4, and 1.5 Forwarding and Control Element Separation (ForCES) Open vSwitch (OVS) control Multi-controller support and interoperability
Management	System management: CLI, SNMP v2/v3, Programmatic API (ESWAPI), Open vSwitch Database Management (OVSDB)-based configuration, OF-CONFIG, NETCONF/YANG User access control: TACACS+, RADIUS IP services: SSH2, TFTP, FTP, NTP Cloud orchestration: OpenStack Neutron (LBaaS) plugin