

# CLEARWATER CORE

## TAKING THE BITE OUT OF IMS

*HARDENED AND SUPPORTED  
BY METASWITCH NETWORKS*



WITH ITS OPEN SOURCE FOUNDATION, PROJECT CLEARWATER REPRESENTS A FUNDAMENTALLY NEW APPROACH TO DEVELOPING, DELIVERING AND DEPLOYING COMMUNICATIONS NETWORKS: WITH SOFTWARE SOLUTIONS ACCELERATED THROUGH COLLABORATION, AT WEB-SCALE AND WITHIN LOW-COST ELASTIC DATA CENTERS. SPEARHEADING THE NETWORK FUNCTIONS VIRTUALIZATION REVOLUTION, METASWITCH IS NOW EASING THE TRANSITION WITH CLEARWATER CORE, PROVIDING INDIVIDUAL NETWORK OPERATORS ONGOING SUPPORT AND MAINTENANCE OF THEIR CLOUD-BASED IMS CORE.



- Full IP Multimedia Subsystem (IMS) Core
- An NFV-Ready Virtual Network Function
- Scalable, resilient and high-performance
- Freedom afforded by open source code
- Professional QA & usage-based support
- Reduces costs while nurturing innovation

### PLAIN SAILING WITH CLEARWATER

Clearwater is an implementation of IMS built using web development methods to provide voice, video and messaging services to millions of users. Architected from the ground up for massively scalable deployments within virtualized public or private elastic compute clouds, Clearwater combines the economics of over-the-top (OTT) style service platforms with the standards compliance and reliability expected of telco-grade communications network solutions. The web services-oriented design inherent to Clearwater makes it ideal for instantiation within NFV (network functions virtualization) environments as a virtualized network function (VNF).

### THE OPEN SOURCE PROJECT

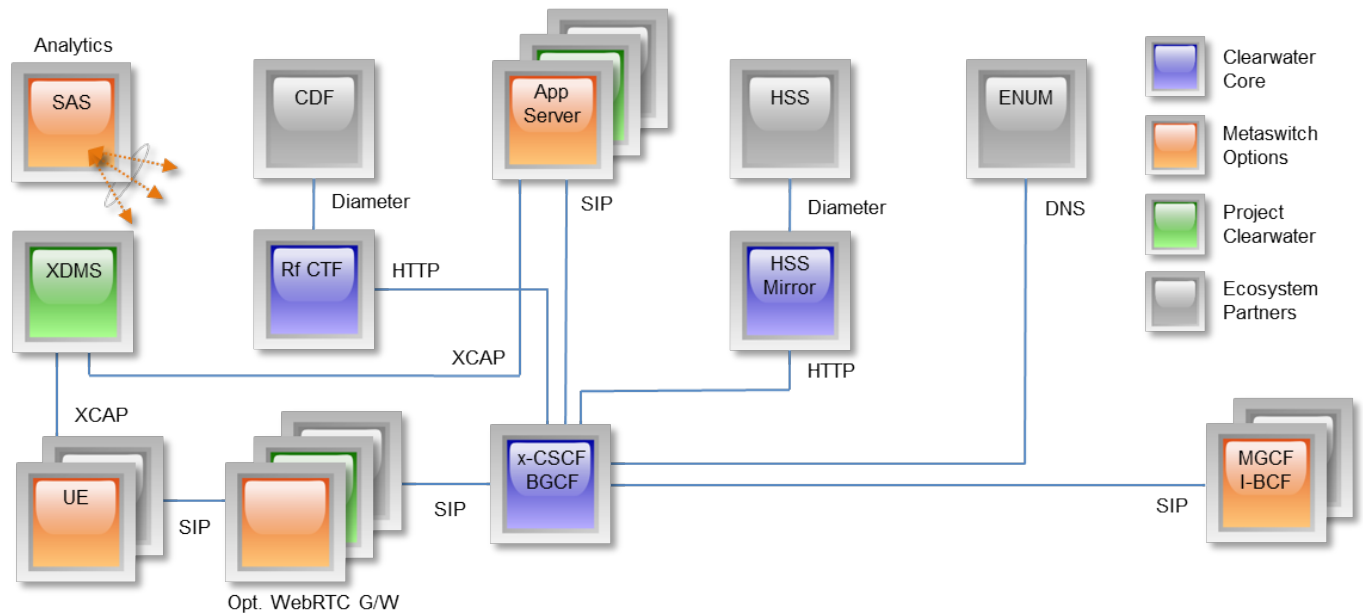
With a goal of increasing the velocity of innovation in carrier networks, Metaswitch contributed the initial code base for Project Clearwater to the worldwide community of industry software developers and systems integrators. Together with this group of dedicated independent telecommunications engineers, Metaswitch continues to drive the evolution of this code base, in line with open source best practices, to meet the requirements of today's most forward-looking service providers.

### CLEARWATER CORE

Meeting the demand of worldwide network operators, Clearwater Core is a hardened and supported subset of the open source project which is then combined with powerful analytics options afforded by Metaswitch SAS. Clearwater Core includes key IMS elements such as the I-CSCF, S-CSCF, BGCF along with an offline charging trigger function and an HSS Mirror.

With no up-front acquisition costs or licence fees, Clearwater Core provides a foundation for complete wireline and wireless IP communications while effectively removing the typical cost barriers to deploying IMS-centric Voice over LTE (VoLTE) and Rich Communications Services (RCS). A Network Operator simply leverages their standard compute resources while incurring a minimal usage-based software support subscription fee based on the number of virtual CPU cores utilized.

When combined with Clearwater developer ecosystem partners Clearwater Core can also be employed as the foundation for delivering extremely competitive OTT text, voice, video, and messaging services along with highly abstracted telephony developer environments.



*Clearwater Core components within a complete IMS Architecture*

## THE CLEARWATER ARCHITECTURE

Clearwater was designed from the ground up to be optimized for deployment in virtualized cloud environments. It leans heavily on established design patterns for building and deploying massively scalable web applications, adapting these design patterns to fit the requirements of SIP and IMS.

Clearwater was built in a manner that enables all components to scale out horizontally using simple, stateless, load-balancing. Long-lived state is not stored on individual nodes, avoiding the need for complex data replication schemes. Instead, long-lived state is stored in cloud-optimized clustered storage technologies such as Apache Cassandra and Memcached.

Characteristic of innovative internet software architectures, interfaces between the front-end SIP components and the back-end services use RESTful web services APIs while interfaces between the various components use connection pooling with statistical recycling of connections. This guarantees that traffic loads are effectively spread evenly as nodes are added and removed from each layer.

## UNMATCHED RELIABILITY AND RESILIENCY

The Clearwater approach to reliability follows common design patterns for scalable web services, keeping most components largely stateless and storing long-lived state in specially designed resilient and scalable clustered data stores.

Targeting short-lived state maintenance, all nodes are transaction-stateful rather than dialog-stateful proxies. As nodes remain in the signaling path for individual transactions only, outages do not cause established SIP dialogs to fail. Long-lived state, such as SIP registration data and event subscription state is stored in a clustered, redundant shared data store (Memcached) which is not tied to any individual node.

Similarly, the HSS Mirror only retains local state for pending requests, with all long lived state being stored redundantly in associated database clusters (Cassandra) while being mastered on the HSS itself.

Geographic redundancy is facilitated by deploying a single Clearwater Core instance across two or more distinct data center locations with a secure, private, connection between them, enabling the replication of registration information. Standard cloud-based DNS services are then employed to manage failover.

## MANO, ACTIVE ANALYTICS AND PERFORMANCE MONITORING

Critical in software-defined service function chains built on NFV constructs, Clearwater supports a wide range of management and orchestration (MANO) lifecycle operations. This includes instantiation, configuration, startup, clustering, quiescing and termination. Clearwater Core is delivered as a set of application install packages for the appropriate operating system to provide maximum flexibility.

While standard SNMP interfaces are exposed for performance and fault monitoring, carriers implementing Clearwater Core will also benefit from the Metaswitch Service Assurance Server. SAS provides proactive, real-time, analysis of all Clearwater processes, presented in simplified ladder diagram and detailed decode views. This includes SIP messages, HTTP and Diameter queries, Cassandra and ENUM lookups plus all authentication, rule-matching and routing performed by individual nodes.

## CLEARWATER + METASWITCH: TAKING THE BITE OUT OF IMS

Together with near-term NFV initiatives, Clearwater Core is helping revolutionize the telecommunications marketplace by easing the transition to new software-defined service function chains that are uniquely flexible, resilient and scalable.

With Clearwater, your IMS core can be operating in a matter of hours, with Metaswitch standing behind this critical infrastructure, providing superior support, custom engineering, bespoke professional services and consultancy. To learn more contact Metaswitch at [www.metaswitch.com/contact](http://www.metaswitch.com/contact)

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## CLEARWATER CORE FUNDAMENTALS

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### SUBSCRIPTION SERVICES

- Tested and hardened binaries based on Project Clearwater
- Guaranteed Service Level Agreements (SLAs)
- 7 x 24 x 365 support
- Tiered subscription model
- Annual charge, billed monthly (post-pay)

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### PROFESSIONAL SERVICES

- Bespoke engagements
  - *Supporting trials, proof of concepts*
  - *Systems Integration*
  - *Contact Metaswitch for more details*

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### IMS SPECIFICATIONS

- I-CSCF, S-CSCF and BGCF
- 3GPP IMS Release 10
- Full compliance statement available as ETSI TS 102 790-1 PICS pro forma
  - *To request the PICS, please contact Metaswitch*

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### SUPPORTED OS

- Ubuntu 12.04
- Distributed as debian install packages

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### OTHER OPEN SOURCE PROJECTS USED INCLUDE

- Cassandra
- Memcached
- pjsip
- freeDiameter
  - *Contact Metaswitch for the complete list*

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### DEPLOYMENT MODELS INCLUDE

- VoLTE
- RCS/RCS-e
- OTT voice/video
- Developer API Ecosystem
- PacketCable 1.x to 2.x migration
- CLASS 5 replacement
- Hosted Business Voice
  - *Contact Metaswitch for more use cases*

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### PROJECT CLEARWATER OPEN SOURCE RESOURCES

- Community website: [www.projectclearwater.org](http://www.projectclearwater.org)
- Email list: <http://www.projectclearwater.org/community/>
- Source code repository: <https://github.com/Metaswitch/>

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### ACKNOWLEDGEMENTS

- This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. ([www.openssl.org](http://www.openssl.org))