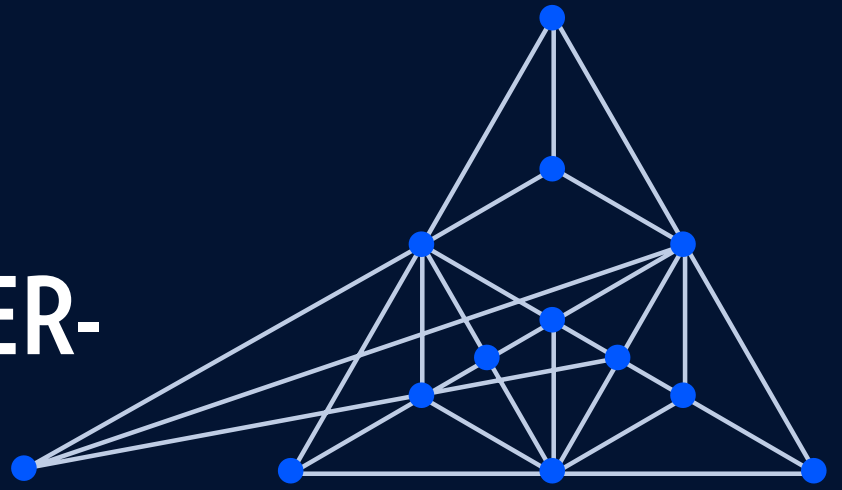


# MUSE CARRIER- GRADE PaaS



SCALABLE AND CLOUD  
NATIVE BY DESIGN

As communications service providers (CSPs) begin their transformation to digital service providers (DSPs) and customer expectations soar, a transformation is required in the network infrastructure. Current network architectures do not optimally support today's goals of service agility, automated operations, and resource optimization.

Many SPs have started to introduce Network Function Virtualization (NFV) and Software Defined Networking (SDN) technologies to speed up the process of shifting business value from the hardware layer to a software layer in an SP (telco) cloud. Also, SPs are adopting cloud-based business models and software as a primary means to achieve digital transformation.

ECI's Elastic Services Platform, powered by the Muse™ software suite and a carrier-grade PaaS was designed with these requirements in mind. The Muse carrier-grade PaaS enables:



## FAST APPLICATION ROLLOUT

to increase customer  
loyalty and revenues



## DEPLOY APPLICATIONS ANYWHERE

for rapid response and  
lower costs



## 3rd-PARTY APPLICATIONS

for unlimited  
innovation

# SERVICE PROVIDERS ARE TURNING TO SOFTWARE

When it comes to network operations, ‘*Slow is the new down*’. This mantra embodies the state of customer expectations today, where if a need is not fulfilled instantaneously, a customer might immediately seek another source. This thinking is driving communication service providers (SPs) to undergo digital transformation. Today’s goals are service agility to increase customer loyalty and revenues, automated operations for rapid response and lower costs, and resource optimization for best use of capex.

SPs are adopting cloud-based business models and software as a primary means to achieve digital transformation. They strive to emulate over-the-top service providers who have successfully built their businesses on a cloud-based software approach.

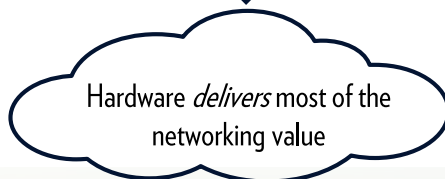
Many SPs have started to introduce Network Function Virtualization (NFV) and Software Defined Networking (SDN) technologies to speed up the process of shifting business value from the hardware layer to a software layer in an SP (telco) cloud. The aim is to invert the value equation. In the past, networking hardware provided the value supported by software-based network management. In the new approach, networking hardware enables value (after all, something needs to carry bits from point A to point B), but the business value itself comes from software-based service, control, and operations applications.

## OLD APPROACH

### SP Corporate Computer Center



- OSS/NMS applications support the network
- Based on slow-changing enterprise software architectures

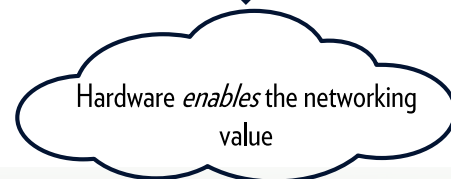


## NEW APPROACH

### SP CLOUD



- Service and control applications deliver most of the networking value
- Based on agile cloud native software architectures

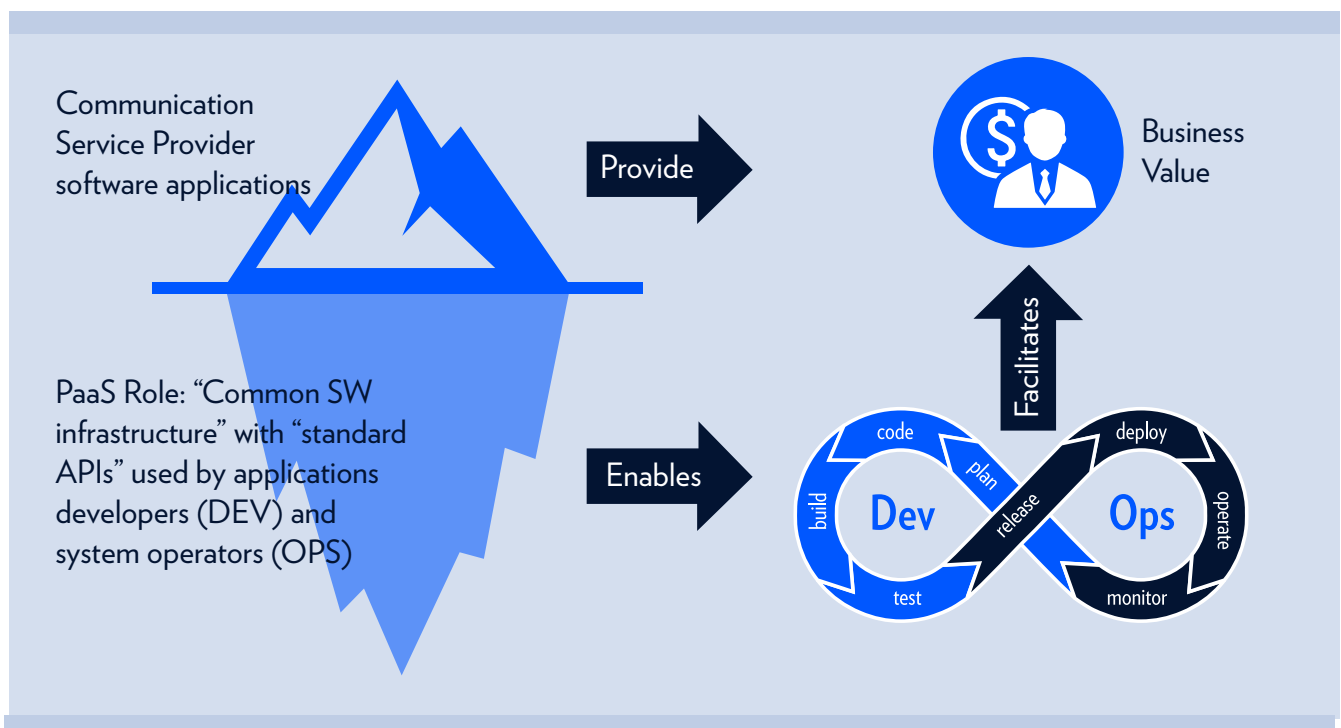


# SOFTWARE DRIVES THE NEED FOR PaaS

The power of software is its endless flexibility. This also makes software complicated. Service and operations control software crosses many functional domains and disciplines, and is commonly distributed physically across multiple locations and device types. Software must stitch together different physical and virtualized network functions, and often operate in real time. This is a dynamic scenario and is under constant pressure to evolve to support new needs. In addition, software must meet SP expectations for resilience and high availability.

Applications software must also be developed and deployed rapidly. We no longer have the luxury of multi-year projects with updates occurring infrequently in highly controlled releases. The push is towards continuous software delivery, where new features and updates are introduced as soon as they become available. Moreover, this must be accomplished economically, with minimum impact on existing services.

The goal is to establish a successful DevOps environment, where software is developed, tested, released, updated, and maintained rapidly and reliably. DevOps encompasses a set of practices that allow smooth collaboration between the software developers (Dev) responsible for writing and testing application software, and the software operations (Ops) responsible for deploying and managing the applications. Such an environment aims to overcome the “throw-it-over-the-wall” culture that previously separated these organizations, which stalled application delivery.



The key to achieving smooth DevOps is to invest in common software infrastructure, so that the people responsible for the service and operations applications can focus solely on the business value of these applications. They must be totally liberated from concern about the underlying infrastructural software used in developing, testing, integrating, and deploying the applications software. This is the clear-cut role of Platform-as-a-Service. PaaS does not provide business functionality itself, but it does make life much easier for software applications to bring business value.

# CARRIER-GRADE PaaS

A Carrier-Grade PaaS uniquely provides the infrastructure to develop, deploy, and operate cloud-native software for service provider applications. It builds on features of two types of PaaS; Applications PaaS and Integration PaaS.

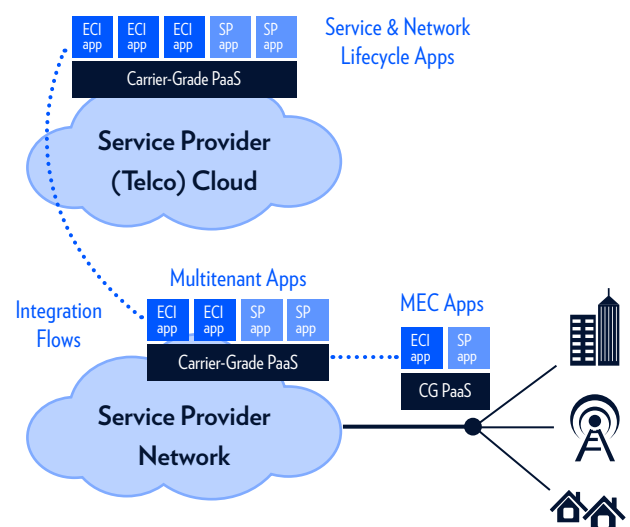
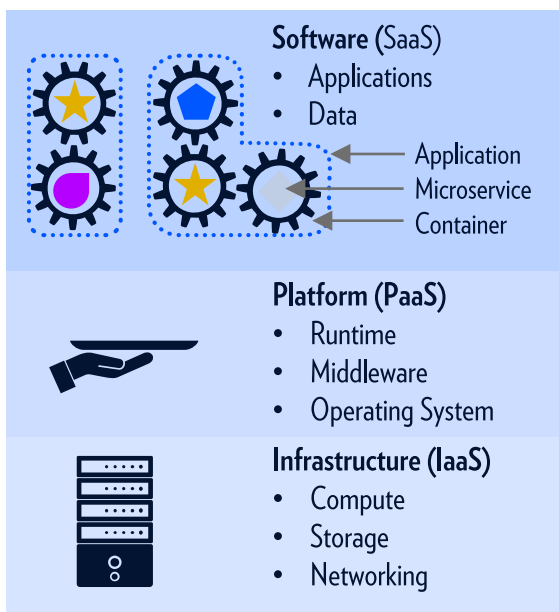
Cloud native computing is based on layers, in which each layer serves a different set of end-users. Software-as-a-Service (SaaS) delivers the business value bearing applications to end users. In an SP context, typical applications are service provisioning, service assurance, network analytics, network health monitoring, and VNF management. In a cloud-native world, these applications are broken into microservices that fulfill distinct functions. These, in turn, are packaged in containers that use a virtualization layer to allow portability across different development and runtime environments. (To learn more about microservices and containers see the ECI WP, [“Going Cloud Native, SPs Trying to Catch Up.”](#))

Infrastructure-as-a-Service (IaaS) contains the compute, storage, and networking equipment, and is managed by system administrators. Again, in an SP context, these will not only be located in data centers, but can also be distributed in close proximity with network equipment, such as with multi-access/mobile edge computing (MEC) applications.

An Applications PaaS is situated between the SaaS and IaaS to accelerate the creation and delivery of innovative applications. It provides tools to application developers to develop, test, integrate, run, and monitor software applications. The PaaS ties everything together.

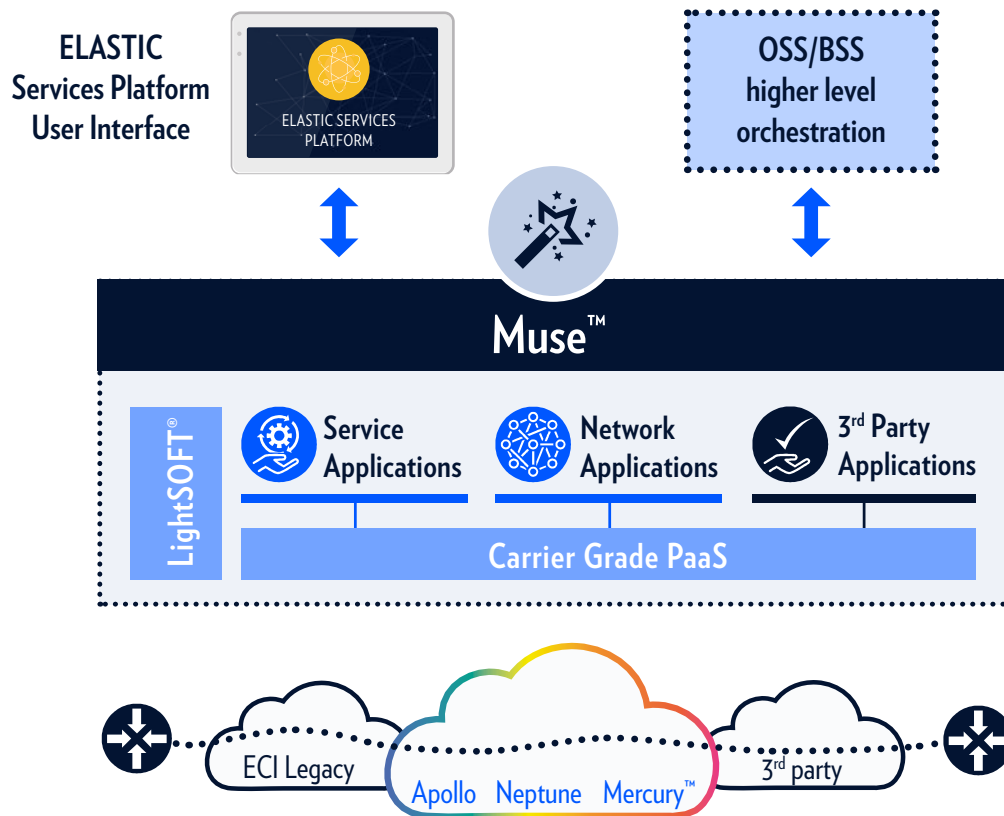
When these applications are deployed in a Services Provider environment, the PaaS takes on an extended role, with functionality often referred to as an ‘Integration PaaS’. Its mandate is to connect applications that are distributed across the SP cloud and network, providing independence from the deployment environment. In particular, it needs to be scalable to meet increased data and transaction volume from different environments. It must also allow SPs to develop and integrate their own applications with other applications pre-provided at the SaaS level. Overall, it strives for real-time integration with minimum disruption, providing end-customers with an enhanced overall experience.

We attain a Carrier-Grade PaaS when these two aspects of applications development and application deployment come together for the unique operational needs of an SP environment.



# ECI'S MUSE CARRIER-GRADE PaaS

ECI's Muse modular suite of service and network lifecycle automation applications exercise real-time control over a programmable network infrastructure – delivering the values of software defined networking (SDN) and network function virtualization (NFV). Muse is powered by a Carrier-Grade PaaS, bringing a rich set of application development and deployment benefits to communication service providers outlined above.



Specifically, the focus of the Muse PaaS is to provide a common infrastructure to facilitate developing, deploying, and managing the Muse lifecycle applications – including applications developed by the service providers themselves – thus providing business and end-customer value.

The following are key elements of the Muse Carrier-grade PaaS:

## Microservices and Docker Containers Application Environment

The Muse Carrier-Grade PaaS is based on a cloud-native architecture. It creates a distributed development and deployment environment for microservices applications, based on Docker containers and using Docker Swarm management. The PaaS integrates many open-source components and enables high availability and scalability for Docker applications. PaaS components are essentially

services that are deployed as Docker containers. In effect, any application packaged as a Docker image can run on the PaaS.

## High Availability and High Resiliency Infrastructure

For maximum availability, Muse applications are deployed over a cluster of three or more servers or virtual machines (VMs) – each running the PaaS layer. A Muse orchestration function distributes the Muse applications across the servers, and performs auto-scaling and load balancing to maximize run time efficiency.

Advanced monitoring and analysis services gather detailed information on application performance and link these with recovery capabilities. For example, an application instance with a suspected problem can be taken offline, while spinning up a replacement.

Based on this multi-server approach, Muse also supports rolling updates, where a new version of an application can be deployed, without impacting current services.

## Common Services

The Muse CG PaaS delivers its value to developers, integrators, and deployment managers, via a collection of services that are exercised through RESTful APIs. These include a rich set of best-in-class open-source services as well as ECI-developed services.

## Tailored for Telecom Applications

The Muse Carrier-Grade PaaS is tailored to the specific needs of telecom networking applications, with the ability to control a wide variety of underlying networking infrastructure via adapter plug-ins. It also supports geographical redundancy and distribution across geographical areas, making it highly suitable for mobile/multi-access edge (MEC) applications.

To deal with a distributed network deployment, Muse CG PaaS emphasizes high-efficiency resource allocation, particularly compared to centralized data-center-oriented PaaS platforms.

**ECI Gateway**  
Mediates client requests to microservices

  
**CentOS**  
Open-source Linux operating system


  
Clustering and scheduling for Docker containers

  
Open-source stack for analyzing and visualizing data from multiple sources

**ECI Configuration Manager**  
Manages distribution and run-time of microservices

  
**ANGULARJS**  
Open-source web front-end application framework

  
**RabbitMQ**  
Open-source message broker

  
**Prometheus**

**ECI Backup/Restore**  
Manages redundancy of microservices and data

  
**node JS**  
Open-source web server application framework

  
**MariaDB**

Open-source MySQL relational database management system

Open-source monitoring and metrics gathering

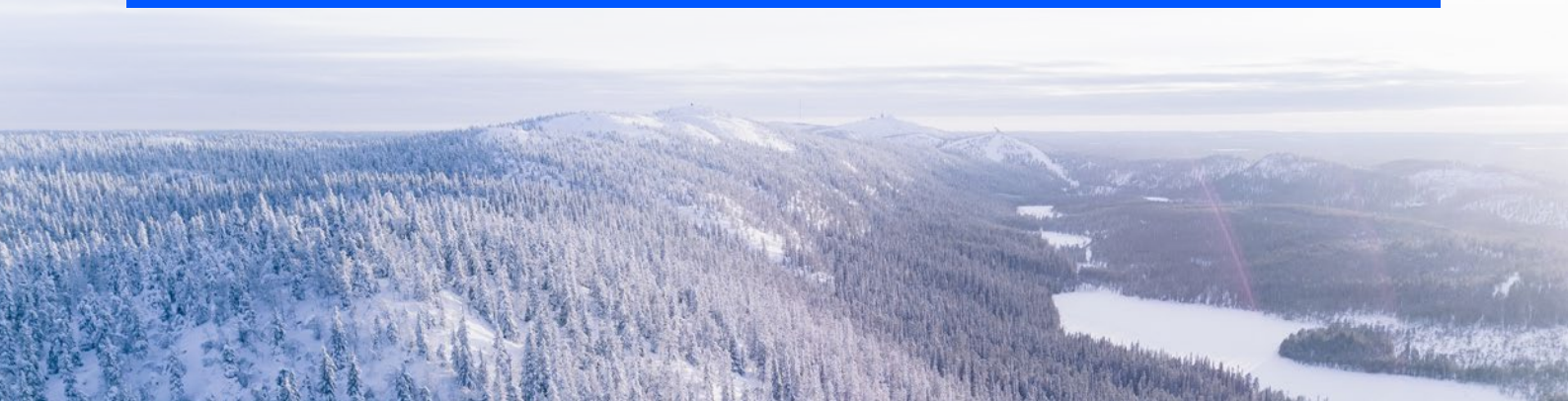
**ECI License Manager**  
Manages creation and use of licenses for microservices

  
**spring**  
Open-source Java application framework

  
**mongoDB**  
Open-source cross-platform document-oriented database

  
**APACHE kafka**

Open-source distributed stream processing



# SUMMARY

SPs are adopting cloud-based business models and software as a primary means to achieve digital transformation and remain competitive. Application software based on a Carrier-Grade PaaS is fundamental to achieving this goal. This enables SPs to deliver innovative applications from a variety of development sources and deploy them in a distributed fashion, from the telco cloud to the network edge, with high availability.

## BENEFITS OF A CARRIER-GRADE PaaS



**Rapid delivery of innovation** – Developers can focus on the business logic and value of service and network applications. The underlying details of the development and runtime environment are taken care of by the PaaS.



**SP application development** – The same environment made available to the CG PaaS platform developers is available to SP software teams, so that they can add their own innovation.



**Develop once for multiple cloud and network platforms** – The PaaS simplifies running the same applications in different target environments; for example, from a centralized telco data center to a mobile/multi-access edge cloud.



**Benefit from new underlying technologies** – The abstraction and loose coupling provided by the PaaS allows applications to be upgraded in a modular fashion, and thereby benefit from or take advantage of new computing and network technologies.



**Modular application rollout** – The PaaS enables loose coupling between applications, so that functionality can be introduced continuously in response to changing business needs, to meet DevOps objectives.



**Automatic scaling of infrastructure** – The PaaS allocates runtime resources as needed, ensuring continuous availability and smooth operation of the applications.



**Business intelligence** – Analytics tools provided with the PaaS provide insight into how the applications and their associated data are used, and can drive improvements to business processes and efficiency.

## ECI's DevOps Software Architecture paves your road to SDN and NFV

### ABOUT ECI



ECI is a global provider of ELASTIC network solutions to CSPs, utilities as well as data center operators. Along with its long-standing, industry-proven packet-optical transport, ECI offers a variety of SDN/NFV applications, end-to-end network management, a comprehensive cyber security solution, and a range of professional services. ECI's ELASTIC solutions ensure open, future-proof, and secure communications. With ECI, customers have the luxury of choosing a network that can be tailor-made to their needs today – while being flexible enough to evolve with the changing needs of tomorrow. For more information, visit us at [www.ecitele.com](http://www.ecitele.com)