Creating end-to-end network, compute and storage

Remove network boundaries with CloudBand™, delivered by Alcatel-Lucent
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By accelerating delivery of a new class of high-performance, high-availability “carrier cloud” solutions, Alcatel-Lucent and Citrix address the top requirements of service providers and enterprises.

Abstract
Moving from “closest node” to “best node”

Cloud environments are all about providing optimal services—near real-time response times, transparent management, increased flexibility and agility. Traditionally, service providers have met these requirements by placing all services for a particular client on the node/virtual machine (VM) closest to the client.

But as workloads become increasingly demanding and constraints more complex, the traditional “closest node” model no longer meets the needs of either the client or the communications service provider (CSP). Many SPs must reject requests for additional services because the closest node is unable to provide the necessary support—resulting in lost business for the SP and dissatisfaction for the client. And in today’s highly competitive marketplace, a dissatisfied client is a lost client.

Rather than place new services on the closest node, CSPs need to identify the best node for each new service and the associated constraints. This way, CSPs can support a dramatically increased number of clients and new service requests—boosting customer satisfaction and loyalty, as well as driving up revenue.

Gathering deep insight

Today’s clients constantly search for newer offerings with greater value. To better prepare for evolving service demand and a changing competitive environment, CSPs need deep insight into customer usage patterns—made possible through advanced analytics.

Bringing it all together

Supporting both “best node” placement and comprehensive analytics, CloudBand—delivered by Alcatel-Lucent—brings together a service provider’s infrastructure, operations and network into a centrally managed cloud platform. The result is a better performing set of cloud services—enhanced by reduced CAPEX and OPEX and increased profit margins.
Today’s networking challenges
Enabling 100% core network service availability

In today’s highly competitive market, growing your business requires you to continuously onboard new clients, deliver new and innovative services as quickly as possible, and ensure all systems and applications remain up and available all the time. Meeting these requirements means building an increasingly complex—and often geographically diverse—ecosystem that includes physical hardware, virtual machines, cloud orchestration software, and a comprehensive management system. Taken in isolation, each system provides excellent support for a particular workload. But when viewed holistically, operating such a diverse and sprawling environment is a daunting challenge.

Let’s consider a system failure in a global infrastructure with hundreds of thousands of nodes spread across multiple continents. How do you know which node failed? Success in today’s rapidly evolving virtual telecommunications industry demands an answer to this basic and fundamental issue, which up until now has remained unsolvable.

Creating end-to-end compute, storage and network—not only the LAN and WAN, but also across the boundaries of the network

Traditional solutions clearly differentiate compute resources from network resources. But as we look to the future of service delivery, the distinctions between network and compute no longer exist. The entire ecosystem will be viewed and managed as a single end-to-end entity, where the network operates on the same level as the compute, with the same levels of flexibility and agility.

The ability to reach between isolated networks—even in a very large-scale distributed cloud environment—means operators will be able to move resources from one data center to another, as well as shut down a node in one data center and restart a new one in real time. A unified ecosystem will also enable true data federation, where data is aggregated from multiple disparate sources in a virtual database, enabling all information to be viewed and managed as a single entity.

Deploying an end-to-end management environment

As cloud environments become larger in scale and more distributed geographically, management becomes increasingly complex and costly. To control complexity and cost—as well as enhance management capabilities overall—operators need a holistic view of the entire ecosystem using a single, centralized, logical management layer. By applying this methodology, all resources, regardless of where they reside across a distributed cloud environment, can be managed holistically.

For example, deploying application instances across all branch offices in multiple geographic locations creates a significant challenge for traditional management methods; each instance must be individually managed and maintained. To streamline management, drive down cost, and boost efficiency, operators need a fast and reliable way to manage all instances—all at once—from a central location.
Optimizing complex operations and making operations more cost-efficient

In a typical service environment today, virtualized network functions operate side-by-side with non-virtualized network functions. Legacy operation support systems (OSSs) manage the non-virtualized functions, and a combination of legacy OSSs, cloud management systems and application management systems control the virtualized network functions. In fact, most operators use hundreds of OSSs today—which not only slows operations, but also delays deployment of new services and technology.

To overcome these obstacles, SPs need to integrate all OSSs into a single management system. But today, no clear migration path exists for doing so.

Transforming existing telecommunication applications for network functions

Most traditional applications are built on high-cost hardware that requires significant manual operations. To make these applications available to a larger client base—as well as significantly reduce support and management costs—operators need a fast, secure, and reliable way to onboard the apps to a cloud environment. They also need a solution that can handle the entire lifecycle management—from onboarding to self-healing to upgrades. Such a solution would enable operators to easily deploy applications on multiple sites in different physical locations, appearing as one large data center.

Using a single model that integrates all applications to run on one network

Service providers deploy networks in diverse geographic locations spread across the globe—with some solutions being managed and operated by regional technology providers. Regardless of the type or location, each network is a separate entity.

To boost agility, lower OPEX, and dynamically shrink or expand services based on need, today’s operators need a single model that can integrate and run all apps on one network. Such a model would enable operations to allocate more capacity as necessary to meet changing needs for voice, television, and collaboration services—while leveraging the same infrastructure for all services.

Enabling CSPs to cost-effectively and efficiently allocate resources/capacity to meet the unique needs of each client

Just as every organization is unique, the needs of each individual client are also unique. To meet these needs, service providers must be able to allocate resources and infrastructure on a client-by-client basis. But for very large service providers supporting hundreds of mobile virtual network operators (MVNOs)—each under a unique agreement—this can be an extremely formidable task.

Today’s service providers struggle to address:

- Responding to unexpected demands for resources from not one, but dozens of MVNOs
- Providing additional capacity on demand
- Delivering the corresponding IT infrastructure to meet the demands of the network
- Controlling the cost of change
A single solution: CloudBand based on Citrix CloudPlatform

Answering the call for a single solution that can resolve the challenges of today’s complex virtual telecommunications environments, Alcatel-Lucent worked with Citrix Systems to deliver the foundation for a new class of carrier cloud—CloudBand. Enabling CSPs to bring the benefits of the cloud to their own network and business operations, CloudBand allows CSPs to offer a new range of high-performance cloud services to their customers.

By bringing the power of the network to the cloud, CloudBand:

- Optimizes your business, infrastructure and operations
- Sets the stage for new business models, speed to market and decrease in CAPEX and OPEX costs

Unique capabilities

New vision of the cloud

Today’s cloud reality includes isolated stacks of compute, network and storage cloud resources in highly centralized data centers. Alcatel-Lucent and Citrix share a vision for a new cloud reality—one where the cloud is delivered as an end-to-end solution with end-to-end and fully automated stacks, automated installation and self-management capabilities. With all resources located in a pre-configured node—a virtual “cloud in a box”—CloudBand enables you to rapidly deploy compute and storage resources in a distributed cloud, where cloud services are close to their users. The result—a higher-quality experience.

Bringing together all assets from all locations, you can build on the assets you already own and control—i.e., the network—and augment them with additional resources from other locations and clouds. With CloudBand, you can differentiate your organization from any other public cloud vendor by managing and consuming the network in the same way you manage and consume IT resources.
Placement algorithm

Growing your business requires onboarding new clients and providing whatever services they need. Meeting that goal is virtually impossible using the closest-node methodology discussed earlier. To help you overcome this barrier, CloudBand uses an advanced new “placement algorithm” that uses the best node, not the closest node, for supporting new clients and service requests. By applying algorithms and logic to capacity and network configurations, CloudBand’s built-in optimization engine finds the best location to allocate cloud resources according to customer-defined constraints. This highly cost-efficient technique enables you to support a dramatically increased number of clients and services.

End-to-end cloud services

By merging the compute, storage and network sides of your infrastructure, CloudBand not only enables you to provide a wider range of services, but also offers end-to-end visibility into every service operating in your cloud environment. You can configure the compute, storage and network layers to optimize the customer experience, based on the bandwidth or response time required by a service.

Open standards-based, with multi-vendor support

Designed for highly open architectures, CloudBand is vendor-agnostic across every interface. Able to run on any existing vendor hardware or hypervisor, CloudBand uses a plug-in-enabled architecture.

Complete lifecycle management

Upgrading to a carrier cloud includes numerous steps, with application transformation rating very high on the list. As most complex legacy apps are built on high-cost hardware and managed manually, they must be modified to operate in a cloud environment. To ease the onboarding process, CloudBand includes Carrier Platform-as-a-Service (cPaaS)—a management layer that brings together the cloud and application layers. With cPaaS, an application can be deployed on multiple sites in different physical locations, but managed as a single entity.

Unlike a typical cloud environment where applications must explicitly handle multi-zone deployments, cPaaS uses a policy-driven approach to handle the application workload and availability. Here’s how it works:

- Policies describe the desired application service-level agreement (SLA).
- cPaaS maps the deployment of the application resources on the cloud node that best fit the latency, load or availability requirements.
You can use cPaaS to manage the end-to-end application lifecycle:

- **Provision new applications** – Create and test a descriptor for an application. The descriptor specifies the compute, storage, and networking resources and policies, as well as the software images required for application instances.

- **Deploy an instance of an application in a particular location** – Based on the descriptor, you can allocate and start an instance of an application.

- **Monitor applications** – Stop problems before they occur, such as failure of cloud resources, with comprehensive monitoring capabilities.

- **Scale applications** – Meet your changing business needs by scaling out or scaling your applications as necessary.

- **Self-heal applications** – Ensure no data is lost by re-creating cloud resources after a system failure.

- **Upgrade/patch applications** – When a new version of the software is available, a new instance is deployed in parallel to the old version. Once upgraded, application traffic can be migrated to the new version.

- **Shut down an application instance** – When a particular application instance is no longer needed, you can shut it down from a central location.

With cPaaS, you can drive down OPEX by automating management processes and procedures enterprise-wide. In turn, customers benefit from your ability to leverage cloud and network resources to deliver the best service at the lowest cost.

**Citrix CloudPlatform—the core of CloudBand**

As applications are moved into the cloud, they are structured into multiple tiers, i.e., they are partitioned into logical units with one or more VMs each. In some cases, tiers are associated with different virtual private networks (VPNs). To support multi-tier applications, SPs need an underlying platform with the right level of functionality. To satisfy this need, Citrix designed CloudPlatform—one of the primary components in the CloudBand solution.

CloudPlatform is a cloud orchestration product primarily used for building Infrastructure-as-a-Service (IaaS) clouds. Serving as the orchestration layer that sits above the hypervisor, storage, and all other raw service layers, CloudPlatform enables the abstraction of raw layers into VM workloads. In short, CloudPlatform is the hypervisor of all hypervisors—enabling SPs to gain the elastic, on-demand, self-service workloads required by today’s cloud clients.
Service providers can use CloudPlatform to:

- Quickly and easily build cloud services within the existing infrastructure
- Offer on-demand, elastic cloud services
- Deliver higher efficiency, limitless scale and faster deployment of new services and systems to clients
- Seamlessly move workloads from one VM to another
- Orchestrate any storage, server or network
- Identify resource location and latency
- Deploy VMs according to customers' SLA and latency requirements

The CloudPlatform advantage

- **Open and flexible architecture** – Dedicated to open standards-based technology, Citrix designed CloudPlatform with open APIs that allow SPs to choose the underlying systems for their cloud, as well as easily move workloads from an Amazon-type cloud to CloudPlatform. Backed by the Open Source community, CloudPlatform provides the “glue” that adheres all the pieces of a carrier-grade cloud.

- **Time to value** – Today’s SPs and telcos have no time to waste. New cloud solutions must be built very quickly and efficiently. Meeting those goals requires a proven turnkey solution designed to help SPs get to market faster and at lower cost.

- **Maturity of the solution** – Supporting more than 100 production clouds running mission-critical applications—both enterprise and cloud-era—CloudPlatform is recognized by industry analysts as a solution that delivers on the promise of the cloud.

- **Scalability** – To ensure massive scalability and simplicity, CloudPlatform was designed with an Amazon-type of cloud operations. In fact, recent figures show CloudPlatform’s ability to support up to 40,000 servers.

- **Best enterprise private cloud foundation** – By enabling SPs to leverage existing investments and expertise, as well as use familiar applications, CloudPlatform makes it easy to run mission-critical enterprise applications in the cloud by maintain isolation, performance and security requirements.
Resolving today's networking challenges with CloudBand

In today’s highly competitive marketplace, cloud operators need to provide a comprehensive array of traditional services, as well as innovative offerings that clearly differentiate their organization from any other public cloud vendor. You can meet that important goal by using CloudBand to “bring the network to the cloud.”

Quite simply, “bringing the network to the cloud” means:

• Building on the assets you already own and control, i.e., the network
• Modifying the network for greater efficiency, flexibility, performance, reliability, availability and overall quality of service
• Combining the network with cloud
• Bringing together assets from all locations
• Managing and consuming the network in the same way that compute and storage resources are managed and consumed

Following this methodology enables you to create a highly distributed topology consisting of numerous data centers and cloud nodes that can communicate seamlessly with one another, thus addressing the demands of complex applications. In addition, “bringing the network to the cloud” enables all data centers and nodes to be triggered by events.

The key to creating this environment is CloudBand’s ability to automate network configuration through interfacing with a network controller such as Nuage, other SDN controllers, or other network controllers with open APIs. Using advanced virtualization techniques, CloudBand enables you to run any legacy network function as a service/application on top of the carrier cloud.

By tightly integrating application and system management capabilities, the carrier-grade cloud can maximize the time between failures and minimize the time to failover.

Moving to Cloud technology enables a shift from providing five-nines per service to providing five-nines per system. Therefore, the reality of hardware failure must be considered, and it should trigger a quick response to offer alternatives. This way, the application would be unaware of such a failure, enabling service continuity.
Let’s compare
Traditional carrier networks include static systems with a dedicated platform for each service. This siloed approach is very expensive to set up, use and run because each system requires hands-on management and administration. From the cost management and planning perspectives, the traditional method slows time to market.

With the carrier-grade cloud, however, all services are merged onto a single, multi-purpose infrastructure. So as we compare traditional carrier networks with the dynamic, virtualized network made possible by the Alcatel-Lucent and Citrix solution, we find the carrier-grade cloud is:

• More efficient
  – Onboard new enterprises quickly and easily
  – Layer any type of end user onto this infrastructure

• Less costly to set up, use and run
  – Reduce CAPEX and OPEX by automating management vs. requiring human administrators to manage each siloed system

• More agile
  – Speed time to market by merging all services on one infrastructure

• Fully integrated
  – Build software that seamlessly integrates with the management system, infrastructure segmentation and security zones, where different users have access to different hardware

The carrier business is changing

Carrier of today

1. Static systems with dedicated hardware platforms per service
2. OPEX-heavy with large, siloed operational teams
3. Complex capacity planning and slow time-to-market
Enabling a new operational model

Rather than spend time racking, cabling and configuring your new carrier cloud, the Alcatel-Lucent CloudBand Node solution arrives pre-cabled and ready to run—complete with commodity servers and all the software you need to run a very cost-effective cloud environment. Installed in 3–4 hours from bare metal to fully functional cloud node, this “cloud in a box” enables you to manage multiple clouds at one time from a single console.

Using sophisticated software and highly scalable nodes, the Alcatel-Lucent carrier-grade cloud is designed to meet rapidly growing demands. Whenever a threshold is met or surpassed, you can add a new CloudBand node to the environment, which will be immediately and automatically added to the overall system—including the management system.

In addition, carrier-grade clouds are autonomous, with self-monitoring on all resources running on a node, as well as self-healing capabilities. When a rack goes down, all services are automatically and immediately failed over to another rack, resulting in zero downtime.
Create new service offerings faster, with better network quality of service

No longer restricted to just applications, the cloud enables providers to offer end-to-end services—servers, storage, applications and network. And with CloudBand, you can take those services to the next level of effectiveness and efficiency by applying business policies to every new service request.

For example, when a client requests a new service, CloudBand uses the built-in Alcatel-Lucent Bell Labs algorithm to pull all the requirements together, and then deploy the new service in the best-node location. Using the algorithm, CloudBand can enhance the quality of service between the application, storage and network tiers to ensure proper latency and resource utilization. The customer receives the best possible experience in terms of response time, availability and cost for every new service; you benefit from rapid service deployment and cost-efficiency.

To further illustrate the power of the Alcatel-Lucent algorithm, let’s consider what happens when you offer a new application to clients. You are unsure of how your clients will respond to the service, so you initially assign limited resources to the application. As the application matures and gains popularity, you see dramatic increases in the number of new requests for the service. To support this growing demand, you can use CloudBand to automatically assign additional resources to the application in terms of service, networking, security, etc. In short, CloudBand enables you to start small and grow as large as client demand dictates.

Conclusion

Supporting both best-node placement and comprehensive analytics, the Alcatel-Lucent CloudBand Management system brings together your infrastructure, operations and network into a centrally managed cloud environment. The result is a better-performing set of cloud services and a 360-degree view of your customer base—enhanced by reduced CAPEX and OPEX and increased profit margins.

With the Alcatel-Lucent CloudBand and Citrix CloudPlatform solution, you benefit from:

• Unified self-management
  – Bring together all the specific virtualized domains, including applications, infrastructure, network and cloud.
  – Receive unprecedented access to many network capabilities, including managing all the applications that run on the cloud.
  – Define rules for each application such as how to automatically heal failures, how to deliver security, and how to implement/enforce elasticity.
  – Simplify the view of largely distributed resources, and manage them from a single logical centralized location.
  – Reduce operating costs, compared with any other way of delivering cloud-based services by using fewer administrators and spending less time and less money.
• **Faster service development**
  - Includes all the essential building blocks for introducing new services to a cloud environment, starting with the infrastructure itself (cloud node) to the orchestration and automation layer, and up to the cPaaS layer for onboarding and lifecycle management of new services.
  - Enables you to run all services on one infrastructure; when you want to launch a new service, you can dynamically scale your infrastructure and launch the service very quickly.
  - Works in tandem with CloudPlatform to automate the infrastructure; together, CloudBand and CloudPlatform create a unique solution that leverages the power of cloud.
  - Makes it easy to onboard new services; simply add more resources and introduce the service to the management system in minutes, enabling consumers to use the new service immediately.

• **Flexibility**
  - Supports multi-vendor infrastructures, networks and hypervisors.
  - Enables you to set up new nodes or management systems in 3–4 hours, and then immediately begin delivering services to customers; in the non-cloud era, this could take months to accomplish.

• **Openness**
  - Enables you to work with an ecosystem of partners to develop new services and seamlessly onboard them to your network.
  - Enables you to meet a wide variety of unique needs of a large customer base.