Dialogic®

White Paper

LTE Drives Opportunities for Cloud-Based Mobile Video Services, Operators, and Providers

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Executive Summary

The demand for mobile video is increasing — poised to become the predominant data type flowing through the networks — and LTE's attractive higher bandwidth capabilities and quality of user experience is positioned to deliver the new and innovative services that businesses and consumers are seeking for their mobile video experience. As LTE networks are deployed, broadband access from smartphones will become nearly ubiquitous, allowing mobile users more access to new services in areas such as entertainment, advertising, and video-enabled call centers.

Businesses can benefit by providing these new services as "cloud-based" to enable fast, cost-effective, accessible, and scalable deployment for mobile users. Providing services from the cloud will put pressure on the mobile video ecosystem — from content creation through delivery — and who delivers these services, whether operators (those who own and/or manage the networks), Over The Top (OTT) video providers (those who deliver services but do not own or manage the network), or a combination of both still remains uncertain; however, both stand to benefit by delivering their services more efficiently from clouds, enabling interaction and mashing of their respective services.

Products from Dialogic have the maturity, density, reliability, and capability to support the delivery of the most complex of cloud-based services; examples include the Dialogic® PowerMedia™ Media Processing Product Family, delivering unparalleled software media processing support for cloud deployments; the time-tested industry-leading fax technology of the Dialogic® Brooktrout® SR140 Fax Software for cloud-based fax services; the interworking between IP and PSTN networks provided by the Dialogic® BorderNet™ 2020 Integrated Multimedia Gateway; the carrier-ready Dialogic® Vision™ 1000 Video Gateway's that can connect interactive SIP-based video and multimedia services to mobile, IP, and PSTN networks; and the Dialogic® BorderNet™ 500 Gateways that supply any-to-any connectivity and call routing for connection to SIP trunks or PSTN trunks and virtually any on-premise PBX.

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LTE and the Data Explosion

As LTE addresses areas such as round-trip latency, higher peak rate, and spectral efficiency, it enables more connections and higher bandwidths. And the need is great, as surveys of carriers reported by Infonetics show that 42% expect to be able to have a downlink speed of 50+ Mbps [Infonetics, 4G]. This is phenomenal when compared to the data link speeds of just a few years ago.

Although Infonetics expects global mobile subscribers to reach 6.5 billion by 2014, by its estimates only 3% (or around 160 million) will be LTE subscribers by that time [Infonetics, LTE]. IDATE, on the other hand, expects LTE subscriber numbers to be 207 million by 2014 [IDATE]. These expectations mirror the slow but steady growth in LTE deployments over the next few years. However, with over 100 operators having already committed to LTE as of October 2010, the number of potential LTE subscribers is expected to ramp up significantly with the rollout.

LTE will be able to deliver on better bandwidth capabilities for the consumer and to support the delivery of new and innovative services, coupled with providing a high quality of experience. Cisco forecasts mobile data traffic by data volumes and types, and reflects the prediction that traffic volumes will be heading into Exabyte territory by 2014 with 66% of this data expected to be video-based [Cisco]. Video traffic covers a wide spectrum, such as video telephony, entertainment, advertising, as well as the push out to the end user of video from video-enabled call centers and services.

Operators looking to deliver these new video services need a platform to enable the flexibility for growth, while also limiting their capital expenditure, which will need to be focused on the rollout of the LTE network itself. Until LTE has been deployed, HSPA+, with its increasing bandwidth capabilities, will support the drive for new services and capabilities, and it is expected that even in mature markets there will be a combination of networks deployed side-by-side for some time.

Service Delivery Architecture

Traditional deployments of services required a capital expenditure (CAPEX) outlay for building the services, evolving from single mainframe-based in the 1980s, through to client server and grid computing, and finally to current collaborative computing architectures in which the users' requirements drive the connections among various services and service parts. Much of this deployment evolution has been enabled through the access of information from internet sources, with Web 2.0 as the interface, allowing for the linking or mashing of the many parts to deliver a service.

Within the current incarnation of collaborative computing, the deployment scenarios are numerous but have gravitated to what is called "cloud computing." The terminology appears to come from the network diagrams that represent the internet or various parts of it as "clouds," and moving the applications and services into the cloud has become "cloud computing." In truth, the model is not something that appeared overnight. Remote access to computing resources and applications hearkens back to time sharing of computer systems. More contemporarily, many different types of services and applications are being delivered from "the cloud," in many cases without the need for software to be running on the device that is used to access the services. This is similar to the Application Service Providers (ASPs) model of software availability to customers through thin clients or browsers, which has been around since the 1990s, and has evolved today to become Software as a Service (SaaS).

Many companies are delivering services from the cloud. Some notable examples as of 2011 include the following:

- **Google** — Has a private cloud that it uses for delivering many different services to its users, including email access, document applications, text translations, maps, web analytics, and much more.
- **Microsoft** — Has Microsoft Sharepoint online service that allows for content and business intelligence tools to be moved into the cloud, and Microsoft currently makes its Office applications available in a cloud.
- **Salesforce.com** — Runs its application set for its customers in a cloud, and its Force.com and Vmforce.com products provide developers with platforms to build customized cloud services.
- **Amazon.com** — Has Amazon Cloud Player, enabling customers to store music in the cloud, to be accessed and played from any location using web access or an Android application.

Service and Deployment Models

Cloud-based services have service models describing the way their capabilities are made available to the users of the services. These models include Software as a Service (SaaS), which is the access to software on a transaction or subscription basis; Platform as a Service (PaaS), which is the access to systems available for deployment of applications; and Infrastructure as a Service (IaaS), which is access to and control of the physical infrastructure, enabling deployment of operating systems and applications. Figure 1 shows these different cloud service models.

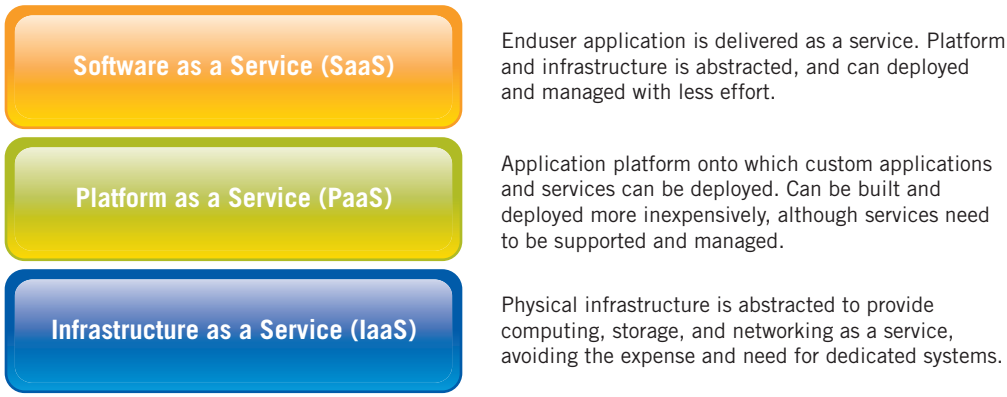

Figure 1. Cloud Service Models

Other models also use the "as a Service" label, but in those cases the terms generally refer to subsets of the three mentioned above and pertain to specific types of service. An example of this is Communications as a Service (CaaS), which is the access to IP-based communications (for example, VoIP, contact center, and IVR) from a cloud-based deployment. In many deployments, CaaS is included under the SaaS label.

When deploying services in clouds, a number of deployment models can be considered (for examples, see Figure 2). The "public" cloud model refers to a service that is accessible to all; this is the preferred deployment for operators who want the services available to their customers and to encourage others to use the operators' capabilities. The "private" cloud model works for enterprises that have their own capabilities, and who do not want data stored outside of their enterprise (for example, for security reasons). The "hybrid" model cloud deployment, which is a combination of public and private models, can in some cases deliver the best of both worlds, allowing an enterprise to maintain a level of capability in-house, while also using capabilities and services from an external provider. The public cloud portion of the hybrid model may only be required during times of peak service usage, or the enterprise may choose to join together the private (internal data) and the public external service.

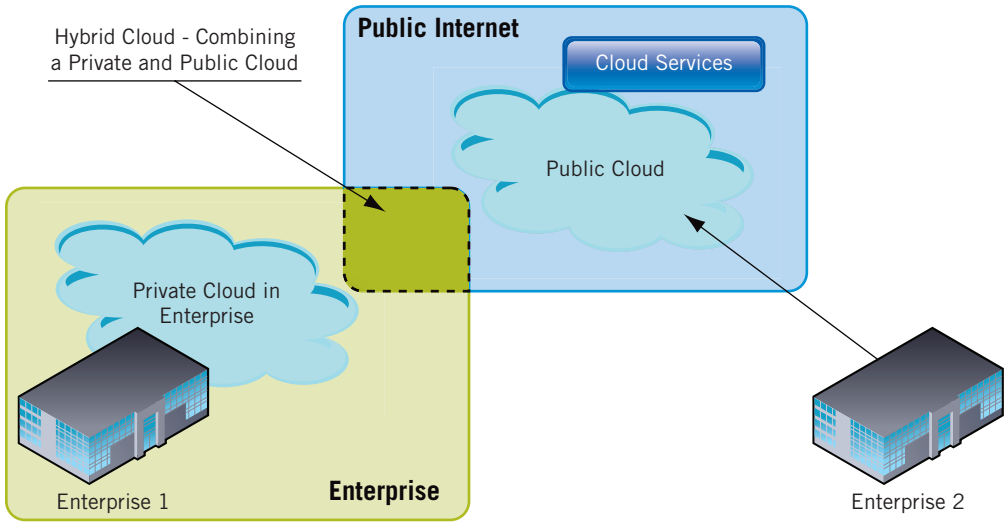

Figure 2. Cloud Deployment Models

Benefits

Choosing to deliver services through the use of cloud computing environments can provide many benefits, including:

Cost Savings — Companies can reduce their CAPEX and use operational expenditure for increasing their computing capabilities, providing a lower barrier to entry and also requiring fewer in-house IT resources to provide system support.

Scalability/Flexibility — Companies can scale from a small deployment to a large deployment rapidly and then scale back if necessary, allowing use of extra resources at peak times to satisfy demands.

Reliability — Companies can leverage multiple redundant sites to offer services, supporting business continuity and disaster recovery.

Maintenance — The cloud service provider provides system maintenance and access is through APIs, which do not require application installations onto PCs, thereby further reducing maintenance.

Mobile accessible —The infrastructure is available anywhere, allowing mobile workers access to systems from any location, and enabling increased productivity.

Accessing Services from the Mobile Device

Delivery of cloud-based services also works well for both smartphone and feature phone users. A number of operators working with the Wholesale Applications Community (WAC) and other such organizations use widgets to deliver applications, and thus services, to users across phone types. This enables an application to be written once and run across many device types. In November 2010, WAC held its first developer event, and WAC formally launched in February 2011 at Mobile World Congress.

For cloud-based services, the primary processing takes place in the cloud, not on the device. This provides the added benefit that new features and capabilities can be rolled out in the cloud quickly and without requiring the application on the device to change. The operators can expand and manage the services being delivered based on their needs, and this elasticity will be important when delivering the processing needed for those services that grow quickly.

Using cloud-based service deployment also allows operators to try new services and to easily disregard those that receive little or no traction, providing operators with more rapid service investigation, rollout, and feedback loops.

Consumer and Business User Needs

Depending on the consumers that are using the mobile service for voice and data, distinct differences exist in the type and quantity of data that will be required from the network. Mobile broadband consumers expect to have broadband access that delivers rich communications feature sets, and phone applications will change and increase for the consumers who wants to use their devices for:

- Voice
- Video — Calling, streaming of programs
- Data — Internet browsing, email, social network interaction, access to entertainment such as music
- Messaging — SMS, Multimedia Messaging Service (MMS), instant messaging, voice SMS, video SMS

The operator managing the network needs to expand its opportunities to become the primary provider of these services to consumers and to compete with newer Over The Top (OTT) providers who are using the operators' data pipes to deliver services. The operator also needs to be in a position to support a broad range of media types, the transcoding between them, and to be able to quickly adapt new media types as they appear.

The mobile broadband business user's requirements should be considered as a superset of the consumer's as invariably the business user will use the device(s) to access video, entertainment, and messaging. Business users' devices will more likely be smartphones with extra capability that can be leveraged by business applications. Consumer and business users also differ in that the business users' focus is aimed at:

- Richer access and communications capabilities linked to business applications and processes
- Access to Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) applications, and adding capabilities such as click-to-call for customers to request an immediate connection with another person in real-time either by phone call, Voice over Internet Protocol (VoIP), or text
- Cloud-based services accessible from smartphones and the desktop
- Business mobile access into enterprise private cloud space

Accordingly, providers need to support the communication-enabling of business applications, and they can do this by providing cloud-based access that can be easily integrated or mashed with other services to deliver communications or to use Communications as a Service (CaaS) types of capabilities.

Who Delivers the Cloud-Based Services?

Cloud-based services for mobile users can be delivered by Over the Top (OTT) video providers or by the operators themselves. The following sections describe these delivery options as well as the relative merits in using such options to provide cloud-based services to customers.

Over The Top Providers

OTT providers, namely those who deliver services but do not own or manage the network, build their service offerings to create a new market or to gain service delivery market share away from the operator. They want their services to be standalone, while providing the capabilities for the services to be "mashable" and to be taken up by other application developers and service providers in order to be incorporated into further services and offerings. This helps them increase not only their penetration into

the market but also their revenues and ultimately the worth of their company. In this highly competitive environment, they need to remain nimble, quick, and opportunistic in exploiting new services and adjuncts to services they already provide. This flexibility is one of the main assets these companies have compared to incumbent operators.

The competitive and flexible nature of this environment means that OTT providers need a way to establish services that is not cost-prohibitive, while also enabling quick expansion of successful services, and deemphasizing and eliminating unpopular services. The cloud enables this because with a cloud-based service OTT providers do not need to own the equipment, or they could use their own data center and then overflow to a cloud PaaS or IaaS provider, as needed.

Operators

The operators' motives for using the cloud are driven at least in part by the fact that they own the network. They need to increase ARPU and to increase those areas where they can leverage their networks. However, unlike OTT providers, they can be slower to adapt and to leverage their assets in order to give a better return. Operators are in a struggle with the OTT providers who run services over their networks, oftentimes resulting in the operators being seen pejoratively as "bit pipe" providers. Operators have a number of opportunities open to them which, if properly taken, could deliver new areas and revenue streams:

- **Aggregate cloud-based services and deliver as packages** — By embracing the delivery of services and understanding that they cannot deliver all services themselves, operators could become the providers of choice by aggregating services to end users, as shown in the example in Figure 3, enabling single billing to a customer. This will help an operator to maintain its "provider of choice" positioning and will allow the operator to leverage the delivery of new services by OTT service providers by negotiating and adding the new services to the overall packages the OTT service providers make available.
- **Aggregate Machine to Machine (M2M)** — M2M delivers new revenue streams by increasing connections to and traffic on the network. M2M is poised to have a significant upsurge, and, at least at the outset, most of the communications capabilities used will be mobile, or, more specifically, SMS-based. Operators are positioned to support M2M capabilities by providing the necessary routing within the network and aggregating the messages, making it an unnecessary task for the overall M2M capability provider, enabling it to concentrate on its core business.
- **Communications as a Service (CaaS)** — The delivery to enterprises of IP-based unified communications in a cloud is an area that is a good starting point for operators. This is because they understand the communications capabilities and can incorporate CaaS into their current offerings and encourage their current customer base to move to the new network architecture by demonstrating the benefits of cloud-based deployments.
- **Leverage of context and location awareness for services and revenue enablement through advertising** — Since access to location services is opt-in, but the information is available within the network for mobile devices, it becomes much easier for the operators to leverage these services by providing their customers with benefits and services that they can monetize through advertising. If the services are free but require a location-aware opt-in, then the advertising can be more focussed.

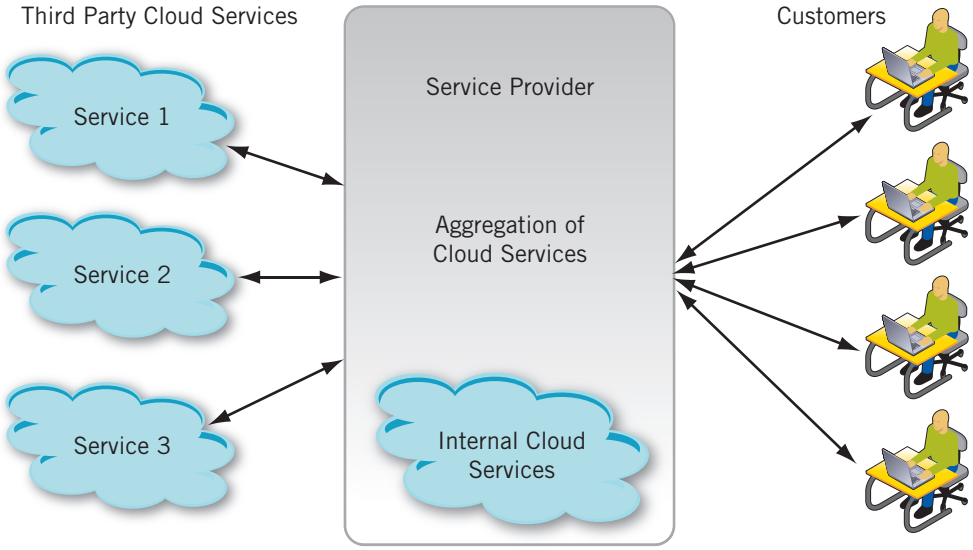

Figure 3. Service Provider Aggregating Cloud-Based Services

Operators who leverage their knowledge, capabilities, and customer relationships to deliver new services can be in the best position to be the providers of choice. The cloud-based deployment stands to provide operators with unmatched ROI and flexibility, allowing the operators to keep up with service delivery while maintaining a high quality of experience for an increasingly demanding customer base.

Funding the LTE Rollout

Where the delivery of services using cloud-based deployments can support a reduced CAPEX, operators also face the issue of being pushed to deliver on the networks that cater to the extra bandwidth requirements. Continuing to roll out networks can present operators with funding difficulties, and they need a business case that delivers a solid ROI.

It is broadly acknowledged that flat rate tariffs alone will not be able to fund a network upgrade, leaving operators desiring new billing models. The flat rate tariffs may continue as an entry level option and can be used for volume-based connections, such as M2M deployments. However, operators are already looking at new models aimed at reducing bandwidth needs or establishing variable pricing (including data management techniques). Areas for consideration include:

- **Quality of Service (QOS)** — A customer gets a guaranteed quality of service based on the subscription that is paid. One example might be a business user who is willing to pay more than a standard consumer in order to ensure timely access to the business systems and applications that are needed. Those without a quality of service level would simply receive a “best efforts” level of service.
- **Bandwidth Guarantees/ Traffic Prioritization** — Different types of traffic have different priority requirements. In general, an email delivery is not time critical in the way that the delivery of video or voice traffic might be. Customers may pay to ensure they have the necessary bandwidth or priority for their data, especially when it is time critical.
- **Advertising** — This is especially important when associated with video, where pre/post roll and overlay advertisements are extremely vital to the service provider to generate the revenue for the content delivery. However, adapting the content in this way may require relationships with the content providers, and adapting the content cannot be done by adapting streams from an OTT provider.

- **Service Level Agreements (SLA)** — This can be associated with applications that the operator makes available. Different SLA levels are charged at different rates.
- **Pay as you go or transaction-based billing models** — These are particularly useful when looked at in terms of cloud services or mobile application usage. With these models, there may be a charge each time an application is used, and the charge for the application itself may be removed.

Managing the Video Datastream

As mentioned previously, video is poised to become the predominant data type flowing through networks, and this includes video tied to entertainment and video that is added to many non-entertainment services that we use today (for example, SMS, voice mail, and video ring tones). Figure 4 shows the evolution of many services to include video.

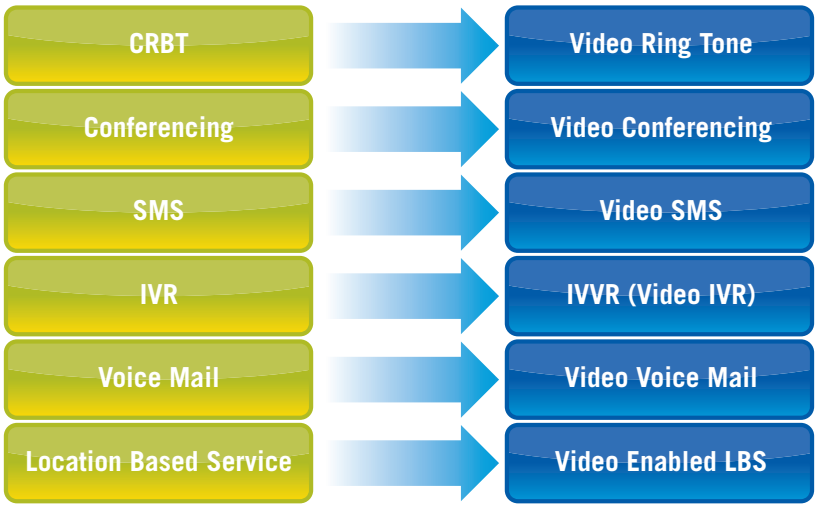

Figure 4. Evolution of Services to Include Video

Transcoding, transrating, and trans-sizing of video streams are required to deliver these video services, and are generally focused on the end user device type. The operator needs to be in a position to make these conversions as needed, enabling a better Quality of Experience (QoE) for the user based on the device, screen size, and resolution capability.

However, these capabilities can also be used to support a QoE in congested networks, by adapting the video stream based on the knowledge of the device and the network congestion. In this way, a QoE can still be maintained for the end user, which is particularly useful when advertising revenue is taken into consideration because an advertiser does not wish to be associated with a bad QoE for the end user. Thus, such management can support the operator in maintaining its advertising revenues as well as reducing churn.

Further uses of such video transcoding/transrating/trans-sizing technologies may be related to the billing type being used. For example, a lower payment plan could appeal to a consumer who does not want to pay extra for high definition video streaming capabilities and would be willing to accept a lower definition video.

Technologies related to managing the video data stream will be important for operators as they address the explosion of video data in their networks and adapt their payment plans to better cater to their needs and those of their consumers.

Dialogic Enables Cloud-Based Services

Dialogic has a range of products that support cloud-based mobile services.

The Dialogic® PowerMedia™ Media Processing Product Family delivers unparalleled software media processing that has the maturity, density, reliability, and capability, such as virtualization and video, to support cloud deployments. These products provide a range of interfaces from MSML to Restful Web APIs to support the delivery of the most complex of services, such as cloud-based video and voice conferencing, IVR, Unified Communications, messaging, contact center support, and other CaaS services.

The Dialogic® Brooktrout® SR140 Fax Software (fax over IP software) provides time-tested industry-leading fax technology for the delivery of cloud-based fax services.

Dialogic's media and signalling capabilities may be deployed as part of cloud-based solutions delivering connectivity into the SS7 network, or providing high level web-based APIs for service creation around SMS, USSD, or location-based services.

The Dialogic® BorderNet™ 2020 Integrated Multimedia Gateway enables interworking between IP and PSTN networks via high-density optical telephony. The BorderNet 2020 IMG handles signaling and media in a single carrier-ready chassis, provides any-to-any voice network connectivity, and can deliver SIP services into SS7, SIGTRAN, PRI, and SIP-I networks. The BorderNet 2020 IMG also features multimedia border element functions, such as SIP mediation and IP-to-IP transcoding for network-edge applications.

The Dialogic® Vision™ 1000 Video Gateway is a carrier-ready video gateway that can connect interactive SIP-based video and multimedia services to mobile, IP, and PSTN networks, in addition to IMS-based networks through support of BICC/Nb-Up. The Vision 1000 Video Gateway can also support real-time video and voice transcoding, allowing service providers and mobile operators to deliver enhanced video quality and interoperability for converged services, such as video portals, multimedia contact centers, and multi-terminal video conferencing.

For the connection from the enterprise to the cloud, the Dialogic® BorderNet™ 500 Gateways supply any-to-any connectivity and call routing for connection to SIP trunks or PSTN trunks and virtually any on-premise PBX, including IP-PBXs, hybrid PBXs, and legacy TDM PBXs, along with integrated enterprise Session Border Control (SBC) features.

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