



WHITE PAPER

## Billing in the cloud: The missing link for cloud providers



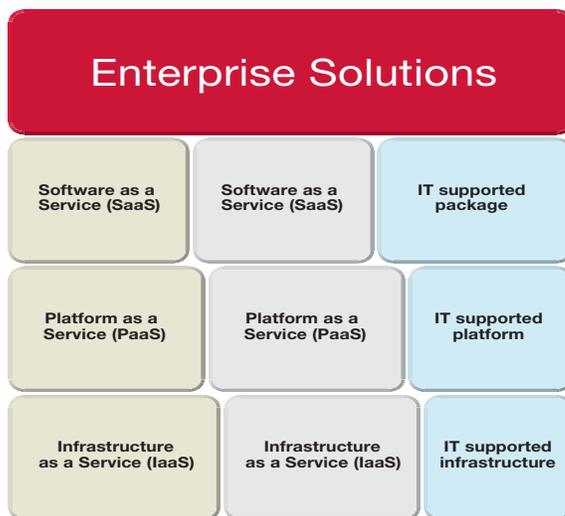
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## 1. INTRODUCTION

The tantalizing promise of cloud computing is carefree IT—honed to enterprise needs and quick to react to changing business circumstances. One of the key attributes of cloud computing is the usage model; customers consume resources as a service and pay only for what they use, rather than buying a license and annual maintenance. Regardless of whether the provider focuses on Infrastructure as a Service (IaaS), Platform as a Service (PaaS) or Software as a Service (SaaS), billing is the missing link, yet it's key to the provider's ability to monetize cloud offerings.



**FIGURE 1: HYBRID ENTERPRISE CLOUD**

Similar to a more traditional delivery model in which organizations use different product packages from different suppliers because no single supplier can meet all of their needs, there are different cloud suppliers. Figure 1 above shows a simple scenario where the business needs are met by two different SaaS solutions illustrated in the left and middle stacks and combined with traditionally licensed IT supported packages illustrated in blue.

Cloud computing is based on a usage model where access to computing resources is delivered through Internet technologies. The user pays per usage, rather than buying a license and annual maintenance. Infrastructure costs (servers, DASD, network costs) are typically included in SaaS. Usage can fluctuate and a billing system needs to reflect the billing usage granularity per the cloud provider's business model.

Cloud computing has its friends and foes. The analyst community has been forecasting significant growth in its adoption, but there have been dissenting voices. Larry Ellison, co-founder and CEO of Oracle, has stated: "The interesting thing about cloud computing is that we've redefined cloud computing to include everything that we already do...The computer industry is the only industry that is more fashion-driven than women's fashion...It's complete gibberish. It's insane. When is this idiocy going to stop?"

## 2. CLOUD BILLING RAMIFICATIONS

Let's examine different components of cloud computing and their impact on billing. For our purposes, "customer" is defined as a billing entity and could be an enterprise, enterprise department, enterprise project, or a government agency. Such customer entities can be changed as departments merge or new departments are created. With cloud computing's "pay per use" model, defining and redefining customer entities must be handled by cloud billing systems.

Usage data for the services below needs to be collected and rated for each "customer" in the enterprise or government organization. It may also need to be gathered and rated per department.

Cloud providers often partner with product vendors and provide their products out of the cloud. This means they need to keep track of not only the enterprise balance per business unit or department, but also the partner balance, so that they can settle with the partner. Where the partner provides a product suite consisting of different modules (e.g., Unified Communications or ERP), such balance may be maintained per module, or even per module combined with embedded technology from another partner (e.g., Unified Communications may use Oracle RDBMS).

### 2.1 Infrastructure as a Service (IaaS)

Different hardware resources are provided through Infrastructure as a Service (IaaS). Charging model examples include the following:

- **CPUs:** CPUs are differentiated by power and number of CPU cores and, consequently, price. CPU power may be differentiated by time zone, e.g., static (based on peak and off peak resources) or dynamic, where price is determined by demand at the time. An extreme example of this concept is a two-way negotiated price between buyer and seller, similar to the priceline.com model in e-commerce where the buyer states the price he is willing to pay per unit and the seller may accept or refuse it.
- **Server type:** Because the same CPU can be deployed either in a low cost server or in a top-of-the-range server with high availability and a significantly different cost point, the customer price must reflect this variation.
- **System administration:** The same server type resource may be charged at a different rate depending on the operating system (e.g., Windows or Linux).
- **Storage (DASD):** Different storage capacity (including mirroring) is available, as well as different types of storage reflecting different price points from disk storage suppliers. The same variability exists as in the case of CPUs. For example, the cost for 1GB will vary depending on whether it's provided in a low- or high-end unit.

- **Disaster recovery:** This involves the time window within which SaaS would need to be available should a disaster take out a data center from which SaaS is provided. For short time window an active-active deployment in two data centers may be required.
- **Other:** Charges for space, power, network capacity, security, operating system and so on are built into the infrastructure pricing.
- **Service level agreements (SLAs):** If high availability is part of the agreement, SLAs may impact the price (e.g., refunds when contractual SLAs are not achieved).

Billing for IaaS may be done based on the quantity and quality of the infrastructure resources provided.

## 2.2 Platform as a Service (PaaS)

PaaS includes software frameworks and the necessary hardware in which to develop and deliver Software as a Service (SaaS). Examples of such frameworks include the following:

- Different hardware architectures with different server sizes—from small, Intel-based servers to mid- or top-range servers and mainframes—utilizing different chips
- Various software operating systems (e.g., Windows, Linux, MAC OS, Solaris, z/OS, and so on)
- Various development and application frameworks (e.g., Java, .Net)
- Solution stacks (e.g., LAMP, MAMP, WINS, and so on)

Billing must take into account Infrastructure as a Service (IaaS) costs, as well as software features and product offerings provided in the PaaS layer. Different frameworks have different prices and may include different infrastructures. All of this, together with usage, needs to be taken into account.

## 2.3 Software as a Service (SaaS)

Software as a Service (SaaS) may be delivered as a single or multi cloud offering. An example of a single cloud offering is Unified Communications (UC), which consists of different modules. An example of a multi-cloud offering is one including UC and ERP clouds. The assumption is that the cloud provider deploys all third party products necessary to run such offerings into the cloud.

### 2.3.1 Single cloud offerings

Different providers may offer different packages in a single cloud offering. The offering may also include third party software and, where such software is commercial and carries a license (e.g., a database), a sublicensing model would need to be devised between the provider of the solution and its supplier. (Note: cloud licensing models for embedded commercial packages are slowly evolving because the static “per user” or “per server” models do not work in the cloud environment).

*“Different providers may offer different packages in a single cloud offering. The offering may also include third party software...”*

Price models differ based on the supplier, with the most basic plans following a “per user/per month” paradigm. Price per user may be usage based, e.g., user A’s price using VoIP for one local call will pay less than user B spending 20 hours on international calls. Different granularity can be implemented for different products and services. These may be based on users or other criteria. The pricing model of one supplier will be different from the pricing model of another. Also, different contracts with different service level agreements (SLAs) are involved.

Price models for the small and medium business (SMB) market are simple. They are typically driven by the number of users and sometimes reflected by tiers. Often, several basic packages are included in an SMB cloud because the price may be attractive enough for an SMB to pay for bundled services, even if they use only a proportion of it.

The single cloud computing model, however, breaks down when it comes to an enterprise. The cost of enterprise software is significant. With a large number of users, the advantage of cloud computing in an enterprise is paying for use, which translates to accurate usage measurement and billing. This in turn reflects usage costs (different for different applications similar to different license costs and maintenance costs for different applications) and IaaS (possibly also platform as a service) “usage” costs as outlined in the IaaS area. The latter example of PaaS may be thought of as a difference between a “development license” and “runtime license”, as typical charges for these are different.

### **2.3.2 Multi-cloud offerings**

A typical enterprise has a number of different software suppliers for different applications. If such software is supplied out of the cloud, cloud integration and corresponding convergent billing is needed for the overall enterprise solution (as shown in Figure 2 on page 8, which illustrates different clouds for different applications and from different cloud suppliers).

### **2.3.3 SaaS billing challenges**

#### **2.3.3.1 Single cloud offerings**

Even in single cloud offerings, there are likely to be different price models. An offering from a single vendor, e.g., Unified Communications, consists of different software modules, e.g., VoIP, messaging, videoconferencing (low and high grade), call centers and fixed-mobile convergence. A UC offering provided as an SaaS will need to reflect different pricing based on the number of UC modules used and each module usage. Different UC modules may also have different cloud prices, charging units and cross-discount incentives. ERP is another example, as different customers use different ERP modules from the same supplier.

A UC offering needs servers, handsets and communications “pipes” from communications service providers, which, in turn, requires a data center infrastructure, including system administration, database administration, security, SLAs, and so on. The amount of computing power will depend on the number of users, usage and the number of UC applications. Different application modules may have a different number of users and a different infrastructure utilization per user. For example, VoIP and high resolution videoconferencing will have different network capacity requirements.

UC SaaS provided by a UC vendor or a systems integrator would thus include the price for an integrated solution. In a “pay per use” environment, this price would need to reflect the above costs directly—through a breakdown on the bill—or indirectly by abstracting some of the detail to the end user.

However, the cloud provider would still likely want to understand the detailed usage breakdown, so as to establish the right business model and, in turn, plan the capacity of different “tiers.” Such cloud offerings may have different SLAs and associated penalties for non-compliance.

The billing system would need to keep a balance for the UC product partner when a systems integrator is responsible for the cloud deployment. If there are dependencies on third party products not provided by the product supplier (e.g., a UC solution may need an RDBMS) and the third party product is excluded from the UC license, the cloud offering would also need to reflect such license and customization costs in the usage price. The billing system needs to maintain balance for the enterprise at different levels (e.g., per business unit or project) as well as for multiple cloud product suppliers at a “module” level (e.g., VoIP, Telepresence, FMC, etc.) and where applicable also for products embedded in the partner offering (e.g., an RDBMS).

### 2.3.3.2 Multi-cloud offerings

Now consider a multi-cloud offering, as this is the most likely scenario in an enterprise. There is no license fee or annual maintenance in the ultimate cloud computing model, as the enterprise client pays per use. Most enterprises use different software from different suppliers (e.g., ERP from SAP or Oracle and UC from Siemens, Cisco, or Avaya). Target modules from two of the most common packages—ERP and UC—are customized and implemented based on enterprise needs. The initial enterprise implementation represents one-time costs.

Such modules need to be updated over time as product suppliers issue new releases. Each upgrade cost may vary depending on the implementation effort required. Another recurring cost is maintenance, which splits into two parts: 1) product supplier maintenance cost (equivalent to an annual maintenance contract in a licensed environment), and 2) systems integration support and maintenance of the specific implementation. It is important to note that there may be more than one supplier for one SaaS solution (e.g., UC would include third party communications pipes from a CSP, and ERP would include third party RDBMS costs). The cloud provider needs to understand all of these costs in order to create a working usage-based model for the enterprise customer.

If a single entity, such as a systems integrator, provides a combined integrated cloud solution, a single usage bill will also need to be prepared. Further, the cloud integrator will need to maintain two types of balances—one for the enterprise, the other for the solution partners (e.g., UC or ERP product suppliers). Such balances are needed for the cloud supplier’s internal use (e.g., SOX compliance). Note that the supplier may want to incent the customer by, for example, providing the third UC module usage at half price.

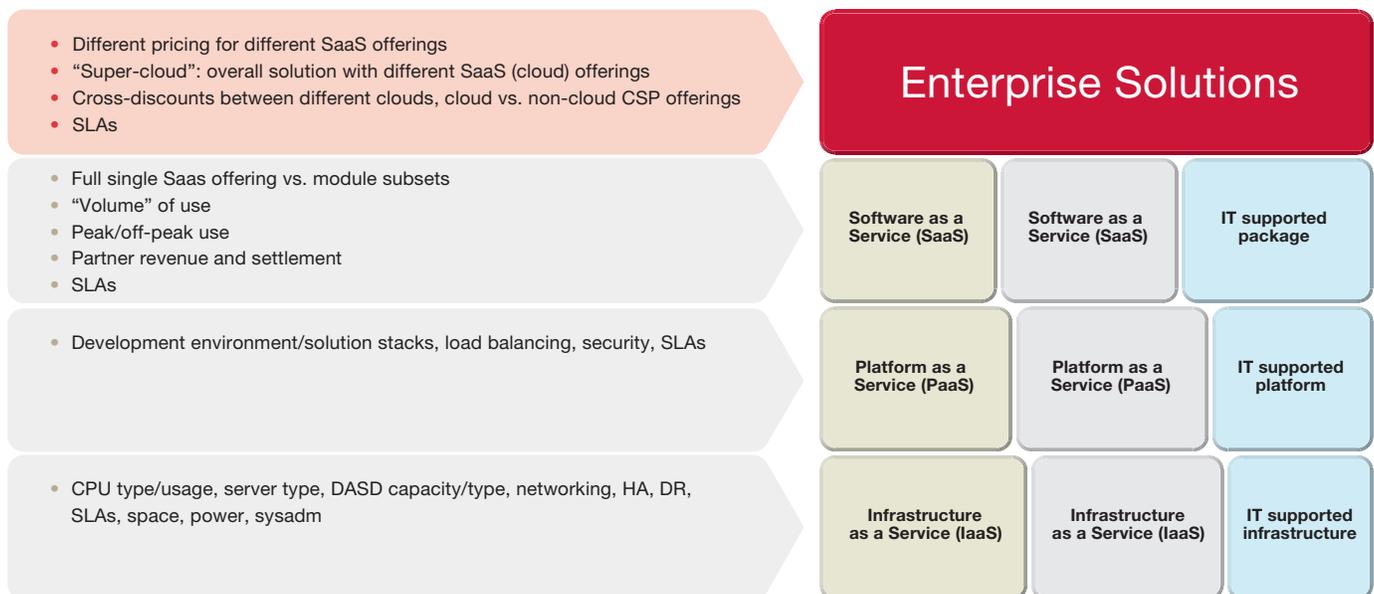
*“There is no license fee or annual maintenance in the ultimate cloud computing model, as the enterprise client pays per use. Most enterprises use different software from different suppliers...”*

Lastly, let's consider a cloud provider offering multi-tenant cloud solutions to different customers in a public cloud. The cloud provider would need to segment charges by enterprise customer and its hierarchies (e.g., ERP usage for Customer A and Customer B, where Customer A could be a business unit or project), combined with the specific ERP module partner balance based on an agreed business model with the partner and in turn linked to an enterprise client for auditing purposes.

Billing flexibility to support different business models for the product suppliers and enterprise client is key, as there are likely to be different business arrangements for both the end customer (enterprise) and the product supplier, similar to different license and annual maintenance pricing for different packages. The cloud supplier/integrator may wish to provide incentives and cross-discounts (e.g., "If you buy services from Cloud A, you can get services from Cloud B at a different discount."). This is similar to cross-discount incentives within a homogeneous cloud, which includes different functional modules, as in the UC example above.

There could also be tiered discounts, where the enterprise price point decreases "per unit" for higher usage, or for usage in off peak time periods, reflecting the desire to incent customers to spread processing as much as possible and thus maximize the utilization of the cloud provider infrastructure.

In summary: Cloud cross-discount could happen at three levels: 1) based on a module discount within each cloud (e.g., if you use module 1, you can get a discount on the use of module 2); 2) based on a cloud discount (e.g., if you use Cloud A, you can get a discount on the use of Cloud B); and 3) based on a cross module discount between heterogeneous modules within different clouds (e.g., if you use module 1 in Cloud A, you can get a discount on the usage of module 2 in Cloud B).



**FIGURE 2: EXAMPLE OF CLOUD BILLING CRITERIA**

### 3. CLOUD AND TELECOM BILLING PARALLELS

The above model is very similar to a convergent telecom rating and billing model in terms of complexity. Cloud A could be equivalent to a “silo” in a telecom offering (e.g., wireless), where CGI has built up both its products and implementation expertise over the past 30 years. Modules in Cloud A could be equivalent to different packages (e.g., wireless application A (voice), B (broadband), and so on). An equivalent of enterprise cloud cross-discounting would be to cross discount within each telecom silo as well across such silos.

A single cloud provider may choose to provide a flat rate billing model, e.g., per user charge. However, due to the complexity described, combined with multiple product and cloud suppliers in an enterprise, a usage predictability model for an enterprise will be very hard to implement. The very nature of cloud computing is the ultimate flexibility—any resource in any volume and at any time. This is similar to a recent wireless broadband charging change by major carriers (implemented by AT&T, announced by Verizon and others), which moved from the unlimited flat rate model to the tiered usage based model when they found data services were growing at CAGR over 100% while their broadband revenues remained flat. As described above, the complexity of cloud billing is significantly higher than that of billing for one product/service.

Prepaid models could be considered for customers wishing to control costs more closely. Alternatively, tiered usage approval could also be considered. For example, if a customer’s employee uses \$X in a month and needs more, he needs an authorized approval. Again, this is similar to NTT DoCoMo gaming applications where the user specifies the amount at which he wants to be asked whether to continue playing and approve such continuation explicitly.

“Preferred” customer model, defined as no other enterprise customer has a better deal, can also be introduced, with the ramifications of “re-rating” usage records for all “preferred” enterprises should the cloud provider wish to introduce a better than existing “preferred” pricing e.g. for a new customer.

One can also see a pre- and post-paid convergence, where certain essential services would go to a post-paid balance and “optional” services could either be pre-paid or have an approval threshold. This is similar to the family plans in the UK where “friends and family” calls are included on the post-paid bill and charges for calls by other family members, such as children, have a pre-paid limit per month.

*“The very nature of cloud computing is the ultimate flexibility—any resource in any volume and at any time.”*

Other parallels with telecom include the following:

- **High volume:** A huge number of records will need to be “collected” and “rated” in an enterprise.
- **Multiple rating parameters:** Fig. 2 shows examples of a significant number of rating parameters. These can be used to provide cross-discounts for an enterprise.
- **Large number of formats:** Different records from Fig. 2 will have different formats, which will need to be processed in a cloud billing convergent offering.
- **Time to market:** Introduction of new products quickly and cost efficiently will be a key differentiator for cloud providers. Their billing systems need to support this flexibility through the separation of the business logic from the code. The business user rather than a programmer needs to be able to define different models.
- **Support for an explosion of products and services:** As cloud offerings take hold, many providers will enter the market with different offerings. Swift updates in the business models supported by cloud billing will be key to competing. This is parallel to the telecom situation today, where IP (Internet Protocol) achieved what regulators could not—an exponential increase in competitive offerings and low barriers of entry, as everything became an application.

There are headwinds in providing cloud flexibility, which are worth mentioning.

- **Business model change for product suppliers:** Transitioning from a license plus maintenance fee to “pay per-use model” for product suppliers is complex. It’s possible some providers will have a combination of usage with a minimum recurring charge.
- **Multi-tenant support:** The multi-tenant product prerequisite is the separation of business logic from the code.
- **Evolving the cost and corresponding price model:** Given the complexity in the enterprise or government, this would be very hard to model manually. A flexible billing system can provide the modeling baseline from which to start with these complex business models.
- **APIs:** Cloud standards related to APIs.

Despite the headwinds, the promise of maximum business agility combined with metered pricing is likely to be too attractive for enterprises and governments to ignore.

## 4. CONCLUSION

Many cloud items need to be sorted out to fully meet the promise of cloud computing. Flexibility in billing is one of them. Ignoring this aspect will mean that the cloud provider doesn't reflect its true costs in the customer model, which in turn is likely to either impact the provider's competitiveness through overcharging or its survival through undercharging. Supporting this functionality allows the provider to aggregate data and to understand usage patterns. This is important for capacity planning as well as offering analysis for sales and marketing. To fulfill the promise of cloud computing and charge per usage, flexibility in billing—the complexity of which is comparable to convergent telecom billing—is a key ingredient for cloud providers. CGI's deep domain knowledge and IP in telecom billing acquired through three billing system generations over the past 25 years can help cloud providers monetize their offering in a flexible manner.

## 5. ABOUT CGI

At CGI, we're in the business of satisfying clients by helping them win and grow. For more than 30 years, we've operated upon the principles of sharing in clients' challenges and delivering quality services to address them.

As a leading IT and business process services provider, CGI has a strong base of 31,000 professionals operating in more than 125 offices worldwide, giving us the competitive advantage of close proximity to our clients. Through these offices, we offer local partnerships and a balanced blend of global delivery options to ensure clients receive the optimal combination of value and expertise required for their success.

We define success by helping our clients achieve superior performance and gain competitive advantage.

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