451 Research

CLOUD BROKERS

Now Seeking Ready-to-Pay Customers

Are cloud brokers poised to offer a viable alternative route for cloud service users and providers – or will this be a replay of the failed broker/exchange models of the 1990s?

CLOUDSCAPE

KEY FINDINGS

- The jury is out on what role brokers can play in the market for cloud services. There are a wealth of startups, established vendors and service providers currently examining this opportunity. At best, cloud brokers should provide a point of control for what we call 'best execution venue' strategies – enabling users to make rational decisions about where to place apps and workloads, and which 'XaaS' offerings to use.
- While there's a lot of talk about hybrid cloud models, it's still mostly about choice – and brokers can help deliver this choice, especially for users who don't want to paint themselves into a corner.
- A cloud broker should enable effective data-driven decision-making by offering transparent choice in cloud services, while removing the pain in terms of governance, procurement, utilization and settlement.
- Successful exchanges will require three elements: commodities, liquidity and volatility. Cloud services aren't yet able to be traded as a pure commodity, and brokers have yet to prove they can drive liquidity. Volatility may come from off-peak variable usage models, but one out of three isn't going to cut it here.
- There's more hype about cloud brokering than actual shopping for services via brokers at this point, and many brokers are making a living with consulting until this market lights up. The broker market still looks a whole lot like a potential replay of the failed broker/exchange models of the 1990s.

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TABLE OF CONTENTS

SECTION 1
Executive Summary

The key question at the heart of this report is: "Is this is a real market?" And if not now, will it ever be?

We've covered over a dozen vendors of broker services in this report (as well as service providers) – which is by no means an exhaustive list. There's been $48m in funding put into a dozen of these vendors – plus $47m for RightScale and $75m for Virtustream. Yet we find scant evidence of revenue from brokering activity to date. That's hardly surprising given that it's at an early evolutionary stage, but will there ever be meaningful revenue?

At the present time, most participants are focused on securing liquidity – either buyers (consumers) or sellers (of services/resources). There are no identifiable reference customers yet. Right now it seems that those who potentially have the most to lose through disintermediation are the most skeptical about this market's prospects.

1.1 KEY FINDINGS

The Positives for Cloud Brokers:

- Cloud brokers can provide a point of control for 'best execution venue' strategies, enabling users to make rational decisions about where to place apps and workloads, and which XaaS offerings to use.
- A cloud broker should enable effective data-driven decision-making by offering transparent choice in cloud services, while removing the pain of governance, procurement, utilization and settlement of said services.
- A broker can procure and manage a wide range of cloud services for customers in a many-to-many model. A broker may or may not offer service recommendations.
- Cloud computing is still not for the technology fainthearted. As users seek multiple suppliers to meet diverse needs (BEV, XaaS), a re-intermediation for providers of 'curated' or otherwise aggregated or federated cloud services – brokering, federation, marketplaces – seems inevitable. This is a role formerly played by systems integrators and consultants.
- A cloud broker can be considered as a passkey to access a wide range of services, as well as to avoid vendor lock-in.
- A hybrid/multi-cloud capability will be increasingly important for users who don't want to paint themselves into a corner – i.e., avoiding vendor lock-in. There's a lot of talk about hybrid clouds, but it's still mostly about choice. Brokers can deliver this choice.
- It's a very interesting place for startups. We may get some great, quick exits if they position themselves in the right way, and the management vendors see an opportunity to offer this function either as an externally provided or internal resource to customers – or both.

The Negatives for Cloud Brokers:

- The broker market looks a whole lot like a replay of the failed broker/exchange models of the 1990s – and the reasons for failure don't appear to have changed. Bandwidth exchanges (i.e., Arbinet, Band-X, RateXchange and Enron), which placed traffic onto the best route based on price, were all high-profile failures and can provide some useful lessons.
- There's a fundamental question around who assumes the risk in the equation. Will small brokers have the ability to assume financial risk? If something goes wrong, another intermediary in the mix only increases the amount of finger-pointing.
- Loss of control – this is what really sank Arbinet and other bandwidth exchanges. In the end, despite billions in potential SG&A savings through the use of an automated exchange, these models went up in smoke largely because they found that carriers actually valued the personal relationships formed when they manually negotiated the access. The trust created through the development of these relationships carried through. At the end of the day, the buyer wanted to know who they were buying from.
- Customers also worried that the exchanges would gain too much leverage with the intelligence they amassed on route costs, so they brought the function in-house. Likewise, a cloud broker could gain too much leverage with its intelligence on various cloud platform costs.
- In the telco space, the exchange/broker concept was sunk because carriers fought it tooth and nail. They hated the idea of arbitrage. Will IaaS providers fight the concept of brokers because it threatens to disintermediate them?
- Successful exchanges will require three elements: commodities, liquidity and volatility. Cloud services aren't yet able to be traded as a pure commodity. Brokers have yet to prove they can drive liquidity. Volatility may come from an off-peak variable usage model, but one out of three isn't going to cut it here.
- IaaS providers don't have the same motivations as the telcos; it's simply a different business, even if the same basic economics apply. With governance and security already largely baked in, success is going to come via application stores and service exchanges that deliver value on top of the infrastructure.
- There's more talk about cloud brokering than actual shopping for services via brokers at this point. Many brokers are making a living from consulting activity until this market lights up.
- A cloud broker could be seen as merely introducing another layer of cost associated with cloud adoption.
- Price-driven mechanisms to differentiate between cloud providers and their offerings could lead to a mismatch between expectations and reality.
- It will be very hard for brokers to do a fair cost comparison. A 20% variability in price is nothing compared with actual performance differences between clouds.
- Cloud service brokerage, federation, utility, marketplace, supermarket, storefront, etc. – cloud intermediation is currently a jumble of ideas and approaches, and is a very nascent market.

1.2 METHODOLOGY

This report on cloud brokers is based on a series of in-depth interviews with a variety of stakeholders in the industry, including IT managers at end-user organizations across multiple sectors, technology vendors, managed service providers, telcos and VCs. This research was supplemented by additional primary research, including attendance at a number of trade shows and industry events.

Reports such as this one represent a holistic perspective on key emerging markets in the enterprise IT space. These markets evolve quickly, though, so 451 Research offers additional services that provide critical marketplace updates. These updated reports and perspectives are presented on a daily basis via the company's core intelligence service – the 451 Market Insight Service. Forward-looking M&A analysis and perspectives on strategic acquisitions and the liquidity environment for technology companies are also updated regularly via the Market Insight Service, which is backed by the industry-leading 451 M&A KnowledgeBase.

Emerging technologies and markets are also covered in additional 451 practices, including our CloudScape, Enterprise Security, Eco-Efficient IT, Information Management, Infrastructure Computing for the Enterprise (ICE), Datacenter Technologies (DCT) and 451 Market Monitor services. All of these 451 services, which are accessible via the Web, provide critical and timely analysis specifically focused on the business of enterprise IT innovation.

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SECTION 2

What Is a Cloud Broker?

In one role, a cloud broker is an aggregator with an index of providers based on cost and consumption characteristics, matching end-user needs with ideal cloud provider(s). It is a matching or 'meet me' service; the broker is providing an introduction. In a second and more active role, a cloud broker also orchestrates and federates servers/workloads between cloud instances (public, private, hybrid) based on end-user requirements (compliance, performance optimization, cost optimization, administration).

Whatever the role of the broker, the service is typically provided by an external, third-party entity to buyers and sellers alike. Some initial attempts at brokering have seen brokers aggregating and providing anonymous spare capacity (akin to the Hotwire travel website) to ensure the least friction with the cloud providers as they dispose of this capacity. Enomaly's SpotCloud was an early example here. Brokers themselves could even arbitrage or buy futures on spare cloud cycles.

In the widest sense, a cloud broker should enable effective data-driven decision-making by offering transparent choice in cloud services, while removing the pain in governance, procurement, utilization and settlement of said services. Cloud brokers make it easier for a user to purchase cloud services from a range of providers. This is done by procuring and managing cloud services for customers – possibly, but not necessarily, at the lowest possible cost – in a many-to-many model.

These services are measured and metered. Brokers may provide cost transparency, pricing, optimization and chargeback functions, or they may use partners for this. Indeed, there is an entire sector of companies focused on the cloud cost/spend management opportunity. 451 CloudScape tracks these vendors, but they are not the focus of this report (see our recent series of MIS reports on this market, as well as the 451 ICE long-form report, *IT as a Business*).

In addition to consolidating resource usage across various users in order to drive volume and off-peak-based discounts, successful brokers will also be able to take advantage of price reductions through spot pricing and arbitrage. Beyond providing this natively, brokers will also have the opportunity to deliver this capability via third-party broker-dealers such as Strategic Blue, as well as IaaS commodity exchanges.

This talk of arbitrage, exchanges and broker-dealers brings us to a key convergence point, because we have a meeting of two semantic worlds in the term 'cloud broker.' In IT, connections between systems are very often negotiated by an automated appliance somewhere along the line, which decides where to make a connection based on relevant factors. That is to say, it 'brokers' connections. This happens everywhere, from voice to SMS to TCP/IP; it's so common that the term 'connection broker' is widely understood in the software arena. Think also of 'message brokers.' When people started inventing cross-cloud connection services and software, they called them 'brokers' for this reason – and all those cloud brokers that we identify share this trait; they let you consume various services from a single point.

The term 'broker' also carries the connotation of financial markets, and brokerage as a special financial service, enabling commodity-style trading and facilitating the buying and selling of securities. Market participants are well versed in calling out differences and identifying the nuances of different models (e.g., broker vs. broker-dealer or exchange); however, in the wider marketplace, terms like 'cloud broker' and 'brokerage' are used interchangeably.

Just as buyers and sellers of equities don't engage in this activity in order to realize any benefit from a dividend payout, participants in an IaaS futures market aren't going to convert to actual use. A futures exchange is what it's billed as: a mechanism to practice arbitrage for financial gain by trading futures contracts.

In addition to broker services provided by a third-party entity to buyers and sellers, we expect IT departments themselves to operate as service brokers within their own organizations (as well as to customers and partners), as they seek to transform from IT cost centers into service delivery organizations. Beyond intermediating relationships between their own end-user consumers and third-party providers of business and IT services, when used in conjunction with a cloud management platform, the combination can enable the provisioning, operation and reporting of a broad portfolio of cloud-based applications (i.e., both the organization's own and third-party apps and services).

There are a range of vendors that are targeting this opportunity – which is not directly addressed in this report – including VMware (Cloud Automation Center, nee DynamicOps), HP (CloudSystem), Microsoft, ScaleUp Cloud, Dell (Gale), Cisco (Intelligent Automation for Cloud), BMC Cloud Service Management, CA Technologies and IBM. If the broker concept takes off, the established management and security players would be forced to enter the market and would likely become active acquirers, especially with the overlaps around governance, security and control.

In addition, service providers may want to become brokers themselves (see Section 5) to avoid disintermediation and to give them more control over workload placement. This will also drive consolidation as service providers look to acquire external IP.

2.1 HOW DOES IT WORK?

At the most basic level, a cloud service broker connects providers of available 'aaS' resources (typically service providers) with interested buyers. It has technical and pricing knowledge of the market and arranges a trade in which the buyer (typically, but not exclusively) pays the seller directly.

In the more active role, besides aggregating service demands and offerings, a cloud broker will also add value on top of these services, such as arbitrage, security or audit. It should also provide a unified billing, licensing and provisioning interface to enable

the use of diverse cloud vendors and services. In this case, it could be responsible for filling a number of roles to facilitate transactions, including:

- **Registration & Control:** Buyers and sellers both register with the broker, which maintains a common system and interface for displaying inventory, pricing, billing and user information to both parties.
- **Reporting & Management:** The broker is responsible for providing a reporting mechanism that allows both buyers and sellers to track active workloads, pending transactions and historical usage, all facilitated via the individual broker system.
- **Billing:** Buyers and sellers have already provided all necessary data to the broker via the registration process, which then allows transactions to take place in a secure, trusted manner.
- **Rating & Reputation:** Brokers can facilitate reputation and trust between buyers and sellers that can generate repeat business – and limit risk, fraud or illicit activity.

The broker makes money from one or more of the following:

- Referral fee from seller
- Software sale to buyer
- Consulting fee from buyer
- Royalty/fee on value of transaction and/or ongoing service over period/lifetime.

2.2 WHY WILL THE MARKET NEED THEM?

A broker can simplify the vast number of 'aaS' options available by categorizing the features and benefits of each provider to match end users with an ideal set of providers. This kind of service-matching meets a basic near-term need. In the longer term, though, cloud brokers may be able to provide price arbitrage, business continuity and SLA assurance; this is currently not easy due to interoperability and standards across various clouds.

Today's reality is that most users only have access to a single supplier or one alternate supplier – much like for their basic utilities. In order to take advantage of a wide range of available services, intermediaries will be required that can aggregate, federate and broker services to end users.

In a more proactive role, a platform can actively broker servers/workloads between multiple providers and public/private cloud topologies. This enables control of server/workload location and movement while providing business intelligence and analytics specific to the environment and how the server/workload operates within it.

By registering with a broker, buyers can take advantage of multiple providers of capacity for a given task at a given time, providing options around pricing and availability while leveraging a common broker interface for the movement of workload data to the selected provider.

A future benefit of cloud brokers will be realized by users looking to take advantage of transitory pricing for discrete projects or computing tasks that can be processed in short periods of time. Predictable consumption of computing resources (e.g., production applications) requires more predictable pricing, and probably greater resource availability than today's cloud broker markets typically make available. SMBs will likely need to engage professionals for identification of the most suitable cloud services for their specific operations.

Meanwhile, as enterprise IT departments make the shift to becoming internal service providers, they will look for more diverse suppliers of compute resources, allowing them to provide tailored services for particular applications – enterprise computing for tier one apps, and other resources as appropriate for T&D, HPC, latency-sensitive applications.

Despite the ongoing hype, cloud computing is still not for the technology fainthearted, which makes on-ramps of all descriptions attractive. However, there are far-reaching technology disparities – not to mention business and economic models – between different cloud providers. Indeed, APIs are diverging quickly as providers innovate and iterate their services.

A broker brings an easy-to-use interface to the consumer, from which they can compare services (arbitrage) and coordinate delivery and support. In future, cloud brokers may enable enterprises and communities to access exchanges to offer underutilized assets via a brokerage, much like *net producers* of energy via solar and wind installations can sell their excess production back to the power company.

2.3 WHAT CORE SERVICES ARE CUSTOMERS LOOKING FOR?

End Users

Users will be seeking cloud brokers that can help them determine which offerings are best for a particular use case. The goal is to intelligently orchestrate and federate servers/workloads between public, private and hybrid clouds while at the same time enforcing users' governance and security policies – and then helping them simplify and manage cost models and expenses by turning data analysis into usable business intelligence for server/workload distribution and migration.

Vendors in this report have already seen demand for services such as:

- Unified billing across multiple providers
- Abstraction of APIs at the infrastructure level
- Image factory/customer software depository
- Identity management, SSO federation (with tokens or similar)
- Multiple access methods to a variety of services from multiple providers (API and/or Web)
- Transparency in data to enable apples-to-apples comparability as well as to drive BI (metrics include pricing, performance, health).

Providers

Providers will be looking for a broker service that can deliver 'ready to pay' customers for their aaS offerings – including idle capacity. In the case of IaaS capacity, once an infrastructure purchase has been made, time and utilization are key factors that providers look to optimize in order to maximize their profitability.

Brokers are expected to facilitate the movement of customer data and information to the provider's cloud to enable the workload to function. In this scenario, brokers provide a 'many to one' function, allowing the provider to dedicate a portion of its unused capacity to a broker, perform the connectivity setup once, and then let the broker's system facilitate customer usage with as little interaction between provider and end user as possible – in order to reduce friction in the transaction process.

What we understand is that these transactions are often short-term in duration and low in volume and price, in which case the higher the costs to the provider in terms of ingesting relevant data around both workload and user information, the less attractive the broker model will be.

2.4 POTENTIAL USERS OF CLOUD BROKERS

What type of organizations would be most likely to use and benefit from cloud broker services?

- Users that can, or want to, use multiple clouds.
- Users that can forecast some of their usage out for a few months, but not a full year.
- SMBs without internal IT shops, which lack expertise and don't want to invest capex in IT, can operate and scale business with cloud services.
- Enterprises with multiple internal business and IT users that need access to cloud services.
- Companies and public-sector organizations pursuing hybrid/multi-cloud strategies.
- Organizations seeking to minimize the risk in moving to public clouds in terms of service selection and lock-in.
- Organizations with geographic distribution and cross-border data requirements.
- The channel (IT service providers, MSPs and VARs) can use brokers to extend its reach.

SECTION 3
Drivers of Change

3.1 CLOUDBURSTING

Our conversations with companies at the forefront of cloud deployment – vendors and end users alike – suggest that none are undertaking, facilitating or even witnessing 'cloudbursting' between multiple public clouds – yet. That's to say users aren't seeking to swap workloads and applications between different cloud providers and hosted resources based on minute-by-minute or penny-by-penny changes in price.

The kind of cloudbursting, brokerage and arbitrage implied by one massive dynamic spot cloud is a vision of the future. When and if it does exist – and we acknowledge the likelihood of IaaS becoming an exchange-traded product quite soon – this isn't going to be useful for running workloads and applications with live and complex information architecture, or data payloads that have specific storage, data management and networking requirements. True interoperability and compatibility just doesn't exist.

3.2 BEST EXECUTION VENUE

Instead, what we see driving demand is a requirement among end users to make rational decisions about how and where to run applications and tasks based on workload profile, policy and SLA characteristics. It's what we've been referring to as 'best execution venue' (BEV). Today these are mostly bilateral sourcing relationships between a user and cloud operator (IaaS and PaaS), MSPs, telcos, colo providers and datacenter operators, which are based on trust, security and availability, rather than brand, technology and cost. In more advanced hybrid cloud models, which may involve multiple clouds and sourcing suppliers, users will be able to make these decisions from within a single catalog or console and within a dynamically federated environment.

In the enterprise sector, the drivers for hybrid clouds stem mostly from the need to utilize both public clouds for test/dev and non-mission-critical applications, and private clouds for mission-critical or non-virtualized apps. In theory, users can deploy different parts of the application tier in different environments (e.g., a database locally [private], and Web tiers at a service provider or in a different geography). They could run front-end applications and Web services in the cloud, and at the same time maintain PCI-complaint databases on dedicated infrastructure.

BEV practices and tools can automate the delivery of workloads and applications to the most suitable execution environments – whether that is determined by price, performance, compliance requirements or some other SLA. The BEV itself may be an internal cloud, a public cloud, some trusted cloud or a hosted dedicated environment. (The BEV concept borrows from Europe's MiFID (Markets in Financial Instruments Directive)

legislation, which requires financial institutions to guarantee that customer transactions will be executed in the best available venue). In the marketplace, every vendor we speak with essentially wants to become the control point for delivering BEVs.

3.3 MULTI-CLOUD AND HYBRID CLOUD: PROPAGANDA VS. REALITY

While a lot of people are talking about wanting to implement hybrid or multi-cloud strategies, our recent channel checks with vendors operating at the forefront of cloud adoption, including on-boarding and orchestration firms, suggest that – with a few notable exceptions – not many customers are actually doing this today. RightScale, for example, finds 85% of customers it surveyed are incorporating a multi-cloud strategy into their cloud plans. In theory, multi-cloud strategies could become an increasingly useful option for companies seeking to avoid lock-in or guarantee availability in case of an outage affecting one provider/region (for governance, risk assurance or regulatory reasons), or to provide price leverage in procurement.

The thing that's holding most customers back from moving toward a hybrid model continues to be fear – over security, lack of trusted available services and lack of some critical technology. The critical technology missing is mostly on the networking and storage side. While there are a few (and more coming), the overall lack of bare-metal clouds is also a barrier, since not all apps are virtualized.

On the networking side, the need for a single, secure network that flows from inside the enterprise and back remains largely unmet. VPNs and physical networks that can directly connect a customer to their clouds so that the cloud resources look like an extension of their own network is rudimentary today, but telcos such as AT&T, Verizon, Colt Group, NTT and Deutsche Telekom are starting to deliver. Moreover, we believe strongly that the promise of software-defined networking will have a vital role to play here, especially as VPNs have a hard time scaling with the cloud.

If the user is comfortable with IP storage and is not latency-sensitive, this network capability also helps with the storage issue (FC vs. Ethernet). If they are bound to FC or are latency-sensitive, then they'll probably be stringing fiber between datacenters, or they'll just stay with in-house private clouds. Moreover, today's clouds can't deal with apps that don't want to be virtualized. All clouds are virtual today, so either your app fits into a virtual container, or it doesn't. If it doesn't, you're not using a public cloud.

SECTION 4

Vendor Landscape: Operations and Functions

This section provides an overview of the supplier landscape for cloud brokers, plus a specific examination of the operations, platform and marketplace functions of the various market participants. What do these offerings really do – what technologies are being productized today, or being worked on in near-term roadmaps? These are the firms with cloud broker capabilities and offerings available today.

Platform and Marketplace Functions

Most vendors have a single, self-service unified interface or dashboard that can be used to access all services and to execute resource requests (some also via API) with policy/role enforcement. They offer metering and unified/consolidated billing. Most are brokering IaaS services (ComputeNext has 10 providers live already, for instance), while some are brokering SaaS, and some are doing both. One or two are also offering PaaS. There's essentially a 50/50 delineation between companies that provide service recommendation/arbitrage and those that leave choice entirely to the user.

Meanwhile, there are fewer value-added services actually available than we anticipated finding, based on the level of noise and expectation in the market. DR and backup, identity management, single sign-on, resource metering, migration and service assembly, plus third party application libraries, are those most frequently referenced. This suggests the market is nascent, still waiting to hear about user requirements. There are a range of pricing mechanisms in use, depending on the particular orientation of the broker.

4.1 6FUSION

HEADQUARTERS	Raleigh, NC
STAFF	40
FUNDING	$10m in two rounds
REVENUE	N/A

Offering – 6Fusion Platform – utility metered cloud (since 2010).

Capabilities – Its platform enables global workload distribution over public, private and hybrid clouds as pay-per-use billable utilities. It features a metering algorithm and Workload Allocation Cube (WAC), and it quantifies supply and demand for compute resources. 6fusion operates the iNode network of datacenter provider partners.

Target Markets – Enterprise IT groups, service providers and Web app vendors. Higher education, financial services, disaster-recovery verticals.

Differentiators – 'One-stop shop' for a geographically and technologically diverse set of services accessed from a single console, metered and billed in a single model – standard IT metric kWAC (Workload Allocation Cube) – on a single invoice. It offers public, private and hybrid cloud in one console.

Partner Ecosystem – Pre-integrated Microsoft server software, e-ternity, Asigra Backup software and Vyatta firewalls; iNode Network partners include VMware, Microsoft, HP, BroadCloud and Singtel.

Customers – US cable network (unnamed).

Competition – Public clouds that are not in the iNode Network – Amazon, Rackspace, etc. Private cloud and private cloud ISVs, such as Eucalyptus and Abiquo, as well as aggregators/cloud management – e.g., RightScale, enStratus.

Pricing – 6fusion meters customers' consumption, bills them based on consumption, and then pays the suppliers on the back end, retaining a brokerage fee. Cloud Resource Meter is priced at $1,500 per annual subscription, per 25 VMs; iNode Network pricing is on a per-kWAC unit, based on consumption. Prices set by iNode Network: $25/kWAC to $50/kWAC; Enterprise iNode – $2,250 annual subscription for 25 VMs.

SLAs/Enforcement, Accountability, Cyberinsurance – Universal SLA: 99.99% monthly availability across all 6fusion iNodes – for cloud services provided by 6fusion. In case of downtime, customers contact 6fusion, which will manage the SLA across the various underlying vendors.

Platform Functions

Consolidated Interface – Yes.

Execution of Resource Request – Self-service.

Delivery Model ('XaaS') – IaaS.

Service Recommendations – 6fusion doesn't offer them, although datacenter partners can market themselves via the platform.

Value-Added Services – Resource metering, IaaS marketplace, account management, third-party app library, media management.

Aggregation – A Control Room is the core integration and aggregation point for security management, account management, workload management, metering and reporting, and it provides access to public and private iNodes. It communicates with individual Engine Rooms that sit at the hypervisor level in each of the iNodes, where they deploy machines and workloads, and meter usage on that iNode. This architecture enables it to scale across an unlimited number of iNodes, allowing organizations to deploy workloads into public or private datacenters located anywhere in the world.

API Support – The 6fusion API is designed to facilitate the collection of metering metrics, enabling third-party reporting, providing open federation of compute resources and more.

Integrated/Federated Services – Four iNodes in US/Canada, two in Singapore and one in the UK (BroadCloud).

Fulfillment/Resource Creation – Enables users to deploy and manage IT resource meters (Cloud Resource Meter), virtual machines and workloads. VM and workload deployment is done in four steps: 1) Select a datacenter for deployment; 2) Select software template/image to be deployed on the VM; 3) Select a network interface; and 4) Name the machine. Management capabilities include deleting, stopping, forced stopping, starting, restarting, and forced restarting of VMs and workloads.

Billing and Metering – This is the core of 6fusion's business. Its WAC algorithm and costing methodology is based on WAC units of consumption: comprising CPU, Memory, Storage, Disk I/O, LAN I/O and WAN I/O. The WAC is used across all 6fusion technology to measure IT resource consumption across virtual, physical, public and private infrastructure.

Marketplace Functions

Services and Pricing – Cloud Resource Meter: $1,500 annual subscription per 25 VMs; iNode Network pricing is per kWAC units based on consumption. Per-kWAC prices are set by iNode Network datacenter partners and can change at any time. Currently prices range from $25/kWAC to $50/kWAC across iNode facilities; Enterprise iNode carries a $2,250 annual subscription per 25 VMs.

Arbitrage (Enabling Users To Choose Between Similar Services) – Allows customers to choose provider, location, facility and price.

4.2 BESOL

HEADQUARTERS	Seville, Spain
STAFF	7
FUNDING	Private, seeking seed/bridge and A round
REVENUE	N/A

Offering – Tapp cloud management, migration and brokering.

Capabilities – Cloud control panel (service management console) for server configuration and infrastructure management/monitoring across multiple clouds, and, in an upcoming release, drag-and-drop migration between clouds. SaaS-based, SMB-focused cloud service broker that is targeted at the US market and currently in closed beta.

Target Markets – Channel partners/ISVs for broker product – SMBs are the end-user target audience.

Differentiators – Richer set of management and migration features than others offer.

Partner Ecosystem – None yet – in closed beta.

Customers – Telefonica-acens for Tapp.

Roadmap – Adding app/workload migration; heading to the US for launch in early 2013, followed by launch of broker service.

Competition – RightScale, enStratus, ScaleXtreme, plus other brokers in this report.

Pricing – N/A (for broker service).

Platform Functions

Consolidated Interface – Key to Tapp.

Execution of Resource Request – On multiple target clouds.

Delivery Model ('XaaS') – IaaS; SaaS to come in broker offering.

Service Recommendations – Will suggest best execution (optimal) venue for each server.

Value-Added Services – Multi-cloud, migration, integrated functions.

Aggregation – All supported clouds accessed and managed via a single console.

API Support – Tapp API supports partner's APIs.

Integrated/Federated Services – Amazon Web Services, Rackspace, Linode, GoGrid, IBM SmartCloud, Spanish managed hosting and cloud provider Arsys, and Spanish provider acens (acquired by Telefónica in 2011), as well as CloudSigma. It is adding integration for the OpenStack APIs for hybrid environments.

Fulfillment/Resource Creation – Self-service.

Billing and Metering – Up to $1,500 per month for 10 VMs for Tapp. Broker service pricing TBD.

Marketplace Functions

Services and Pricing – N/A (in closed beta); ISVs and partners being sought.

Arbitrage (Enabling Users To Choose Between Similar Services) – TBD.

4.3 CLOUD CRUISER

HEADQUARTERS	Roseville, California
STAFF	24
FUNDING	$7.6m in two rounds
REVENUE	200 customers with deal sizes between $5,000 and $15,000 per month

Offering – Cloud Cruiser Enterprise Edition, Cloud Cruiser Service Provider Edition.

Capabilities – Enables cloud service providers to measure customer resource usage at a granular level, apply customized pricing models, and then chargeback those costs to their customers. Features include cost transparency, hierarchical resource mapping, BI analytics, and chargeback for business-critical cost management – for both the cloud service provider and each of their IaaS customers.

Target Markets – Companies embracing private or public clouds – especially companies that have implemented and are leveraging multiple public and/or private clouds because Cloud Cruiser is able to bring all the financials together for the various environments.

Differentiators – Cloud Cruiser claims to make private and public clouds more profitable by enabling cost transparency in hybrid environments, chargeback and multi-tenant billing, cost analytics, and fiscal responsibility through budgets and alerts.

Partner Ecosystem – Many partners, including Hewlett-Packard, Microsoft, Seamless Technologies, Pepperweed Consulting, Redynamics, OpenStack, CloudStack, VMware and Amazon.

Roadmap – It has both a direct sales and a channel program. Seamless, Pepperweed and Redynamics are resellers. It is a Microsoft partner, and Microsoft currently refers customers to Cloud Cruiser or its channel partners (e.g., Redynamics focuses on Microsoft System Center with Cloud Cruiser).

Competition – Other chargeback and billing systems (including homegrown), Apptio.

Pricing – It supports traditional software licensing and SaaS-based licensing, and also provides installation and customization services directly or via channel partners.

SLAs/Enforcement, Accountability, Cyberinsurance – It has standard software licensing agreements, and is able to implement SLA indemnification as a feature of its offering. SLA information is simply another usage input for manipulating end-user charges. If an SLA is not met, Cloud Cruiser can react in various ways, including a reduction of charges, credits, etc. Thus, it facilitates a service provider or IT department to become accountable. No cyberinsurance is offered.

Platform Functions

Consolidated Interface – Cloud Cruiser provides a single interface for cost intelligence/chargeback/financial management across multiple cloud environments.

Execution of Resource Request – Handled by the deployment engine (e.g., HP CloudSystem).

Delivery Model ('XaaS') – Cloud Cruiser supports all cloud models. It can provide cost management for raw infrastructure or high-level applications and service. For instance, it can provide visibility and charges for resources like CPU, memory, VMs, storage or higher-level usage metrics like users, transactions, mailboxes, etc.

Service Recommendations – It claims to provide visibility into all costs. Going forward, we'd expect it to provide a means to take action based upon outcomes and modeling.

Value-Added Services – It has integrated with single-sign-on environments and claims a customer-defined hierarchical multi-tenant architecture, allowing users to only see their own costs. It offers a wide array of pricing models, such as variable, tiered, try-and-buys, discounts, schedule-based and more. This allows the broker to fine-tune their pricing and enables easy on-ramping of new customers and service providers.

Aggregation – Customers, departments and services can span multiple deployments. For example, a service may have part of its capacity deployed from a private cloud and part from a public cloud – and Cloud Cruiser can handle this and provide proper financial management. Cloud Cruiser's data aggregation and cost analytics enable the broker to negotiate discounts, plan for future resource needs and drive greater profitability.

API Support – Cloud Cruiser has both northbound and southbound APIs. Northbound APIs allow collectors to be developed by the customer, SIs or Cloud Cruiser to pull usage or billing data from virtually any source (infrastructure, hypervisors, cloud management platforms, facilities, SLA monitors, service desks, applications, etc.). Southbound APIs allow Cloud Cruiser reports and data to feed accounting systems and more.

Integrated/Federated Services – Similar to aggregation, Cloud Cruiser supports this model from a financial/cost perspective.

Fulfillment/Resource Creation – Resource provisioning/creation is performed by a cloud management platform (e.g., HP CloudSystem, System Center).

Billing and Metering – This is the core value of Cloud Cruiser.

Marketplace Functions

Services and Pricing – Pricing is software-license-based, and revenue-sharing-based with strategic accounts.

Arbitrage (Enabling Users To Choose Between Similar Services) – It facilitates this with post-deployment chargeback and analytics.

4.4 COMPATIBLEONE

HEADQUARTERS	Open source project coordinated by Bull SAS, France
STAFF	N/A
FUNDING	€10m for R&D
REVENUE	Pre-revenue

Offering – CompatibleOne open source, Accords Platform. Public launch in November 2012 under Apache V2.0.

Capabilities – Cloud services broker provides a single consistent interface to multiple providers. It features automated provisioning and deployment of workloads with governance and security policies.

Target Markets – Hybrid cloud operation – IT vendors and distributors, telcos, service providers, cloud software providers.

Differentiators – Open source foundation. CompatibleOne and self-deploy the Accords Platform on any cloud infrastructure. 'Cloud-aware' application is compliant with cloud characteristics – i.e., on-demand, multi-tenant, self-service, elastic, measurable.

Partner Ecosystem – Cedexis, ComputeNext, eNovance, Intel, UShareSoft, Prologue.

Customers – Use-case scenarios are being developed with partners.

Competition – RightScale, enStratus.

Pricing – Pricing will be set by the companies operating the platform.

SLAs/Enforcement, Accountability, Cyberinsurance – Apache V2.0. CompatibleOne offers a means to control correct execution of workloads and to audit all operations in order for operators to provide transparency and process to their customers.

Platform Functions

Consolidated Interface – CORDS (CompatibleOne Resource Description System) for description of cloud resources.

Execution of Resource Request – Automated deployment of cloud resources.

Delivery Model ('XaaS') – IaaS, PaaS.

Service Recommendations – CompatibleOne Platform resolves provisioning decisions as brokering, where the platform is an intermediary between other commercial entities and mediates between offers as required by operational and other constraints.

Value-Added Services – Supports various ID management applications.

Aggregation – N/A

API Support – The usage of CORDS model enables the platform to describe any cloud resource, application or service. The OCCI proxies (PROCCI) enable it to match this model with any cloud API.

Integrated/Federated Services – Leading open source cloud provisioning systems, OpenStack and OpenNebula, and on Amazon EC2, Microsoft Azure in an interoperable fashion with the other open source and third-party cloud provisioning systems.

Fulfillment/Resource Creation – In accordance with SLAs.

Billing and Metering – Allows definition and automatic connection of monitoring channels for the surveillance of deployed application components and their operating conditions. Performs automatic financial transaction recording for all priced operations and commodities.

Marketplace Functions

Services and Pricing – Provided by third-party services, such as ComputeNext Federated Marketplace, for example.

Arbitrage (Enabling Users To Choose Between Similar Services) – Implements SLA categories, which enables it to describe both customers' needs and providers' capabilities. The CompatibleOne placement service enables it to place workloads on providers that match the customer's criteria. This placement can also be influenced by usage-defined algorithms – e.g., security feature, geographical localization or energy consumption.

4.5 COMPUTENEXT

HEADQUARTERS	Bellevue, Washington
STAFF	8
FUNDING	$2m in two rounds. Will raise a further round in Q1 2013
REVENUE	~$10,000 per month

Offering – Federated Cloud Marketplace.

Capabilities – Connects users with suppliers in 'Expedia-style' model.

Target Markets – <$100m-revenue enterprises with niche needs; startups, developers, international incubators. European SMBs dealing with cross-border data.

Differentiators – Offering options/choices in the marketplace; transparent pricing, with no mark-ups; 'single pane' to control all the resources from across various cloud providers.

Partner Ecosystem – Systems integrators, 'cloud brokers'/consultants without a platform, ISVs and app developers that have been shunned from the AWS marketplace (which includes all developers without a US base of operations).

Customers – It's working on two large named account (PoC) projects, set for completion in Q1 2013. Use-case scenarios: global footprint that requires multiple providers; unified billing and BEV function across existing providers; location; benchmarking; CDN expansion; app developers expanding their reach.

Roadmap – Recruiting SI, SaaS and PaaS players in the ecosystem to drive channel utilizing ComputeNext inventory; business intelligence.

Competition – Virtustream's Enomaly SpotCloud, Zimory, Besol's Tapp, Gravitant.

Pricing – Agent fees: 15% transaction fee from compute providers; 15% transaction fee from app providers (whereas AWS marketplace charges 20% and only allows for deployment on its own infrastructure).

SLAs/Enforcement, Accountability, Cyberinsurance – Standard terms and conditions are applicable, and consumers are bound by the providers' legal agreements. ComputeNext operate across control plane; it will take responsibility for level-one problems, but hands off after that (customer/provider retain relationship).

Platform Functions

Consolidated Interface – Marketplace interface consists of an inventory of procurable, on-demand services offered by each of its cloud providers.

Execution of Resource Request – User executes requests via dashboard or API. Chef, jclouds and CORDs (CompatibleOne) access gateways are in the works.

Delivery Model ('XaaS')

IaaS: Its core product, the federated marketplace, currently exposes the service catalog and thousands of compute variations of eight diverse IaaS providers for procurement on ComputeNext site.

SaaS: ComputeNext is currently enabling its first outside app/SaaS developer to push image into its marketplace and replicate across clouds. Another PoC effort is in progress for $20m SaaS provider to expose ComputeNext inventory to its users via its Web GUI.

PaaS: Coming soon – ComputeNext in talks to enable its brokerage as an IaaS inventory for two PaaS providers.

Service Recommendations – Some brokers are developing VAR-like portfolios, and recommendations may not actually be in the customer's best interests, according to ComputeNext. Thus, ComputeNext itself doesn't make recommendations – in turn, it offers wide choice and enables end users to make effective data-driven decisions facilitated by community-procured recommendations, ratings and reviews.

Value-Added Services – Search & discovery across cloud services; services have been normalized in the back end; access management to various services/resources; unified and granular billing; snapshots; image management; and cross-cloud security groups.

Aggregation – Aggregation of many providers and their service catalogs – has 10+ providers live now: SoftLayer, OpSource, GoGrid, BroadCloud, HP Cloud, Arsys, AvantaaS, CloudSigma, Bit Refinery, SoftCom, GreenQloud, Internap, Joyent; and 20+ in pipeline (many in APAC, EU).

API Support – Search and Provision APIs integrated into provider gateways.

Integrated/Federated Services – Platforms: OpenStack, Eucalyptus, VMware, OnApp, CloudStack, as well as multiple libraries like DeltaCloud, jclouds, Cloud Foundry.

Fulfillment/Resource Creation – Procurement is fulfilled with full lifecycle resource management.

Billing and Metering – Integrating OneBill as a subscription billing engine – granular billing reports vs. Amazon, etc. For end users: unified billing, granularity, reports. For providers: billing enablement (metered, tiered pricing, foreign currencies).

Marketplace Functions

Services and Pricing – Pricing: It is a transparent marketplace; the prices of the IaaS + image bundles listed on the marketplace are 'as is,' managed by the providers or app providers themselves.

Arbitrage (Enabling Users To Choose Between Similar Services) – Choice is normalized in the back end (API/platform abstracted), and exposed in the marketplace (federation trends toward interoperability). Strong inventory model and search/discovery enables choice and efficient procurement/consumption of services. Matches requirements with resources available on global market.

4.6 FEDR8

HEADQUARTERS	Camberley, UK
STAFF	<5
FUNDING	Partially funded by UK cloud and VDI shop CDG
REVENUE	Claims some revenue from consulting and email, plus some backup opportunities

Offering – Fedr8 expects to operate in three ways: as a reseller (of Microsoft, Google and others, making a small margin); by white-labeling products (such as DR and backup from Fujitsu); and by creating its own services, such as online backup. It will do the lifting (i.e., conversion and migration of workloads between vCloud, AWS or OpenStack) as part of this – but this isn't the core of its offering. Between consulting, cloud service brokering and bridging across infrastructure, the biggest opportunity – and the primary revenue generator – for Fedr8 will be the brokerage activity.

Capabilities – Fedr8 offers both cloud service lifecycle consulting and cloud service brokering. Cloud service lifecycle consulting includes cloud value assessment, strategy and design, implementation, business process enablement, and continuous service improvement modules.

Target Markets – It's targeting companies with 3,000-5,000 users.

Differentiators – Fedr8's goal is to move users through the journey to cloud much more quickly than with the path offered by traditional consultants and systems integrators – in three weeks, rather than three months.

Customers – Its reference user base is in manufacturing and financial services. It is a UK Government Procurement Service G-Cloud accredited service provider.

Roadmap – It plans to act as a broker of services, which will be the basis of its business, and to offer integration and migration as well. It will offer service brokerage on an international basis, but is currently only operating in the UK.

Competition – ComputeNext and Gravitant.

Pricing – The cloud value-assessment service costs from £10,000-30,000 ($15,500-46,500).

Platform Functions

Fedr8 provides aggregated cloud services (federation, integration) via its own platform, which sits above the IaaS layer.

A single portal is on the design board, in addition to a unified billing system. It will soon begin offering SaaS as well as IaaS, and it has PaaS in the pipeline.

Marketplace Functions

As stated, Fedr8 will operate in three ways – as a reseller; white-labeling products; and creating its own services. It will focus on cloud service lifecycle consulting and cloud service brokering.

4.7 GRAVITANT

HEADQUARTERS	Austin, Texas
STAFF	< 50
FUNDING	$3.7m of a planned $5m in August 2012
REVENUE	N/A

Offering – Gravitant cloudMatrix, MyGravitant.com – an online broker for IaaS and hybrid infrastructure clouds. It also offers a white-labeled Internal CSB for enterprises, SIs and other cloud providers.

Capabilities – On-demand cloud brokering, sourcing, cost control and management applications for enterprise IT across multiple cloud service providers.

Target Markets – Enterprise cloud management and IT management market; enterprises currently deploying private clouds; departmental customers looking to go to the public clouds; CIOs who would like to set up a single hub for brokering and managing cloud consumers and providers. It's also targeting the government market – state, federal, local – as well as education, healthcare, financial and other private enterprises (medium-sized to large size).

Differentiators – Simple and quick to design, size, purchase and provision a virtual datacenter across different sources – one-stop interface with built-in simulation. Sourcing and procurement for cloud services with integrated BOM. Integrated and current BOM to track and control costs while providing non-intrusive access to cloud services from multiple providers. Command and control: enables users to plan, provision, measure and control cost, resources and SLAs across different internal and external providers. Cloud brokering/management in the platform – managing catalog line items and assets in one framework.

Partner Ecosystem – Cloud providers: Verizon/Terremark, Savvis, AWS, Rackspace; SI/VARs: Hitachi, NJVC, General Dynamics IT.

Customers – Texas State Agencies (PoC) – customer deployed enterprise Internal CSB for its different agencies/business units to design, source, order, provision and govern public cloud services from AWS, Terremark, Savvis and GoGrid, along with third-party IT ops and managed services. Large SI and MSP for the US Dept. of Defense deployed CSB to offer it as a service to its current customers. Large private industry SI is offering CSB as a service to its multiple customers to broker IaaS offerings across public and private clouds (AWS, Terremark, VMWARE VCD and OpenStack).

Roadmap – CloudMatrix v6.3 features automated resource discovery across hybrid clouds; correlation to bill of materials; architecture and asset managed for application portfolio. CloudMatrix 6.4 (Q1, 2013) will feature chargeback management, integrated capacity and demand planning. CloudMatrix 6.5 (Q2, 2013) will feature policy-based governance of deployment, resource and cost management. CloudMatrix 7.0 will feature brokering of SaaS offerings.

Competition – *Cloud service brokers:* JamCracker, Parallels, AppDirect (all are supporting SaaS brokering); Gravitant specializes in IaaS and PaaS. *Cloud management space:* new vendors like RightScale and enStratus and ServiceMesh (focused on 'devops'). The 'Big Four' extending to cloud.

Pricing – *Internal CSB:* for enterprises – annual SaaS license + % of cloud spend; for SI/VAR/MSPs – annual SaaS license + % of spend. *Mygravitant.com:* SaaS pricing based on functional scope, number of users and assets brokered/managed. This is Gravitant's own online brokerage.

SLAs/Enforcement, Accountability, Cyberinsurance – It provides contracts and has customers sign them – pass-through model. It reports on SLA of cloud services consumed and provides third-party performance metrics from cloud harmony. Not all vendors have exposed SLA APIs yet, so it's a work in progress, but for providers that have done it (like AWS), Gravitant provides SLA compliance visibility.

Platform Functions

Consolidated Interface – A process hub for enterprise cloud consumption focused on business, IT users; self-service and role-based access to cloud consumption functions; unified interface for cloud planning, architecture design, sourcing, procurement, service provisioning and governance (including dashboards, reporting and integrated advanced analytics).

Execution of Resource Request – Design-time capability to aggregate resource; solution configurator that enables design and configuration of application and architecture services; simulation capability to size and assess resources; one-touch resource provisioning across IaaS and third-party ancillary services that enable enterprise-class datacenters.

Delivery Model ('XaaS') – Infrastructure; IT ops – monitoring, etc.; security – VPN, data encryption; managed services; app deployment services (third-party integration as part of a broker).

Service Recommendations – Comparison and sizing of services; identifying 'best fit' services.

Value-Added Services – Single sign-on; managed services.

Aggregation – Third-party services, data integration.

API Support – REST support.

Integrated/Federated Services – IaaS, third-party IT ops, devops, legacy data from behind firewall.

Fulfillment/Resource Creation – Automated self-service across clouds; manual for hardware and apps.

Billing and Metering – Consolidated billing across supported services – consolidated bill of materials.

Marketplace Functions

Services and Pricing – Multi-vendor service catalog; pricing engine to support different provider and private cloud pricing models; integrated and single system of record.

Arbitrage (Enabling Users To Choose Between Similar Services) – Comparison of solution scenarios that includes services sourced from multiple providers. Integrated bill of material and spend analysis across different sourcing scenarios.

4.8 NEPHOS

HEADQUARTERS	London
STAFF	Three founders, outsourced ITIL SOC, outsourced product development to India
FUNDING	Self-funded
REVENUE	<£200,000 in first year

Offering – Nephos cloud services brokerage platform.

Capabilities – One-stop shop for a range of third-party cloud services it is reselling, integrating and managing, plus consulting and migration services.

Target Markets – Media, retail, professional services and government.

Differentiators – Focus on helping customers avoid lock-in.

Competition – RightScale, Gravitant, enStratus, Flexiant.

Pricing – SaaS-based model.

SLAs/Enforcement, Accountability, Cyberinsurance – It aggregates contracts from cloud partners to provide a single, standard SLA and limited liability. It passes through any refund from breach of SLAs from the cloud provider. Claims to offer better SLAs than the cloud providers can directly, since it aggregates services from multiple providers to enable failover.

Platform Functions

Consolidated Interface – Yes.

Execution of Resource Request – Yes.

Delivery Model ('XaaS') – IaaS and PaaS – with SaaS and StaaS coming shortly.

Service Recommendations – Currently a manual process, but will soon be an automated process based on a number of external influences.

Value-Added Services – Automated DR between clouds; governance (set spending thresholds); identity access management; cloud optimization (cost and performance); and Cloud Decision Engine (ability to select cloud providers based on performance, cost and other factors).

Aggregation – All services are aggregated at the front and back end.

API Support – Currently supports 15 different cloud providers, bringing on about 10 a year.

Integrated/Federated Services – All federated through its system.

Fulfillment/Resource Creation – Connects to an Image Factory that enables creation of any images.

Billing and Metering – Centralized.

Marketplace Functions

Services and Pricing – Brokerage Platform (management, automation, orchestration, image backup, capacity planning, advanced monitoring); Enterprise App Store; Image Factory; Cloud Decision Engine; Cloud Optimisation; Multi-Cloud Load Balancer; Multi-Cloud DNS; CDN Optimization; Data Encryption; Managed Service. *Additional Services:* Storage as a service, backup as a service, cloud archiving.

Arbitrage (Enabling Users To Choose Between Similar Services) – N/A

4.9 RIGHTSCALE

HEADQUARTERS	Santa Barbara, CA
STAFF	200+
FUNDING	$47.3m in three rounds
REVENUE	N/A

Offering – RightScale Cloud Management.

Capabilities – Cloud management platform delivered via SaaS model.

Target Markets – Organizations running applications on public and private clouds; industries include advertising, consumer products, gaming, healthcare, media, MSPs, SaaS providers.

Differentiators – Enables the launching and migrating of workloads based on price, performance, SLAs, disaster recovery and more, without having to worry about how to customize or port applications from one provider to another. Will work across clouds and behave in a consistent and predictable manner – enabling brokering.

Partner Ecosystem – *Cloud partners:* RightScale integrates with and supports management of IaaS/PaaS providers; in most cases, RightScale can also resell and single-bill. *ISV partners:* RightScale MultiCloud Marketplace offers a publishing platform for ISVs to offer software across clouds – via ServerTemplates or Scripts or Recipes – to bill by RCU, by hour, or in bundles, and to have customers be single-billed. *SI/MSP partners* – RightScale enables resellers and integrators of the RightScale product with revenue sharing and wholesale pricing.

Customers – Multi-vendor and hybrid cloud use represents a majority of RightScale usage, including multiple public and public/private cloud scenarios. The most common examples are: applications are moved between public and private clouds as they mature (Zynga hybrid cloud for performance); applications are run in different clouds based on security and compliance (Shuffle Master private cloud for gambling operations); applications are run in different clouds based on geography (Coupa private cloud in Canada for data privacy); applications are run in different clouds based on business-unit preferences (Pearson uses AWS and Rackspace); applications are run in different clouds based on SLA (Quest Diagnostics uses multiple cloud providers).

Competition – Most 'cloud brokers' are currently SIs or consultants that advise on cloud vendor deployments, rather than software-based offerings. *Brokers* – Tapp. *Cloud marketplace providers* – UShareSoft and Standing Cloud may offer this sort of functionality in future.

Pricing – Subscription and support fee, charged per month; usage fee, per VM hour scaled to VM size (RightScale Compute Unit, or RCU); services one-time fees; single billing offered for IaaS/PaaS cloud services and ISV software.

SLAs/Enforcement, Accountability, Cyberinsurance – SLAs are defined by each cloud provider. RightScale does not assume liability for the terms of those SLAs.

Platform Functions

Consolidated Interface – Single dashboard and API to manage entire application lifecycle across cloud providers. Multiple cloud resources can be mixed and matched in a single view. Configurations work across clouds.

Execution of Resource Request – Administrators can constrain which types of configurations a user can launch and set soft budget quotas. If a user has permission, resource requests are self-service and made instantaneously across different cloud providers.

Delivery Model ('XaaS') – *IaaS* – compute, storage, networking; *PaaS-level* – load balancing, databases, CDN and many others.

Service Recommendations – RightScale does not currently provide service recommendations in its product, although its sales and services teams will make cloud and technology recommendations based on specific customer use cases.

Value-Added Services – Unified identity and access management with SAML/Active Directory; unified cost and usage reporting; portable and interoperable VM configurations; abstracted resources with similar behavior across IaaS and PaaS providers.

Aggregation – RightScale abstracts many aspects of IaaS resources – including machine images, storage entities, configuration models and security concepts – across clouds, including security groups (firewalls) and SSH keys. It aggregates application data across clouds, including monitoring, configuration, audit trails, logs, usage data and cost data.

API Support – RightScale exposes a set of APIs that are heavily used by its large enterprise and MSP customers.

Integrated/Federated Services – Resources can be mixed and matched across clouds to deploy applications or portfolios of applications – for example, VMs running in a private cloud with backups to a public cloud storage service and delivery by a public CDN.

Billing and Metering – RightScale provides usage metering and cost showback across clouds and services. It also offers single billing across RightScale, cloud and ISV services.

Marketplace Functions

Services and Pricing – For each cloud credential added, RightScale displays the available cloud services from the vendor.

Arbitrage (Enabling Users To Choose Between Similar Services) – RightScale has a free app, PlanForCloud, which allows companies to forecast their cloud costs. Users can specify the details of their deployments and usage patterns, and then calculate costs for different clouds or alternate scenarios (for example, purchasing reserved instances, using different types of servers, or using different regions). RightScale Cloud Management also shows cost estimates of various usage models at the launch of a resource (e.g., on-demand, spot, reserved) and enables users to easily deploy to new cloud resources.

4.10 RIVERMEADOW SOFTWARE

HEADQUARTERS	Westford, MA
STAFF	< 50
FUNDING	A round, March 2012
REVENUE	N/A

Offering – The enCloud cloud migration SaaS.

Capabilities – RiverMeadow is a passive cloud aggregator with an index of cloud providers based on cost and consumption characteristics. It matches end-user needs with ideal cloud providers. A functional layer orchestrates and federates servers/workloads between cloud instances based on end-user requirements.

Target Markets – RiverMeadow's direct customers/partners are carriers and cloud service providers; they own the relationship with the end-user customer. Other targets are top-level OEMs and SIs for cloud infrastructure (these companies also have the capability and business model to be brokers).

Differentiators – RiverMeadow says enCloud automates migration from start to finish, and eliminates the need to use a hosting provider (CSP) template or manual migration method.

Partner Ecosystem – CSPs (e.g., NaviSite), OEMs (infrastructure, cloud platforms), SIs, cloud management platform providers.

Roadmap – *Cloud service providers* – Top tier cloud and carrier cloud service providers; *OEMs* – cloud infrastructure providers as CSP enablers & cloud brokers (leveraging infrastructure installations); *SIs* – as cloud brokers to CSP platforms via enCloud SaaS.

Competition – Racemi Cloud Path & DynaCenter, RackWare, AppZero, Appcara, enStratus, 6fusion, OnApp, CliQr.

Pricing – Sliding scale per migration (e.g., 500 migrations/mo for $X)

Platform Functions

Consolidated Interface – Dashboard view of workloads in the cloud, location, status, characteristics and analytics.

Execution of Resource Request – Input credentials to access and integrate enCloud SaaS into CSP ecosystem for availability to CSP services or end-user client migration teams. Single point-and-click migration for enacting core migration functions (collect, convert, deploy, sync).

Delivery Model ('XaaS') – Cloud migration as a service (CMaaS); disaster recovery as a service (DRaaS).

Value-Added Services – Automates the migration/on-boarding of servers and workloads into and between public, private and hybrid clouds; physical-, virtual- or cloud-to-cloud; supports Windows and Linux; DR as a Service for CSP platforms.

API Support – Rich API for SI and OEM partners to develop repeatable workflows and tight integration with cloud and management offerings.

Integrated/Federated Services – enCloud places server/workload migration into a single point of control that is hypervisor-agnostic and interoperable among cloud flavors.

Fulfillment/Resource Creation – SaaS-based offering from datacenter appliance.

Billing and Metering – Billed on a per-migration basis.

Marketplace Functions

Services and Pricing – Per migration.

Arbitrage (Enabling Users To Choose Between Similar Services) – RiverMeadow presents options and allows uses to make a choice between similar services.

4.11 VIRTUSTREAM

HEADQUARTERS	San Francisco
STAFF	200+
FUNDING	$75m, including A and B rounds
REVENUE	N/A

Offering – Virtustream offers xStream and SpotCloud. SpotCloud provides a consolidated interface for buyers and sellers and is available globally. Buyers can filter available providers by inventory type (CPUs and RAM of virtual machines) as well as physical location. Results are displayed with provider information, including price, duration of availability and provider rating. Buyers are required to create a profile on SpotCloud and deposit funds in order to bid on available instances and complete a transaction. In addition to the marketplace functionality, SpotCloud also provides a data repository of pre-built virtual appliances, as well as the functionality for users to upload their own templates.

Capabilities – SpotCloud in xStream enables users to access verified providers for additional cloud capacity, and allows migration of images and data to and from providers. Any will be able to provide any spare or idle private cloud capacity as available inventory on SpotCloud.

Target Markets – Enterprise end users.

Differentiators – SpotCloud integrated into xStream enables users to access capacity from other xStream users.

Partner Ecosystem – Citrix, IBM, EMC, Intel, NeverFail, NetApp, Oracle, Microsoft, VMware, SafeNet, Red Hat and more.

Customers – Virtustream claims 50 corporate and 500 midsized hosting customers, with five beta customers of xStream – four enterprises and one service provider. Customers include Allied Irish Bank, Barclays, DirecTV, Domino Foods, Fannie Mae, News International, GlaxoSmithKline, NHS, Pizza Hut.

Roadmap – Virtustream is enhancing SpotCloud for enterprises to offer: service levels of infrastructure inventory; value-added services such as backup, disaster recovery and tiered storage; security and trust compliance (e.g., Intel TXT silicon-level authentication, FISMA compliance, etc.); consumption data reporting via its Micro-VM technology. This will also be available as software for third parties to build and operate their own cloud marketplaces, as well as a service offered by, and integrated into, xStream Enterprise Cloud platform, enabling xStream users to access verified providers for additional cloud capacity, and will facilitate secure, compliant and trusted migration of both images and data to and from registered providers.

Competition – Essentially, all in the cloud broker space.

Platform Functions

Consolidated Interface – There is a common interface for both buyers and sellers, although the options are specific to each role. Seller setup is a bit more involved, for example, due to network connectivity and service registration process between exchange and seller.

Execution of Resource Request – Requests are immediately cleared with providers and executed as buyer requirements are met.

Delivery Model ('XaaS') – Primary focus around infrastructure (compute) offerings. Future intention to provide PaaS.

Service Recommendations – Buyers have the ability to rate individual sellers. SpotCloud currently provides data around sellers' geographic location. Additional criteria around certification-compliant infrastructure (PCI, FISMA, etc.) enhanced security (silicon-based trust authentication) and SLAs will be introduced in 2013. One of the additional categories may be applications, at which point recommendations about providers focused on certain vertical markets or technologies will be made.

Value-Added Services – The IAM function will be extended to support integration with provider environments/landscapes or third-party authentication (oAuth and others) in the future.

Aggregation – Aggregation of services across multiple marketplaces is planned. This assumes there are industry verticals or closed marketplaces where aggregation is appropriate.

API Support – Buyer, provider and administrator APIs are available.

Integrated/Federated Services – Federation with other marketplace offerings is planned.

Fulfillment/Resource Creation – Fulfillment is performed by the provider of the infrastructure.

Billing and Metering – Consumption is based on run-time of the appliances or applications at a provider's locations. These are estimated and charged for based on increments of run time.

Marketplace Functions

Services and Pricing – Pricing is currently VM-based and can be provided by sellers on an hourly, daily or monthly basis. Support for Virtustream's Micro-VM and consumption-based billing at a predetermined rate will be coming in 2013.

Arbitrage (Enabling Users To Choose Between Similar Services) – The buyer is able to make decisions on their own through the user interface or by using the API for scenarios like automation, once pricing for compute falls below a certain threshold.

4.12 ZIMORY SYSTEMS

HEADQUARTERS	Berlin
STAFF	52
FUNDING	€7.2m in two rounds
REVENUE	€2.2m in last financial year

Offering – Zimory supplies cloud software for IaaS management.

Capabilities – Zimory enables a global neutral marketplace for IaaS resources – it brokers demand between service providers and customers.

Target Markets – Service providers, enterprises, exchange builders.

Differentiators – Enables unified cloud management and standardized trade of different virtualizations; automated settlement between supplier and user.

Customers – T-Systems has implemented Zimory.

Platform Functions

Consolidated Interface – Yes.

Execution of Resource Request – Yes.

Delivery Model ('XaaS') – PaaS and SaaS.

Service Recommendations – IaaS vendors that want to build app stores as an addition to their IaaS offering.

Value-Added Services – Quality control, enabling multi-source assembling, update support, and interface to license servers.

API Support – Yes.

Integrated/Federated Services – Federated services are supported.

Fulfillment/Resource Creation – Service creator module, service testing and approval/publishing support, helpdesk.

Billing and Metering – Functions are integrated.

Marketplace Functions

Services and Pricing – Zimory offers software for marketplace enablement, including brokerage functions.

Arbitrage (Enabling Users To Choose Between Similar Services) – Enables a fully transparent marketplace.

SECTION 5

Service-Provider Perspective

To develop an accurate picture of how service providers see the cloud broker opportunity, we interviewed more than a dozen of these firms – from hosting and datacenter providers to telecom operators. Overall, two-thirds of the service providers we spoke with had a positive view of the broker model. Their level of appetite/involvement varies from one service provider to another (see Figure 3).

At least 20% of these providers said they are already offering or are very likely to offer cloud broker services. A further 50% said they are somewhat likely to get into the business. This feedback suggests that some will prefer to get involved in the cloud broker business directly ('operate'), while others will look to take part via partnerships ('participate'). One service provider told us that the term 'broker' is a misnomer and that the perceived need for such a function is in fact a response to the need for a broader and more cloud-ready workload and management function than is available today.

Reasons for these vendors to participate in the cloud broker business include:

- Value creation
- Aggregation gets volume
- Effective channel sales enablement
- Service extension
- Desire to avoid being left behind.

Despite an apparent shared interest in exploring the potential of the cloud broker model, with the exception of one interviewee (which claims to be in the early phase of the cloud broker business), interested parties have yet to come up with any concrete implementation plans. Their concerns are that issues associated with service integration, pricing models and service management remain mostly unresolved, and therefore point to a market still in its infancy. There will undoubtedly be further tweaks of the business model here before something sticks in the market, and we see providers keeping their powder dry until the opportunity becomes clear, lest they overshoot the market.

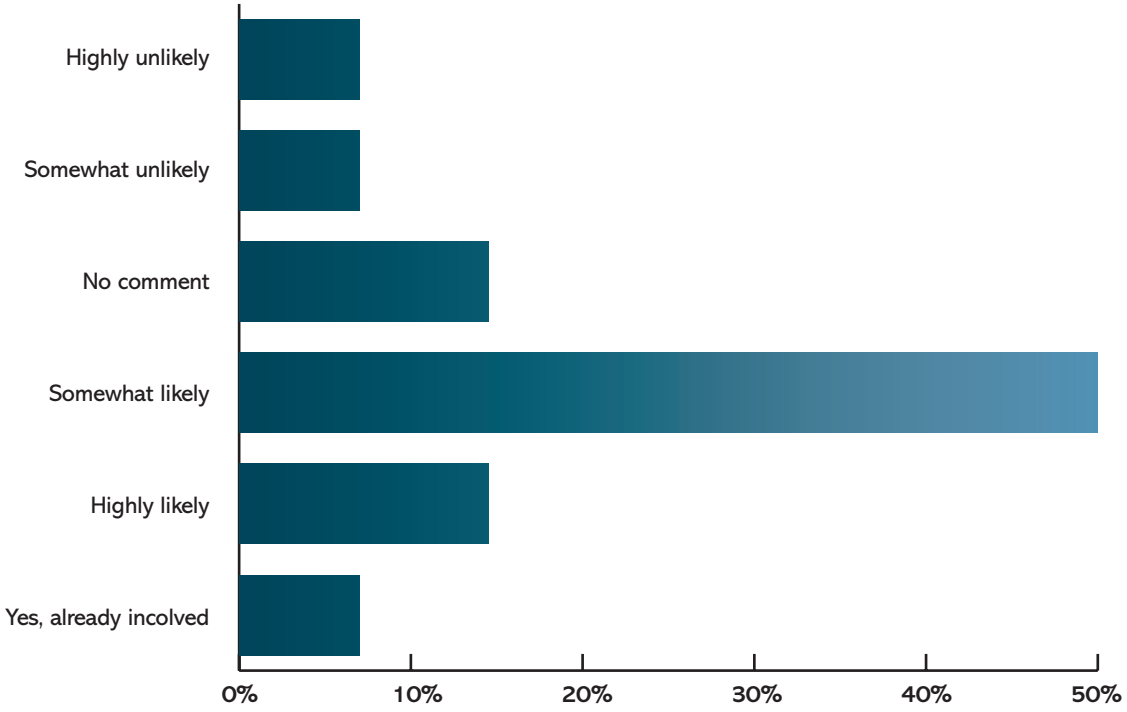
Responses at the other end of the spectrum suggest that the cloud broker model won't be a part of every service provider's armory. Approximately one-third of the providers we interviewed either have no plans for or no interest in the cloud broker business. As they see it, the broker model would need to mature significantly to bring additional value to their infrastructure services business. This is especially the case for cloud providers looking to differentiate services through technology innovation, reliability, security and manageability.

Cloud service providers we interviewed were somewhat skeptical when it comes to partnering with cloud brokers, pointing to their lack of deep technical understanding of

enterprise requirements, business viability (most are startups, of course) and liquidity (number of services offered). Brokers threaten to disintermediate them.

The key thing that service-provider responses warn of is that price-driven mechanisms to differentiate between cloud providers and their offerings could lead to a mismatch between expectations and reality. After all, it's very hard to do a fair cost comparison – a 20% variability in price is nothing compared with potential performance differences between clouds.

SURVEY RESULTS: WILL YOU GET INVOLVED IN THE CLOUD BROKER BUSINESS?



Companies surveyed: AT&T, Concentric, Datapipe, Equinix, Hostway, Hughes Cloud Services, Logicworks, Peak 10, PEER 1 Hosting, Racksapce, Savvis, TDS, Tier 3 and Windstream.

5.1 IMPLICATIONS

Does it make sense for providers to operate or participate in a mechanism that provides the end user with arbitrage opportunities? Brokers clearly offer ways to reach a wider audience and additional markets, and to potentially monetize underused resources. However, this is not the same as operating or participating in an application marketplace. A broker service can provide a channel and a storefront, but it can also disintermediate the provider from the buyer.

Playing the role of an intermediary, cloud brokers can potentially complement the marketing and deployment strategies of service providers – especially tier two providers seeking additional geographical reach and the ability to tap into new markets.

Cost savings may well be the yardstick by which the usefulness of cloud brokers are measured, but their true value does not rest solely on this economic model. The ability to hide the complexity of IT procurement and provide a consolidated interface and unified billing mechanism should not be ignored. Moreover, cloud brokers should be able to act as a control point for delivering users' requirements to the best execution venues.

5.2 AMAZON

As the biggest supplier of IaaS services by a long way, Amazon will be a key source of resources (liquidity) for brokers of all hues – those providing introduction and matching services, brokers with full-service federation or integration, broker-dealers, exchanges and more. So how does Amazon see this opportunity? In short, thumbs-up for basic user-to-XaaS provider introductory and matching services, and thumbs-down for all the rest.

In Amazon's view, the first and most problematic aspect is the complexity involved in federating, migrating and managing workloads between different clouds, which is too steep. It won't work, in Amazon's opinion. Cloud types aren't compatible enough to make this work smoothly, and the gap between them will only get wider as cloud providers iterate products and pricing even faster. Even if providers use the same underlying technologies and products, they would still implement them differently or cause them to act differently. APIs may be fairly coarse at the outset of service creation, but they get built on very quickly, Amazon observes. (And it has no plans to establish any kind of legal framework to guarantee its APIs – it reserves the right to change them at any time).

Second, brokers introduce intermediation, another price sticker – meaning they won't be able to provide cloud services at the lowest cost. Meanwhile, service providers are likely to fight tooth and nail to avoid disintermediation. Third, in order to be successful, a broker/exchange will need liquidity, which – for the reasons above, and because there aren't enough choices – won't come to pass anytime soon, Amazon believes. Moreover, cloud service suppliers in general are offering higher-level services, which end users are consuming as bundled or packaged services. Equivalents are not going to be readily available or moveable across different providers. Last, and by no means least, Amazon says it tried building a broker function for use internally, but gave up due to the complexity.

So what about the marketplaces Amazon itself operates – for reserved instances and spot instances? It certainly hasn't done this to prevent users from trading capacity on third-party exchanges. It believes these markets enable users to better undertake capacity planning and provide the ability to exchange instances based on price or demand changes. Organizations can, for example, look at demand histories and migrate this capacity to reserved instances and sell others, or buy capacity on spot markets for near-term requirements. It has considered opening these marketplaces up to third parties, such as brokers, but it has no current plans to do so.

Interestingly, when Zimory Systems announced its public cloud and the intent to operate an IaaS marketplace back in 2009, Amazon said at that time it would be prepared to connect to it and provide liquidity. The marketplace didn't ultimately get off the ground, though.

Amazon uses a raft of third parties to reach markets that have typically been harder to reach – principally enterprises. Systems integrators, trusted advisors and other on-ramps are needed in part because, as we've said, the cloud is still not for the technology faint-hearted – even for big organizations. However – and perhaps more so for large organizations – it's the need for organizational change management and radically different procurement policies that are core to cloud adoption here, rather than the technology itself. Trusted relationships, security and availability trump brand and the underlying technology.

SECTION 6

Broker vs. Direct Approach

What are the advantages and disadvantages to using a cloud broker vs. dealing directly with the cloud/hosting service provider?

In the broker model, buyers can gain access to multiple providers via a common interface that allows them to select options based on price and service, without having to go through multiple sign-up processes. They may be able to consolidate their source image data in a single repository. Brokers provide integrated billing and a common approach to inventory across providers, and they serve as an aggregation point for demand.

However, if there comes a point for companies where infrequent, batch-based tasks that have been running in a cloud turn into more predictable, steady-state applications, then the broker model makes less sense. Once a workload becomes predictable and sizable enough, additional investment in a more permanent infrastructure makes more economic sense.

Moreover, in exchange for pledging predictable consumption of infrastructure, buyers receive additional visibility, service offerings and SLAs from a provider. If a buyer knows an application will run with a given footprint +/- 10% for two years, this drives predictability for its internal cost structure, and can potentially allow it to extract better pricing from its provider. However, offering a predictable revenue stream, and knowing that the capacity will always be there and how much it will cost, is the exact opposite of what will allow the broker model to thrive.

Providers are less likely to invest in additional service offerings that require higher touchpoints or interaction of staff for transitory customers who may or may not be around the following month. Value-added services like backup and recovery, managed networks or application managed services don't make sense for workloads that aren't predictable consumers of underlying infrastructure.

However, as the broker market evolves, the types of organizations looking to leverage this market are changing. Historical investment in broker services has been driven primarily by providers looking to sell unused capacity. As an example, Amazon's 'Spot Instance' market is less of an open market and more of a strategic resale mechanism for its excess capacity – whereas our definition of a 'market' implies more than one provider.

Data from 451 Research's enterprise end-user program indicates that high-level messages around transparency, security and availability resonate best with users. Moreover, giving end users control, transparency and security, with a strong SLA and management processes, is the key to managing and building trusted client relationships. Service providers and brokers alike should be able to take advantage of these end-user findings to improve their offerings.

Vertical markets – especially in government and the public sector – and other community use cases are expected to drive demand for cloud exchanges. The UK government's G-Cloud, for example, provides a catalog of accredited XaaS services that can be used by UK public-sector agencies, according to different Business Impact Level certifications.

6.1 ADVANTAGES OF BROKER MODELS

- Purchasing power & economic efficiencies (if in a free-market model).
- Market knowledge, pricing knowledge, technical knowledge.
- Options and flexibility.
- Access to wider audience via federation/global choice.
- Ability to compare and make data-driven decisions (service arbitrage).
- Manage demand and supply.
- Better alignment of management (CIO) and IT vision.
- Can stage enterprise requirements through T&S, QA and deployment environments as necessary, and to IT to transition to the next IT service delivery model.
- Unified billing mechanisms.
- Pre-qualification on services and workloads – matching engine.
- Less headaches in contract/vendor management.
- No vendor lock-in.
- Hedge against cloud outages.

6.2 DISADVANTAGES OF BROKER MODELS

- Brokers mark up price or have an opaque model.
- Intermediaries bring process issues into play – i.e., a resulting time lag to execution. (But this may be handled by brokerage platforms.)
- Strong relationship and customer support might not be apparent.
- Questions on ownership of SLA, its enforcement, and remuneration – what's the insurance policy, and who pays?
- Direct relationships will always be advantageous in some situations – i.e., if you're doing physical hosting, to build out complete custom offerings, or have significant size.
- Cloud brokers may only support a subset of total available vendors and services.
- Technology provisioning and deployment APIs have to be maintained at the orchestration platform level.
- Major providers build larger ecosystems that are richer.
- The broker market has a small number of players, most of which are recent startups that lack business viability; moreover, revenue generated from sales through brokers is at this point too small to count.

INDEX OF COMPANIES