Multicloud Portability

for dummies®

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Survey your cloud landscape

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Build a cloud to fit your needs

—

Make your hybrid multicloud happen

Ed Tittel
Eric Schabell
Roel Hodzelmans
Gordon Haff

Red Hat Special Edition

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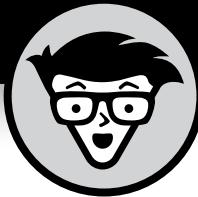
Multicloud Portability

Red Hat Special Edition

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Multicloud Portability For Dummies ®, Red Hat Special Edition

Publisher's Acknowledgments

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Introduction

The cloud rules computing as we know it today. Cloud computing is everywhere with IT infrastructures of all kinds and sizes extending into private and public clouds. For most organizations, a single cloud isn't enough for IT (and users, customers, partners, and more) to get the job done. That's why understanding how multicloud can benefit your business is so important.

About This Book

In this book, you take a journey, looking closely at what multicloud means for your business, and its various applications, data, and services. The term *multicloud* is best defined as "using multiple cloud platforms from multiple providers for multiple tasks." Therefore, a multicloud involves several different public or private clouds.

"Why multiple clouds, and not just one" you ask? Good question! Organizations usually use different clouds to meet various goals. Such goals include achieving greater flexibility, reducing costs, avoiding vendor lock in, and tapping into specific regional cloud providers. Digging into these goals is the focus for *Multicloud Portability For Dummies*, Red Hat® Special Edition.

Foolish Assumptions

Although making assumptions is a risky business, we make some about you, the reader, in writing this book:

>> We assume you're a cloud administrator, cloud operator, infrastructure architect, IT manager, or executive who wants to understand multicloud architectures and their proper design, configuration, and management.

>> We assume you're somewhat familiar with two or more cloud platforms and technologies, such as OpenStack®, Amazon Web Services, Microsoft Azure, Google Cloud Platform, Alibaba Cloud, the IBM Cloud, and more.

>> We assume that while you might not have a technical job, you're "technical enough" to understand how the multicloud works. You also understand which cloud technologies and services your organization currently consumes and want to understand how to craft a cost-effective and efficient multicloud setup.

If these assumptions make sense, this book should, too. If not, keep reading anyway. It's important info, and when you're done, you can appreciate how a multicloud setup could work in your workplace.

Icons Used in This Book

We sometimes use special icons to focus attention on important items. Icons you see in this book include the following:

REMEMBER Remember icons note information that's worth recalling.

TECHNICAL STUFF Take this icon in one of two ways: Nerdy types can zero in on juicy and significant details; others can skip to the next paragraph.

TIP Tips flag something useful or helpful by way of suggestion, advice, or observations.

WARNING Warnings grab your attention to steer you clear of gotchas, time-wasters, and other pitfalls. Beware!

Beyond the Book

There's only so much we can cover in the short pages of this book. If you want to find out more, visit these URLs:

>> www.redhat.com/en/topics/cloud-computing/
what-is-multicloud

>> www.redhat.com/en/topics/containers/
why-choose-red-hat-containers

Chapter **1**

Surveying Your Cloud Landscape

Multicloud is an approach that incorporates more than one cloud service, from more than one cloud vendor, either public or private. Organizations usually deploy multi-cloud environments to help them meet various IT-related goals that include improved flexibility, lowering costs for IT services, avoiding vendor lock-in, and tapping into regional cloud provid-ers (especially relevant for companies that operate globally, where a single provider may not be available in certain locations, or where they offer specific cloud features otherwise unavailable).

Important business goals also drive multicloud adoption. These include the desire to accelerate and foster innovation, to pro-vide new and better services to customers. Ultimately, it's also about increasing revenues along with market and mind share. Because IT is really there to help organizations succeed, multi-cloud increases the chances for such success.

Multicloud is also as much a strategy as it is a sourcing deci-sion, so it's important to know what you're dealing with. This requires taking stock of your current infrastructure, both physical and in the cloud. It also requires understanding your computing

needs, so you can determine if what you've got is necessary and sufficient, or if some other combination of ingredients — including additional or different private and public clouds — might work better than the status quo.

Multicloud can also involve a mix of public and private cloud components. Public cloud platforms are available from third-party vendors like Amazon Web Services, Microsoft Azure, Google Cloud Platform, Alibaba Cloud, the IBM Cloud, and others. Private cloud generally means employing cloud technologies in company- or organization-controlled datacenters, to make computing resources available across an entire organization, irrespective of location.

What Makes the Cloud Compelling?

Given that the vast majority of companies and organizations consume cloud computing resources or services of some kind — often, more than one kind, in fact — there must be good business reasons for doing so. And indeed, cloud computing offers numerous benefits and advantages to its consumers.

Cloud benefits in brief

Cloud computing is all about flexible computing power and resources, enabling faster software development, adjusting quickly to changing demand, and achieving cost transparency. Public cloud computing has revolutionized IT because it provides a viable alternative to capital outlays for computing equipment, space to house that equipment, and power, licensing and people costs to run that equipment.

TIP

The public cloud model confers many advantages to cloud computing consumers:

» Convert capital expenses to operations expenses (no more depreciation or amortization).

» Pay for consumption (costs are unit based, so consume more and pay more, or consume less and pay less).

>> Add storage and compute capacity when needed for peak consumption periods. There's no reason to over-build or over-provision IT to anticipate such peaks, while paying for idle excess capacity during non-peak periods.

>> Cloud service providers absorb the cost, work, and complexity of dealing with maintenance and upgrades (for both hardware and software). Cloud consumption frees organizations of those burdens.

REMEMBER

Pay-as-you-go and consume-only-what-you-need are two mantras, often repeated, and widely appreciated, used to justify investing in cloud computing.

A multicloud also covers the situation when it may not make sense to migrate workloads solely into the public cloud, however. This might be for reasons related to security, confidentiality, or regulatory compliance. The private cloud confers all the advantages of flexibility, rapid development, and easy innovation. But it does put limits on scalability and costs, which includes capital expenditures, and operations and personnel charges.

Workload deployment goals

The cloud sounds almost too good to be true to many prospective consumers. And in fact, it is a mistake to jump into the cloud just because it offers seemingly compelling economics and cost justifications. It's essential, in fact, for organizations to take a survey of their current computing infrastructure and assets — which may already include one or more public or private clouds, if not both — before investing (or investing more) in this technology.

In other words, if an organization is going to migrate from the status quo to a multicloud IT environment, it needs to understand specifically what it seeks to achieve and how it can get from its status quo to a new multicloud configuration. Not all organizations will be well or efficiently served by such a move, so it's important to work through the time, effort, and cost involved to get from A to B, as well as costs incurred when B is actually achieved.

WARNING

Many an organization has raced headlong into the cloud expecting to save big on IT expenses, only to discover that unexpected costs, delays, and difficulties turn an attractive target into a white elephant. It is downright crucial to map out, plan for, and above all understand the costs and consequences of doing a multicloud deployment.

The questions to ask as you survey your IT domain and ponder your present and future cloud posture must include

» What assets, information, and applications are in use?

» How well is the current environment working?

» Which compliance regimes apply to my data and customers, and how does the cloud affect them?

» How do current features, functions, and capabilities map against current and future needs? What's missing?

» What is the plan for ensuring data remains persistent and available over the whole hybrid multicloud environment?

» How do privacy, confidentiality, and integrity needs map to cloud provider SLAs and capabilities?

Organizations follow cloud's lead

Sometimes, current or pending needs for functionality can lead to adoption of specific applications whose vendors host them on a public or private cloud platform. This is a huge contributing factor that leads many organizations into a multicloud scenario.

Another profound contributor to the use of multicloud is proximity. To improve on poor response time for cloud users far away from company HQ (or certain public cloud providers), it may make sense to host certain workloads at regional cloud providers closer to where users are. This approach lets organizations maintain high availability and better response times. It also allows them to comply with data sovereignty laws that may apply in countries where data is located.

Multicloud environments also protect organizations from disruptions or outages. As a failover solution, multicloud provides organizations with available, highly scalable backups for data, workflows, and systems if — or perhaps *when* is more apt — a primary cloud goes missing.

And finally, so-called "shadow IT" often finds organizations backing into multicloud situations, sometimes unwittingly. Cloud instances deployed independently of central IT sometimes becomes substantial enough to warrant more oversight.

Mastering Cloud Combinations

Inevitably, a multicloud means that multiple types of clouds must be used in combination. This introduces some interesting and useful terminology. Read on for the details.

The hybrid cloud

Readers may wonder: "What's the difference between multicloud and hybrid cloud?" Multicloud means multiple clouds, either public or private, sourced from multiple vendors. By contrast, a hybrid cloud involves multiple types in a single deployment with some degree of integration and orchestration between components.

REMEMBER

When choosing cloud technologies, it's not always either private or public. You can create a hybrid and combine them. Neither option is absolutely right nor totally wrong. A multicloud approach, by definition, involves multiple clouds. A hybrid cloud approach involves multiple cloud environments plus some necessary unified management and orchestration to tie them together. What's most workable often emerges from trial and error — a good reason to bring in a trusted (and experienced) advisor.

Multicloud is inevitable

Organizations find themselves in a multicloud way for all kinds of reasons. These can include unintended involvement through shadow IT, ties to public or private clouds attendant to specific applications, added failover protection, or solutions designed to deliver better user experiences. Whatever the cause might be, for most modern organizations a multicloud scenario is either already a fait accompli, or just around the corner (in next year's budget and plan, if not already on this year's schedule).

The need for hybrid multicloud

The typical combination of public and private cloud components in most organizations can predispose them to adopt (or already use) a hybrid multicloud scenario. It's a wild and crazy world, but one that IT pros (such as system and network admins, infrastructure and datacenter specialists, data analysts, and application developers) and executives must grapple with. Ideally, they'd like to make the hybrid multicloud efficient and cost-effective as well.

That's where and how you come back to planning and strategy. Owing to the infrastructure requirements for orchestration, the workload deployment that hybrid multiclouds entail, and the data and storage considerations involved in migrating workloads, it's simply not viable to wing it and see what happens.

If organizations are to survive hybrid multicloud — which appears to be unavoidable for most of them — they must go into that encounter with eyes wide open and plan to cope with the potential pitfalls and gotchas. Anything else is simply unacceptable.

Chapter **2**
Strategizing Your Best Cloud Solutions

Taking multicloud seriously means formulating a real cloud strategy. In turn, this means understanding where your organization currently is, IT- (and cloud-) wise, and where it would like to be. To help you strategize effectively, there are numerous important points to ponder and plan for.

Is the Cloud "One Size Fits All"?

A hybrid cloud is a combination of multiple private or public clouds that enjoys some degree of workload portability, integration, orchestration, and unified management. If any single cloud were truly universal in scope and coverage, there would be no need to combine multiple clouds. But such a need obviously exists. And that need can be satisfied, if you can tailor a workable, cost-effective solution that combines clouds to meet your needs.

TIP

The key to a workable hybrid multicloud solution is to build the proper "connective tissue." This means designers must consider, and developers or implementers address, issues related to interoperability, workload deployment, data persistence and availability, and workable, effective connections between tasks running in different clouds.

The hybrid multicloud, in fact, is a next generation infrastructure. It requires that organizations rethink their current procedures, policies, and DevOps approaches. KISS (Keep It Simple, Splendido!) is paramount because complexity threatens hybrid multicloud success. Not all pieces and parts need be interconnected or integrated. However, we should always keep our goals of integration, portability, and interoperability at the top of our minds.

Where the Cloud Hits Limits

With all its lovely capabilities, global reach, and potential scale, the cloud is potentially unlimited. If the cloud is a network whose endpoints are everywhere and whose servers are arbitrarily located, there will be circumstances when even the best possible response times and network latencies aren't good enough for some applications. Thus, for example, it probably doesn't make sense to put real-time commodities or financial trading applications in the public cloud. When every (micro)second counts, that's not a good place to compute.

Other reasons that may argue against the public cloud in particular have to do with security, privacy, data accessibility, or confidentiality requirements. Strong encryption and careful attention to security make the public cloud suitable for many applications. But those that touch on highly sensitive, proprietary, or classified data may not always be among them. Users of related applications will recognize when it's not a good fit, if they're not explicitly instructed — or mandated — to avoid public clouds for security reasons.

TIP

For workloads where maintaining control over the data and content, and visibility of the computing and resource management activity is important, a private cloud will sometimes make more sense than a public one. Bear this in mind as you target workloads.

Here's something else to ponder: Do you want to migrate applications to the cloud that provide key competitive advantages or your most important lines of business? Before an organization moves such things to the cloud, it must be sure that they perform acceptably (and securely). If you store large volumes of data in a single public cloud, the cost of moving it elsewhere can be prohibitive. This kind of "data gravity" is another source of lock-in that's best avoided. Thus, you always want to aim for multitenant

workload isolation with a shared data context. Then, you can put data where you want, and move it when you like.

It's up to the organization, in fact, to determine which applications are best suited to a cloud environment and which are best left inside the organizational boundary.

Cost Constraints on Cloud

One factor that many organizations fail to grasp when moving to the cloud is labor costs. According to a 2016 *Tech Republic* article, labor costs can account for fully 50 percent of the bill to migrate into the public cloud. Orchestration, interoperability, and integration costs add to this total. Before jumping into a cloud commitment, organizations must factor such costs into their decision-making processes.

It's not just the services cost for cloud consumption that count. There are considerable costs involved in migrating to the public cloud and in integrating public and private cloud components for hybrid multicloud scenarios, too. But wait! There's more to consider when moving to the hybrid multicloud. Industry analysts and veterans both note that customer-facing applications usually include substantial new code, instead of simply relying on transporting existing code to cloud platforms. Development resources for hybrid cloud applications can be hard to come by . . . and expensive, too! Limiting developers to tools from a single cloud developer could also hamper developer productivity.

More clouds (public and private) means more careful monitoring for costs and consumption is mandated. *Business Insider* reports that more than 80 percent of on-premises datacenters have excess server capacity. They also observe that some organizations don't routinely monitor resource consumption there, either (licensing, electricity, cooling, and maintenance). Hidden costs inside the corporate firewall still count, even after public cloud brings related consumption costs into play.

Likewise, when organizations jump into public cloud service arrangements, they often end up overpaying. *Business Insider* reports further that companies pay an average of 36 percent more than they need to for cloud services they consume. Therefore, understanding public cloud providers' pricing and cost structures,

and using them to minimize actual outlays, is essential. Your own purchasing department may be able to help with this, or you may want to retain a cloud consultant who helps organizations optimize cloud costs.

REMEMBER

When negotiating with public or private cloud service providers, review and understand costs carefully and closely. Because it's vital to optimize the value of the outlays involved in paying for cloud services, make sure you get all this fully ironed out before signing any contracts.

Data Is Key!

No matter where it resides — on-premises or in a public cloud — ready access to and proper persistence for your data is key to IT success. This means that deciding where and how to store the data that applications and their users need is crucial to formulating a cost-effective and efficient hybrid cloud solution. This includes performance considerations, to empower users with a satisfactory experience (or better!) when working with data. It also includes arranging for underlying storage that applications need.

Storing data also includes other important considerations. Does the user's host country impose data storage requirements? What about privacy and confidentiality? Does the provider (or you) comply with the EU's General Data Protection Regulation (GDPR)? What happens if a service or network interruption or disaster occurs? Answers to all these questions are needed to make sure your vital information assets can persist over time and come and go safely, securely, and compliantly in or out of the cloud.

WARNING

Because of access, bandwidth, and transmission charges, the costs of transferring data out of a public cloud to another destination can be significant. In architecting a hybrid multicloud solution costs of data motion (and causes) are essential to plan for, calculate, and monitor.

Issues with Interoperability

In looking for a workable hybrid multicloud solution, putting the pieces of such a puzzle together is critical to success. This means making sure that the elements of your hybrid multicloud

can interact with each other without imposing undue hardships on your design and development teams at the start of migration, or your users, clients, or customers once deployment goes into production.

Key interoperability concerns or issues to ponder along the path toward a workable solution include the following:

» **Orchestration:** Will (or can) your orchestration tools and techniques mesh with the cloud provider's?

» **DevOps:** Will (or can) your automation tools and techniques meld with the cloud provider's? Do they offer automation APIs or tools you can use to aid this process?

» **Consistent storage strategy:** When you have a multicloud container platform, does it implement a consistent storage strategy to facilitate workload portability?

» **Self-service/portals:** Is there some way to cobble together a workable extension to existing self-service tools to incorporate or accommodate the service provider's offerings? Again, do they offer APIs or tools you can use?

REMEMBER

The best proof of interoperability is a pilot test of some kind. Most cloud service providers offer test drives or demo environments. These let your developers examine making public and private cloud components work together harmoniously. Be sure to take full advantage during selection, design, and deployment processes.

What's Your Exit Strategy?

Nothing lasts forever. This applies to service relationships with cloud providers, as it does to other things. If a provider goes out of business, is acquired by a competitor, or raises its prices beyond reasonable limits, you must be prepared to pick up the pieces and take them elsewhere.

Understanding what's involved in moving from one provider to another constitutes an exit strategy for those with hybrid multi-cloud solutions. This can be tricky and difficult to plan for but is an essential ingredient of entering into any business relationship. Don't forget the costs, effort, and risks involved in moving significant amount of data out of any public cloud, either.

Hybrid Multicloud to the Rescue

The real secret to successful hybrid multicloud architectures is to insulate the users, and their services and applications, from down-and-dirty details (especially provider-specific API calls or proprietary tools and technologies). This works best if you use an agnostic container platform that sits between users (or the organizational boundary) and public cloud services and resources. Then, you need not be so concerned about future migrations from one cloud provider to another.

In fact, the rework in moving to a new cloud comes from getting your agnostic container platform configured and running on the new cloud platform. After that work is done, your workloads should move over to the new environment without further issues.

Chapter **3**

Building a Cloud to Fit Your Needs

When creating cloud solutions, you must identify your needs first and foremost. Only then can you combine the right ingredients to meet them in a way that affords you sufficient flexibility, manages or (ideally) reduces costs, and avoids vendor lock–in. This process begins with a tally of your current situation, with an eye to what could or should be changed, replaced, or expanded on, particularly in the cloud direction.

Assessing the Status Quo

You can't get from "here" to "there" unless you know where you're starting from (and where you want to wind up). Here's what it takes to assess the current situation:

» **List your current operating systems and applications.**
Pay special attention to existing use of APIs, middleware, and custom development work, with particular emphasis on mission-critical or line of business applications. You also want to identify applications you know you need or want to add, change, or replace with cloud-based equivalents.

>> **Identify cloud-based applications or services.** Find out how they're deployed, provisioned, and managed. What kinds of dependencies and connections are involved? To answer this question, compile a complete picture of your applications, hosts, and the overall existing software architecture (the links and dependencies between and among architecture element). You must understand your data-intensive applications particularly well: Those that are deeply embedded in the data layer are difficult to move out of the public cloud.

>> **Create a baseline of current performance and availability for applications.** Use this to set performance targets for applications you wish to move to the cloud (or replace with a cloud-based equivalent). It's vital to understand the performance characteristics of critical applications. This permits you to identify potential big gotchas in advance.

>> **Prepare a cloud migration priority list.** This requires you to monitor and measure every layer of an application. For each application, examine potential errors or migration issues, and establish metrics for application and infrastructure health. This drives the all-important management dashboard you'll eventually use, if you don't have one already.

Moving Apps and Migration Goals

When choosing and adopting new, cloud-based applications, or migrating existing applications into the cloud, make sure that the new regime works as well, if not better, than the old. As you migrate, it's essential to catch and fix unexpected behaviors, performance and reliability issues, plumbing problems, or anything else that pops up along the way.

Set goals for the state of your infrastructure as deployment gets underway and works to completion. This makes handling issues related to any new cloud architecture, its performance and ability to scale, and general workability and manageability vital tasks. The key to success is to make sure you monitor usage, bandwidth consumption, errors and omissions as you go. Then, you will know how well things are working, and where additional effort or insight might be needed to smooth out wrinkles.

REMEMBER Use all kinds of metrics to establish and maintain the health and viability for your hybrid multicloud. Be sure to configure management tools and dashboard(s) to capture resource consumption (bandwidth, compute, storage, and so forth), availability, uptime, response time and latency, and application stability/error rates.

Who Ya Gonna Call? Cloud Partner

There is no single decision more important in achieving a successful move to a hybrid multicloud than the selection of a partner organization to assist with, or possibly to guide and manage that effort. By selecting an organization with prior experience and knowledge of the process, problems encountered and solved, and potential pitfalls, your organization can steer clear of common sources of delay, added expense, or outright failure.

WARNING In 2017, *InfoWorld* predicted that 1 of 3 cloud projects would fail in 2018. It's difficult and daunting to move an application portfolio to the cloud, or from one cloud to another, even for those who've done it before. First-timers will benefit from an influential partnership to help them get things right and to reduce risk of failure. Even those who've already had some experience can still benefit from expert help. Partner up!

Creating Your Business Case

Gee! The public cloud is wonderful and offers all kinds of opportunities to save on costs, trade capital expenditures for operating expenses, and pay for only as much as you consume. But all those benefits are theoretical and won't hold water (or do you any good) unless you can build and justify a strong business case for moving into the cloud. That goes double for a hybrid multicloud environment where you must also factor in the costs of achieving interoperability, avoiding vendor lock-in, and crafting a workable umbrella under which design, orchestration, and management will fit comfortably.

Putting pieces together from multiple clouds is a challenge. But if properly assembled, the end results mean better usage of resources without isolation in separate and distinct silos.

REMEMBER Most organizations cite cost as a profound driver toward hybrid multicloud solutions. But many of those same organizations still end up surprised by the total bill for cloud projects because they don't plan or account for labor costs completely or accurately enough. They also don't factor in continuing costs for on-premises IT and private cloud investments.

Public Cloud Platforms

Public cloud platforms come from big names such as Amazon Web Services, Microsoft Azure, Google Cloud Platform, IBM Cloud, Alibaba, and others. Integrating applications into these environments requires special, focused expertise on the APIs and services they deliver. This requires planning, design, pilot, and production efforts, plus ongoing maintenance and upkeep.

TIP Weigh the pros and cons of such providers. Look carefully at requirements, including time and effort, to move from a current application to a cloud-based alternative or equivalent. This step is where a good partner makes a big difference. Make sure to plan and account for personnel costs, plus costs for public (and private, where applicable) cloud services once a project gets underway. Most experts estimate that half the costs of moving to a hybrid multicloud goes to paying for person-hours necessary to get from the prior status quo to the target environment.

Working in the cloud

Before migrating an entire application portfolio, start small. Work with one or two high-priority items to see how things go and obtain a new cloud-based baseline to compare against the status quo. This helps you truly understand costs and benefits of migration to specific cloud platforms, with cons to consider as well as pros. Performance, resource consumption, and other key metrics can guide you in determining what fits your needs and budget best.

Benefits of abstraction

One big risk in moving to the cloud comes from the occasional but predictable need to drop one cloud platform or service provider and move to another. This might occur for business reasons such as cost increases, inefficiencies, market changes, competition, and so on. When you switch from one to another, all code that ties

your applications and users to cloud components may have to be reworked and rewritten.

There is, however, a valid design and implementation approach you can — and should — use to avoid vendor lock-in. It leans on open technologies to ensure interoperability, workload portability, and management. Such technologies work across multiple clouds — the essence of hybrid multicloud — to ensure workload portability. They insulate applications from hard-wired dependencies on underlying platforms and their APIs. This also eases the pain and effort involved in changing providers. Data and applications can be housed where they work best for users and your budget. And when change comes calling, it won't involve recreating the cloud solution you've already built.

Open technologies also help provide a common management view across specific applications, data, storage, and infrastructure elements you deploy. This approach also offers "cloud agnostic" integration for applications to interact with any or all of the public cloud providers. It also means that cloud data is easier to store and manage, for applications across whatever hybrid multicloud environment you adopt.

Picking Your Cloud Environment

By working with a cloud partner, and using metrics and pilot implementations to validate and demonstrate capabilities you want, you can assemble the elements that make up your cloud environment. Some may be dictated by specific third-party applications. Others will be needed to support mission-critical and line of business applications. Still more serve to support end-users and customers wherever they might be located, on whatever devices they use to access your applications, data, and services.

Measurements and experiences can guide your selection process and build on small successes to achieve bigger ones as you move into the hybrid multicloud. Eventually you'll put the pieces of the puzzle together that work best for you.

REMEMBER

At the risk of sounding repetitive, consider people and process costs when budgeting (and accounting) for migration efforts. Much of the real work and expense come from time and effort involved in researching, testing, and building actual solutions, not paying for cloud service costs.

Pondering Cloud Components

As you choose hybrid multicloud building blocks, pick items from a variety of bins to assemble a solution. These include the following:

» **Local components:** Some on-premises elements do figure into a hybrid multicloud solution. Keep track of such elements to monitor resource consumption, licensing, and other direct costs. Local assets are essential for proprietary and sensitive applications and data, and to maintain a physical computing presence for users.

» **Open technology elements:** These are enterprise open source tools, environments, and platforms designed to work across the spectrum of available public clouds.

» **One or more public clouds:** These are the cloud service providers you pick to provide hosting, services, virtual infrastructures, and so forth.

» **Storage, management, and more:** These vital elements help ensure interoperability, common management, and data storage for your applications and users. Consider them the resources that drive the infrastructure. Also, consider carefully what data needs specific locations, security and confidentiality constraints, and compliance requirements as you parcel out what goes where, and who gets to access it.

Chapter **4**

Making Your Hybrid Multicloud Happen

Assuming you've conducted a thorough analysis of needs and costs and have decided that a hybrid multicloud is in the cards, it's time to roll up your sleeves and get cracking. This chapter gives you some tips, tricks, and points to ponder to help you transition from wishing on a cloud to floating amidst them with style and grace.

Planning a Hybrid Multicloud

Multiple clouds can — and often do — chug along independently. To build a hybrid multicloud, however, you must integrate such cloud components so they can interoperate. Thus, hybrid multiclouds must include shared core software services to facilitate deploying workloads, resources, platforms, and applications between their constituent cloud elements. Building this plumbing is the biggest and most important task when constructing a hybrid multicloud.

Complex tasks don't work well — or at all — off the cuff. After you've made the "Go" decision for hybrid multicloud, use your plan to select and assemble those pieces. Your plan is a living

document, too, because things you learn along the way through initial steps have an impact on later steps. So plan to maintain your plan, as it guides your steps from planning through production.

Here are those steps, in not too much detail:

» **Survey and assess.** Take stock of applications and services in use, note where and how they run, and which ones are (or aren't) in the cloud already. You should also think about which ones make sense to migrate into the cloud. Then, prioritize those items so you'll know what to tackle first. (See Chapter 3 for more details.)

» **Characterize workloads.** You'll need to understand what resources applications need, of what kind, and how usage scales up with rising demand. Look for workload characterization tools to help with this.

» **Choose workloads for migration.** Pick, at the least, a short list that you can use for pilot testing.

» **Interview, evaluate, and build a short list of cloud service providers.** Understand their cost models, available services, policy controls, compliance stances, and migration tools.

» **Run one or more pilot tests.** For each cloud service provider on your shortlist, work through the process of migrating at least one high-priority application into their environment. This is a good time to start enlisting test users, so you can get their feedback on performance and functionality, too.

» **Set up and use management and provisioning tools.** This occurs along with the preceding item, and remaining steps as well. In addition, it makes sense to bring up and use container orchestration tools for packaging, installing, and configuring containers used to deliver abstracted access to applications, services, and data.

» **Make final provider selection(s), begin long-term migration process.** This part could easily take years to work through. Make sure you plan for fallbacks, and for a smooth transition for applications headed for the cloud.

» **Complete all surviving applications on the migration list.** This list, too, will change over time as old ones leave and new ones are added.

Where possible, you may even want to consider replacing existing applications with cloud-native alternatives or equivalents. They work better in a hybrid multicloud.

Plan Execution, Sans Failure

Planning and advice help foil problems before they occur. Set up a task force to advise, consult, and consent to your plans and pilots as the plan proceeds toward completion. It's especially important to enlist backing and participation from executives and other stakeholders, application owners, and the development and DevOps teams in your organization.

Working from Pilot to Production

The time to stop piloting and start scaling up for production is when one or more of your pilots gets the seal of approval from its target user population. That means the test users you recruit from that population must be engaged enough in your efforts to really work through them thoroughly. You want as much feedback from them as you can get and to act on all feedback you find actionable (be prepared to explain why you didn't implement the other stuff, too — it will come up).

Only when test users say the pilot is ready for prime time, should you begin the process of bringing other applications into production. The more important the application, the more it makes sense to pilot them first and foremost. Your test users will tell you when they're ready for prime time, too.

Monitoring and Managing Production Hybrid Multicloud

Curiously, many of the very features and functions that make the hybrid multicloud attractive and might therefore be taken as advantages also have their downsides. More providers mean more relationships to manage with added needs for contract negotiation and renewal, billing, and monitoring. This also means a

broader learning curve with more territory to cover. There's an undeniable increase in complexity as more players join the game, and intercommunication and interoperability issues loom larger. Likewise, managing and monitoring the whole hybrid multicloud itself becomes more interesting, if not more difficult.

It's possible to manage a hybrid cloud environment manually using multiple management tools, redundant policy implementations, and extra people to work the gears and levers. On the other hand, cloud management tools — such as Red Hat Ansible® Automation — are purpose-built to provide unified management and operations for hybrid multicloud environments.

Readers who want to benefit from partner insight and information can turn to the Red Hat Certified Cloud and Service Provider (CCSP) program for information and assistance. In particular, Red Hat OpenShift® and Kubernetes platforms can be key to successful hybrid multicloud implementations. To get the ball rolling, visit www.redhat-partner.com/solution_program.

Containers and Workloads

When it comes to hybrid multicloud, insulating developers and users from the details of specific cloud platforms can make the difference between success and failure. That's what makes containers critically important.

Containers (and associated storage) let developers spin applications up and down on multiple clouds, on whichever cloud platform(s) make sense, including public and private clouds. A container handles the interaction with underlying cloud environments so that developers can write an application once, yet run it on multiple cloud platforms without undue concern or extra effort. Also, storage may be allocated on a per-container basis so that application data has a place to live as containers spin up and spin down, across clouds and runtime environments.

REMEMBER

Red Hat OpenShift Container Platform, an enterprise Kubernetes solution, works with all major public cloud platforms, including AWS, Azure, Google Cloud Platform, IBM Cloud, Alibaba, and others, and on-premises, too. Associated Red Hat OpenShift Container Storage does likewise and provides a safe haven for data in environments where many balls are in the air, and many hands throwing

them — in the hybrid multicloud, in other words. In addition, Red Hat OpenShift Container Storage can scale (and shift) locations as needed to support high-demand, rapid-growth scenarios.

Avoiding Common Pitfalls

Given potential benefits of hybrid multicloud it's important to understand where potential pitfalls lurk. This section points out some things to watch out for.

Cost

Though cost savings are a purported benefit of moving to the cloud, and cost drives many organizations into the cloud, promised savings don't always materialize. Thus, it's vital to fully map out and understand all costs involved in using a hybrid multicloud before jumping into those clouds.

WARNING

Getting a good handle on costs is incredibly difficult. Keeping that handle in your grip isn't easy, either, because costs and contributing factors keep changing. Revisit your cost model(s) regularly as you go through pilot into production phases. Cost models will do their best to defy complete analysis.

Labor costs are a big part — usually about half — of what it takes to move into the cloud. But other costs continue even when that move is complete. Somebody must monitor cloud usage, performance, SLA compliance, and usability. Somebody needs to pay bills and manage the contracts involved, too. All this overhead should be incorporated into the overall cost picture and carefully evaluated before any commitments get made or migrations get underway.

TIP

One reason why containers are incredibly valuable from a cost perspective is because of the savings on development costs they can deliver. After a container-based approach is implemented, workloads can migrate from cloud to cloud, public or private, with little or no additional developer effort. This saves big on costs that might otherwise recur in future cloud moves and migrations.

Technology

Even if you've got a hybrid multicloud at your disposal, not all business applications should move to the cloud. Thus, organizations must decide which applications are suited for cloud deployment and use and which are not. This goes triple for essential, mission-critical, or line of business applications, where accessibility and performance are key factors in deciding what goes into the cloud and what stays home.

Storage

Storage can have astounding cost impacts when cloud service plans include automatic upscaling to meet demand. Thus, for example, after the Paris Charlie Hebdo attacks French Internet users crashed all local news sites. Walloon (the French-speaking part of Belgium) sites at De Persgroep handled an extra 1.2 million unique visitors at that time. Had they been forced to pay for extra bandwidth through a cloud service provider, added costs could have bankrupted them.

WARNING Pay-as-you-go sounds great in theory, but what happens if something causes demand to spike enormously? Unless offsetting income also jumps, you should set caps on automatic scaling as part of your service contracts. You may, in fact, decide to keep high-usage data on premises to avoid getting slammed with costs if a sudden change in access patterns leads to huge demand for certain data, along with excessive access and bandwidth costs.

Once data is in the public cloud, it's difficult to move. But it's also expensive to access it, particularly as unforeseen demand drives access rates and bandwidth consumption through the roof (and beyond).

TIP Red Hat OpenShift likewise helps monitor, manage, and control costs associated with data access and migration from cloud to cloud. Consider this another benefit for container-based implementations.

Chapter **5**

Ten Hybrid Multicloud Secrets

For Dummies books end with a Part of Tens to highlight key points. Here, we present ten secrets for hybrid multiclouds:

» **The real multicloud stands up:** A hybrid multicloud is one or more public or private clouds running together. It should offer interoperability, combined management, common core services, and the ability to locate workloads on any of the clouds involved.

» **Hybrid multicloud may or may not fit a workload:** A hybrid multicloud doesn't fit all situations or data processing needs. Not everything belongs in the cloud, nor works there optimally. Workloads not architected for the cloud are better kept on traditional infrastructure.

» **Master cloud goals:** Until you understand costs and consequences of cloud workloads, you won't understand what belongs in the cloud. Determining which applications should be deployed in the cloud and which ones should stay on traditional infrastructure is Job One.

» **Choose hybrid multicloud components carefully:** If you build a hybrid multicloud, make sure it truly saves on costs,

adds to flexibility, avoids vendor lock-in, lets you serve users better, and fosters business innovation. Also, if you choose a vendor without a specific public cloud of its own, you'll be more likely to hear advice that doesn't stack the deck for that solution over another.

>> **Cost models reveal cloud limits:** Detail cost models to avoid unnecessary costs for overconsumption in the public cloud and idle capacity at home. Understand how bandwidth and resource consumption costs scale with on-demand growth and keep your data where it makes the most sense (and costs the least) to serve up.

>> **Good plans include escape routes:** Ironically, an exit strategy needs to be part of the entry play when signing up with a cloud provider. You don't want to do business with a provider who won't let you go or makes it prohibitively expensive for storage egress costs or other reasons when it's time to say goodbye. The ease and cost of migrating your data upon exit is important, too.

>> **Change must always be an option:** Create a plan and follow it closely, but be ready to change that plan as you learn and grow. Make the most of hybrid multicloud: Be on the lookout for new applications and uses.

>> **Success means demonstrating value:** During the deployment process (pilot or production), it's vital to look for unexpected costs, development issues, and divergence between what the requirements say and users want, and what gets delivered. You must be able to offer and demonstrate value for hybrid multicloud to make sense and for it to succeed. Anything less is unacceptable.

>> **User buy-in is key:** Make sure your users approve of your pilot efforts before jumping into production. Keep a close eye on ongoing feedback, performance, resource consumption, and usage trends to separate the turkeys from the buzzards.

>> **Containers are good; strategy is better:** Insulating developers and users from details of specific cloud platforms keeps them happy and your computing options open. Containers and associated cloud-native capabilities provide a handy and powerful method to accommodate applications without digging into the down-and-dirty details for each cloud platform in use. Developers can revel in this abstraction, but DevOps teams as a whole need to understand all relevant platform details. Therefore, a good container strategy is key.

Benefit your business with multicloud

The cloud rules computing today. For most organizations, a single cloud isn't enough so you need to understand how multicloud can benefit your business. In this book, take a journey and look closely at multicloud's various applications, data, and services. Achieve greater flexibility, reduce costs, avoid vendor lock in, and tap into specific regional cloud providers. Welcome to *Multicloud Portability For Dummies*, Red Hat Special Edition.

Inside…

- Identify necessary goals
- Handle project politics
- Establish migration targets
- Choose cloud components
- Avoid vendor lock-in with portability
- Know your safe exit strategy
- Reveal ten hybrid multicloud secrets

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