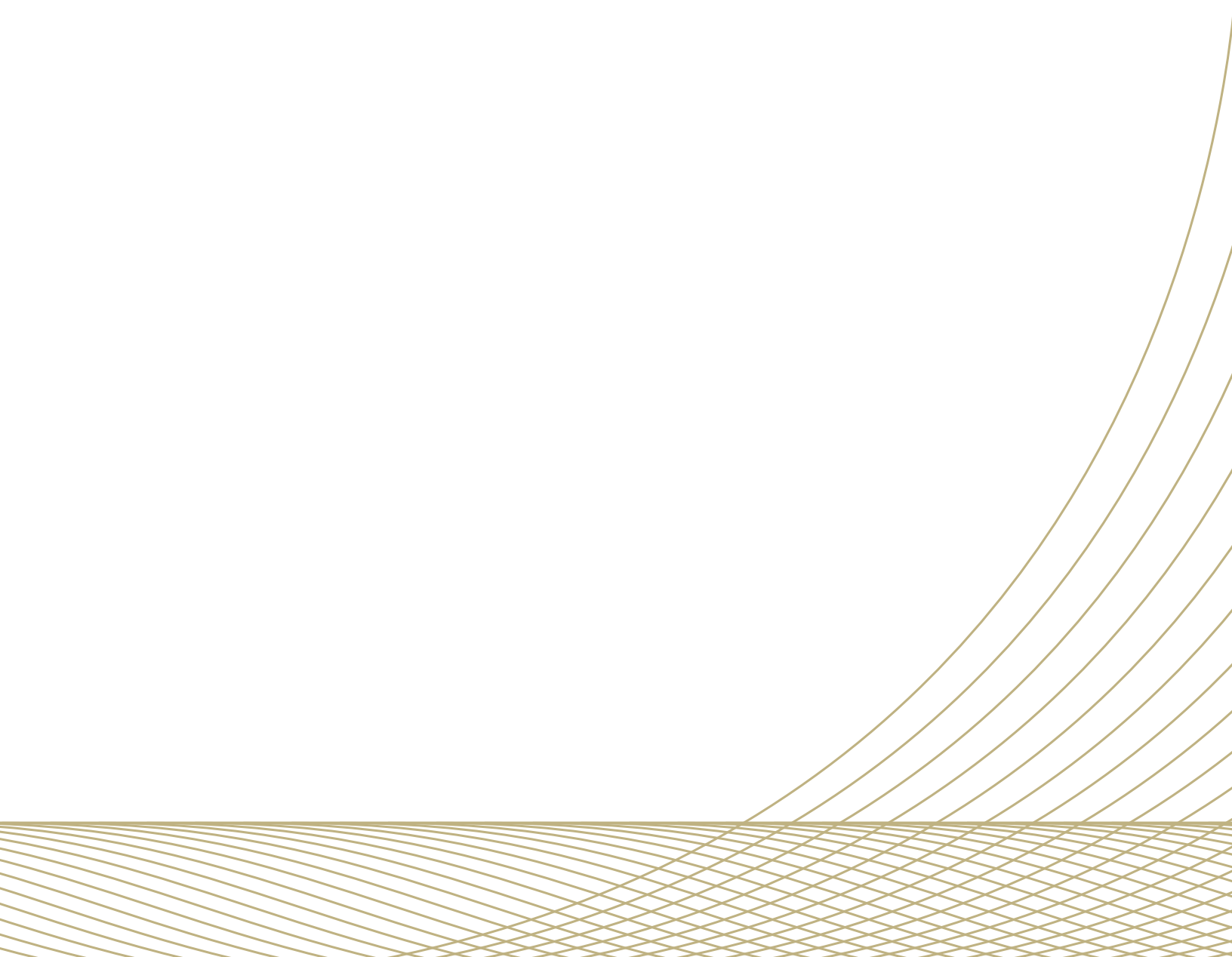




# Skytap Cloud Dedicated Regions



## Executive Summary

Most cloud providers sell infrastructure components. Skytap Cloud provides *environments*. Skytap Cloud environments encapsulate applications, infrastructure, networking, operating system, software, storage, data, and VM memory state. By using these environments, Skytap Cloud customers realize substantial business value as part of their software development lifecycle (SDLC) from unit tests to production, for technical training efforts, and for sales demos and proof-of-concepts.

Skytap Cloud hosts customer environments in datacenters, known as regions, based in North America, Europe, and Asia. Skytap Cloud's multi-tenant regions host environments for many customers, while providing isolation between those environments in any given region. Skytap Cloud dedicated regions are offered for customers who desire additional datacenter-level isolation from other customers. Skytap Cloud dedicated regions are single tenant.

This document details the technical architecture of Skytap Cloud dedicated regions and an overview of how they work in Skytap Cloud.

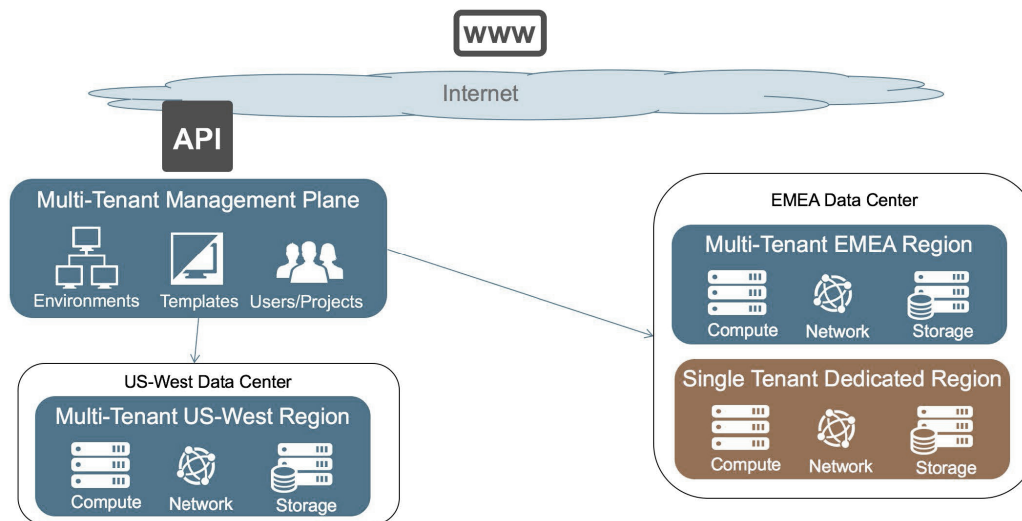
## Overview

While multi-tenant regions are well suited to provide cheaper access to massively scaled resources— and suffices for a number of scenarios—there are some scenarios where a Skytap Cloud dedicated region is needed. Some examples of such scenarios are:

- Meeting regulatory or company requirements that require workloads to be run on dedicated infrastructure, compute, storage, and networking
- Having resources dedicated to their workload, without being affected by workloads of other customers (aka noisy-neighbor)

## Technical Approach

Skytap Cloud is designed to treat Skytap Cloud dedicated regions just like multi-tenant regions in terms of resource management, with the additional constraint that it only hosts environments for a single customer. This ensures that customers with Skytap Cloud dedicated regions can still use the rich set of capabilities and ease of use that Skytap Cloud provides. Customers may enable both standard regions and dedicated regions to enable bursting to the public portions of Skytap Cloud when a dedicated region is at capacity.



The picture below illustrates the logical architecture of regions within Skytap Cloud.

Deployment and management of environments and VMs in a Skytap Cloud dedicated region is still completely managed by Skytap Cloud without the need for any customer intervention. The dedicated region appears in the customer's account as another region available to the account. Users in the account can run through their usual workflows with their environments in this region. Skytap Cloud ensures that these workloads are not deployed anywhere other than the dedicated region chosen by the user. Additionally, this region is completely invisible to other customers.

Dedicated regions are available in existing Skytap Cloud datacenters. They can also be provisioned in most datacenters that IBM SoftLayer operates. For a list of the potential locations that a private region can be created, visit IBM SoftLayer's datacenters page at: <http://www.softlayer.com/data-centers>.

## Key Characteristics

The following are some key characteristics of Skytap Cloud dedicated regions customers should keep in mind while deciding whether to use them:

- The minimum size of a Skytap Cloud dedicated region is 2500 SVMs.
- Skytap Cloud Virtual Machine (SVM) bursting is not available in Skytap Cloud dedicated regions. Customers cannot burst past the size of their subscription, i.e. the size of their dedicated region, as they can in a multi-tenant region.
- Size of the region can be expanded with 30-days advanced notice. The expansion must be

done in discrete lots with a minimum lot increase being 500 SVMs.

- The Skytap Cloud account team can help customers figure out the right starting size and future increments.
- Customers do not have access to the underlying hardware in the Skytap Cloud dedicated region.

## Skytap Cloud Technology Background

A Skytap Cloud dedicated region, like any other region in Skytap Cloud, has its own resources and services, including the following key components:

- Skytap Cloud’s regional resource management services
- Basic virtualization services
- Hardware resources: hosting service, storage service, networking service, VM access service, etc.

The diagram below shows the service layers that form a single region:

Resource Tier	HOSTING SERVICE		STORAGE SERVICE	NETWORK SERVICE	
	ESX	Others	Storage Nodes	VIR	VGR
	ESX	Others	Storage Nodes	VNI	

### Regional Resource Management Services

Resources in each Skytap Cloud region area managed by services running in that region. These include:

- **Hosting Service:** manages the lifecycle of hosting nodes in the region
- **Storage Service:** manages the lifecycle of storage nodes in the region
- **Network Service:** manages the networking resources, both virtual and hardware in the region

These services are part of the core intellectual property of Skytap. For a Skytap Cloud dedicated region, all of these services are managed resources for a single customer.

Apart from the services that run in each region, Skytap Cloud also has services that run in a management plane. These services are multi-tenant and hence are shared with other customers even when choosing a Skytap Cloud dedicated region. The customer’s data-level isolation is still

maintained for these services. The management plane includes services such as:

- User management service: to manage users and role-based access control
- Orchestration services: to manage the customer workflows during deployment of environments in various regions
- Accounting service: to manage quotas and keep track of usage
- Reporting service: to report on usage
- Auditing service: to provide auditing and governance controls
- Customer-facing REST APIs

## Basic Virtualization Services

### VMware ESX

Skytap Cloud licenses vCenter and ESX from VMware as part of the VMware Service Provider Program (VSPP). vCenter and ESX are used very differently from that of a traditional on-premises deployment. Key differences include:

- Skytap Cloud customers have no access to VMware products or APIs
- Skytap Cloud uses only the VMware ESX hypervisor technology, as Skytap Cloud is not just a layer on top of VMware products
- Skytap Cloud includes all management logic and policies for ESX

In Skytap Cloud, ESX nodes are integrated to vCenter in order to comply with the usage metering requirements of the VSPP program under which Skytap Cloud licenses the VMware technology. Generally, we strive to avoid creating dependencies on vCenter. The only features of vCenter used in Skytap Cloud are:

- API pass-through to control ESX
- API control of vMotion (as described below)
- API control of VM IOPs constraints (not support in ESX API)

Each ESX host has nominal storage used for swap and logs for ESX. Each VM is stored in a distinct Skytap Cloud managed ZFS file system, which is shared to a single ESX host (via NFS) when it is started, and the sharing ends when it is stopped.

### VMware vMotion

Skytap Cloud dedicated regions are completely isolated from each other from a VMware

perspective. That is, there is no way to use vMotion to move workloads between regions. In this way, customers can be assured VMs cannot be moved to unlicensed servers.

## Hardware Resources

At the lowest layer in a region are the hardware resources. These hardware resources are managed by the regional services, as mentioned above. Hardware resources for a Skytap Cloud dedicated region are provisioned based on the size of the region requested by the customer, as long it meets the minimum size requirements.

The specific hardware provisioned is based on known and well tested hardware profiles and topology. These topologies are battle tested already in our multi-tenant regions. Over time, hardware will change as Skytap Cloud takes advantage of the latest generations of hardware. As of today, in general, compute nodes have 20 or more cores and up to 512 GB of RAM. More information on hardware in a specific Skytap Cloud dedicated region can be made available if needed.



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