Skytap

A Practitioner's Guide to Enterprise Application Modernization

EXECUTIVE SUMMARY

For enterprises running mission-critical workloads on legacy applications and infrastructure, modernization is imperative to achieving agility and competitiveness. Many business leaders have identified modernizing the enterprise application portfolio and moving to the cloud as critical initiatives.

This paper is written for technical practitioners tasked with successfully executing an enterprise application modernization strategy.

Skytap Cloud makes application modernization a realistic, achievable initiative by providing both the approach and platform required to execute. In this paper, you will learn:

- How to implement Skytap Cloud's progressive approach of Infrastructure, Process, Architecture (IPA)

- Skytap Cloud's unique capabilities for modernizing traditional applications with agile methodologies and next-generation technology

- Real-world examples from enterprises who have already succeeded.

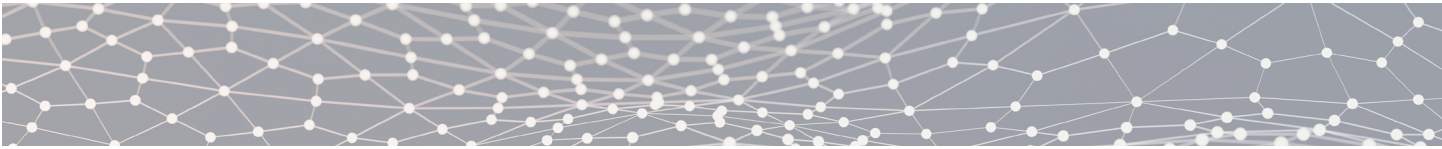# 1. INFRASTRUCTURE, PROCESS, ARCHITECTURE: APPLICATION MODERNIZATION WITH SKYTAP CLOUD

Embarking on an application modernization initiative can seem overwhelming; you must rapidly modernize legacy systems without jeopardizing the business foundation.

The key to success is to modernize iteratively, by breaking your journey into realistic, attainable segments. We've seen enterprises achieve success by using a progressive approach of Infrastructure Modernization, Process Modernization, and Architecture Modernization (IPA).

Infrastructure Modernization

Infrastructure Modernization is the process of adopting cloud infrastructure and leveraging its inherent capabilities (capac-

ity on-demand, self-service, global reach, multi-tenancy, and metered pricing) to eliminate constraints in the application development and delivery lifecycle.

Process Modernization

Process Modernization occurs when enterprises accelerate application development and delivery by leveraging modernized infrastructure to implement new processes such as agile development, DevOps, and Continuous Integration/ Continuous Delivery (CI/CD).

Architecture Modernization

Architecture Modernization is the act of changing the technology or communication patterns an application uses to operate in order to meet business goals. Architecture modernization can occur after or in parallel to process modernization.

Not every application or business case will require completing the entire IPA cycle to achieve modernization success. Determine what level of advancement is necessary based off of your application's unique requirements.

2. GETTING STARTED: SELECTING APPLICATIONS FOR MODERNIZATION

Determining which applications are the best candidates for modernization is a critical step in an enterprise modernization initiative. Skytap partners with each of its enterprise customers to provide guidance on evaluating and selecting applications. We've found that successful application modernization projects start with the following steps:

1. **Gather a List of Candidates:** You should start by confirming the candidate pool. This could be as large as your entire on-premises application portfolio or a more selective group of core business applications. You should also take this opportunity to reevaluate applications that were retained or retired in previous cloud assessments because they couldn't be moved to the cloud.

2. **Use Your Business Goals to Determine Priorities:** When evaluating the application candidate pool, start by considering the business goals for each application. Consider whether the goals are to improve business value and deliver new functionality, improve development agility, consolidate or maintain an application, or simply migrate out of an on-premises datacenter. From here, you can determine which IPA stage makes the most sense for each application.

3. **Prioritize Applications:** Skytap offers a logical framework to prioritize applications for modernization. You need to evaluate and apply values to applications across three characteristics: complexity, value, and confidence.
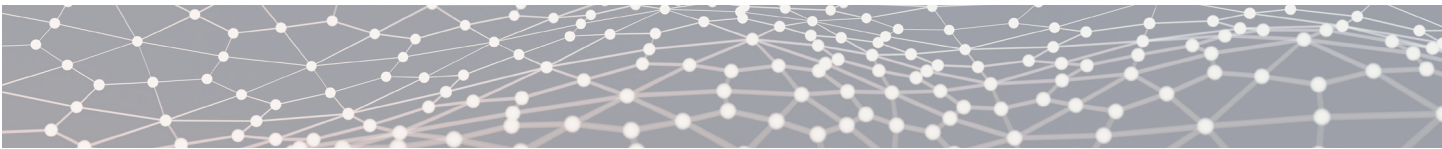
-- Complexity: Estimate the intricacy of moving the application to the cloud. For example, a small application with no external connectivity might be considered low complexity, while a large application with external connectivity might be considered high complexity.

-- Value: Assess the dollar amount your enterprise will gain or save from moving to the cloud.

-- Confidence: Determine your team's ability to execute a cloud migration and application modernization journey. This should take into consideration your business's unique challenges around skillsets, internal politics, compliance requirements, etc.

Once you've assigned values for each application across the three characteristics, use a visual representation to prioritize applications and select finalists.

Cloud Migration Value Analysis

Capture application metrics

	Complexity	Value $1k	Confidence
HR	21	15	90%
Financials	13	10	75%
CRM	21	77	75%
Accounting	55	15	75%
POS	8	45	80%
Inventor Management	55	95	95%
BI	55	45	30%
Customer Engagement	1	110	80%
eCommerce	21	125	80%
Plant Management	34	75	90%

Analyze to set priorities based on complexity and ROI
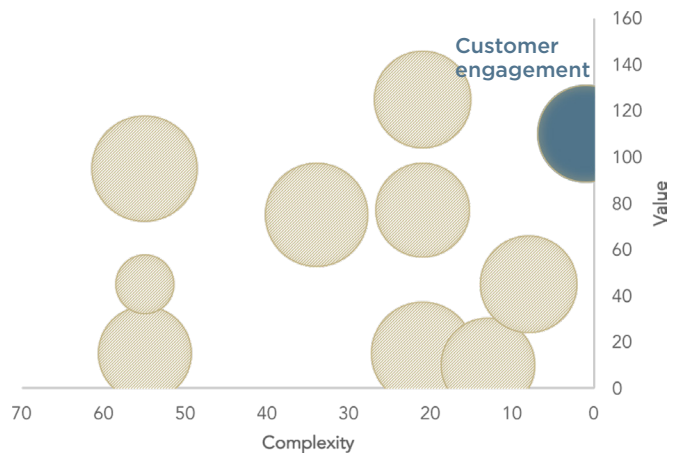
In this example, the best application to start with has highest business value (y) and confidence (circle size) with the lowest complexity (x).

Once you have selected an application, you can start your modernization progression. The overall goal is an understanding of your existing portfolio and a flexible, efficient, and easily optimized work plan that divides the project into small batches that can be executed in parallel.

3. INFRASTRUCTURE MODERNIZATION

For organizations wanting increased agility, some of the biggest and most common bottlenecks through the application development lifecycle boil down to a shortage of application environments, inefficient resource provisioning, and inconsistencies between development environments and production.

For application teams, waiting weeks or even months for environments is common. These delays translate directly into slow release times.

Once environments are available, they are often out of date with production settings, must be shared among disparate teams and workers, or are inconsistent between development, integ, and QA streams. These inconsistencies result in inaccurate testing cycles and reduced test coverage, leading to lower quality software in production.

The problem is exacerbated when production deficiencies must be reconciled

CHALLENGES WITH ON-PREMISES INFRASTRUCTURE

- **Not enough environments**

- **No self-service**

- **Long provisioning times**

- **Configuration drift**

- **Under utilization**

using the same environments that were used in pre-release activities, creating traffic jams that cascade into future releases.

Configuration and provisioning delays can result in environment hoarding and underutilized capacity. This causes IT costs to increase without a corresponding return in agility and business value.

## Infrastructure Modernization with Skytap Cloud

Infrastructure Modernization enables enterprise teams to remove bottlenecks from their application development lifecycles by adopting cloud infrastructure. Skytap Cloud is designed and built to help organizations streamline the adoption of cloud for traditional applications, the provisioning of resources, and the management of these resources.

Skytap Cloud takes a unique approach to

infrastructure: instead of siloed infrastructure components, resources are bundled into environments. A single environment is a virtual datacenter that contains everything an application needs to run, and encapsulates infrastructure, networking, storage, OS, and memory state. Environments are the fundamental units of work in Skytap Cloud, and they are what enables a traditional application to leverage the inherent capabilities of cloud infrastructure.

Skytap Cloud Environment
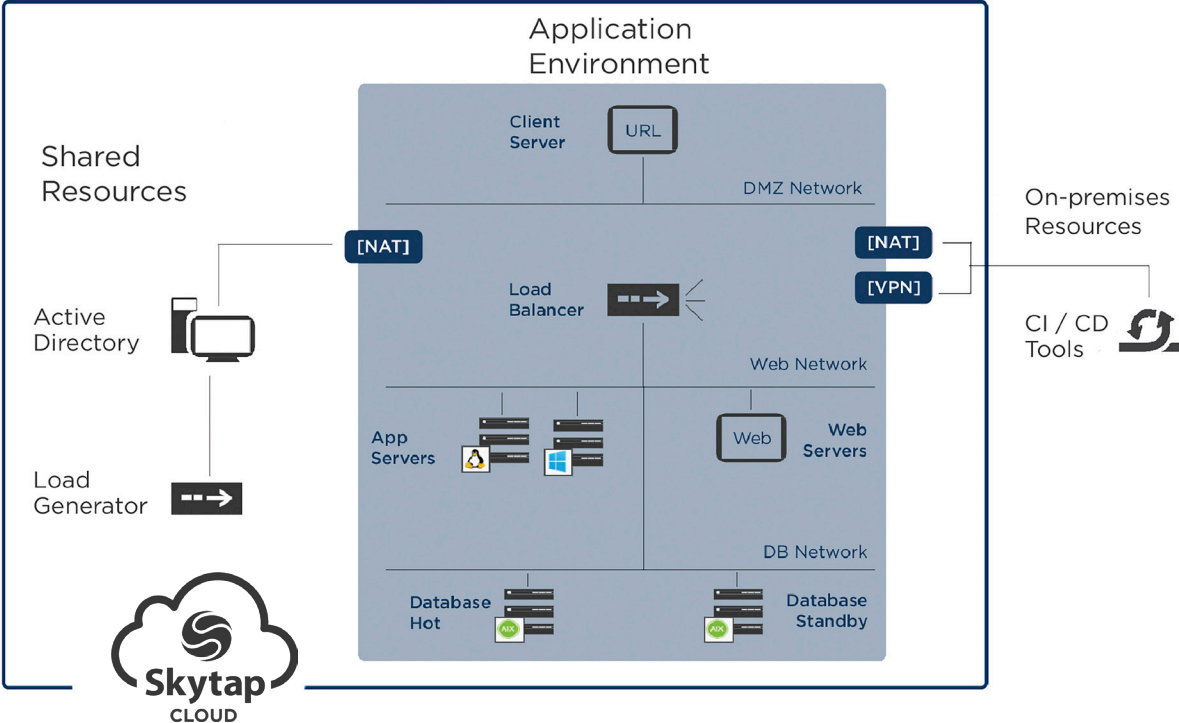
Rapid, Easy Migration

Skytap Cloud environments function as virtual datacenters and replicate your application's datacenter settings in their entirety. This includes:

- **Compute Type:** Skytap Cloud natively supports VMware ESXi and IBM PowerVM hypervisors, so VMware and AIX applications are supported as-is.

- **Complex Networking Topologies:** Skytap Cloud supports Layer 2 and Layer 3 networking, eliminating the need for teams to change application IP addresses before migrating to the destination cloud.

- **Highly Customizable Compute Re-**

sources: Skytap Cloud does not have fixed instance sizes, allowing any mixture of CPUs and RAM. Each VM instance can be customized to the exact needs of that system, enabling the most efficient resource allocation and greatly simplifying migration.

- **Containers:** Skytap Cloud Container Management enables teams to introduce containers to environments.

Skytap Cloud also provides a number of capabilities enabling applications to be rapidly imported, including:

- **Global Availability Zones:** Skytap Cloud operates seven datacenter regions
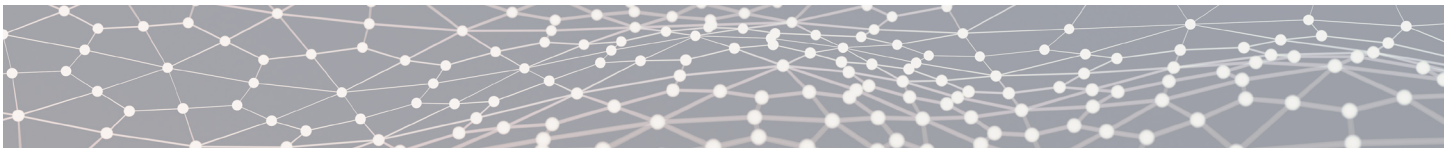
around the world, including the United States, Canada, United Kingdom, Asia, and Australia, so workloads can operate in required regions with lowest latency.

- **Cloud Import Management Appliance (CIMA):** CIMA enables large-scale imports of VMs and applications in days.

Combined, these capabilities enable traditional applications to be supported, as is, in Skytap Cloud without refactoring or rearchitecting. Previously landlocked applications can be migrated in just days.

True Cloud Infrastructure for Traditional Applications

Skytap Cloud's environments-first approach to cloud infrastructure enables IT teams to provide the volume of environments and the self-service resources needed for agile development, while dynamic management controls eliminate idle infrastructure and only utilize capacity when environments are in use. Skytap Cloud features:

- **Templates:** Environments can be configured once, then saved as templates. Templates allow teams to save environment settings when they are not in use, eliminating the need to reserve capacity for idle environments. Using templates, Skytap Cloud customers reduce capacity requirements and increase utilization.

- **Self-Service:** Templates eliminate provisioning times by enabling end users to spin up an environment with a single click, then delete it when no longer needed. Environment hoarding is no longer necessary, further increasing environment utilization.

- **Subscription Billing:** Skytap Cloud lets you buy cloud resources with a defined quota. You can buy capacity for your entire company (in terms of peak VM and storage amounts) to make sure you are covered for peak demand, while still setting bursting limits that allow you to surpass the quotas up to a certain limit. Skytap Cloud also offers pre-paid and pay-as-you-go plans.

- **Auto-Suspend:** Administrators can set a universal rule that all VMs will be automatically suspended after a chosen period of time or enable management at the environment level. Customers often select a longer universal auto-suspend time (e.g., 1 hour) and individually select shorter auto-suspend times (e.g., 10 minutes) for individuals based on their use cases.

Security and Compliance

Skytap Cloud offers a host of product features to ensure that customers' cloud environments are secure, several of which are highlighted below:

- **Dedicated Regions:** Private datacenter regions are offered for enterprises that need to meet regulatory or company requirements.

- **Dedicated Hosts:** Single-tenant hosting is offered for workloads utilizing software that is licensed by physical cores, sockets, or RAM.

- **Role-Based Access Controls:** Granular access controls enable enterprises to set permissions at the region, department, and user levels.

Fortune 50 Company Transforms Application Delivery, Drives 20% Efficiency Gain with Skytap Cloud

One of the largest and longest standing technology companies in the world operates a healthcare business unit providing transformational medical technologies and services that are shaping a new age in patient care.

Challenges

As part of a companywide initiative to move to the cloud, the business needed to consolidate a datacenter that housed a suite of revenue-generating traditional applications. Most public clouds require timely and costly application rewrites. Given the mission-critical nature of these workloads, both to customers and the business, a refactoring or rewriting initiative was not worth the risk.

The business also needed to consider on-premises development challenges. Originally architected to run on-premises, the applications are comprised of both x86 VMs and AIX-based VMs and are tightly coupled, but development is done individually.

The complex integrations resulted in lengthy provisioning times of up to two weeks. Additionally, after provisioning, the environments still required an additional five hours to configure software. With over 500 engineers, wasted time engaging in redundant labor and configuration drift added up quickly. All of this made testing difficult, and quality slipped.

Solution

Skytap Cloud supports datacenter-native applications as is, so the business was able to migrate its application suite unchanged.

Using Skytap Cloud, teams are able to configure environments oance, then save them as templates that can be cloned in seconds, eliminating configuration drift, provisioning times, and environment hoarding.

With Skytap Cloud's ability to clone, the team of 500 engineers are able to achieve 20% efficiency, focusing on delivering software faster.

4. PROCESS MODERNIZATION

Many organizations have a goal of reaching an agile development cadence, yet the reality is that few have achieved it. Forrester reports that only 23% of enterprises have a release velocity of monthly or greater*.

Not having enough development and test environments inhibits release velocity. Agile development methodologies hinge on delivering more software, in smaller increments, faster. To meet this pace, teams need instant or timely access to environments that match production configurations.

This is why infrastructure modernization is a prerequisite for process modernization. Once your enterprise has removed

resource constraints, application teams are empowered to start implementing agile processes and DevOps.

DevOps enables teams to automate from build through deployment, including Continuous Integration and Continuous Delivery. The goal of Continuous Integration is to remove impediments that block developers from checking in code and to quickly identify if a check-in (code change) is valid or not. Each check-in needs to be tested, which requires a build environment and a unit test environment.
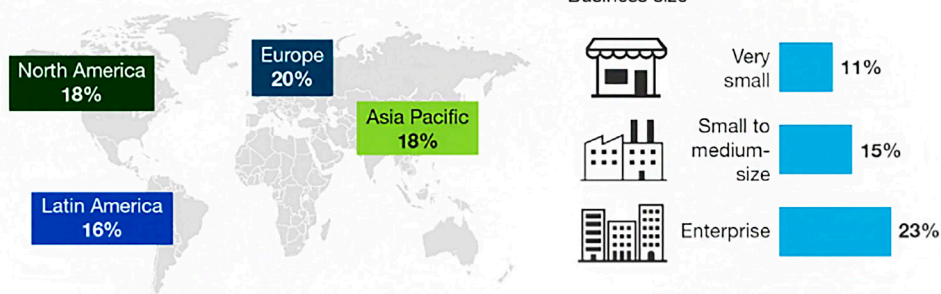
To prevent queueing scenarios where developers are waiting to check-in code and complete tests, ephemeral environments that can be quickly spun up, used,

FORRESTER® DATA

Regardless Of Geography Or Business Size, Release Velocity Is Poor
The Forrester Wave™: Continuous Delivery And Release Automation, Q3 2017

Release velocity of monthly or faster

North America 18%

Europe 20%

Asia Pacific 18%

Latin America 16%

Business size

Very small — 11%

Small to medium-size — 15%

Enterprise — 23%

Base: 320 to 1,542 infrastructure decision makers
Source: Forrester Data Global Business Technographics® Infrastructure Survey, 2016

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* The Forrester Wave™: Continuous Delivery And Release Automation, Q3 2017

and deleted are necessary to process integrations in parallel.

The root of most software problems is when changes occur that are not fully understood or vetted. When changes are halted, bundled, and then implemented all at once, the problem is magnified because it's often difficult to quickly identify which change created an error.

Continuous Delivery is designed to solve this problem by delivering small, comprehensible changes through a consistent pipeline to production. Put another way,

Continuous Delivery ensures that software is always in a production-ready state; from there, the choice to deploy becomes a business decision. To ensure software is steadily prepared for delivery, each change must be vetted with automated, sequential testing. This in turn,

drives the need for dynamic provisioning of environments.

As software moves through its development and delivery lifecycle, environment configurations evolve along with code. As code gets closer to production, environments need to match production configuration (e.g., RAM/memory per VM, inclusion of firewalls and load balancers, etc.) as closely as possible to reduce the probability of post-deployment errors.

Another way to describe this is environment fidelity: as a change moves from the developer's workstation through QA to production, the fidelity of the environment should become increasingly closer to production. Configuration Management tools help organizations establish and maintain environment fidelity and consistency throughout the SDLC.

Development	Integration	Quality Assurance

Low Fidelity		High Fidelity
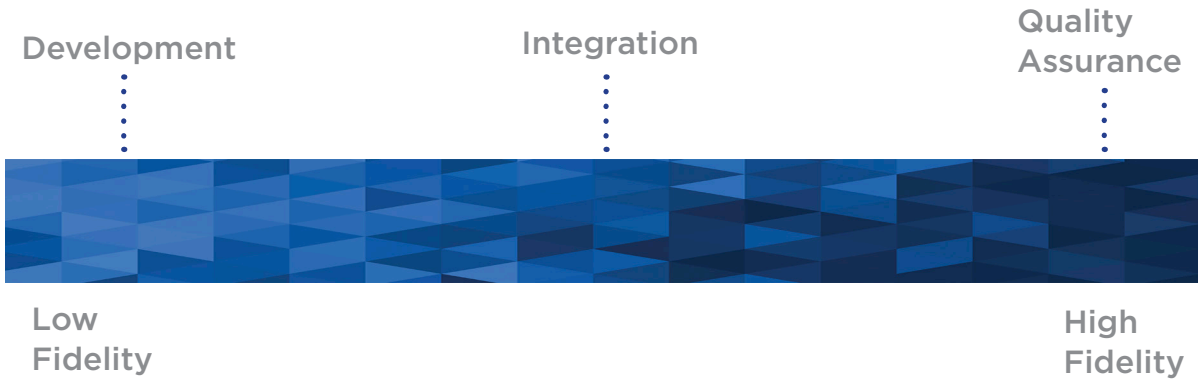
Process Modernization with Skytap Cloud

Skytap Cloud provides teams with the ability to instantly generate as many environments as are needed at each stage of the SDLC. Skytap Cloud environments are endowed with the following capabilities to

accelerate the SDLC from build through deployment:

- **Mixed Platform:** Environments can run x86/Windows/Linux/Solaris VMs

alongside Power/AIX VMs and containers for efficient end-to-end testing.

- **High Fidelity or Low Fidelity:** Configure environments to meet fidelity requirements at each stage of your SDLC; lower fidelity models of production offer fast, cost-effective environments for early- and middle-stage testing, while high-fidelity, full-scale models are ideal for late-stage testing.

- **Integrations with Your Existing Tooling:** Skytap Cloud integrates with your existing infrastructure as code and CI/CD tooling to automate and accelerate the process from build through deployment. Integrations include Ansible, CA Technologies, Docker, GridTools, IBM UrbanCode, Jenkins, Rational Software, Vagrant, and Visual Studio. Skytap Cloud also offers public templates for

Chef, Kubernetes, Puppet, and more.

- **Cloning:** Environments can be replicated with a single click; each copy is identical down to the MAC and IP address.

- **Copy to Region:** Complete environments and templates can be automatically copied to any global Skytap region to which the resources have access (single-or multi-tenant). Like any environment clone, the resulting copy is an exact duplicate of the original.

- **RESTful API:** The API provides access to all of Skytap Cloud's functionality and enables you to automate any feature of our cloud. Skytap Cloud's RESTful API is developer friendly and consumable from all commonly used languages and frameworks.

How Skytap Cloud Complements Configuration Management

The problems Skytap Cloud solves are different than those solved by configuration management (CM) tools (e.g., Chef, Puppet, Ansible, etc.). The key point to remember is that Skytap Cloud is not a provisioning tool; Skytap Cloud provides environments in which to run and then clone complex applications and their tooling. When combined, Skytap Cloud and configuration management tools work together to improve the efficiency of individuals and teams. Here's how:

1. During the build process, a new template is created. The VMs in this template are configured using configuration management tools.

2. End users can self-provision environments from the template representing the latest build to conduct their work.

3. When an environment is created from the template, the configuration management tool runs to verify if the VM matches the latest configuration specification. If the specification has changed since the latest build (i.e., creation of the template), the CM tool applies the delta.

This process ensures that teams and individuals are working against the latest application build with the most current configuration in the least amount of time.

Skytap Cloud Enables Parallel Workstreams

With Skytap Cloud, environments can be scaled vertically as required to meet demand in development, integration, and testing scenarios.
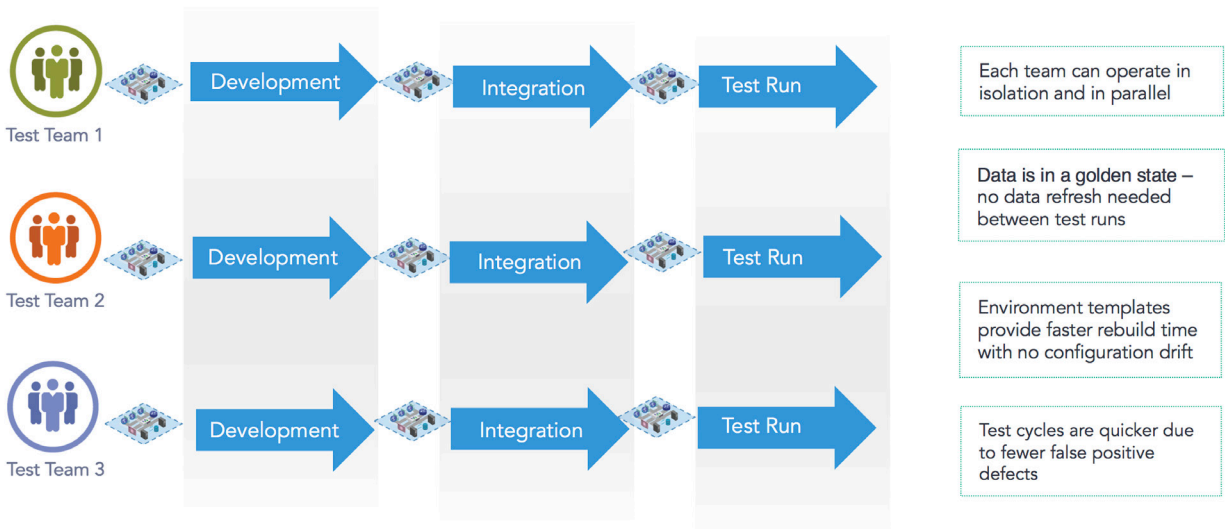
Customers can configure a build template to support Continuous Integration, and because environments can be provisioned on-demand and deleted after unit tests are complete, capacity doesn't sit idle. Skytap Cloud also supports Continuous Delivery by enabling teams to match environment fidelity to production when required.

Organizations typically have limited environments for teams to use. This is because of the time it takes to set-up new environments, maintain those environments, and capacity costs. Limited environments reduce delivery velocity: teams block each other, spend time tracking down configuration drift, and work in a single-threaded manner. Skytap Cloud enables teams to have as many perfectly configured environments as needed without impacting other teams, so they work in parallel, ultimately increasing delivery velocity.

Skytap Cloud delivers an ideal foundation for agile development and DevOps, providing production-ready, on-demand environments to accelerate delivering higher quality software more frequently.

Parallel Execution with Skytap Cloud

Test Team 1	Development → Integration → Test Run	Each team can operate in isolation and in parallel
Test Team 2	Development → Integration → Test Run	Data is in a golden state – no data refresh needed between test runs
Test Team 3	Development → Integration → Test Run	Environment templates provide faster rebuild time with no configuration drift
		Test cycles are quicker due to fewer false positive defects

Media and Entertainment Group Accelerates Release Cycles With Streamlined Testing

One of the largest media groups in the world runs their TV business with a complex TV scheduling application. In order to meet customer demand for new digital services and content, the team application needed to accelerate the deployment of new features and functionality, while ensuring the quality of code deployed to production.

Read the Full Case Study

Challenges

The customer's application delivery was severely limited by a bottleneck in the regression testing suite. Over 1,000 test cases needed to run daily to support the multiple business units depending on the program scheduling application. However, each testing process took nearly two months because only a single server was available to run the tests. Facing inadequate test coverage, delays in new feature releases, and even outages caused by bugs making it into production, the team knew dramatic change was necessary.

Solution

Today, the company's application teams have full control over their Skytap Cloud environments, and they're delivering value to the business faster. With only a single click, environments can be provisioned, cloned and shared for nimble testing and bug remediation.

With Skytap Cloud, the team can spin up 50 environments from a saved template and runs their test cases in parallel, cutting the full testing cycle from 45 days to hours. Testing coverage has increased from 20% to 100%, resulting in a significant decrease in defects passed to production. Furthermore, the company integrates Skytap Cloud with IBM UrbanCode Build and Deploy to implement continuous integration and delivery.

"This is the most powerful DevOps cloud I've ever encountered. It's enabled us to improve code quality by orders of magnitude. Without Skytap Cloud, we would've never been able to achieve these levels of quality and enterprise-grade consistency across multiple business units and applications."
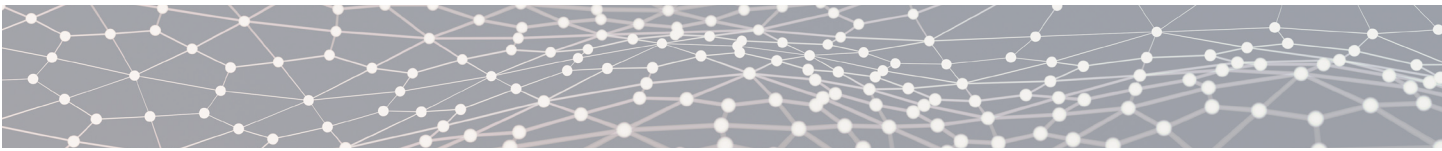— John Comas, Manager of Platform DevOps

5. ARCHITECTURE MODERNIZATION

For organizations whose business goals require changes to application architecture, technology, or modes of communication, architecture modernization can be completed in parallel to, or following, process modernization. Different applications and business goals will call for different modernization scenarios, however many architecture initiatives include the following phases:

- **Refactor for Microservices:** Application components are broken down and refactored into microservices hosted in containers, allowing greater deployment portability. Before beginning this process, teams must prepare the code to be easily broken apart, which involves internal service isolation as well as creating bulkheads and interfaces between existing and future components.

- **Replatform:** In this stage, teams select a platform strategy and relevant tooling that aligns to the modernization objectives (e.g., scale, agility, etc) and the groundwork completed in the refactoring stage. This is where organizations select cloud-native services, communication mechanisms for services (e.g., REST and gRPC), and service wrapping frameworks.

- **Service Brokering and Multi-Cloud:** Existing services are replaced or enhanced with cloud-native services spanning one or multiple cloud providers.

- **External Network Connectivity:** Latency is reduced by adding secure, direct connections between decoupled application components that are running in PaaS, across multiple clouds, and on-premises.
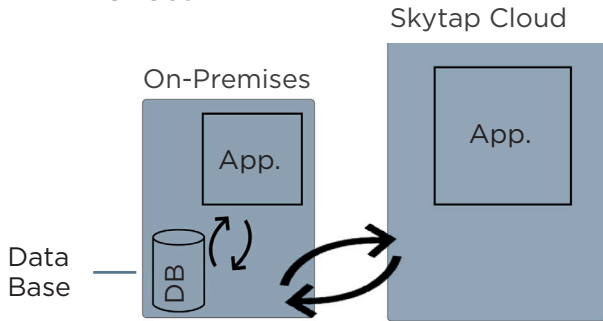
Architecture Modernization with Skytap Cloud

Skytap recommends breaking off complex applications into components and modernizing them in stages. Originally described by Martin Fowler as "The Strangler Method," this approach enables organizations to systematically modernize an application step by step; transformation is completed gradually so mission-critical functionality is undisturbed.
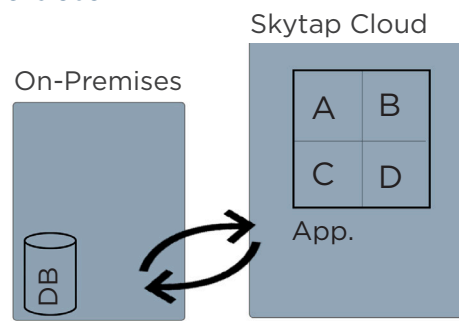
Skytap Cloud accelerates the process of transforming applications from monolithic to microservices architectures. An entire complex application can run in a single Skytap Cloud environment, including x86 VMs and Power/AIX VMs. Templates and rapid cloning ensure that changes can be implemented systematically, then tested against existing functionality. This ability to run old components and refactored components side
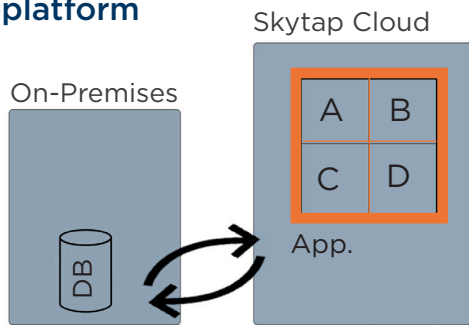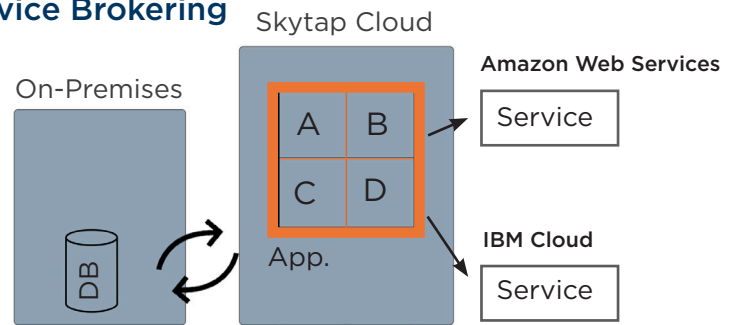
Rehost

On-Premises

Skytap Cloud

App.

App.

Data
Base — DB

Refactor

On-Premises

Skytap Cloud

A	B
C	D

App.

DB

Replatform

On-Premises

Skytap Cloud

A	B
C	D

App.

DB

Service Brokering

On-Premises

Skytap Cloud

A	B
C	D

App.

DB

Amazon Web Services

Service

IBM Cloud

Service

by side dramatically reduces risk while accelerating the rate of progress.

Skytap Cloud simplifies replatforming by enabling integrations with third-party cloud services and container management frameworks. Using Skytap Cloud, teams will be able to connect applications in Skytap Cloud with third-party services like cognitive capabilities, data analytics, and application services from cloud providers like AWS and IBM Cloud.

In many cases, applications that are in the process of or have completed modernization will still contain traditional components alongside new, cloud-native ones running Skytap Cloud or other cloud providers. Often, organizations will start by decoupling application

front and back ends, then modernize the front end to incorporate new services. Skytap Cloud enables these hybrid applications by secure VPN and NAT connections to other clouds and on-premises datacenters, direct connect for low latency requirements, and will be providing third-party service integrations.

Skytap Cloud helps businesses achieve their modernization goals faster by enabling architecture modernization for traditional applications, including the introduction of microservices, infrastructure as code, and third-party cloud services. With Skytap Cloud, enterprises can introduce cloud-native architectures and services to traditional applications while preserving core functionality.

These hybrid applications leverage both traditional and cloud-native components, and can span multiple clouds and datacenters. They embody the incremental approach to modernization in physical form, enabling organizations to drive more business value and deploy more efficiently without starting from scratch.

ISV Integrates IBM Watson to Deliver New Business Value with Skytap Cloud

An independent software vendor (ISV) provides Interactive Voice Response (IVR) solutions to major businesses worldwide. Its technology allows enterprises to scale on-demand for thousands of incoming and outbound customer calls every second.

Read the Full Case Study

Challenges

The business needed to offer its IVR solution as a SaaS product, as well as integrate with new services, to innovate and compete. However, the IVR platform was developed and run on datacenter hardware with a mix of AIX and Linux VMs. This limited, on-premises configuration prevented three key requirements to achieving the business' goals: elastic scaling to meet SaaS call volume, introduction of new technologies and approaches (e.g., AI, containers, PaaS), and the rapid release cycles necessary to support product innovation.

Solution

The business used Skytap Cloud's phased approach to modernization, enabling it to address each challenge iteratively. Because Skytap Cloud supports both Power/AIX and x86 workloads, the business was able to modernize infrastructure by rapidly migrating IVR workloads out of its datacenter. Once in Skytap Cloud, teams could move towards agile development and DevOps, accelerating time to value for business customers.

With Skytap Cloud, the business is able to offer its IVR product to customers as SaaS solution with next-gen capabilities, making it an innovation leader in its industry.

The business modernized the application's architecture by using a multi-cloud approach to integrate the core IVR application running in Skytap Cloud with innovative services from IBM Cloud. This hybrid application connects to IBM Watson services, including Text to Speech, Virtual Agent, and Conversation, so IVR customers can leverage the power of Watson to improve customer experience and insights. Containers are under consideration to optimize delivery and management even further.

6. CONCLUSION

Application modernization requires that the infrastructure and processes used to build the application are modernized along with its architecture. The fastest, most cost-effective path to application modernization is an incremental approach that empowers teams to tackle seemingly insurmountable challenges one step at a time.

Skytap Cloud is the only public cloud specifically designed to migrate and modernize traditional enterprise applications. IPA offers an incremental approach that makes a modernization initiative both realistic and achievable. By using the IPA approach to modernization, teams are able to evolve at the pace and stage that's right for their business.

Skytap Cloud provides the platform to support traditional applications at each stage of modernization, from the adoption of cloud infrastructure, to the acceleration of application development and delivery, to incorporation of cloud-native and next-gen technologies. With Skytap Cloud, you can make rapid application modernization in the cloud a reality.

For more insight on how to apply IPA, download our white paper, *"Enterprise Guide to Application Modernization for IT and Development Leaders"*.

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