Skytap on Azure

IBM i Backup, Recovery and Availability Options

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Summary

Skytap on Azure is a public cloud offering for IBM Power workloads – AIX, IBM i (AS/400) and Power Linux – to run in a hyperscale environment, alongside more traditional x86 Windows / Linux operating systems. The benefits of running IBM Power in the public cloud are many and varied and need not be covered here, however, moving to the cloud brings some additional considerations in certain operational areas for customers, such as backup, recovery, availability, business continuity, and monitoring.

Document Purpose

The purpose of this document is to provide a high-level overview of some of the critical elements of the Skytap solution for customers as they migrate to cloud including:

- Methods for providing high availability and disaster recovery
- Backup strategy
- Potential system monitoring options

Excluded from this document are:

- IBM AIX backup and recovery solutions, this is aimed at IBM i only since it tends to have more specific requirements
- Other aspects of the overall cloud solution such as networking

Version Control

Version	Date	Issuer	Notes
V1	Sept. 9, 2022	RF	Initial Draft
V2	Sept. 29, 2022	RF	Added detail on backup and replication products
V3	Oct. 5, 2022	RF	Added detail on Commvault solution

Acronyms

The following acronyms referenced in this document are defined here:

LAN	Local Area Network
WAN	Wide Area Network
ExR	Express Route
GR	Global Reach (for ExR)
SOA	Skytap on Azure
AIX	IBM UNIX operating systems for Power
IBM i	IBM i (a.k.a. AS/400, iSeries)
VPN	Virtual Private Network
VM	Virtual Machine
LPAR	Logical Partition (see VM)
TR	Technology Refresh (IBM i OS)
TL	Technology Level (IBM AIX OS)
PHN	Power Hosting Node
RPO	Recovery Point Objective
RTO	Recovery Time Objective
VTL	Virtual Tape Library
DC	Data Centre
APAC	Asia Pacific
EMEA	Europe Middle East and Africa
USA / US	United States of America
BRMS	Backup Recovery Media Services
ICC	IBM Cloud Connect – Cloud integration for BRMS
RPO	Recovery Point Objective
RTO	Recovery Time Objective
ASP	Auxiliary Storage Pool
IASP	Independent Auxiliary Storage Pool

Reference Documents and Links

The following documents are referenced in this paper:
None

The following links are provided for reference:
https://skytap.github.io/well-architected-framework/resiliency/

Document Author

This white paper was written by Skytap Cloud Solutions Architect Richard Field. Richard has many years of experience in various roles within the IBM Power system world, including solutions architecture, product management and business development, and in particular on the IBM i operating system. He joined Skytap in 2021 from a consulting role to a variety of partners and customers and is well known in the Power systems ecosystem, having spoken on several related topics at customer events and user groups.

Skytap on Azure Regions

The current Skytap Azure regions are shown on the map below.

Region	Schedule *
US East	Live
Singapore	Live
Amsterdam	Live
Hong Kong	Live
US S Central	Live
UK South #1	Live
UK South #2	Live (DR)
Dublin	Live
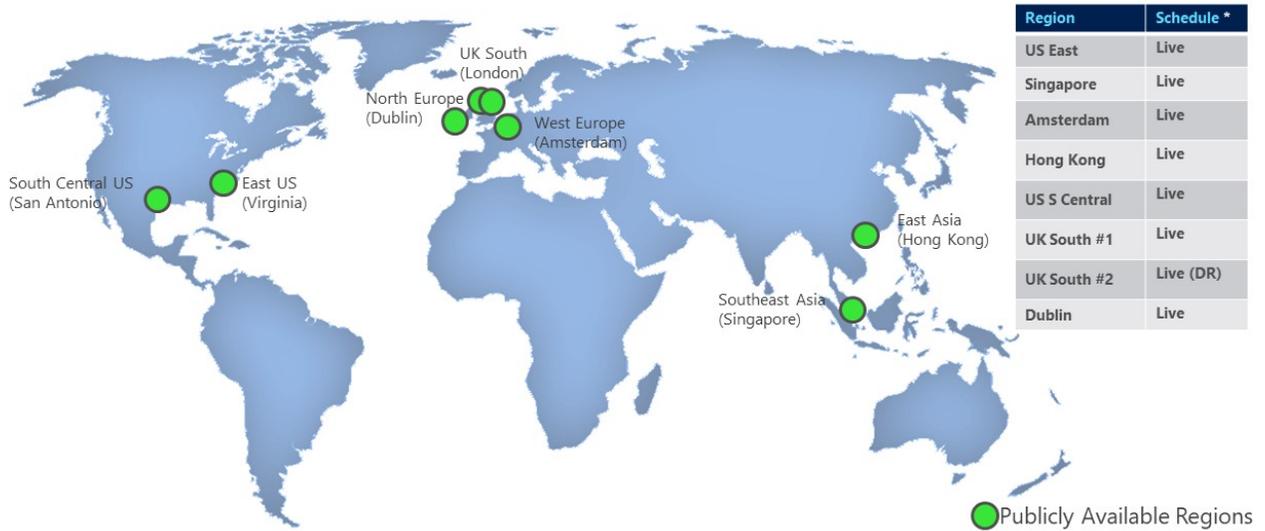
Paired Regional DCs

As can be seen in the Skytap on Azure regions map, data centres tend to be 'paired' locally to allow for high availability / disaster recovery across a reasonable geographic distance, without being too far to create latency issues on wide area networks.

- EMEA – West Europe (Amsterdam) to North Europe (Dublin)
- UK – UK South 1 (London) to UK South 2 (London DR)
- APAC – Southeast Asia (Singapore) to East Asia (Hong Kong)
- US – South Central US (San Antonio) to East US (Virginia)

Discussions about adding more regions are ongoing and will be included here as available.

Skytap Technology

Skytap on Azure is an IBM Power Platform provisioned in the Azure cloud comprised of the following:

POWER9 servers running with industry standard virtualisation technology to deliver IBM AIX, IBM i, and Power Linux in a public cloud service. Additionally, x86 servers running Windows or x86 Linux can also be deployed in the same cloud environment as needed, or these can be deployed 'next door' in native Azure, depending on cost versus latency considerations. This is a key advantage of Skytap on Azure over other cloud platforms since many of the backup solutions require adjacent Windows / Linux servers to act as a graphical interface or backup store or gateway.

For backup and business continuity, Skytap has recognised that these areas are critical to customers moving their IBM i to the cloud and have therefore developed some standard 'cloud optimised' solutions in this space to work as closely to the existing on-premise solutions, utilising either standard IBM practices such as BRMS or tape drive / tape library support, or cloud optimised solutions which will work with IBM i also, but are designed for cloud deployment and integrate into other cloud technologies such as Azure Blob Storage, Rubrik, Metallic and others.

High Availability and Disaster Recovery

Skytap on Azure is inherently stable and has a great deal of built-in resilience and redundancy. However, customers moving any workload to the cloud, especially production, will certainly require additional layers of protection to reach their agreed recovery time and point objectives.

To achieve this, Skytap includes some key features either direct from Skytap or from trusted partners for real-time replication and recovery. These disaster recovery and high availability options are tiered and structured based on the level of resilience and time required and include:

- **Live Clone** – this is a feature available via the Skytap portal, where a virtual machine, shut down or running, can be 'snapped' immediately, and the copy can then be stored locally, or in another region, for simple DR. Recovery time will be the time to start up the copied template, so around 10-15 minutes, but of course recovery point will be back to the last Clone operation.
- **Storage Replication** – this technology is not compatible with cloud solutions since the architecture and interfaces do not support it. Data can be moved between regions (using Copy and Clone features), but not replicated real time.
- **PowerHA System Mirror** - This technology is available in Skytap, the required licensed program is available as a chargeable option in the portal and uses a TCP/IP connection between the two VMs to synchronise changes to data across the cluster of servers. This is ideally deployed where an independent auxiliary storage pool 9iASP is used to store user data. This is not widely used in this form in IBM i customers, so we would not expect a large take up in the cloud either, however, it is an option where sizes of data, and the rate and size of changed data is not high.
- **Logical Replication** – Skytap supports any TCP/IP based logical, or journal-based replication tool. All the products available use the same basic technology, for the large part, writing database and other changes to a journal and pushing this, over a network connection, to another server, or virtual machine in this case, to be applied remotely. The recovery time and point for these solutions depends on the volume and size, and to a degree, the complexity of the data and application, but in almost all cases the recovery point is last completed transaction, and recovery time is from 15 to 60 minutes. Of the main tools available, the table below lists the key products and their support and deployment in Skytap. As for backup patterns noted above, these fall into two categories, those which are supported and deployed, tested and Skytap has expertise and training on them, and those which are more "Bring Your Own (BYO), where the technology will work, but the customer would work with the vendor, or their own operations and support teams, to deploy and support the tools.

Disaster Recovery as a Service (DRaaS) – whilst many clients are moving along a complete cloud pathway with a full and complete migration into Skytap for all environments, others may have a need or desire to maintain a production system on-premises, either for the comfort of their own control or due to data residency or compliance requirements. In these situations, they might want to adopt availability into the cloud so that they do not need to invest in a second set of infrastructure or data centre contracts. In this scenario, adopting DRaaS in the cloud is an excellent option. Whilst storage replication into Skytap and the Skytap specific features such as Live Clone, would obviously not be available in this hybrid scenario, replication using a logical replication technology as outlined above, would work very well, with the added benefit that the target virtual machine in the cloud could be significantly reduced in size compared to production, and up-sized when invoked, saving a large amount of money in cloud consumption, compared to a physical server on standby in a second data centre, which needs to be large enough to take over the production workload.

Backup Solution

Several different backup options exist within Skytap. In most simple terms, backups fall into two distinct categories:

1. Skytap recommended patterns
2. 'Bring Your Own' (BYO) solution

Skytap Backup Patterns for IBM i

Solution	Benefits	Drawbacks
Skytap Live Clone	Integrated into product No cost (except storage) Can clone a running VM	RPO is last clone activity
Commvault	Designed for cloud Multi-platform Integrates with cloud storage Incremental backup capability Compression and deduplication	Lacks VTL capability No BRMS integration
BRMS + ICC	Low cost: software is included with Skytap Tried and tested Supports IBM i commands	Performance is challenging Requires extra space on IBM i VM Suits small environments (up to 2-5TB max) only
DSI VTL	Designed for IBM i Full VTL support BRMS integration	Requires extra VMs in Skytap (cost) DSI license cost

In all cases, the deployment of the chosen backup solution is either a built-in Skytap feature, such as template copy and Live Clone, or a solution that can be fully deployed in the Skytap environment and interfaces, as required, with native cloud functions such as Azure Blob storage. This includes any software-defined virtual backup devices or media agents which require an x86 Windows or Linux VM next to the IBM i being backed up.

Skytap Live Clone - this is a technology built into the platform, where a copy of the virtual machine can be taken, even whilst running, to create a snapshot at a point in time, in the same or another region. Whilst clearly it is only as good, from a recovery standpoint, as the last copy, it provides a simple and cost-effective way to save the whole VM for purposes of upgrade, month end processing, archive or backup from the copy to another solution such as Commvault or VTL. This can effectively act as 'flash copy' and be redeployed as another VM, with the necessary changes to networks and so on, to backup offline where backup windows are reduced, or there is a need to save the data in another region for recovery or added protection.

Commvault - for multiple platforms and operating systems, as a cloud-based solution, Commvault is recommended. This can be deployed in native Azure or, for better performance, within Skytap, with backups performed to Skytap storage and optionally off-loaded to cloud storage in the background. Since Commvault is a 'pull' backup technology, i.e., the CommServer deploys an agent on the IBM i VM and the CommServer initiates its own backup mechanism, the integration with traditional IBM i commands and solutions, such as BRMS, are not there. However, it is an ideal 'single view' solution across a broad scope of assorted virtual machines. The capability for compression and deduplication, plus replication across environments, is very powerful.

DSI VTL – this is a cloud deployment of the long adopted DSI physical VTL appliance, utilised in data centre solutions for some time. The software defined version of this is ideal for cloud adoption since it makes use of the same code and interface as the on-premises version. This means that the functions and usage are consistent and familiar across a previous and new deployment, plus an on-premises physical device can replicate to a cloud deployed virtual instance readily, which aids not only cloud migration, but also a hybrid infrastructure of, as an example, production in a data centre and DR or Dev/Test in the cloud. As the virtualised tape library appears to the IBM i partition, as any other VTL or physical tape library, the standard IBM i commands, menus, and BRMS functions, can used without change. This is a solution designed for IBM i, so it does not have the multi-platform capability and functions of Commvault, for example, but is an option for IBM i deployments that require the familiarity and consistency as they journey to the cloud.

Sample VTL deployment, with a hybrid approach of on-premises migration into cloud, or production on-premises and DR/HA or Dev/Test in cloud, with a physical appliance replicating to a virtual device.

This scenario could equally be cloud to cloud, with two IBM i VMs in Skytap in different regions, with 2 Virtual VTL VMs in cloud also, replicating for off-site backups or synchronisation.
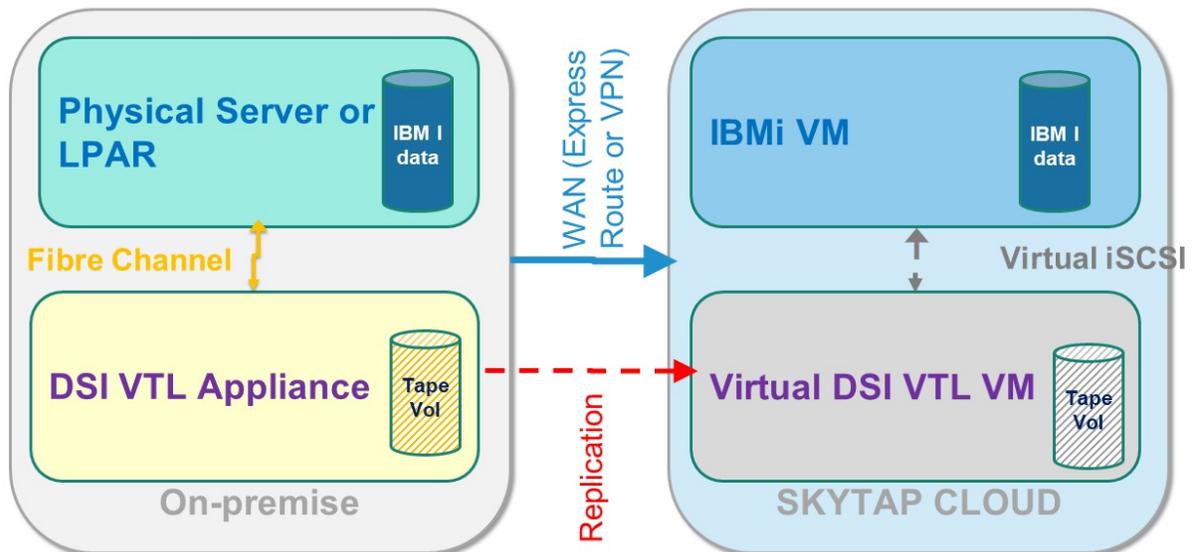

Diagram Key

DSI – Dynamic Systems International – VTL provider

VTL – Virtual Tape Library

LPAR – Logical Partition (or VM – Virtual Machine)

WAN – Wide Area Network

Shared Access Storage

Additional features are continuously being developed to further enhance Skytap for customers. One of the key features under development is Shared Access Storage. This is the ability to configure two Power hosting nodes (PHNs) to one storage instance with the ability to switch the processing from one to the other quickly, to improve both the recovery time and point objectives. This feature is currently in development and this document will be updated when it

is available. The two PHNs need to be in the same region so this is ideal for a local high availability solution.

Multiple systems – switchable 1x iASP
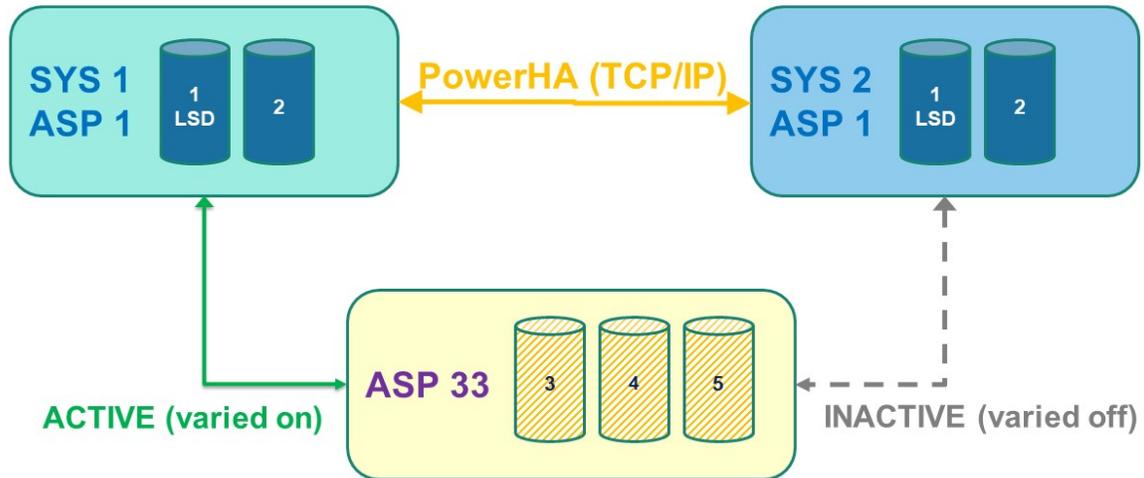
Diagram Key

SYS – System, LPAR, VM

ASP – Auxiliary Storage Pool (group of disks)

IASP – Independent ASP (switched disk)

PowerHA – IBM replication technology

TCP/IP - Transmission Control Protocol / Internet Protocol (Network connection)

Monitoring Solutions

Whilst Skytap has tools in place to monitor the backend of the infrastructure and virtualisation, including storage, there are no native tools available for OS/Application monitoring, since in most cases the customer will bring its own, as for backup and replication to a certain degree. Any IBM i third-party monitoring tool from HelpSystems and other vendors will work in Skytap, just as for a physical server or partition. Maxava's Mi8 monitoring solution, along with its related Mi7 and Mi6 scheduling and security tools, will also function well.

If integration with Azure Monitoring is required, such as where there is a mix of Skytap and native Azure deployments, then this can be achieved with an add-on which monitors IBM i VMs, plus AIX and others, and feeds data into Azure monitor.

Summary

Skytap is principally focused on building and deploying IBM Power systems running IBM i and AIX, in the Azure public cloud. In these migrations, especially for IBM i and in particular for larger, complex production environments, the adoption of the cloud virtual machine in Skytap doesn't happen in isolation. Additional technology and solutions are required around the periphery of the core cloud instance to cover backup, availability, and others, including security (not covered in depth here). Since patterns in use in a traditional on-premise environment do not necessarily fully translate to a cloud deployment, for example storage replication or physical tape, Skytap needs to architect and support other clearly defined solutions to address this need, which is not only fit for purpose, as close as it could be to the original architecture, but also simple to procure and deploy.

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