



Microsoft Cloud Workshop

Migrating SQL databases to Azure
Whiteboard design session student guide
November 2020

Information in this document, including URL and other Internet Web site references, is subject to change without notice. Unless otherwise noted, the example companies, organizations, products, domain names, e-mail addresses, logos, people, places, and events depicted herein are fictitious, and no association with any real company, organization, product, domain name, e-mail address, logo, person, place or event is intended or should be inferred. Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written permission of Microsoft Corporation.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

The names of manufacturers, products, or URLs are provided for informational purposes only and Microsoft makes no representations and warranties, either expressed, implied, or statutory, regarding these manufacturers or the use of the products with any Microsoft technologies. The inclusion of a manufacturer or product does not imply endorsement of Microsoft of the manufacturer or product. Links may be provided to third party sites. Such sites are not under the control of Microsoft and Microsoft is not responsible for the contents of any linked site or any link contained in a linked site, or any changes or updates to such sites. Microsoft is not responsible for webcasting or any other form of transmission received from any linked site. Microsoft is providing these links to you only as a convenience, and the inclusion of any link does not imply endorsement of Microsoft of the site or the products contained therein.

© 2020 Microsoft Corporation. All rights reserved.

Microsoft and the trademarks listed at <https://www.microsoft.com/en-us/legal/intellectualproperty/Trademarks/Usage/General.aspx> are trademarks of the Microsoft group of companies. All other trademarks are property of their respective owners.

Migrating SQL databases to Azure whiteboard design session student guide

Abstract and learning objectives

In this whiteboard design session, you work in a group to develop a plan for migrating on-premises VMs and SQL Server databases into a combination of IaaS and PaaS services in Azure. You provide guidance on performing assessments to reveal any feature parity and compatibility issues between the customer's SQL Server 2008 R2 databases and Azure's managed database offerings. You then design a solution for migrating their on-premises services, including VMs and databases, into Azure, with minimal down-time. Finally, you provide guidance on enabling some of the advanced SQL features available in Azure to improve security and performance in the customer's applications.

At the end of this whiteboard design session, you will be better able to design a cloud migration solution for business-critical applications and databases.

Step 1: Review the customer case study

Outcome

Analyze your customer's needs.

Timeframe: 15 minutes

Directions: With all participants in the session, the facilitator/SME presents an overview of the customer case study along with technical tips.

1. Meet your table participants and trainer.
2. Read all of the directions for steps 1-3 in the student guide.
3. As a table team, review the following customer case study.

Customer situation

Wide World Importers (WWI) is the developer of the popular Tailspin Toys brand of online video games. Founded in 2010, the company has experienced exponential growth since releasing the first installment of their most popular game franchise to include online multiplayer gameplay. They have since built upon this success by adding online capabilities to the majority of their game portfolio.

They decided to take a conservative approach while introducing online gameplay, hosting the gaming services on-premises using rented hardware. This approach allowed them to enter the online gaming market with a minimal upfront investment and lower risk. For each game, their gaming

services setup consists of three virtual machines running the gaming software and five game databases hosted on a single SQL Server 2008 R2 Enterprise instance. They are using the Service Broker feature of SQL Server for sending messages between gaming databases. In addition to the dedicated gaming VMs and databases, their gaming services include authentication and gateway VMs and databases shared across all their games.

Molly Fischer, the CIO of WWI, stated that the response to adding online gameplay has far exceeded their initial estimates. While their games' increased popularity has been good for profitability, the rapid increase in demand for their services has made supporting the current setup problematic. Compounding this problem is the release schedule for new versions of their most popular games. They have a target schedule of releasing a new version every 12 - 18 months, which means adding new VMs and a database server for each new version they release, while also maintaining the services for all previous game versions. Each new release results in increased rental equipment costs, as well as a steadily growing workload on their already overburdened staff. Internally, they have discussed end-of-life scenarios for older game versions, but the number of players remains high for many of these games, so no decisions have been made about when to terminate support for those games.

At its foundation, WWI is a game development company, made up primarily of software developers. The few dedicated database and infrastructure resources they do have are struggling to keep up with an ever-expanding workload. Increasingly, game developers have had to step in to support the infrastructure, which is taking time away from game development and has resulted in several missed release timelines. Molly has expressed concerns over adding additional non-developer resources, as she feels this is outside of their core business. She hopes that migrating their services from on-premises to the cloud can alleviate some of their infrastructure management issues while simultaneously helping them refocus their efforts on delivering business value by releasing new and improved games.

WWI indicated that their current hardware rental agreement ends in three months, and they're hoping to avoid signing another contract by migrating their existing VMs into Azure. They understand three months is a short timeframe, but believe a lift-and-shift approach of their gaming service VMs might be possible if they dedicate the appropriate resources. They already have VM images for each of their games that could be used in the process. They would like to know more about what a lift-and-shift migration might involve so they can plan resource allocation accordingly. They are also interested in learning more about whether this approach will provide better scaling options for the VM and database deployments on a per-game basis. Currently, they use the same number of VMs and databases for each game and version but have frequently run into issues hosting more gamers for popular games. They would like the ability to scale up to meet demand on new releases and more popular games, while also being able to scale down for older and less popular games. They would also like to investigate the possibility of globally distributing their gaming services to address latency issues reported by gamers accessing their services from other locations worldwide.

Of great concern to the WWI leadership team is that SQL Server 2008 R2 is now beyond the end of support. They are interested in hearing more about fully-managed platform-as-a-service (PaaS) options in Azure for their databases. They lack employees with any real database administration

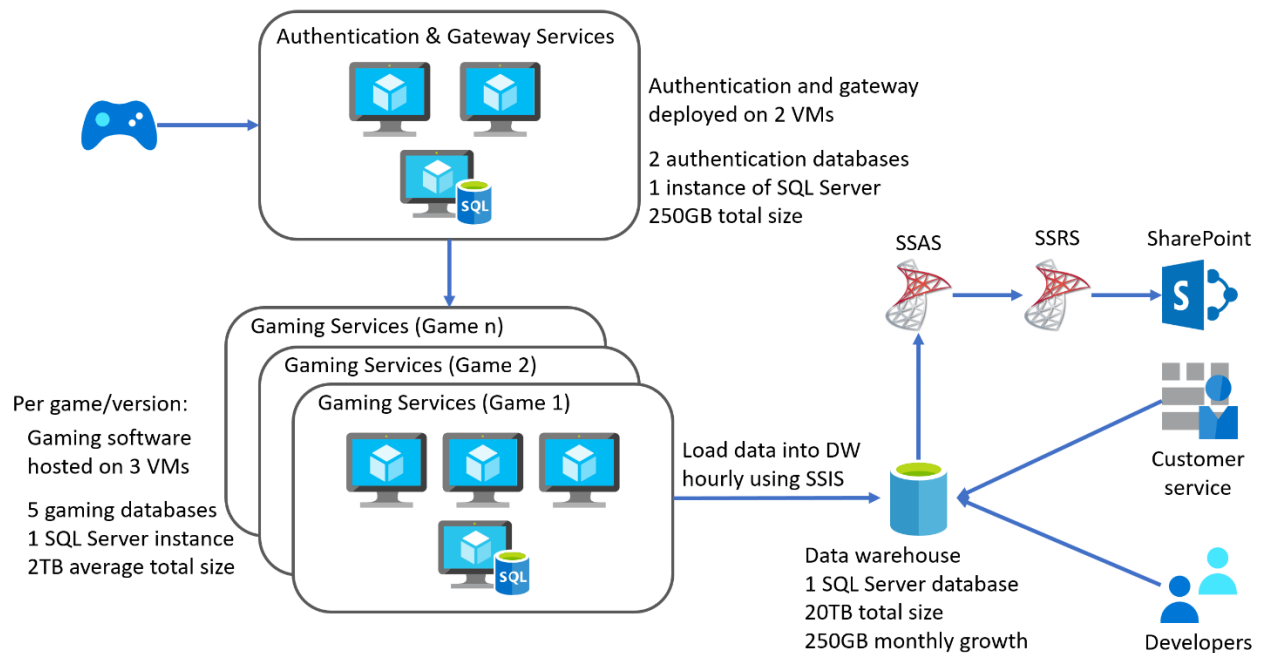
skills, so they feel this would be an excellent first step towards reducing their infrastructure workload. They have requested assistance in assessing any compatibility issues between their current databases and PaaS options in Azure. They have read that the Service Broker feature of SQL Server is partially supported in Azure and would like clarification on whether they can continue to use this with the PaaS database offerings. They are using this functionality for several critical gaming processes, and cannot afford to lose this capability when migrating their gaming databases to the cloud. They have also stated that, at this time, they do not have the resources to rearchitect the gaming services to use an alternative message broker.

In addition to their gaming services, WWI is also interested in migrating their data warehouse and its associated services to the cloud. The data warehouse uses a Symmetric Multi-Processing (SMP) based architecture and is hosted on a dedicated SQL Server 2008 R2 instance. The data warehouse is presently around 20TB in size and is growing at a rate of about 250GB per month. They use the data warehouse to build SQL Server Analysis Services (SSAS) cubes and create reports using SQL Server Reporting Services (SSRS). The SSRS reports are deployed to sites in their SharePoint environment. They feel the data warehouse's performance is adequate for meeting the requirement of presenting data to business users via BI components, such as SSAS cubes, so they indicated a desire to stick with the current architecture, if possible. They do not believe the existing data warehouse requires a Massively Parallel Processing (MPP) architecture at this time. They collect numerous game telemetry data points, including remote monitoring and analysis of game servers and user telemetry (i.e., data on players' behavior, such as their interaction with games and other players). Code embedded in the gaming software transmits data to the gaming databases. Telemetry data is then loaded into the data warehouse hourly using SQL Server Integration Services (SSIS) packages. They also noted that their customer service personnel and developers frequently connect to the data warehouse for various activities.

They also mentioned some reports that are run directly against the gaming databases to analyze user telemetry and gaming metrics in near real-time. While there are not many of these reports, they are essential to the developers and business users. They have noticed that at times of peak gaming activity, running these reports can be very slow, and they have occasionally seen impacts on gaming performance. They are interested to learn if there is any way they can continue to run these reports, but do it in a way that will alleviate the performance impact they've experienced.

WWI is excited to learn more about how migrating to the cloud can improve its overall processes and address the concerns and issues with its on-premises setup. They are looking for a proof-of-concept (PoC) for migrating their gaming VMs and databases into the cloud. With an end goal of migrating their entire service to Azure, the WWI engineering team is also interested in understanding better what their overall architecture will look like in the cloud.

To help you better understand their current environment, WWI has provided the following architecture diagram of their on-premises gaming services implementation.



Customer needs

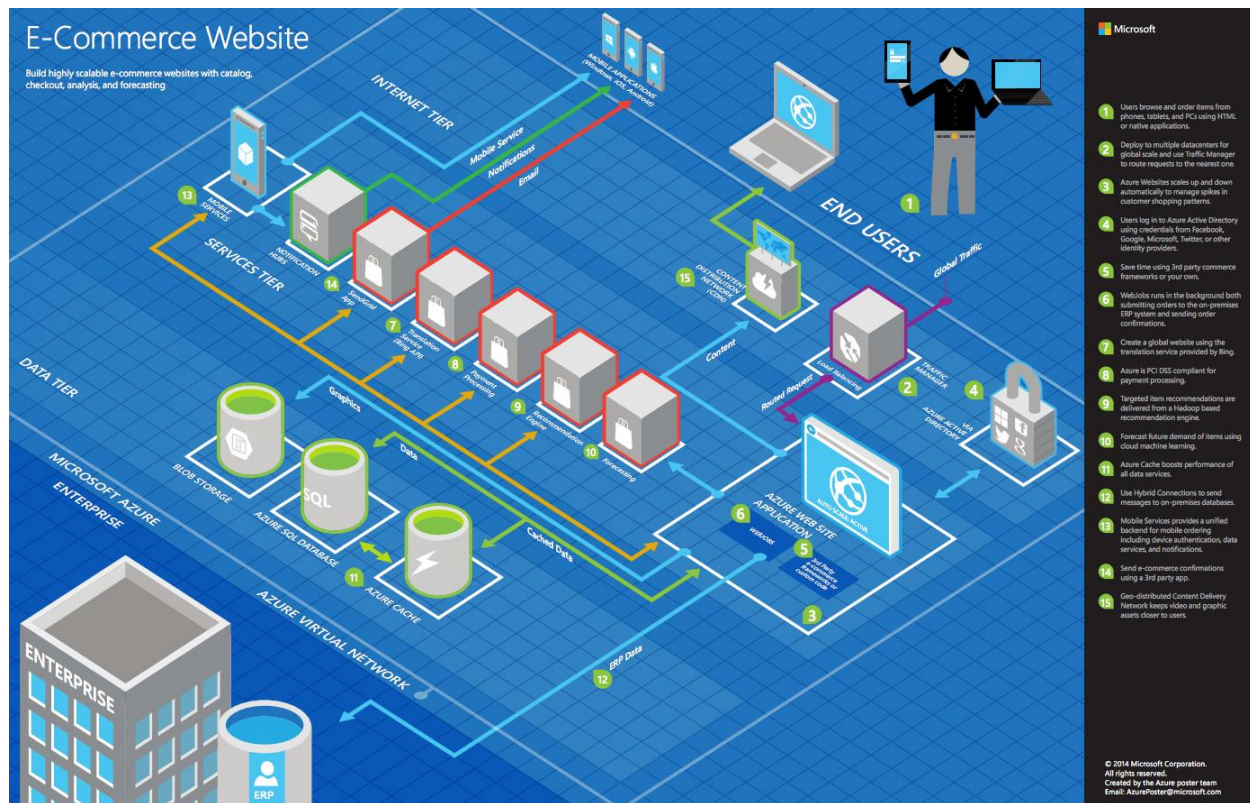
1. We want to migrate all our gaming services infrastructure into the cloud, using PaaS services where possible. We would like to know if this can be accomplished in three months to avoid renewing our equipment rental contract.
2. In addition to our gaming services, we would like to migrate our existing data warehouse to Azure to take advantage of the ability to scale out along with some new SQL features available there. The current data warehouse performs well with an SMP-based architecture, so we would like to keep that, if possible. As part of this request, we would like to know more about:
 - Adding the ability to scale out the data warehouse to serve more requests.
 - The migration or upgrade path for our SSIS packages, SSAS cubes, and SSRS reports.
3. We want recommendations on how to minimize migration costs as much as possible.
4. We want to improve our databases' security posture and learn more about potential vulnerabilities and compliance issues.
5. We have had complaints of high latency from gamers in other regions throughout the world, along with reports that players cannot join games during peaks of high usage. By migrating our gaming services to the cloud, we are looking to improve the overall gaming experience, including:
 - Reducing latency for gamers accessing our services from various places around the world.

- Improving our ability to host more players during peak times or when new game releases.
 - Adding redundancy to ensure high-availability for our gaming services.
- 6. In the event of a regional outage, we would like to resume gaming services within minutes and recover the data warehouse within 48 hours.

Customer objections

1. It appears that there are multiple options for hosting SQL databases in Azure. What are all the different options, and how do they differ? Do they all support the same features as an on-premises SQL Server instance, or are there unsupported features we should be aware of before migrating? Will we be able to continue using Service Broker with a PaaS database in Azure?
2. Are there tools that allow us to evaluate which of the various SQL Database hosting options in Azure will work with our current SQL Server 2008 R2 databases? Is there a way we can test targeted workloads against other versions of SQL? Are there tools that can help us identify potential issues and incompatibilities before we attempt a migration?
3. In moving to the cloud, will we retain the ability to connect to and troubleshoot from our on-premises dev environment, while keeping our back-end networking fully isolated and only enabling talking to the front-end through a secured channel?
4. We want to avoid "vendor lock-in" when moving to the cloud. Will using PaaS services for hosting our databases allow us to have a valid exit strategy? Or should we stick to using VMs in Azure for hosting our databases?
5. Migrating to the cloud represents a significant change in how our organization operates. We are looking for guidance that can help us succeed in making this transition. Does Microsoft have any resources for this?

Infographic for common scenarios



Step 2: Design a proof of concept solution

Outcome

Design a solution and prepare to present the solution to the target customer audience in a 15-minute chalk-talk format.

Timeframe: 60 minutes

Business needs

Directions: With all participants at your table, answer the following questions and list the answers on a flip chart:

1. Who should you present this solution to? Who is your target customer audience? Who are the decision makers?
2. What customer business needs do you need to address with your solution?

Design

Directions: With all participants at your table, respond to the following questions on a flip chart:

High-level architecture

1. Without getting into the details (the following sections address the particulars), diagram your initial vision for handling the top-level requirements for the game databases, gaming services VMs, data warehouse, and associated services. You will refine this diagram as you proceed.
2. How can migration costs be minimized?
3. Is it possible to migrate WWI's gaming services within three months?
4. What functionality should you include in the PoC?

Game databases

1. What are the factors that WWI should consider when deciding between PaaS or IaaS options for hosting their SQL databases in Azure?
2. From the options for hosting SQL databases in Azure, which would you recommend for hosting their gaming databases, and why do you think that the best choice? What pricing tier would you recommend?
3. How would you handle the data migration? Provide step-by-step instructions from assessment to data migration.
4. What are some of the features available in Azure SQL Managed Instance that can help improve WWI's security posture?
5. Are there features of a PaaS database service that could help to reduce the impact of read-only reports running directly against their gaming databases?

Gaming services

1. How should WWI handle migrating their gaming services VMs into Azure?
2. What would you recommend for addressing the latency issues experienced by gamers from other regions of the world?
3. How should the ability to scale gaming services up or down be handled?
4. How can the gaming services be made highly-available?

Data warehouse and reporting

1. What would you recommend as the target platform for their data warehouse in Azure?
2. How could they read-scale out their data warehouse to serve more requests?
3. What is the upgrade path for their SSIS packages, SSAS cubes, and SSRS reports?

Regional outages

1. How can their gaming services be recovered within the specified RTO/RPO?

Prepare

Directions: With all participants at your table:

1. Identify any customer needs that are not addressed with the proposed solution.
2. Identify the benefits of your solution.
3. Determine how you will respond to the customer's objections.

Prepare a 15-minute chalk-talk style presentation to the customer.

Step 3: Present the solution

Outcome

Present a solution to the target customer audience in a 15-minute chalk-talk format.

Timeframe: 30 minutes

Presentation

Directions:

1. Pair with another table.
2. One table is the Microsoft team and the other table is the customer.
3. The Microsoft team presents their proposed solution to the customer.
4. The customer makes one of the objections from the list of objections.
5. The Microsoft team responds to the objection.
6. The customer team gives feedback to the Microsoft team.
7. Tables switch roles and repeat Steps 2-6.

Wrap-up

Timeframe: 15 minutes

Directions: Tables reconvene with the larger group to hear the facilitator/SME share the preferred solution for the case study.

Additional references

Description	Link
Choosing the right Azure SQL	https://docs.microsoft.com/azure/azure-sql/azure-sql-iaas-vs-paas-what-is-overview
SQL Database Platform as a Service	https://docs.microsoft.com/azure/azure-sql/database/sql-database-paas-overview
Business continuity	https://docs.microsoft.com/azure/azure-sql/database/business-continuity-high-availability-disaster-recover-hadr-overview
High availability	https://docs.microsoft.com/azure/azure-sql/database/high-availability-sla
Automated backups	https://docs.microsoft.com/azure/azure-sql/database/automated-backups-overview
Long-term back retention	https://docs.microsoft.com/azure/azure-sql/database/long-term-retention-overview
Auto-failover	https://docs.microsoft.com/azure/azure-sql/database/auto-failover-group-overview
Scale resources	https://docs.microsoft.com/azure/azure-sql/database/scale-resources
Feature comparison: Azure SQL Database versus SQL Server	https://docs.microsoft.com/azure/azure-sql/database/features-comparison
Service broker support in Azure SQL Managed Instance	https://docs.microsoft.com/sql/database-engine/configure-windows/sql-server-service-broker?toc=%2Fazure%2Fazure-sql%2Ftoc.json&view=sql-server-ver15#service-broker-and-azure-sql-managed-instance
Azure SQL Managed Instance	https://docs.microsoft.com/azure/azure-sql/managed-instance/sql-managed-instance-paas-overview
Connectivity architecture for SQL MI	https://docs.microsoft.com/azure/azure-sql/managed-instance/connectivity-architecture-overview
Connecting an app to SQL MI	https://docs.microsoft.com/azure/azure-sql/managed-instance/connect-application-instance

Azure SQL Database service tiers	https://docs.microsoft.com/azure/azure-sql/database/service-tiers-general-purpose-business-critical
Getting started with Azure SQL MI	https://docs.microsoft.com/azure/azure-sql/managed-instance/quickstart-content-reference-guide
Database Migration Guide	https://aka.ms/sqlmigrationguide
Database Migration Assistant	https://docs.microsoft.com/sql/dma/dma-overview?view=azuresqldb-mi-current
Database Migration Assistant	https://docs.microsoft.com/sql/dma/dma-overview?view=azuresqldb-mi-current
Azure Database Migration Service	https://docs.microsoft.com/azure/dms/dms-overview
Azure Database Migration Service	https://docs.microsoft.com/azure/dms/dms-overview
Migrate SQL Server to an Azure SQL Managed Instance	https://datamigration.microsoft.com/scenario/sql-to-azuresqldbmi
Migrate SQL Server to an Azure SQL Managed Instance - Overview	https://docs.microsoft.com/azure/azure-sql/migration-guides/managed-instance/sql-server-to-managed-instance-overview
Migrate to Azure SQL Managed Instance	https://docs.microsoft.com/azure/dms/tutorial-sql-server-to-managed-instance?toc=/azure/sql-database/toc.json
Migrate SQL Server to an Azure SQL Managed Instance - Guide	https://docs.microsoft.com/azure/azure-sql/migration-guides/managed-instance/sql-server-to-managed-instance-guide
Migrate SQL Server to an Azure SQL Managed Instance using DMS	https://docs.microsoft.com/azure/dms/tutorial-sql-server-managed-instance-online?view=sql-server-2017

Azure SQL Database pricing	<u>https://azure.microsoft.com/pricing/details/sql-database/managed</u>
Overview of Azure SQL Database security capabilities	<u>https://docs.microsoft.com/azure/azure-sql/database/security-overview</u>
Azure Defender for SQL	<u>https://docs.microsoft.com/azure/azure-sql/database/azure-defender-for-sql</u>
Data discovery and classification	<u>https://docs.microsoft.com/azure/azure-sql/database/data-discovery-and-classification-overview</u>
SQL Vulnerability Assessment service	<u>https://docs.microsoft.com/azure/azure-sql/database/sql-vulnerability-assessment</u>
Threat detection	<u>https://docs.microsoft.com/azure/azure-sql/database/threat-detection-overview</u>
SQL Database Read Scale-Out	<u>https://docs.microsoft.com/azure/azure-sql/database/read-scale-out</u>
RDL Migration Tool for migrating SSRS reports to Power BI	<u>https://github.com/microsoft/RdlMigration</u>
Cloud Adoption Framework for Azure	<u>https://docs.microsoft.com/azure/cloud-adoption-framework/overview</u>
Azure Migrate	<u>https://docs.microsoft.com/azure/migrate/migrate-services-overview</u>