Migrating applications to Microsoft Azure: lessons learned from the field

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About Me

- Senior Architect, Sela Group
- Microsoft acronyms: RD, ASP.NET/IIS MVP, Azure TSS, MCT
- Co-author of courses and books
- Focus on server, web, and cloud
- Manager of the Israeli Web Developers User Group
Azure From the Field

- Azure Costs and Billing
- Know Your Azure Stuff
- Architecture Lessons Learned
- Azure Preview Features
- Tools of the Trade
Azure Costs and Billing
Azure Costs – the Obvious

- Pay for the services you use
  - Instances, storage, SQL Database, Service Bus, …
- Pay only for outgoing bandwidth
- Pay-as-you-go
- Don’t remember the prices? Check online
  http://azure.microsoft.com/en-us/pricing
- Don’t forget discounts
The Costs You Didn’t Account For

- Small change
  - VM disks, bandwidth, storage transactions, VPN gateway

- The must-have
  - VM Backups, SQL Database backups (exceeding 200%)

- The nice-to-have
  - Monitoring data, diagnostics data
  - Egress for monitoring data

- Don’t go to production without it
  - Technical support
Reducing Azure Costs

- Turn off dev/test VMs off-hours
  Turning off 22:00-7:00 and on weekends to reduce costs by 50%

- Monitor your instances to optimize their usage
  [link](http://blogs.technet.com/b/cbernier/archive/2014/08/05/microsoft-azure-iaas-cost-estimator-tool.aspx)

- Which storage type are you using? (prices in $/GB/month)
  LRS (0.024) / ZRS (0.03) / GRS (0.048) / RA-GRS (0.061)

- Keep track of instances
  - Delete unused VM disks
  - Use basic tiers for dev/test
  - Delete staging deployments

- Regularly inspect your bill!
Learning How Azure Works

- None of us knows how Azure works

- Except maybe this guy

- Learning how stuff works is a process
  - Start with the basics of what each Azure service does
  - Get to know each service’s limitations and performance
  - Look for best-practices, advanced topics, etc.

- Here are some examples of the learning curve
How Stuff Works
Lessons Learned

- Load Balancer
  - Azure LB is round robin, not!
  - Is LB the same for all hosting offerings?

- Traffic Manager
  - What’s DNS load balancing?
  - TTL is a recommendation

- Azure Compute
  - Persistent/Temporary disk
  - Does size only dictate CPU & Memory? (short answer, NO!)
  - Incoming/outgoing IP
Where to Learn Azure Services

- Get updated
  - Azure blog (http://azure.microsoft.com/blog)
  - Team blogs (Azure Storage, Active Directory, ScottGu)
  - Service update (http://azure.microsoft.com/en-us/updates)

- Know your limits
  - Service limits and quotas (http://bit.ly/1mNOSlp)
  - Storage scalability (http://bit.ly/1aPZnt4)

- Check the documentation
  - Walkthroughs (http://azure.microsoft.com/en-us/documentation)
  - REST Management APIs (http://bit.ly/1wLDD5e)
  - Cloud design patterns (http://bit.ly/1CGJSSl)

- Virtual/Classroom training, Azure user groups (http://www.meetup.com/UKAzureUserGroup)
Lessons Learned – Architecting for the Cloud
Azure Scenarios

- Lift&Shift
- Dev/Test
- PaaS
  - Hosting
  - *-as-a-Service
- Big Compute / Big Data
Cloud Architecture Best Practices

- Scale Up / Scale Out
- Disaster Recovery (DR)
- Store session in cache
- Leverage Azure PaaS Services
- Decouple components with async queues

There was a session on these topics on Tuesday
Lessons Learned
Why Can’t I Access my Service?

■ Complaints
  ■ Traffic Manager marks services as degraded (failed)
  ■ Azure Load Balancer “ignores” instances
  ■ External monitoring with Pingdom fails due to timeouts

■ Troubleshooting
  ■ Checked Azure operation logs, but did not find anything substantial
  ■ Requested Azure Support to provide logs for TM / LB, but they didn’t have detailed logs for all services
  ■ Azure Support requested IIS logs, but we didn’t have any (deployment already deleted/updated)
  ■ Time spent so far – about 4 days!
Lessons Learned

Why Can’t I Access my Service?

- After enabling logs we realized that:
  - TM monitoring got blocked by VM Endpoint ACL
  - Endpoints failed when probed due to an internal error – HTTP 500 in IIS Logs
  - Endpoints hanged (>1 minute) when probed because site was overloaded

- Conclusions
  - Keep in mind that ACL Endpoints also blocks Azure IPs
  - Don’t assume Azure monitors everything for you
  - Don’t rely solely on Azure Metrics for diagnostics
  - Use the PaaS/IaaS Diagnostics Plugin
  - Collect application, server, and IIS logs
  - Move logs periodically to Azure Storage

Lessons Learned
Making Developers Happy

- Complaints
  - Deploying to cloud services takes forever
  - Deployment sometimes hangs, and we need to delete it and re-do

- Why is that?
  - Deployment means uploading huge packages to storage
  - Provisioning new instances takes time
  - Complex worker roles are slow to stop / start
Lessons Learned
Making Developers Happy

So what can we do?

- Use compute emulator when possible
- For slow Internet – deploy from an Azure VM
- Enable Web Deploy for single-instance Web Roles
- Don’t be afraid to RDP and replace .dll files (dev/test)
- Replace in-role cache with cache-as-a-service
Lessons Learned
Data Synchronization and DR

- We know how to deploy frontends and backends for DR:
  - Deploy multiple sets of Web and Worker apps to multiple sites
  - Use configuration to manage database and storage addresses
  - Create Traffic Manager endpoints with failover

- We don’t know how to properly:
  - Replicate the database between the sites
  - Replicate Azure Storage (blobs, tables, files) between the sites
Lessons Learned
Data Synchronization and DR

- **Database Synchronization**
  - (IaaS) SQL Server 2014 – AlwaysOn supports HA and DR with multiple datacenters
  - (IaaS) MySQL – Use Master-Master and Multi-Master replications
  - (PaaS) SQL Database – Geo-Replication in Standard and Premium
Lessons Learned
Data Synchronization and DR

- **Azure Tables - Transactional Data Patterns**
  - Write transactions to a queue, not directly to the DB
  - Workers dequeue transactions, and write to the DB
  - For DR, duplicate the transaction to a remote queue
  - Applies to both database and Table storage

- **Blob / File synchronization**
  - Azure doesn’t support storage synchronization - DIY
  - Azure WebJobs SDK provides blob listeners
  - Beware of huge containers
Lessons Learned
Azure Services are not Bulletproof

- Complaints
  - Azure Storage sometimes timeout when reading/writing
  - SQL Database connections sometimes timeout or dropped
  - SBQ suddenly isn’t available for several seconds

- What is happening?
  - Some Azure services use shared computing, networking, and storage
  - Network congestion and high CPU can cripple a single service node
  - Potentially, such interruptions should not take more than a few seconds
Lessons Learned
Azure Services are not Bulletproof

- Resolving with retries
  - Use fault detection and retry logic
  - Most Azure SDKs support retries (Service Bus, Storage)
    http://azure.microsoft.com/blog/2014/05/22/azure-storage-client-library-retry-policy-recommendations
  - For other cases – use the Transient Fault Handling Application Block

- Resolving with failovers/backups
Lessons Learned
Making it Faster

- Complaints
  - Upload to Azure Storage is slow
  - It takes a long time to send 10k messages to Service Bus Queues
  - Listener in Worker Role only utilizing 25% CPU

- Azure services are complex, don’t expect <1ms latency

- What can we do?
  - Do basic tests to get a baseline, make sure it is reasonable
  - Read performance guidance articles – many services have them
  - Investigate, investigate, investigate!!!
Lessons Learned
Making it Faster - Examples

- **Azure Storage**
  - Disable Expect-100 and Nagle
  - For large files, use parallel block uploads

- **Service Bus**
  - Reuse clients and factories
  - Batch messages when sending and receiving
  - Client-side batching and server-side prefetching
Lessons Learned
Making it Faster - Examples

- Database
  - Improve SQL on IaaS by using temporary SSD and disk striping
  - Improve SQL Database by using Active Geo-Replication for load-balancing
    http://azure.microsoft.com/blog/2014/07/12/spotlight-on-sql-database-active-geo-replication
Azure Preview Features – Fight or Flight?
#1 Rule of Preview Features

NEVER USE PREVIEW FEATURES IN PRODUCTION !!!
Preview Features – Why Not?

- Bugs
- Unimplemented/limited feature set
- Minimal documentation
- Restricted availability
- No warranty or SLA
- Possibility of breaking changes
- Uncertainty of release date
- Not covered by Azure Support
Preview Features – Why Use?

- Provide feedback to shape the product to your needs
  [http://feedback.azure.com](http://feedback.azure.com)
- Replace DIY/VMs with platform services
- Stay ahead of the curve
- Take the time to evaluate the new service
- Free of charge / “preview” discount
Preview Features - Getting Started

- Check the list
  http://azure.microsoft.com/en-us/services/preview/

- Use the forums

- Don’t forget to look for “hidden” features via the REST API

- Hook up with an Azure Insider / MVP for private previews
Tools of the Trade

Everything but Visual Studio
Azure Management Tools

- **Azure Management Studio**
  http://www.cerebrata.com/products/azure-management-studio

- **IaaS Management Studio**
  http://iaas.ao-is.com

- **Service Bus Explorer**
  https://github.com/paolosalvatori/ServiceBusExplorer
Azure Storage Tools

- CloudBerry Explorer

- CloudXplorer
  http://clumsyleaf.com/products/cloudxplorer

- Azure Storage Explorer
  https://azurestorageexplorer.codeplex.com

- Zudio (online storage management)
  https://zudio.co

- Cybrduck (blob storage for MacOS)
  https://cyberduck.io

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Command Line and SDKs

- Command-line
  - PowerShell cmdlets
    https://github.com/Azure/azure-powershell
  - Azure CLI
    https://github.com/Azure/azure-xplat-cli

- Service Management API
  - Linq2Azure
    http://linq2azure.com
  - Azure SDK for .NET
    https://github.com/Azure/azure-sdk-for-net
To Conclude

- Having a cloud mindset is important

- Architecting for the cloud is how we do it properly

- Don’t say “I though it worked differently” – read, learn, try!

- With time and experience, new best practices are published

- Keep up with the technology pace
Resources

- You had them throughout the slide deck

Download the slides from:

http://1drv.ms/1BNRinI