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z/OS application considerations when moving to the cloud or x86

Before moving a single-tier application to a multi-tier architecture, examine your workload activity and business requirements

With more enterprises moving to the cloud or x86, traditional IBM z/OS® applications are being examined for deployment on the cloud or x86-based servers. z/OS applications are mostly single-tier, while applications on other platforms are multi-tier. Fundamental differences exist between single-tier and multi-tier application architectures and their placement on cloud and x86 require important considerations.

Single-tier applications

So, what is a single-tier application? Most applications have a programming component and a data component - meaning programs will use data, which could be in the form of a simple sequential file, through a complex database. The programs run and use data, which must be in-memory with the application. On z/OS, all resources are shared and thus many processes run concurrently. This allows for programs to run and for data to reside, and be accessed, on the same physical server. If the application component and the data component run together within the same operating system (OS) image, it is considered to be single-tier.

Multi-tier applications

On x86 and other distributed platforms, the program and the data are typically run on application servers and database servers in different OS images, resulting in a two- or multi-tier application. Separating the two components creates a requirement for the tiers to communicate through a network connection that can introduce communication delays.

Response times, unique file structures and more

Network connections add latency to the response time and throughput of running workloads, which can be 40% or higher for a single application flow.[1] This also adds a requirement to run additional network instructions, which isn't required with a single-tier application. This requirement is applicable to both the application servers and database servers.

IBM internal testing found that a single tier CICS®/COBOL banking application accessing Db2® with z/OS cross-memory communication within the same LPAR on IBM z15™ can have 46% lower CPU usage than a WebSphere® Java™ based two tier application accessing Db2 via JDBC over TCPIP in a separate z/OS LPAR.[1]

Additionally, unique file structures exist on z/OS that aren't supported on other platforms. These could make conversion and migration difficult and possibly require application modification and re-engineering. Some examples of this are Virtual Storage Access Method (VSAM) and Partition Data Set Extended (PDS/E) files that don't have counterparts on any other platform. There are also system

[1] Results were achieved using Rational Performance Tester (RPT) to drive an 8,000 transactions per second (TPS), 180 user simulated CICS/COBOL retail banking environment using an IBM internal use banking application on an IBM z15 system with 8 CPs, 1 zIIP and 32GB memory. The CICS/COBOL application was co-located and used z/OS cross-memory communication with Db2 on the same LPAR. The internal use banking application was rewritten from CICS/COBOL to WebSphere Java and used Jmeter to drive the same TPS and number of simulated users. The Java based application accessed the same Db2 data in a separate LPAR using Java database connectivity (JDBC) over TCPIP. Data in Resource Management Facility showed that the CICS/COBOL test scenario required on average 1,076 Db2 MIPS while the WAS Java test scenario required on average 1,576 Db2 MIPS. Testing was performed in an IBM lab. Results will vary.

exits used for auditing and accounting purposes that don't exist, along with many unique program products that are leveraged within the actual applications.

In cases in which z/OS COBOL applications are rewritten to Java, incremental CPU usage needs to be taken into account. These applications can consume significantly more CPU cycles, resulting in the purchase and provisioning of incremental hardware resource. IBM internal testing found that a CICS/COBOL banking application accessing Db2 on IBM z15 when rewritten to WebSphere Java requires 5.5 times additional application CPU.[2]

Make an informed decision

Networking, latency implications and z/OS unique attributes must be taken into consideration when evaluating z/OS applications as potential candidates for conversion to cloud applications. Failure to do so can create problems with scaling and meeting existing SLAs. The use of additional hardware and software can help, but this can add to the total cost of operations. Nor may it not necessarily guarantee the same service level agreement (SLA) results. Before moving a single-tier application to a multi-tier architecture, evaluate your workload's activity and business requirements.

If your organization is considering deployment of z/OS applications in x86 or cloud environments, contact the IT Economics team at IT.Economics@us.ibm.com for a no-charge application modernization assessment. An evaluation of the application can identify how best to deploy the application for enterprise hybrid cloud IT.

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