Activity 5: Cloud Containers & Research

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CST-323

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Docker Tutorials:

Docker For Beginners

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Doing more with Docker Images:

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First Alpine Linux Containers:

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Docker Images Deeper Dive:

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DockerHub Tutorials completed.

Kubernetes Tutorials:

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Cloud Computing Research:

a. Read the assigned textbook required readings for this topic. Provide the following research:

i. Define the business problem statement for your Milestone project. TODO

ii. Draw a business architecture diagram for your Milestone project. TODO

iii. Identify the business and technical requirements for your Milestone project. TODO

b. Describe three elements that could be defined in a Dockerfile. Discuss what the elements are used for and provide a brief description for each.

A Dockerfile is a file that contains a set of configurable directives that define what sort of system the container should create and how to set its internal environment to suit a very particular use case.

FROM - This directive allows a developer to specify a machine image to use when creating the container. This is a required clause for a valid Dockerfile, since it's the logical start of any container creation process. There are many starter images available in public repositories.

RUN - This command performs a shell command in the container, much like running commands in your MacOS Terminal or Windows Cmd command line. For Linux-based images, this runs commands in the /bin/sh -c shell. For Windows images, this runs in the cmd /S /C space. Other options can be defined which will execute commands in a bash shell or any other available defined one. The basic idea is that the commands defined by RUN will be committed to the image in a layer on top of it, which is then available to the next set of instructions in the Dockerfile. In this way, "commits" behave much the same way as in version control systems like Git. An image can then be created from anywhere in the "commit history" created by the Dockerfile.

ENV - This command sets environment variables for the container, which are available to all subsequent portions of the Dockerfile. This can set one or many variables with one call to ENV. This is an easy way to set values which must be specific for different builds of a containerized application, like a test vs. production deployment.

c. Research the concepts of high availability (HA), failover, and the number of nines. What are HA, failover, and the number of nines? How does the number of nines help solve HA and failover?

The idea of High Availability relates to the amount of time out of a specified period when a service can be expected to be fully operational. Cloud providers use a bunch of different methods to achieve this level of system dependability and uptime. Failover is a process where, in the event of a system failure, other systems come into action and take over the responsibilities of the failed system. In the case of a website, a redundant web server could take over all traffic if the primary server went down for a time.

The number of nines is a concept related to the amount of time in a period of a year that a system could be down to meet a level of HA expressed as a percentage including only the number nine. So, one nine means 9% uptime in a year, two nines is 99% uptime, and so on. Mission-critical systems should shoot for the highest number of nines in an SLA as possible, to ensure they don't suffer more than mere minutes of downtime in a given year.

The concept really standardizes a way of viewing system uptime across cloud providers. Four nines (99.99%) only allow for roughly 52 minutes of downtime in a service per year, which requires a hefty amount of redundancy, failover protection, and monitoring to ensure. This level of promised quality raises trust between service providers and consumers while giving potential customers a key metric to use when comparing the quality of different services or systems.

Reference:

Dockerfile reference. (2023, April 12). Docker Documentation. https://docs.docker.com/engine/reference/builder/

Noonan, J. (2022, July 1). High Availability Architecture: Definition & Best Practices | Redis. Redis. https://redis.com/blog/high-availability-architecture/

Ramirez, N. (2022, January 24). Achieving Website High Availability - HAProxy Technologies. HAProxy Technologies. https://www.haproxy.com/blog/achieving-website-high-availability/