What is stateful and stateless in kubernetes

What is the difference between stateful and stateless filtering. What is stateless and stateful services. What is stateful in kubernetes.

Kubernetes has fundamentally altered the traditional development of applications and distribution models. Application development teams can now develop, test and distribute their apps in a few days, in different environments, all within Kubernetes clusters. The previous technology generations required weeks, if not months. This acceleration is possible thanks to the abstraction that Kubernetes leads to the table, ie that deals with underlying details of physical or virtual machines, allowing users to declare CPU, memory, number of container instances among other parameters. With the support of a numerous and loving community and an ever-increasing adoption, Kubernetes is the leading platform for containers' orchestration, with a considerable margin. The adoption is also growing, the confusion on the patterns of Storage in Kubernetes.with all competing for a slice of the pious storage of Kubernetes, there is a lot of noise around the storage options, drowning the signal. Kubernetes is the modern model for development, implementation and management of applications. The modern model disaggregates storage and computing. To fully understand the disaggregation in the Kubernetes context we need to understand even the concepts of Statolful and Stateless applications and storage. Here that the RESTful API approach of S3 offers a clear advantage over the POSIX / CSI approach offered by alternative solutions. This post discusses Kubernetes Storage models and addresses the stateless status in the goal of understanding exactly why there is a difference and because it is important. More ahead in the post, we will take care of the applications and their storage models in the light of containers and best practices Kubernetes. Templatifier containers are intrinsically light and ephemeral, can be easily stopped, deleted or distributed on another node, all in A few seconds. In a large container orchestration system, this continuously happens without consumers to agree with such movements. However, this movement is only possible if the container has no dependence on the data from the underlying node. These containers are apolidi.Container established a container stores data on locally mounted units (or block device), the underlying storage should be moved to the new node together with the container itself â € "in case of failure. This is important, otherwise the application running in the container cannot function properly because it must refer to the data stored on local mounts. These containers are of state. Technically, state containers can move to different nodes as well. Generally this is obtained via distributed file systems or network block storage connected to all nodes where containers are running. In this way, i have access to persistent volume media and data is stored in the connected archive, available throughout the network. I will refer to this method as the declaring method of the container for the rest of the article for uniformity. In aStateful container approach, application pods are mounted on a distributed file system â € "a sort of shared storage in which all the data data resides. Although there may be some variations, this is the high level approach. Now, let's understand why the Stateful container approach is an anti-pattern in a cloud-native world.Cloud-Native Application Designed the applications used databases for structured data and local units or distributed file systems to download all their Unstructured and even semi-structured data. As the unstructured data grew, the developers realized that Posix was too chattered, had significant general taxes that eventually prevented the application to work on scale. It contributed largely to a new Storage standard, That is cloud-native storage, driven by the RESTful API, freeing the application from any burden to manage local storage and actually making it stateless (as the status with the remote storage system). Modern applications are built to pieces taking into account this. Generally, any modern application that manages a certain type of data (log, metadata, blobs, etc.) conforms to cloud-native design by sending the status to a relevant storage system. The Stateful Container approach shows everything to the point Starting! With POSIX interfaces to store data, the applications behave stately and lose the most important principles of cloud-native design, or. Capacity of having application workers grow and reduce according to incoming load, switch to a new node as soon as a current node goes down and so via. as we get specific plus we find that we are in ã, posix vs rest API for storage all over the head, but with further amplification of posix problems due to the distributed nature of the Kubernetes environments. Specifically, POSIX is Chatty: the posix semantics requires that each operation has associated metadata and file descriptors that maintain the status of the operation. This leads to a lot of general expenses that do not add any real value. Object storage APIs like S3 APIs got up with these requirements, allowing applications to shoot and forget the call. A storage system response indicates whether the action has been successful or not. In the event of a fault, applications can retry. Networks: in a distributed system, it is implicit that there can be more applications that try to write data on a single mount. So not only are the applications compete for bandwidth (to send data to the mount), the storage system itself is contested for bandwidth on the same network to send data to real disks. Thanks to the chatiness posix, the number of network calls increases several times. The S3 API instead allows a clear network calls between clients and servers and internal calls to the server. Security: The POSIX security model was created for human users, with administrators configuring access levels specific to each user or group. This makes it hard to adapt to the cloud-native world. Modern applications depend on API-based templates with access defined policy, service account, temporary credentials and so on. Manageability: state containers add overhead management. Synchronization of parallel data access, guarantee of data consistency, etc. need careful consideration of data access models. This means more software to install, manage and configure, and of course further development effort. Storage Interface of the container While CSI did a great job in the extension of the Kubernetes volume layer to third-party storage providers, it also inadvertently led the ecosystem to believe the stateful container approach as the recommended storage approach in Kubernetes. CSI was developed as a standard to expose arbitrary block storage systems and legacy application files to Kubernetes. And, as we have seen in this post, the only situation where the approach of state container (and CSI in its current form) makes sense is if the application itself is a legacy system without possibility to add support for object storage APIs. It is important to understand that the use of CSI in its current form, i.e. volume mounts with modern applications, will ultimately lead to similar problems we have seen with POSIX-style storage systems. The best approach The important thing to understand is that most applications are not intrinsically state or stateless. Their behavior is defined by general architecture and specific design choices. Of course there are storage applications that must have beenful (e.g. MinIO). We will talk about very stateful apps in a bit. In general, application data can be classified in some broad range types: Data Log Data TimeStamp Transaction Data Metadata Container Images Data Blob All these data types are very well supported between modern storage platforms and there are several cloud-native platforms available to meet each of these specific data formats. For example, transational data and metadata can sit in a modern cloud-native database such as CockroachDB, YugaByte etc. The images of the container or blob data can be stored on a docker log based on MinIO. TimeStamp data can be stored on time series databases such as InfluxDB and so on. We will skip to the details of each type of data and the relevant application, but the idea is to avoid persistence based on local assembly. In addition, in many cases, it is efficient to have a temporary caching layer available as scratch space for applications, but the application should not depend on this layer as the source of truth. StorageWhile state applications is generally better to maintain stateless applications, storage applications, toDatabase, objects, key The stores of value must be standings. We understand how these applications are implemented on Kubernetes. I will take minio as an example, but similar principles apply to all major cloud native storage systems. Cloud native storage applications are designed to take advantage of the flexibility that containers carry, this means that these applications do not make hypotheses on the environment on the environment which are employed. For example, MinIO uses an internal erase encoding mechanism to ensure there is enough redundancy in the system to allow half of the drives to fail. MinIO also manages data integrity and security using its own hashing and server-side encryption. For such cloud-native applications, local persistent volumes (PVs) are best suited as backup storage. Local photovoltaics offer raw storage capability, while the application running on these photovoltaics uses its intelligence to scale and manage growing data requirements. This is a much simpler and scalable approach compared to CSI-based photovoltaics that bring their own levels of management and redundancy that generally compete with the design of the stateful application.The constant march towards unbundlingIn this post we talked about applications becoming stateless, or, in other words, the unbundling of storage from computing. Now, let’s take a look at some real examples of this trend. Spark, the popular data analytics platform, has traditionally been run statically on HDFS-oriented deployment, but as it moves to the native cloud world, Spark is increasingly run statelessly on Kubernetes using the âs3a” connector. Spark uses the connector to send status to other systems, while the Spark containers themselves are running completely stateless. Other major corporate players in big data analytics such as Vertica, Teradata, Greenplum are also moving towards a disaggregated computing and storage model.Similarly, all other major analytics platforms from Presto, Tensorflow to R, Jupyter notebook follow these models. Downloading the status in remote cloud storage systems makes the application much easier to scale and manage. It also helps maintain the portability of the application in different environments.Don’t take our word for it.The best way to understand these concepts is to try them out for yourself. If you are not using MinIO download MinIO here. 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