



SOLUTIONS BRIEF

When to use GitHub Container Registry vs Docker Hub

GITHUB CONTAINER REGISTRY & DOCKER HUB

This brief outlines Liatrio's point of view and compares the difference between GitHub Container Registry and Docker Hub.

TLDR

GitHub Container Registry and Docker Hub are well-supported and popular platforms for hosting public and private container images. The critical difference between them is that GitHub Container Registry uses a pay for what you use model for storage and data transfer. In contrast, Docker Hub uses account-based rate limits on pull requests which can be challenging to understand and potentially cause unexpected failures.

Problem Statement

As organizations shift toward running more applications and infrastructure on container-based platforms, choosing a container registry becomes increasingly essential. The choice of container registries can affect availability, security, and cost.

Our Background

This recommendation is grounded in our expertise and real-world experience with multiple clients with various delivery patterns. Liatrio engineers bring a diverse background of hands-on demonstrations of value through reference implementations and cross-team collaboration. This brief will discuss both the challenges and benefits of using GitHub Container Registry and Docker Hub.

Top Value Points

While there is much to be said for both tools, Liatrio believes these points to be the main differentiators between the two solutions:

GitHub Container Registry

- Container Registry is part of GitHub Packages. Built on GitHub's infrastructure, the container registry is reliable and available with GitHub Free, GitHub Pro, GitHub Free for organizations, GitHub Team, GitHub Enterprise Cloud, GitHub Enterprise Server, and GitHub AE.
- GitHub Container Registry is free for public images and uses a pay-as-you-go model for private images (Container Registry is free while it's still in beta). The pay-as-you-go model charges for storage and data transfer usage over a base amount for each account type.
- Manage access to publish and download container images using the same organization structure as your GitHub source repositories.
- Easily integrate with GitHub Actions to build and publish images to GitHub Container Registry.
- Image URLs are prefixed with the ghcr.io domain (for example ghcr.io/my_org/my_image:latest).

Costs

Plan	Cost	Data Transfer	Storage
Teams	\$4/user/month	10GB	2GB
Enterprise Cloud	\$21/user/month	100GB	50GB
Overage Cost		\$0.50/GB	\$0.25/GB

Docker Hub

- Docker Hub is the official Docker registry with the world's largest repository of container images. Software communities and organizations have widely adopted it.
- Docker Hub limits the number of Docker image pulls (downloads) based on the user's account type pulling the image. Anonymous pulls of public images are limited to 100 per day per IP address.
- Manage access to publish and download container images by creating organizations and teams.
- Integrate with GitHub and Bitbucket to automatically build container images from source repositories and push them to Docker Hub.
- Image URLs do not have a domain prefix (for example my_org/my_image:latest).

Costs

Service Account Add-On	Pulls per Day	Cost
	15,000	Included in paid plans
Tier 1	50,000	\$9,950/year
Tier 2	150,000	\$17,950/year
Tier 3	500,000	\$60,000/year
Tier 4	+500,000	\$60K/year/500k pulls

A Closer Look

Security & Management

GitHub Container Registry and Docker Hub both use Personal Access Tokens (PAT) to authenticate with the image registry. These tokens must be distributed to any source that needs to publish or non-anonymously pull images. They can also easily be revoked if they are compromised.

GitHub uses the same organization, user, and permission interface for the Container Registry as the rest of GitHub. It also has some favorable integrations by allowing images to be linked to a source repository, displaying information about published images and other packages. Docker Hub has its own interface for creating organizations and managing users' permissions within that organization.

Public vs. Private Images

Private images are only accessible by authenticating with the container registry, while public images can be pulled anonymously. Aside from sharing images outside of your organization, public images are also useful for custom base images, pipeline containers or other situations where images do not include proprietary code.

GitHub Container Registry and Docker Hub both support public and private images, but the way they handle anonymous access to public images is very different. Docker Hub limits the number of anonymous pulls from an IP address to 100 per day. This can be very disruptive if this limit is hit unexpectedly and causes an automated pipeline to fail. GitHub Container Registry, on the other hand, allows unlimited anonymous pull requests from public images.

Docker Hub's rate limit is much higher at 15,000 per day (~10 per minute) for an account for authenticated pulls from paid plans. However, using credentials from a single service account across a large number of pipelines or deployments could still cause unexpected failures from limits. On the other hand, GitHub container registry could incur unexpected charges but would not result in unforeseen failures.

Another option for mitigating potential limits or costs from pulling images is to use a proxy repository to cache images requests. A proxy repository is configured to pull images from an upstream source if the image is not already cached and returns it as if it originated from the proxy. Several container image repository applications can be configured as proxies. This solution presents its own challenges in making sure images are being pulled from the

proxy instead of the original source and also adds a point of failure if the image registry proxy fails.

Publishing Images

A personal access token must be used to publish images. Using GitHub Actions to publish images to GitHub Container Registry adds some convenience by automatically making a PAT with permissions to publish images accessible to the action. Docker Hub allows for integration with GitHub and BitBucket to automate building and publishing images to Docker Hub from source repos. Note that this introduces an additional tool to manage pipeline processes.

Recommendation

If you are already using GitHub for continuous integration, using GitHub Container Registry provides excellent features. If you are not using GitHub, the Container Registry is still an excellent choice for hosting public and private images.

Docker Hub's rate limiting policy can be challenging to understand and disastrous if you run into it unexpectedly. If you are using Docker Hub we recommend you pay extra attention to which account credentials are being used for frequent builds or deployments and not use anonymous pulls to public images unless you are using a proxy server.

ABOUT LIATRIO

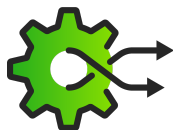


Author

Chris Schreiber is a Technical Principal at Liatrio, helping our clients deliver software faster and safer. With a background in software development, he has spent the past 20 years architecting, building, automating and containerizing solutions at a variety of organizations.

We Help Your Business Deliver Faster And Safer

Liatrio guides complex organizations through their digital transformation journey, enabling them to deliver value faster and safer with Enterprise DevOps and Cloud Native delivery.



Enterprise DevOps Transformation

Accelerate business results and scale your organization with a lean, value-driven approach to software delivery and IT operations.



Cloud Native Delivery

Empower your teams to build scalable apps in dynamic environments and make high-impact changes frequently and predictably with little toil.



Modern Platform Engineering

Reliable applications are built on modern self-service platforms that reduce engineering friction.



DevSecOps

Speed of delivery while always staying safe and secure in an automated way. Remove untimely, manual, last gate siloed approvals and validations.



DEVOPS AND CLOUD TRANSFORMATIONS

[LIATRIO.COM](https://liatrio.com)