IBM

DEVOPS

IBM **Cloud**
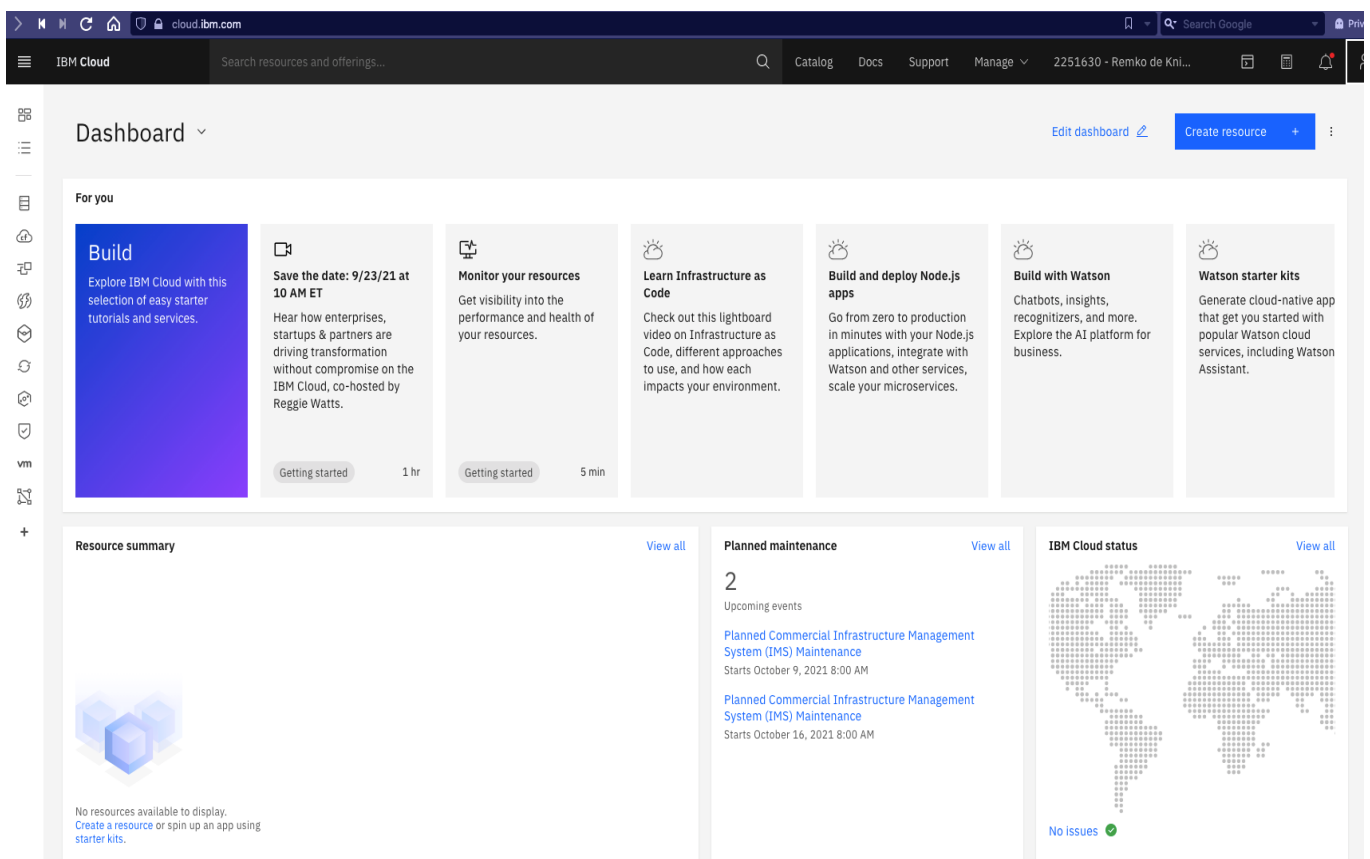
Training Material

INTRODUCTION TO IBM CLOUD

DEVOPS SERVICES

Chapter 1: Overview of IBM Cloud-DevOps

1. Introduction to IBM Cloud

➢ IBM Cloud is a set of cloud computing services offered by IBM that includes both platform as a service (PaaS) and infrastructure as a service (IaaS).

➢ It provides a hybrid cloud solution with a range of capabilities for hosting, running, and managing workloads.

➢ IBM Cloud plays a significant role in the DevOps ecosystem by providing integrated tools, platforms, and services to support the entire software development lifecycle (SDLC).

➢ Its comprehensive offerings facilitate seamless collaboration, automation, and deployment across development and operations teams.

POPULAR IBM CLOUD SERVICES FOR DEVOPS

1. **IBM Cloud Continuous Delivery**

   - **Service Overview**: Automates the entire application lifecycle from build, test, and deployment.

   - **Use Cases**: Ideal for automating the process of building, testing, and deploying applications in a consistent and reliable manner.

2. **IBM Cloud Toolchain**

   - **Service Overview**: Pre-configured toolchains that automate key stages of DevOps workflows such as code management, build, test, and deploy.

   - **Use Cases**: Ideal for setting up a DevOps pipeline quickly, with a set of integrated tools like **Jenkins**, **GitHub**, **IBM Kubernetes Service**, etc.

3. **IBM Cloud Kubernetes Service (IKS)**

   - **Service Overview**: A fully managed Kubernetes service that enables container orchestration, scaling, and load balancing.

   - **Use Cases**: Used for deploying, managing, and scaling microservices-based applications in containers.

4. **IBM Cloud Container Registry**

   - **Service Overview**: A secure, private container image storage service.

   - **Use Cases**: Store and manage Docker container images and integrate with tools like IBM Kubernetes Service for automated deployments.

5. **IBM Cloud Functions**

   - **Service Overview**: Serverless computing that allows running code in response to events without managing servers.

   - **Use Cases**: Ideal for event-driven applications and microservices architectures.

6. **IBM Cloud Monitoring (Sysdig)**

   - **Service Overview**: Provides metrics, logs, and traces to monitor cloud-native applications in real-time.

   - **Use Cases**: Monitoring infrastructure, application performance, and troubleshooting

deployment issues.

7. **IBM Cloud Vulnerability Advisor**

- **Service Overview**: Scans container images for vulnerabilities and security issues.

- **Use Cases**: Ensures security in containerized applications by providing vulnerability scanning and remediation advice.

EXAMPLE IBM CLOUD DEVOPS WORKFLOW

1. **Source Code Repository**: Developers push their code changes to a Git repository (e.g., **GitHub**).

2. **Automated Build**: The code is automatically pulled by **Jenkins** or **Tekton** and built.

3. **Automated Testing**: Unit tests and integration tests are run automatically.

4. **Containerization**: The application is packaged into a **Docker container** and pushed to **IBM**

Cloud Container Registry.

5. **Deployment**: The application is deployed to **IBM Cloud Kubernetes Service** (IKS) using Helm charts.

6. **Monitoring**: The application is monitored in real-time using **IBM Cloud Monitoring** and logs are managed with **LogDNA**.

IBM CLOUD LITE PLAN

The IBM Cloud Lite Plan is a free-tier offering by IBM Cloud that enables developers and students to explore and experiment with IBM Cloud services without incurring costs.

	Lite	Pay-As-You-Go	Subscription
Free Cloud Foundry memory	256 MB	512 MB	512 MB
Access to Lite service plans ⬈	✔	✔	✔
Access to all free plans		✔	✔
Access to the full IBM Cloud catalog		✔	✔
Access to multiple Cloud Foundry regions		✔	✔
No time restrictions	✔	✔	✔
Guaranteed zero cost	✔		
Discounted pricing			✔
Best for learning or building proof of concepts	✔	✔	
Fit for production use cases		✔	✔

Key Features of the IBM Cloud Lite Plan:

1. **Free of Charge**:

   - No credit card required for signup.

   - Does not expire (usage limits apply).

2. **Service Quotas**:

   - Limited use of certain services like Cloud Foundry, Kubernetes, and AI services.

3. **Compute Options**:

   - Lite-tier virtual servers, Cloud Foundry apps, and serverless actions.

4. **Data Services**:

   - Free databases like IBM Cloudant or Db2 Lite.

STEPS TO GET STARTED WITH THE LITE PLAN:

1. **Sign Up**:

   - Visit the IBM Cloud Sign-Up Page.

   - Choose the Lite Plan during registration.

2. **Access Services**:

   - Explore the dashboard to see available Lite services.

3. **Experiment with Services**:

   - Deploy simple applications using Kubernetes, AI tools, or databases.

POPULAR DEVOPS SERVICES IN IBM CLOUD

IBM Cloud offers a range of DevOps services designed to streamline software development, deployment, and management processes.

1. IBM CLOUD CONTINUOUS DELIVERY

IBM Cloud Continuous Delivery provides a set of tools and services to implement Continuous Integration and Continuous Deployment (CI/CD) pipelines. It helps automate application delivery processes, ensuring quicker and more reliable software releases.
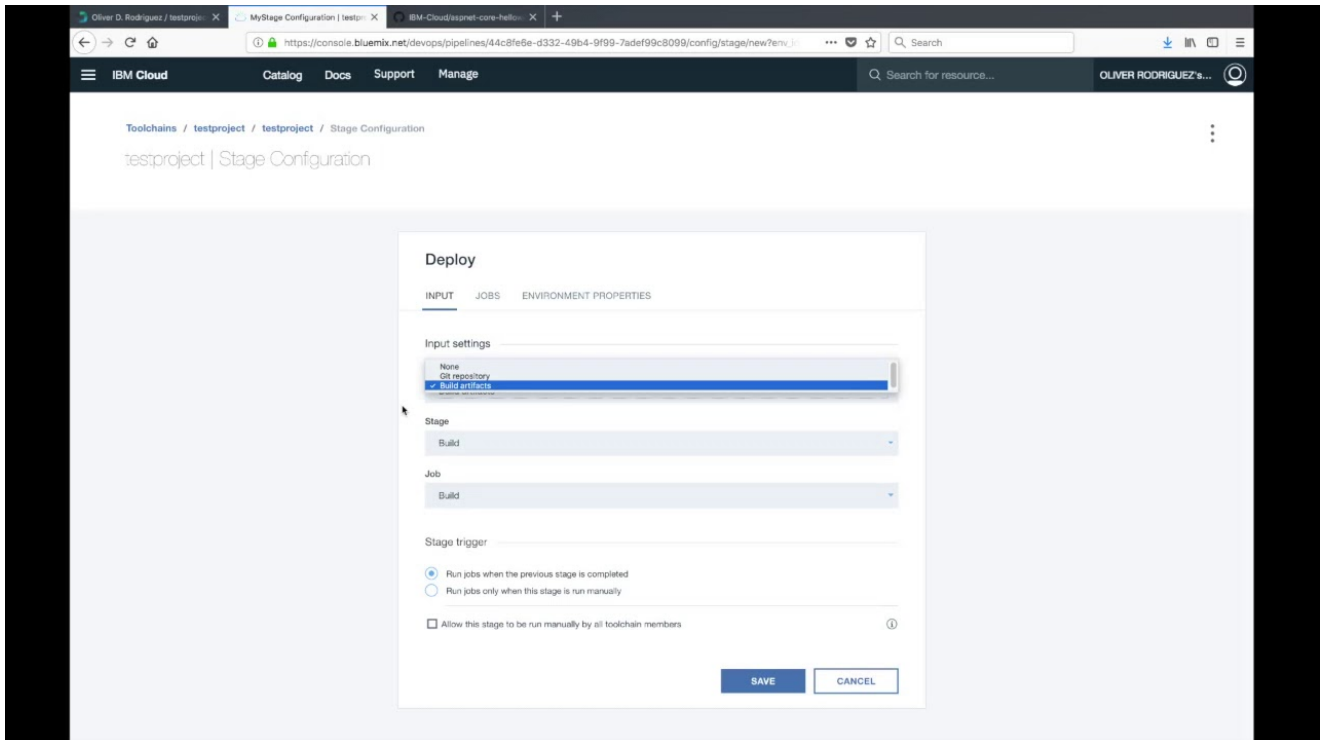
Key Features:

➢ **Toolchains**:

    o   Integrated with popular tools like GitHub, Jenkins, Slack, and Tekton pipelines.
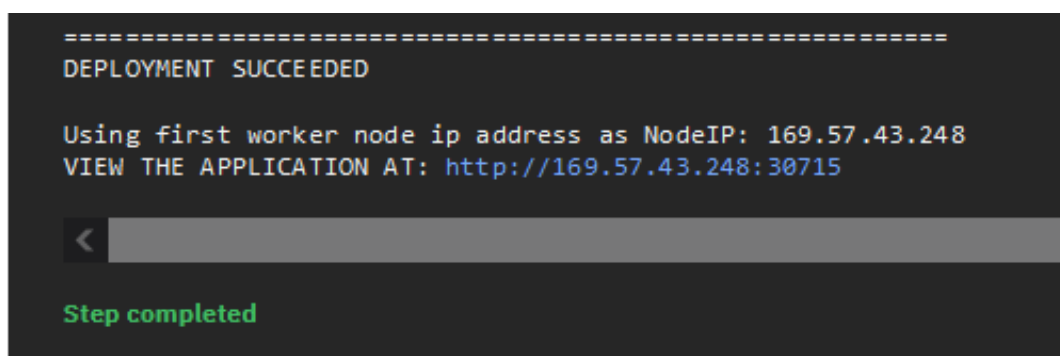
➢ **Pipeline Automation**:

    o   Automates tasks such as code builds, tests, and deployments.

➢ **Environment Management**:

    o   Simplifies deploying applications across different environments, such as development,

       testing, and production.

➢ **DevOps Insights**:

    o   Tracks code quality and deployment risks with integrated analytics.
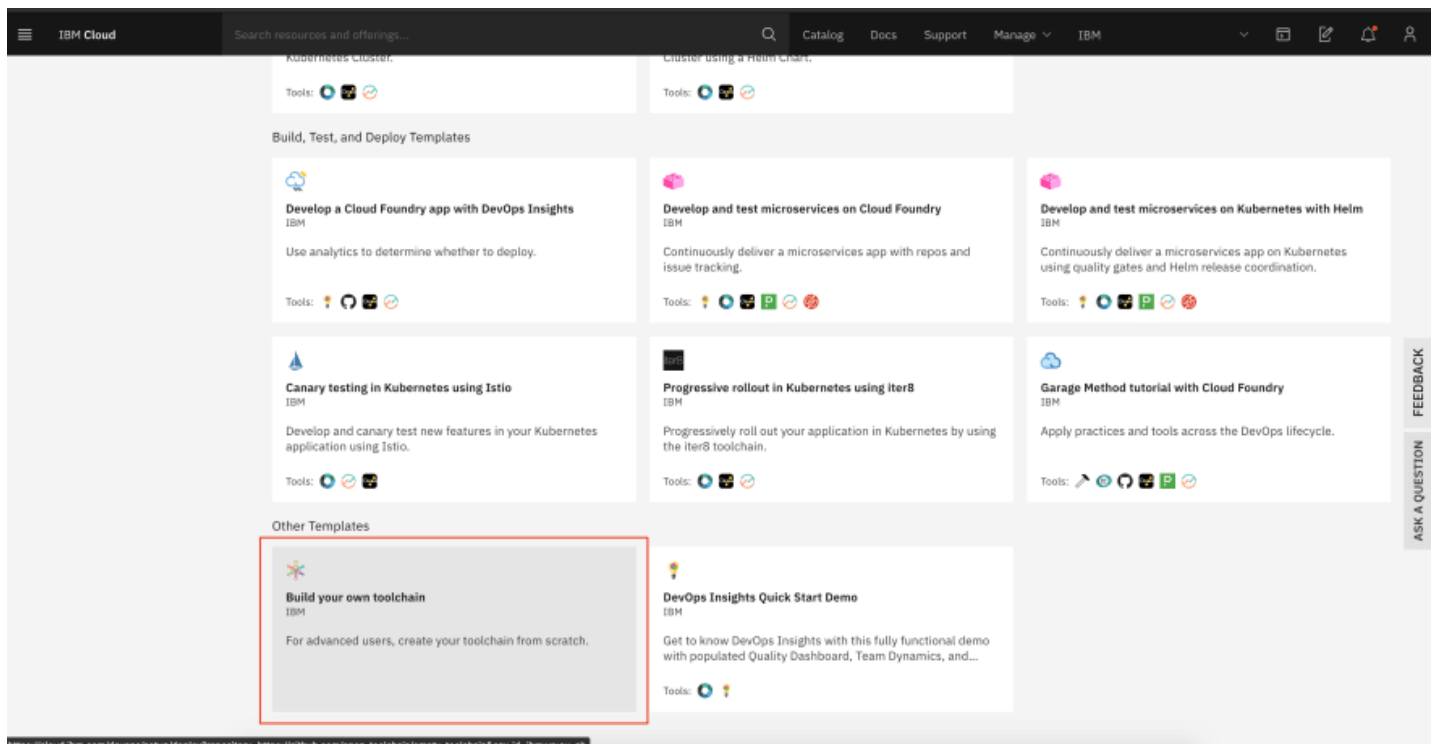
Benefits:

- Speeds up the development lifecycle by automating repetitive tasks.

- Ensures high-quality releases through rigorous automated testing.

- Reduces manual errors and inconsistencies in deployments.

Practical Example:

- A development team can:

  1. Push code changes to GitHub.

  2. Trigger Jenkins to run tests automatically.

  3. Deploy the tested application to Kubernetes or Cloud Foundry.

2. IBM CLOUD TOOLCHAIN

IBM Cloud Toolchain is a flexible framework that integrates multiple DevOps tools into a unified

workflow. It allows developers to customize their toolchain to match project requirements.

Key Features:

- **Predefined Toolchain Templates**:

  - Templates for common scenarios, such as microservices development or mobile app deployment.

- **Custom Toolchains**:

  - Create toolchains with custom integrations for tools like GitLab, SonarQube, and UrbanCode.

- **Collaboration Tools**:

  - Integrates with Slack and PagerDuty for communication and incident management.

- **Multi-Cloud Support**:

  - Supports deployment across IBM Cloud, AWS, Azure, and Google Cloud.

Benefits:

- Encourages team collaboration and transparency.

- Simplifies complex workflows by automating integrations between tools.

- Offers centralized management for all DevOps activities.

Practical Example:

- A preconfigured toolchain for a Kubernetes-based application might include:

  - GitHub for version control.

  - Jenkins for CI/CD pipelines.

  - IBM Kubernetes Service for deployment.

  - LogDNA for centralized logging

3. IBM CLOUD CONTAINER REGISTRY

IBM Cloud Container Registry is a fully managed service for storing, sharing, and managing container images. It ensures that containerized applications are built and deployed securely and efficiently.
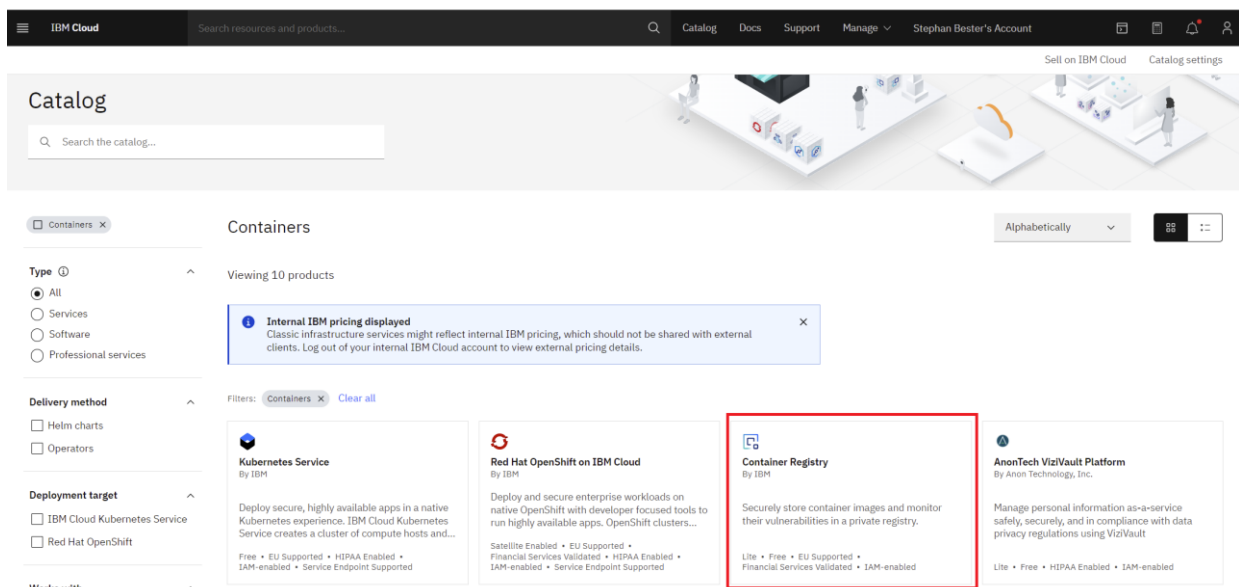
Container Registry

Author: IBM • Docs • API docs

Compliance
EU Supported

Related links
API Docs
Docs
Terms

Estimate costs   Get started

Summary

Manage Docker container images in a fully managed private registry. Push private images into this registry to run them in IBM Cloud Kubernetes Service and other runtime environments. Images are checked for security issues, so that you can make informed decisions about your deployments.

Features

Highly available and scalable private registry
Set up your own image namespace in a multi-tenant, highly available, scalable private registry that is hosted and managed by IBM. Securely store your private Docker images and share them with users in your IBM Cloud account.

Image security compliance with Vulnerability Advisor
Benefit from the automatic scanning of images in your namespaces. Review suggestions, which are specific to your operating system, to fix potential vulnerabilities and protect your containers from being compromised.

Quota limits for storage and pull traffic
Benefit from free storage and pull traffic to your private images until you reach the limit for your free quota. Set custom quota limits for the amount of storage and pull traffic per month so that you avoid exceeding your preferred payment level.

Pricing plans

Plan	Features	Pricing
Lite	Free Plan with limited resources Storage (Gigabyte-Months) - 0.5 GB free per month Pull traffic (Gigabytes) - 5 GB free per month	Free
Container Registry	Namespaces for Container Registry	Free

IBM Cloud   Catalog   Docs   Support   Manage ∨   2001776 - Amol's Team ∨

Container Registry

Quick start
Namespaces   7
Repositories   35
Images   89
Trash   84
Settings

Images

Location
Dallas ∨

View by: Digest ∨   🔍 watson-assistant   ×   ⟳ ⚙   Create +

☐	Repository@digest	Tags	Manifest type	Created	Size	Security status	
☐	isv-scenarios/watson-assistant-slots-intro@sha256:581b2abb5111...	0.0.3 ✎	Docker	1 day ago	493 MB	🚫 6 issues	⋮
☐	isv-scenarios/watson-assistant-slots-intro@sha256:49e09c55bf9f...	✎	Docker	1 day ago	493 MB	--	⋮
☐	isv-scenarios/watson-assistant-slots-intro@sha256:000acb7ea823...	0.0.2 ✎	Docker	1 day ago	493 MB	🚫 6 issues	⋮
☐	isv-scenarios/watson-assistant-slots-intro@sha256:4f83799c57f7...	✎	Docker	2 days ago	493 MB	--	⋮
☐	isv-scenarios/watson-assistant-slots-intro@sha256:d7b8212d8253...	0.0.1 ✎	Docker	3 days ago	493 MB	🚫 6 issues	⋮

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IBM Cloud   Catalog   Manage ∨   Sagar Chamling Rai's Account

Container Registry

Quick start
Namespaces   1
Repositories   0
Images   0
Trash   0
Settings

Namespaces

Location
Global ∨

Resource group: Filter... ∨   🔍 Search   ⟳ ⚙   Create +

☐	Name	Resource group	Repository count	Image count	Retention policy	
☐	⠿ lab_namespace	Default	0	0		⋮

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Key Features:

- **Private and Public Registries**:

  - Supports both private repositories for secure storage and public repositories for open sharing.

- **Integrated Vulnerability Scanning**:

  - Scans container images for known vulnerabilities and provides recommendations.

- **Multi-Zone Availability**:

  - Ensures high availability of container images across multiple geographic regions.

- **Access Control**:

  - Manages who can view and pull images using IBM IAM.

Benefits:

- Enhances security with built-in vulnerability scanning and role-based access controls.

- Reduces downtime with fast, regional image delivery.

- Simplifies collaboration by enabling image sharing within teams.

Practical Example:

1. A developer builds a Docker image locally and pushes it to the IBM Cloud Container Registry.

2. The registry scans the image for vulnerabilities and provides a report.

3. The image is pulled from the registry and deployed to an IBM Kubernetes cluster.

4. IBM CLOUD TOOLCHAIN SERVICE

- ➢ IBM Cloud **Toolchain** is a powerful, integrated platform that enables DevOps teams to automate the entire software development lifecycle (SDLC) from planning and coding to testing and deployment.

- ➢ Toolchains provide a collection of pre-configured tools that can be customized to meet specific needs in software development, allowing developers to build, test, and deploy applications in a consistent and efficient manner.

HOW IBM CLOUD TOOLCHAIN WORKS

IBM Cloud Toolchain provides a graphical interface to create and manage CI/CD pipelines, which are composed of different tools for each step of the process. A typical toolchain workflow includes:

1. **Source Code Repository**:

    You start by selecting a Git repository (e.g., GitHub, GitLab) where the source code is stored. This repository is connected to the toolchain to keep track of changes and trigger build processes.

2. **Build and Test**:

    Jenkins or **Tekton** is typically used to automate the build and testing processes. Once the source code is updated, Jenkins can trigger a build and run unit tests to validate the code.

3. **Deploy to Cloud**:

    After successful testing, the toolchain deploys the application to cloud services like **IBM Cloud Kubernetes Service** or **IBM Cloud Functions**. The toolchain can be configured to deploy to multiple environments (staging, production).

4. **Monitoring and Logging**:

    Tools like **LogDNA** and **Sysdig** can be integrated to monitor applications in real-time and provide logs for troubleshooting. This step helps ensure the health and stability of applications after deployment.

COMMON IBM CLOUD TOOLCHAIN COMPONENTS

Here are some of the common tools that are integrated into an IBM Cloud Toolchain:

1. **Version Control** (e.g., GitHub, GitLab):

For managing source code repositories and version control.

2. **CI/CD Tools** (e.g., Jenkins, Tekton):

For automating build, test, and deployment pipelines.

3. **Build and Test** (e.g., Maven, Gradle, npm):

Tools for building and testing the code automatically during the pipeline process.

4. **Deployment** (e.g., IBM Kubernetes Service, IBM Cloud Foundry):

Automated deployment of applications to cloud platforms, enabling scalability and high availability.

5. **Monitoring** (e.g., LogDNA, Sysdig, Prometheus):

   For tracking application performance and health after deployment.

6. **Security** (e.g., Vulnerability Advisor, IAM):

   For ensuring security through vulnerability scanning and role-based access control.

CREATING A TOOLCHAIN IN IBM CLOUD

Here's a step-by-step process for creating a toolchain in IBM Cloud:

Step 1: Create a New Toolchain

1. Go to the IBM Cloud dashboard and select the **Toolchains** option from the "DevOps" section.

2. Click **Create Toolchain**.

3. Select a template that suits your project, such as a Node.js or Java template.

Step 2: Add Tools to Your Toolchain

1. **Source Code Repository**: Connect your GitHub or GitLab repository.

2. **Build and Test**: Add a build tool like **Jenkins** or **Tekton**.

3. **Deploy**: Add a deployment tool like **IBM Cloud Kubernetes Service** or **IBM Cloud Foundry**.

4. **Monitor**: Optionally, add a tool like **LogDNA** for logging.

Step 3: Configure and Deploy

1. Customize each tool's settings (e.g., connect your source code repository to Jenkins).

2. Define the build, test, and deployment steps.

3. Once configured, save the toolchain and the build process will automatically run every time there is a new code push to the repository.