Adopting a DevOps approach by using IBM Continuous Delivery

Unit objectives

- Describe DevOps.

- Describe the capabilities of IBM Cloud Continuous Delivery.

- Identify the web-based integrated development environment (Web IDE) features in IBM Cloud Continuous Delivery.

- Describe how to use source code management (such as Git) and Issue tracking.

- Explain how to build and deploy applications using DevOps tools on IBM Cloud.

Introduction to DevOps

Topics

▷ Introduction to DevOps
- DevOps services on IBM Cloud
- IBM Cloud Continuous Delivery overview
- Web IDE (Edit Code)
- Source Code Management (Git repository) and Issue Tracker
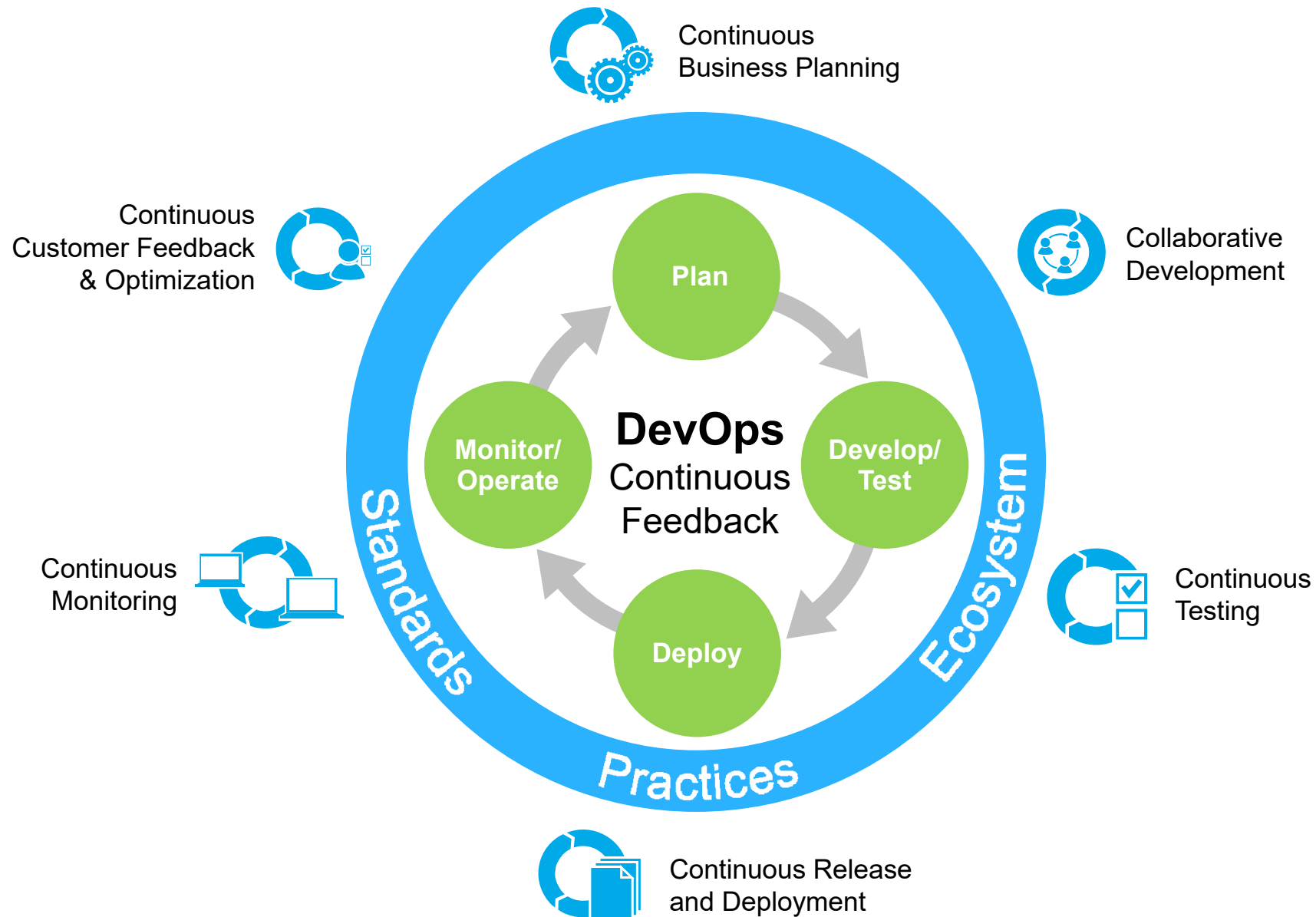- Automated build and deployment (Delivery Pipeline)

What is DevOps
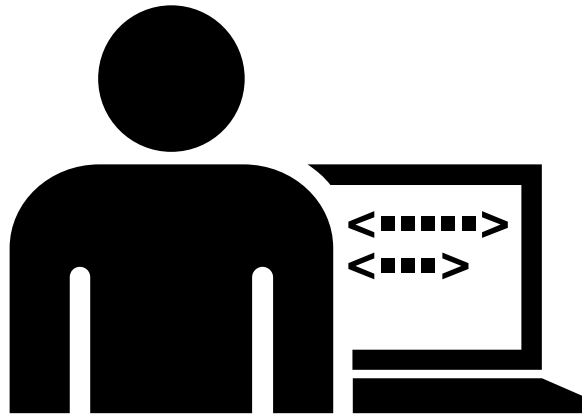
Software developer

Computer operator

Software lifecycle for applying DevOps practices

Continuous
Business Planning

Continuous
Customer Feedback
& Optimization

Collaborative
Development

Plan

Monitor/
Operate

DevOps
Continuous
Feedback

Develop/
Test

Continuous
Monitoring

Standards

Ecosystem

Deploy

Continuous
Testing

Practices

Continuous Release
and Deployment

DevOps practices

- Continuous improvement

- Release planning

- Continuous integration

- Continuous delivery

- Continuous testing

- Continuous monitoring and feedback

IBM Cloud Garage Method

Benefits of DevOps

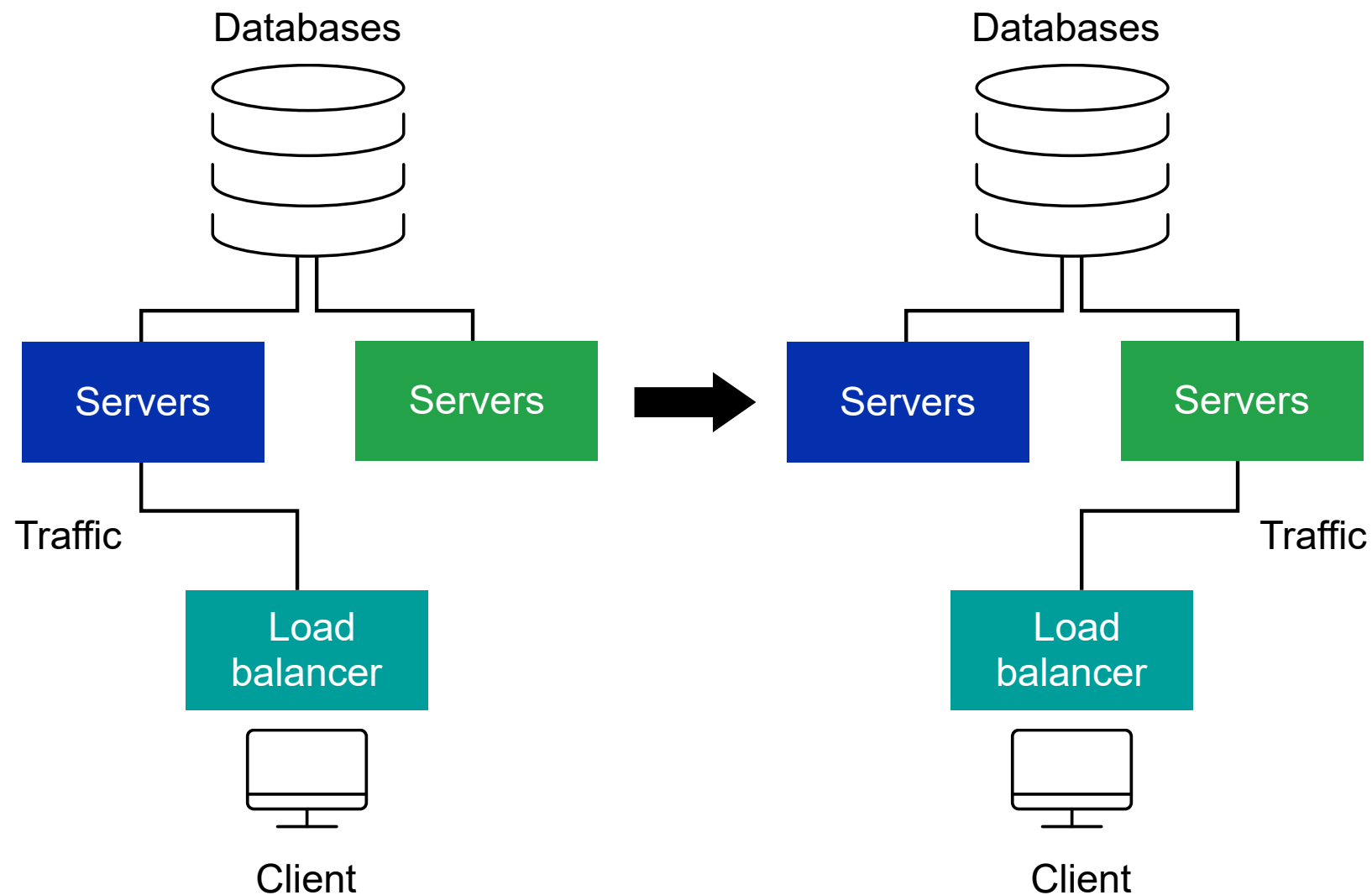From code to production
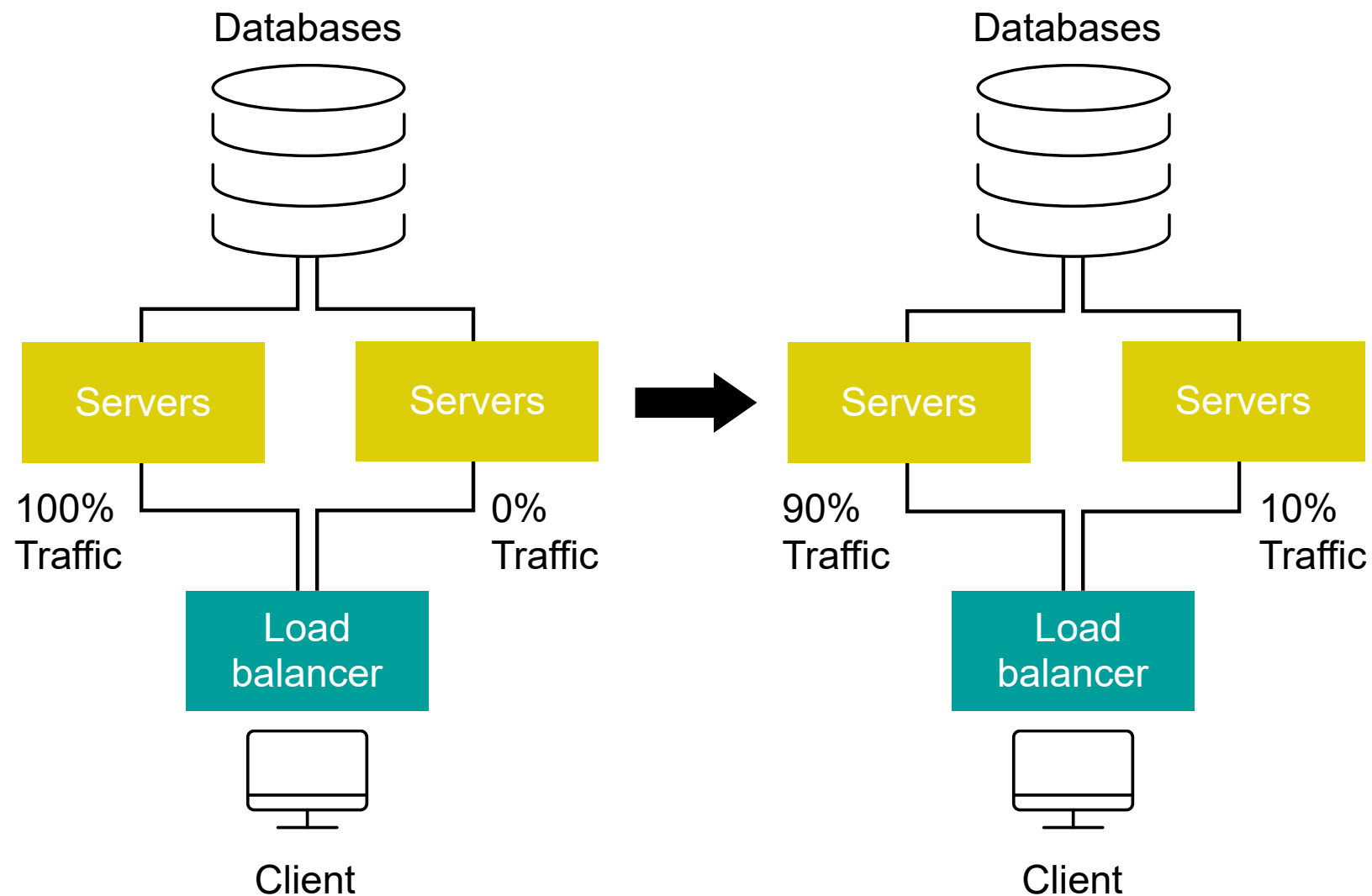in minutes

Accelerate app delivery

Deploy with confidence

Deployment strategies

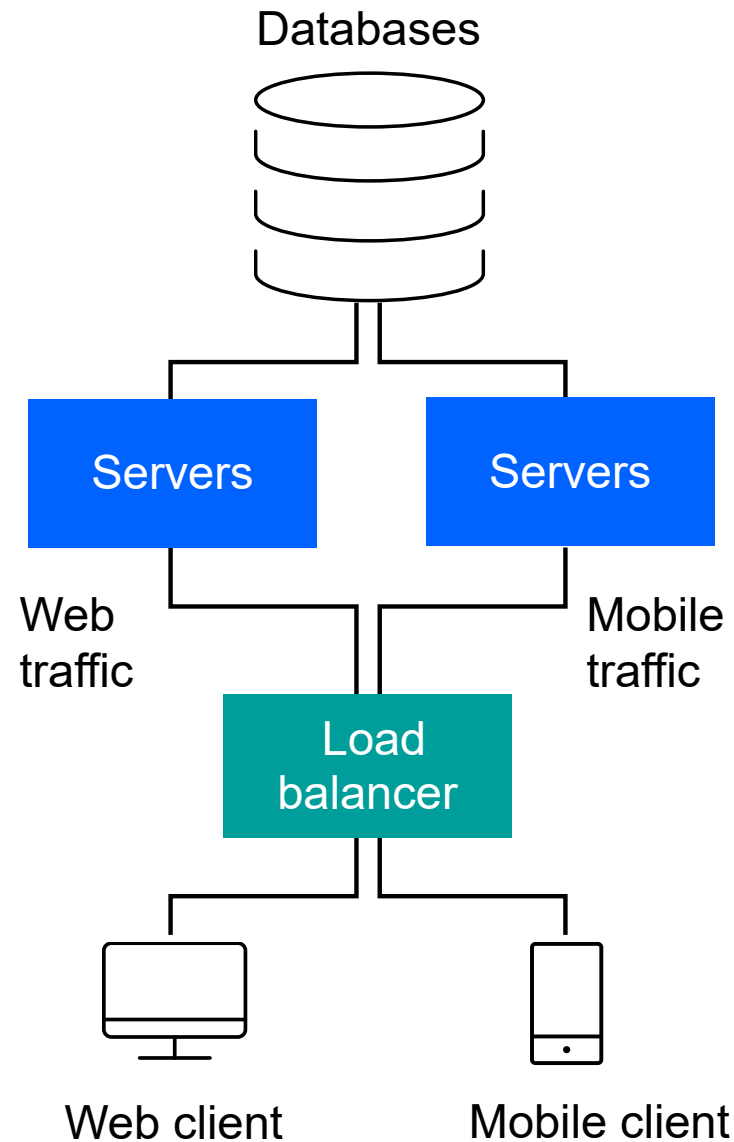- Blue/green deployment

- Canary deployment

- A/B testing

Deployment strategies – Blue/green deployment

Deployment strategies – Canary deployment

Deployment strategies – A/B testing

DevOps services on IBM Cloud

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DevOps services on IBM Cloud

Developer Tools

Alert Notification
IBM

Never miss critical alerts. Notify the right people immediately. Speed up response with automated escalation policies.

Auto-Scaling
IBM

Automatically increase or decrease the number of application instances based on a policy you define.

Availability Monitoring
Lite • IBM

Around the world, around the clock availability and performance monitoring.

Continuous Delivery
Lite • IBM • IAM-enabled

Develop, build, test and deliver using DevOps best practices.

DevOps Insights
Lite • IBM • IAM-enabled

Elevate your DevOps to increase deployment quality, delivery control, and speed to market.

Event Management
IBM

Consolidated operational event and incident management.

Globalization Pipeline
IBM • IAM-enabled

Manage the translation of your cloud and mobile applications using IBM Globalization Pipeline.

Monitoring
Lite • IBM

Collect, store, and analyze metrics from your dynamic cloud environments and micro-service applications.

Toolchain
Lite • IBM • IAM-enabled

Build, test and deliver using DevOps best practices.

IBM Cloud Activity Tracker with LogDNA
Lite • Third Party • IAM-enabled

LogDNA provides collection and search of events that occur on IBM Cloud Activity Tracker. Save searches, design alerts, and build graphs to monitor user activities.

IBM Cloud Monitoring with Sysdig
Third Party • IAM-enabled

Offers visibility into the performance and health of your infrastructure and apps, with in-depth troubleshooting, and alerting.

IBM Log Analysis with LogDNA
Third Party • IAM-enabled

LogDNA provides log collection and log search for IBM Log Analysis. Define alerts and design custom views to monitor application and system logs.

Mendix Platform Service
Lite • Third Party • IAM-enabled

License your Mendix app on the IBM Cloud Portal.

PagerDuty
Third Party

Incident Management and Resolution Platform

IBM Cloud Continuous Delivery overview

Topics

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What is IBM Cloud Continuous Delivery

- IBM Cloud Continuous Delivery provides the capabilities, practices and industry-leading tools:
  - Create open and integrated toolchains that support your development, deployment, and operations tasks.
  - Use automated pipelines to deliver continuously
  - Use the Web IDE to edit and push your code from anywhere
  - Collaborate with your team by using the Git repository and issue tracker

Toolchain templates

Build and Deploy Templates

Develop a Cloud Foundry app

Continuously deliver a Cloud Foundry app with repos and issue tracking hosted by IBM.

Develop a Kubernetes app

Continuously deliver a secure Docker app to a Kubernetes Cluster.

Develop a Kubernetes app with Helm

Continuously deliver a secure Docker app to a Kubernetes Cluster using a Helm Chart.

Build, Test, and Deploy Templates

Develop a Cloud Foundry app with DevOps Insights

Use analytics to determine whether to deploy.

Develop and test microservices on Cloud Foundry

Continuously deliver a microservices app with repos and issue tracking.

Develop and test microservices on Kubernetes with Helm

Continuously deliver a microservices app on Kubernetes using quality gates and Helm release coordination.

What tools does IBM Cloud Continuous Delivery provide

Web IDE (Edit Code)

Source Code Management
(Git Repo) and Issue Tracker
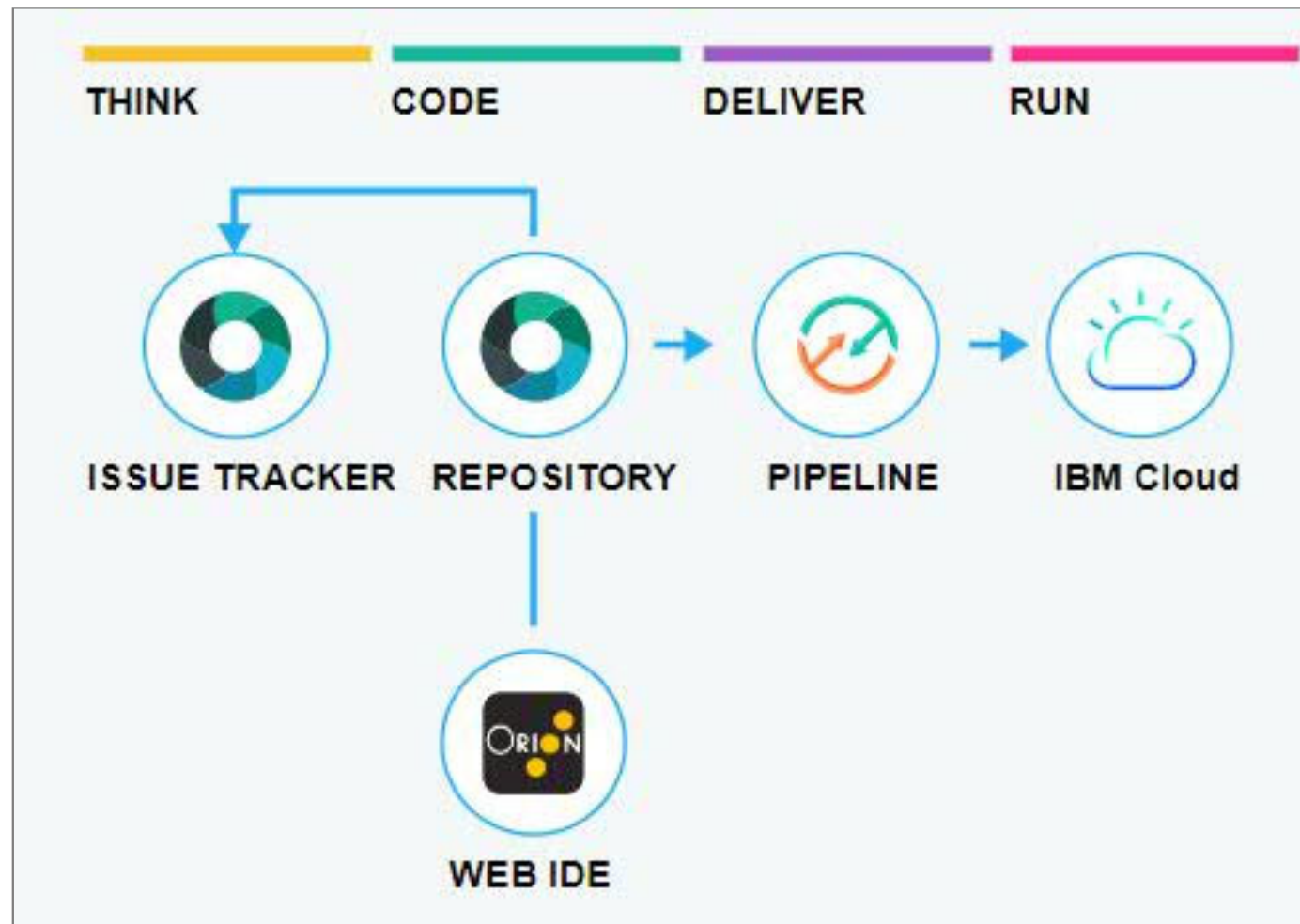
Automated build and deployment
(Delivery Pipeline)

Adding Continuous Delivery

To add Continuous Delivery to your application, complete the following steps:

1. In the IBM Cloud resource list, select your application.
2. Click **Overview** in the left navigation bar.
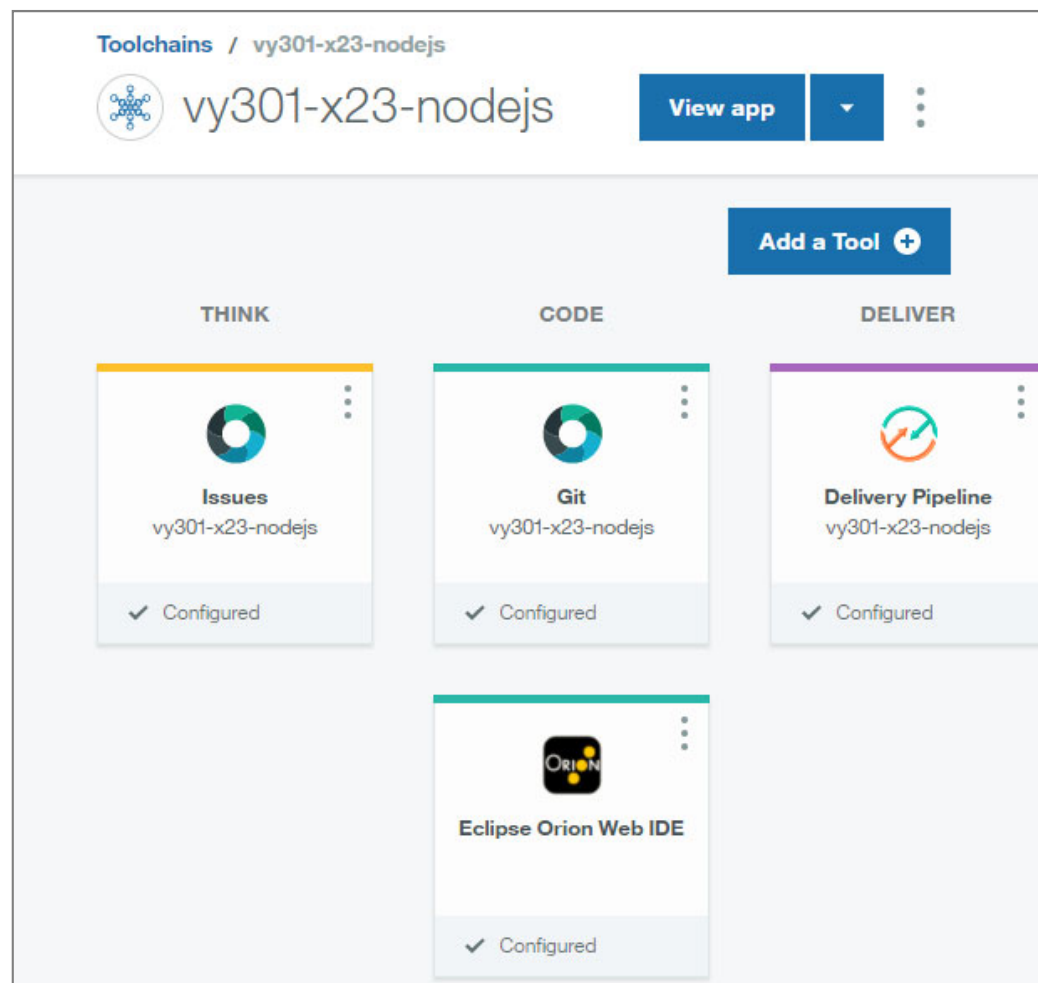3. In the Continuous Delivery pane, click **Enable**.
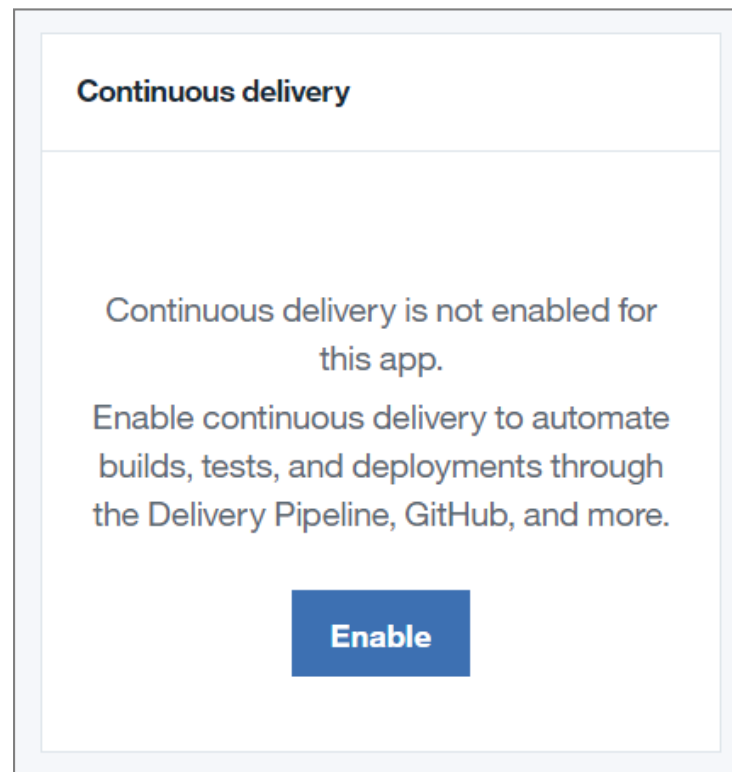
Creating Continuous Delivery Toolchains

Adding Tools to the toolchain

You can add tools into your continuous delivery toolchain.

Adding Tool Integration to a toolchain

Alert Notification
Never miss critical issues.

IBM Experimental

Bitbucket
Store and manage code on bitbucket.org.

Third-Party

DevOps Insights
Use analytics to determine whether to deploy.

IBM Beta

GitHub
Store and manage code on GitHub.com or on your own GitHub Enterprise server.

Third-Party

Jenkins
Build, deploy, and automate any project.

Third-Party

PagerDuty
When major issues arise, send alerts and get alerts.

Third-Party

Artifactory
Store build artifacts in your Artifactory repository.

Third-Party

Cloud Event Management
Turn IT events into actionable incidents.

IBM Experimental

Eclipse Orion Web IDE
A browser-based IDE for web and cloud development.

IBM

GitHub Enterprise Whitewater
Internal GitHub Enterprise allowing IBM Confidential projects.

IBM

JIRA
Manage projects and track issues.

Third-Party

Rational Team Concert
Manage your team and resources.

IBM

Availability Monitoring
Test, monitor, and improve your application as you build it.

IBM

Delivery Pipeline
Automate your builds, deployments, and more.

IBM

Git Repos and Issue Tracking
IBM hosted repos and issue tracking based on GitLab Community Edition.

IBM

GitLab
Store and manage code on GitLab.com or on your own GitLab server.

Third-Party

Nexus
Store build artifacts in your Nexus repository.

Third-Party

Other Tool
Create a custom integration with any tool.

Slack
Coordinate and collaborate on your project.

Third-Party

SonarQube
Inspect the quality of your code.

Third-Party

UrbanCode Deploy
Gain insights into deployments.

IBM Beta

Sauce Labs
Automate continuous integration testing.

Third-Party

Web IDE (Edit Code)

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Web IDE: Edit code features

- Web IDE:
  - Eclipse Orion.
  - No installations. Start coding now.
- IBM Cloud Live Sync for Node.js apps:
  - Live Edit.
  - Debug.

WEB IDE

Web-based integrated development environment
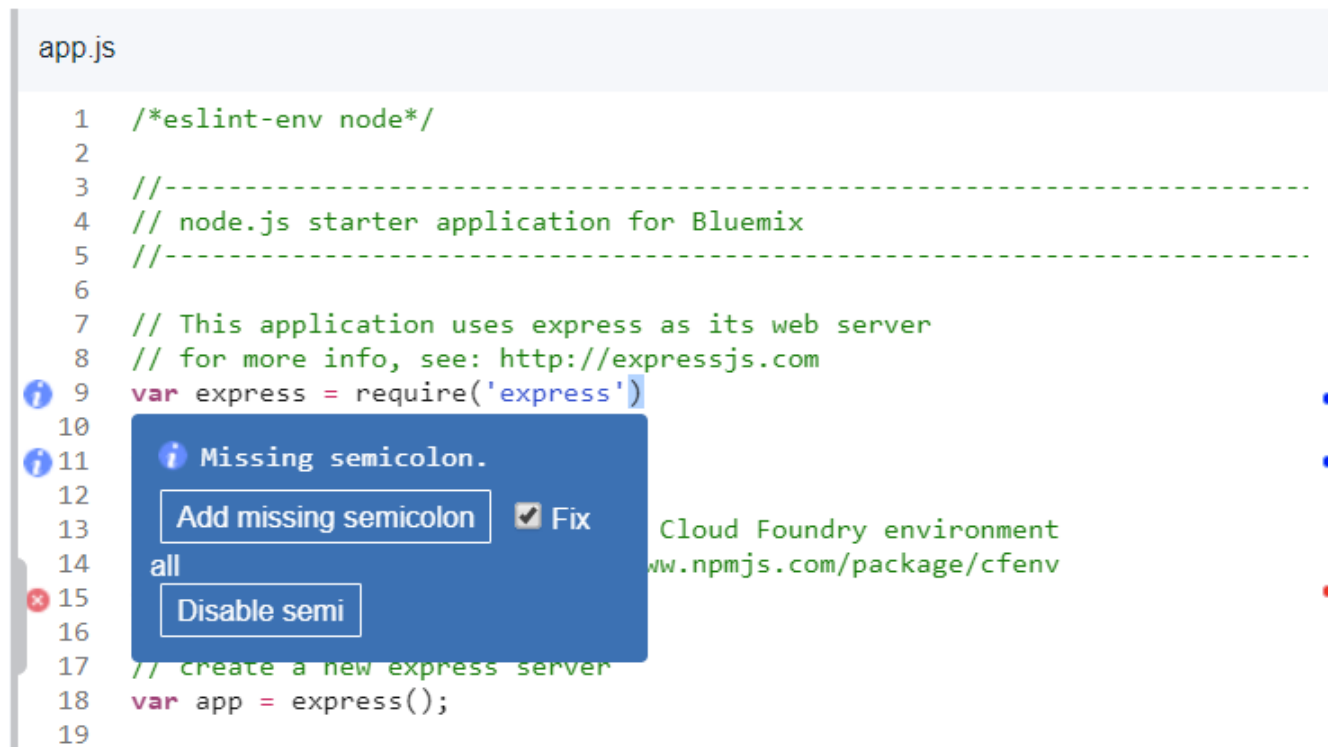
Project Navigator displays the contents of the user directory for the application.

Enable Live Edit and Debug Tools for Node.js applications.

1

3

```
File    Edit    View    Tools       ● vy301-xxx-nodecloud... (running: normal) ▼   ▶  ■  ⬈  ☰   ↺   Live Edit: ◯✕  ↻  🐞
```

Root (cloud.ibm.com) ▼   index.html

▼ vy301-xxx-nodecloudant
  ▸ .settings
  ▸ launchConfigurations
  ▸ public
  ▼ routes
     📄 index.js
     📄 user.js
  ▼ views
     📄 index.html
  📄 .cfignore

```
 1  <!DOCTYPE html>
 2  <html>
 3  <head>
 4      <title>Favorites Organizer powered by Cloudant</title>
 5      <meta http-equiv="Content-Type" content="text/html; charset=utf-8">
 6      <meta name="viewport" content="width=device-width,initial-scale=1,maximu
 7      <meta name="apple-mobile-web-app-capable" content="yes" />
 8      <link rel="stylesheet" href="/style/style.css" />
 9  </head>
10  <body>
11      <div class = "container">
12      <div class = "banner">
13          <img class="newappIcon" src="images/newapp-icon.png">
14          <p class = "appTitle">
15          Favorites Organizer powered by Cloudant
16          </p>
17      </div>
```

2 Review and edit project artifacts from your web browser.

Editing source code

- The Eclipse Orion editor on IBM Cloud provides a fully featured environment for writing your application in your web browser.
- The editor parses source code for Node.js, Java, Python, and Markdown documents.
- The editor provides real-time validation and syntax checking.

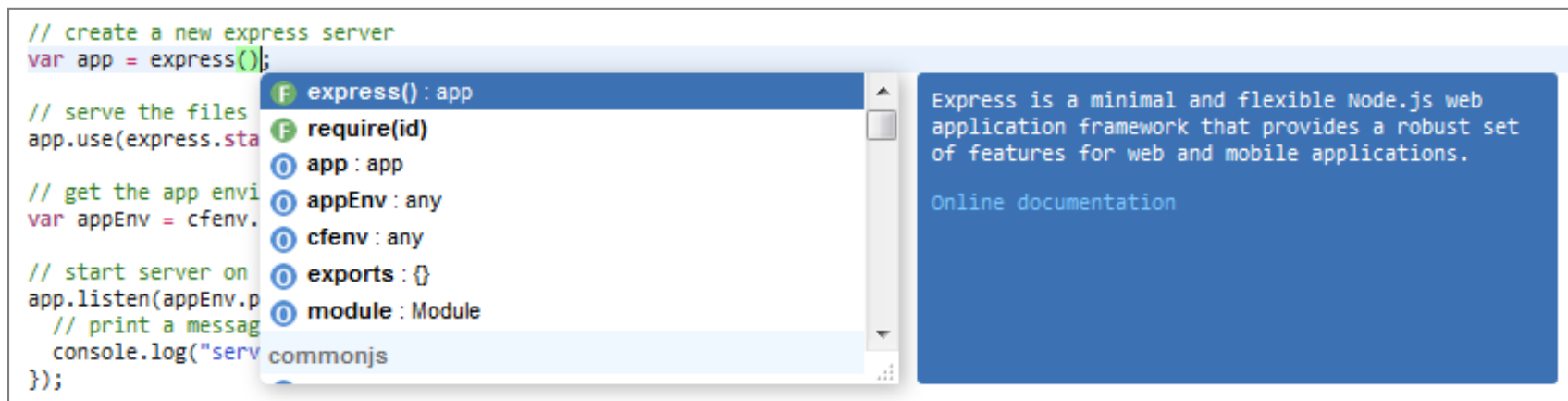# Editor features: Code completion

The code completion feature suggests functions and parameters in the editor:

- This feature dynamically displays all available libraries at the cursor point.
- Press Ctrl + Spacebar to activate the code completion menu.

Editor features: Run bar

- You can deploy applications from the Run bar directly from the Web IDE.

1. The status area shows which launch configuration is selected, and the deployment status.	2. Click **Play** to deploy the app. 3. Click **Stop** to stop the application.	4. Open the deployed app. 5. Open the logs. 6. Open the App Overview page.
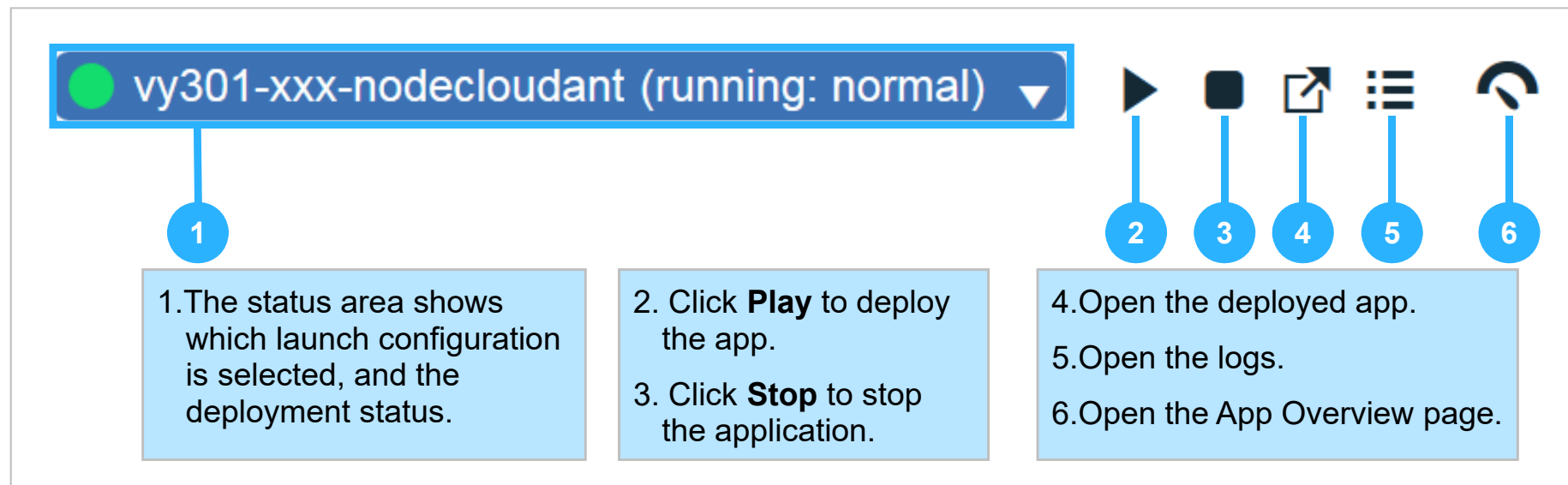
- Click **Play** to deploy the code in the current state of your workspace.
- To deploy only the changes that you checked in to the repository, use **Delivery Pipeline**.

IBM Cloud Live Sync features

If you are building a Node.js application, you can change your application on IBM Cloud as you would on the desktop without the need to redeploy it.
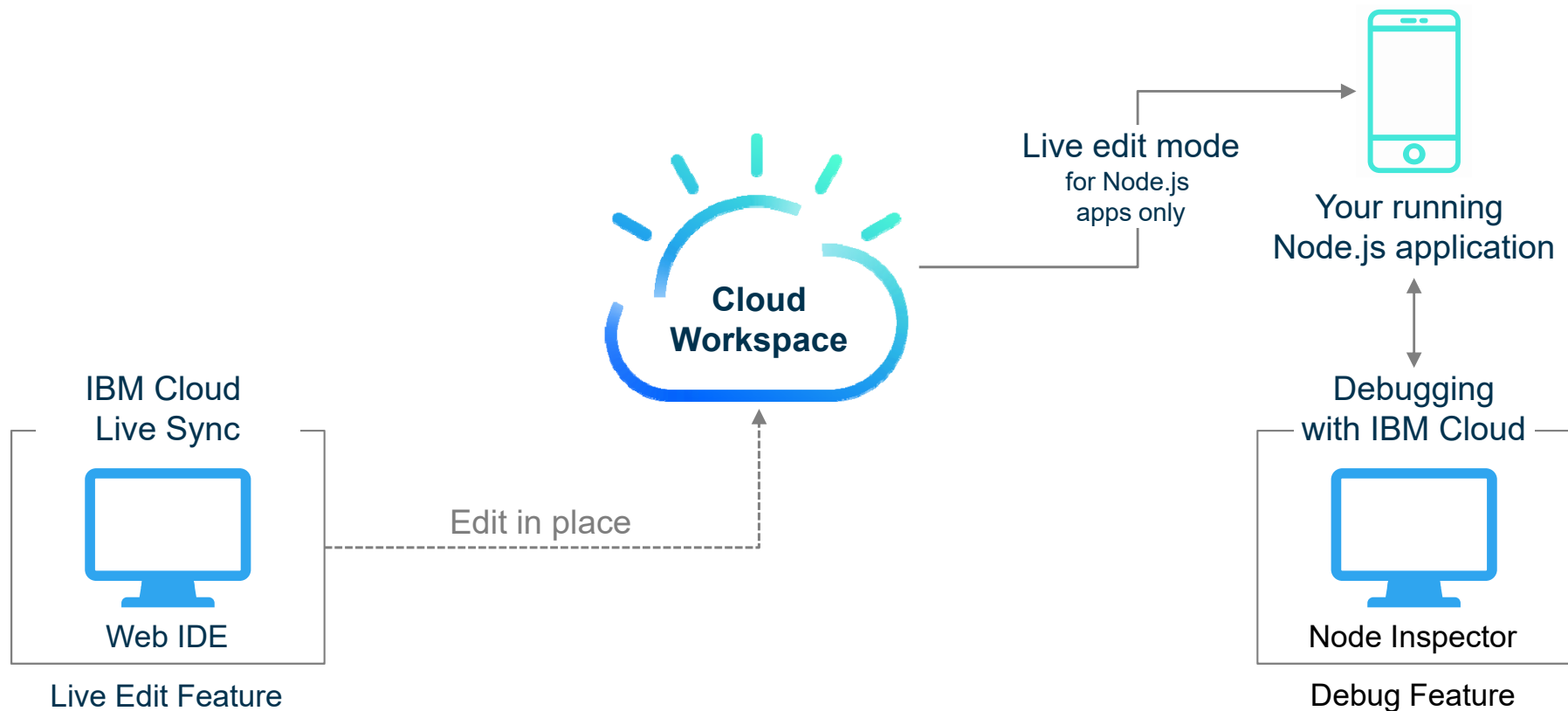
Source Code Management (Git repository) and Issue Tracker

Topics

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- Automated build and deployment (Delivery Pipeline)

Git repository and Issue Tracking

- Collaborate with your team and manage your source code with a Git repository (repo) and issue tracker that is hosted by IBM and built on GitLab Community Edition.

- The Git Repos and Issue Tracking tool integration supports teams to manage code and collaborate in many ways:

  - Manage Git repositories through fine-grained access controls that keep code secure.

  - Review code and enhance collaboration through merge requests.

  - Track issues and share ideas through the issue tracker.

  - Document projects on the wiki system.

Source control with a Git repository

- When you enable continuous delivery for an application, a Git repository is created to manage your source code.

- When you develop your application online, you can enter common Git commands through the Web IDE.

- If you develop your application on your own workstation, use a Git client to synchronize your own workspace and push your changes to the Git repository.

- For more information, see the open source Git project at this website:

  http://www.git-scm.com/

Git repository overview from Web IDE

1 Switch to **Git** from the navigation bar.

Active Branch (master)

Sync

Working Directory Changes
4 files changed. 4 files ready to commit.

▼ Outgoing (0)

Push ▾

6 Push the committed changes to the remote repository.

Fetch ▾

No Changes

▼ History

fix manifest.yml
Ahmed Azraq on 6/18/2017, 12:17:26 AM

more ...

fix NLU label in manifest

2 Review the commit history and comments.

4 Select files to commit in the Working Directory Changes pane.

Commit

Enter the commit message

5 Commit the changes to your local repository.

☐ Amend previous commit

more ...

☑ Select All   4 files selected   ⊞ ⊟

☑ ▾ 📄 app.js

```
22 22
23    //Provides utilities for dealing with director
24    var path = require('path');
23    //Routes module
24    var routes = require('./routes');
25
26
```

3 Review the changes that were completed.

Connecting a Git client to your repository on IBM Cloud

- If you want to develop your application on your own workstation, use a Git client to save your changes to the Git repository that is provided by IBM Cloud Continuous Delivery.

- Issue the `git clone` command with the Git repository address to retrieve a copy of the source code in the remote repository:

```
git clone https://github.com/IBMRedbooks/Cloud-
Application-Developer.git
```

- Issue the `status` command to check whether your local copy is synchronized with the remote repository:

```
git status
```

- Issue the `commit` and a `push` command to push changes from the local repository to the remote repository:

```
git add -A
git commit -m 'Adding application description.'
git push
```

Issue Tracking tool

IBM Cloud Continuous Delivery toolchain includes a tool to track issues.
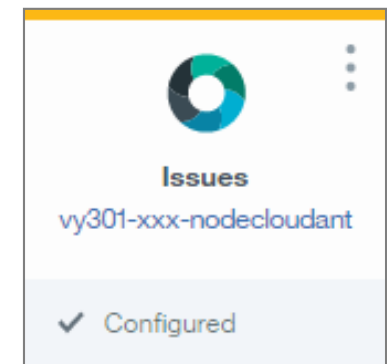
The Issue Tracker is the place to add things that need to be improved or solved in a project

Issues can be bugs, tasks or ideas to be discussed. Also, issues are searchable and filterable.

New issue

Creating an issue

To create a bug or task, click **New issue**.

Automated build and deployment (Delivery Pipeline)

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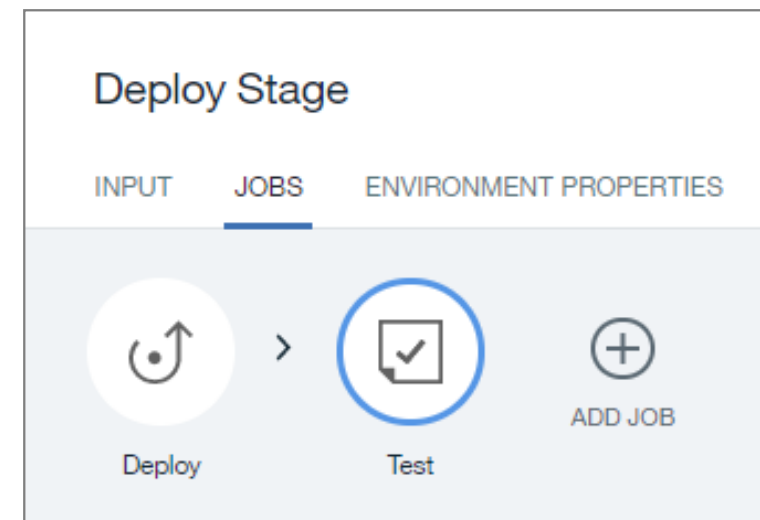- ▶ Automated build and deployment (Delivery Pipeline)

Delivery pipeline

- IBM Cloud Continuous Delivery runs the build and deploy scripts when either of the following conditions occur:
  - When you commit your changes to the remote Git repository if this function is configured to be triggered automatically.
  - When you click **Play** from the run bar.
- Jobs (Build, Deploy, and Test) are grouped into stages.

Delivery Pipeline
vy301-xxx-nodecloudant

✓ Configured
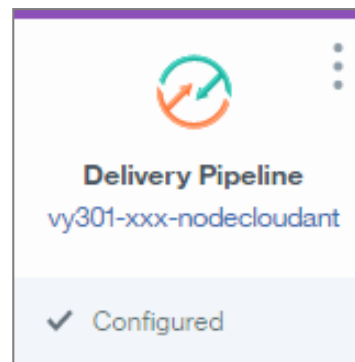
Customizing Delivery Pipeline

- When you commit changes to the Git repository, Delivery Pipeline pushes out the changes to your IBM Cloud application. Edit the delivery pipeline to customize the deployment tasks that run when you commit your changes.

- You can customize Delivery Pipeline in multiple stages and multiple jobs within a stage:

  - Create multiple stages that deploy code to the testing, staging, and production environments.
  - Add jobs within a stage to run automated tests of your code.

Deploy Stage

INPUT   JOBS   ENVIRONMENT PROPERTIES

Deploy Test ADD JOB

Example: Default delivery pipeline

1. The default delivery pipeline takes the files that are pushed to the remote Git repository.

2. The build stage by default contains a build job that builds the code artifact.

3. The deploy stage by default contains a deploy job that deploys the built application to your IBM Cloud space.

Configuring the build stage

Build Stage
Delete

Input   Jobs   Environment properties

Input settings

Input type ⓘ

Git repository ▾

Git repository

vy102-XXX-express ▾

Git URL

https://git.eu-gb.bluemix.net/Karim.E.El-Bawab/vy102-XXX-express.git

Branch

master ▾

1 — By default, the build stage is configured to run when a client pushes any changes to the master branch in the remote Git repository.

Stage trigger

◉ Run jobs whenever a change is pushed to Git

◯ Run jobs only when this stage is run manually

☐ Allow this stage to be run manually by all toolchain members ⓘ

2 — It is not necessary for you to run the build stage manually. However, you can disable automatic builds by using the State Trigger setting.

Save   Cancel

Configuring build jobs

Build Stage

Delete

Input   Jobs   Environment properties

⊕ ADD JOB

Build

You can add multiple Build, Test, and Deploy jobs to a particular stage.

Build   **Remove**

Build configuration

Builder type   ⓘ

Simple ▾

The simple build type runs the appropriate build scripts for your runtime environment.

Pipeline image version   ⓘ

Inherited from Configure Pipeline (1.0) ▾

Run conditions

☑ Stop running this stage if this job fails   ⓘ

Save   Cancel

Configuring deploy jobs

Deploy   **Remove**

Deploy configuration

Deployer type   ⓘ

Cloud Foundry

Pipeline image version   ⓘ

Inherited from Configure Pipeline (1.0) ▾

IBM Cloud region   ⓘ

London - https://api.eu-gb.bluemix.net

API key   ⓘ

API Key for vy102-XXX-express ▾

Organization   ⓘ

Karim.E.El-Bawab ▾

Space   ⓘ

dev

Application name   ⓘ

vy102-XXX-express

Deploy script   ⓘ

```
#!/bin/bash
cf push "${CF_APP}"

# View logs
# cf logs "${CF_APP}" --recent
```

1 The Deployer type gives the option to deploy the application either to Cloud Foundry servers or to Kubernetes clusters.

2 Specify a Cloud Foundry provider as the target; for example, one of the IBM Cloud regions.

3 You can clone this deploy job and specify other environments in your account.

4 You can customize the exact Cloud Foundry command-line interface commands in the deploy process in the Deploy script section.

Configuring test jobs

Example: A successful build and deploy result

Build Stage ▶ ⚙

STAGE PASSED

LAST INPUT   Git URL 🔗

Last commit by Karim El-Bawab   now
Adding .gitignore file

JOBS   View logs and history

✓ Build   Passed now

LAST EXECUTION RESULT

🔺 Build 1

Deploy Stage ▶ ⚙

STAGE PASSED

LAST INPUT   Stage: Build Stage / Job: B...

🔺 Build 1

JOBS   View logs and hi...

✓ Deploy Passed now

LAST EXECUTION RESULT

vy102-XXX-express
View console

🔺 Build 1   ↻

1 Review the status of the build job.

2 Review the status of the deploy job.

3 Check the LAST EXECUTION RESULT to see whether the application is successfully deployed to your IBM Cloud account.

Unit summary

- Describe DevOps.
- Describe the capabilities of IBM Cloud Continuous Delivery.
- Identify the web-based integrated development environment (Web IDE) features in IBM Cloud Continuous Delivery.
- Describe how to use source code management (such as Git) and Issue tracking.
- Explain how to build and deploy applications using DevOps tools on IBM Cloud.

Exercise 2: Developing IBM Cloud applications with IBM Cloud Continuous Delivery

Exercise objectives

- In this exercise, you work with the IBM Cloud Continuous Delivery services to explore, develop, build, and deploy IBM Cloud applications.

- After completing this exercise, you should be able to perform the following tasks:
  - Enable your application to use IBM Cloud Continuous Delivery.
  - Create a Git repository to manage your source code.
  - View and edit code in the Eclipse Orion Web integrated development environment (IDE).
  - Build and deploy code to IBM Cloud.
  - Test the application in IBM Cloud.

References

- DevOps For Dummies®, 3rd IBM Limited Edition:
  https://www.ibm.com/downloads/cas/P9NYOK3B

- Open-source Git project:

  www.git-scm.com

- Continuous Delivery Docs:
  https://cloud.ibm.com/docs/services/ContinuousDelivery?topic=ContinuousDelivery-cd_getting_started#cd_getting_started

- IBM Cloud Garage Method:

  https://www.ibm.com/cloud/garage/

- DevOps toolchains:

  https://www.ibm.com/cloud/garage/toolchains/