1 Managed CI/CD

1.1 Overview of Service

NTT's Managed Services for Continuous Integration and Continuous Deployment ('CI/CD') platforms are designed to help Clients achieve a higher level of operational automation within their development lifecycle.

Managed CI/CD supports PaaS solutions, using public cloud-native tools, and IaaS solutions in public cloud, using Jenkins and Gitlab.

1.2 Service Levels

Managed CI/CD service levels allow the Client to contract for the exact level of management that they require.

Platform Management: NTT manages CI/CD tooling while the Client retains the responsibility of managing their own code pipeline. NTT will manage permissions and access, providing the Client with the least privileged access to CI/CD tools needed by the Client to perform setup and management activities. This service doesn't include the management of the underlying infrastructure that supports the technology, which can be added with the corresponding managed service.

Charges are based on the quantity of toolsets in the solution (q x toolsets).

Pipeline Management: NTT provides setup and full management of the Client's code pipeline solution, allowing the Client to focus solely on development activities. Client must supply the accompanying unit and integration tests to be part of the pipeline.

Charges are based on the quantity of pipelines under management (assuming one app or microservice per pipeline) plus the quantity of toolsets in the solution (q x pipelines + q x toolsets).

The figure below demonstrates the scope of each service level. Platform and Pipeline service levels both require that NTT also manage the underlying infrastructure.

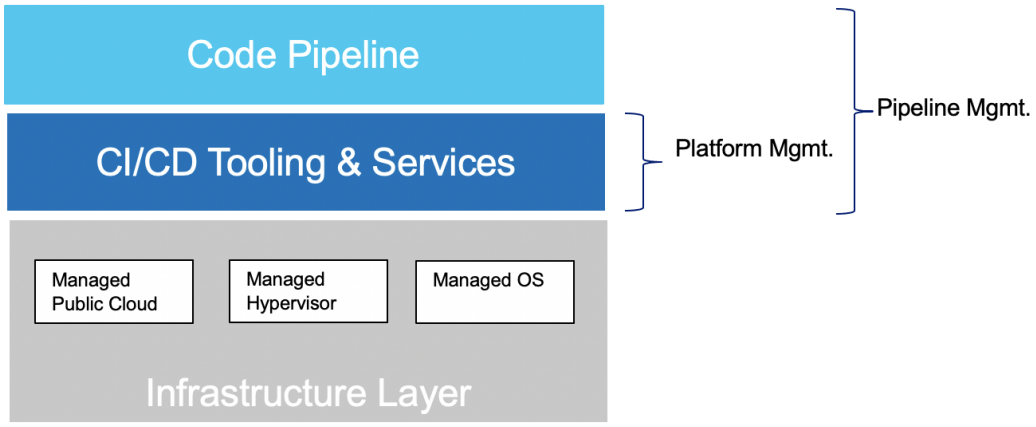

Figure 1 Managed CI/CD Service Levels
*Management of infrastructure supporting CI/CD contracted separately. See Prerequisite section of this service description.

1.3 Scope of Services

The table below shows the tasks which are included within each level of management.
Task legend:

(a) Tasks marked as ✅ are included.

(b) Tasks marked as ❌ are not included.

(c) See remarks below for tasks marked with ⚠ or ⭐.

Task	Platform	Pipeline	Limitations
CI/CD Platform provisioning	✅	✅	
CI/CD Platform updates/patching - (for Jenkins LTS, Gitlab) Minor Releases	✅	✅	Patches applied twice a year . In the event that enhancements or changes which are not required for patching are identified during the patching process, they will be fulfilled following the Service Request process defined in the *Client Service Description.*
CI/CD Platform updates/patching - (for Jenkins LTS, Gitlab) Major Releases	⚠ 1	⚠ 2	[1-2] Major version upgrades or releases are not included and must be scoped as a project; additional charges apply

CI/CD Platform management (Jenkins, Gitlab, Azure DevOps or AWS CodePipeline)	✓	✓	
. User / Role Management	✓	✓	
. Infrastructure Plugin Installation	✓	✓	
. Infrastructure Plugin Updates	✓	✓	Aligned with platform patching
. Pipeline Plugin Installation	✗	✓	
. Pipeline Plugin Updates	✗	✓	Aligned with platform patching
CI/CD Pipeline monitoring	★ [3]	⚠	[3] Optional services for monitoring and remediation following Client provided runbook are available. See Statement of Work for details. Client is still responsible for configuration, execution, and management of pipeline jobs. Only pipeline execution for production environments will be monitored. By default, alerts will be sent directly to the Client. Any further action to be performed by NTT must be defined during *Pipeline Design/Definition* task mentioned below.
Pipeline Design / Definition	★ [4]	★ [5]	[4-5] Consulting services are available for pipeline design. See NTT's *Cloud Enablement Sprint - Software Development Lifecycle Modernization* for details.
Third party (SaaS) tooling used within the pipeline	✗	★ [6]	[6] Third-party services within the pipeline can only be used if Client provides all required configuration and credentials. Management of the third-party service is out of scope.
Pipeline configuration and setup	✗	✓	Small incremental changes to pipeline are included. Full rewrite or refactor of a pipeline will require an additional project.
Integration and performance testing	✗	✗	
Application codebase	✗	✗	

1.4 Support Platforms

NTT can provide managed platform and pipeline service levels on the following platforms:

(a) IaaS based platforms

(i) AWS native PaaS

(ii) Azure native PaaS

(b) IaaS based solutions

(i) Jenkins LTS

(ii) Gitlab - latest version

Jenkins LTS	
Overview	Jenkins is a free and open-source automation server.
Setup Activities	Platform level . Setup master node: standalone or HA architectures are supported . Setup worker node pools . Define and setup worker node configuration or templates . Setup authentication (local if <5 users, external otherwise) . Setup authorization (via plugin) Pipeline level . Additional to tasks in Platform service level . Creation of new pipeline jobs
Client Request	Platform level . Setup and manage worker pools . Update or change worker node configuration or templates . Setup and management of all plugins . Creation of Job folders . Change access permissions Pipeline level . Additional to requests in Platform level . Update existing pipeline jobs (small incremental changes) . Optimize job concurrency
Infrastructure Plugins	. Matrix Authorization Strategy . Folders

Available Monitors	Platform level . OS level monitoring as defined in OS Management service description, for master and worker nodes . Application monitoring as defined in Standard Application services description, for master nodes . Canary pipeline for infrastructure dependency monitoring. Alerts received and processed by NTT. Pipeline level . Additional to monitoring in platform level . Canary pipeline for application dependency monitoring. Alerts received and processed by NTT. . Pipeline status monitoring for application production pipelines. Alerts will be sent to client directly.
Service Limitation	. Any required plugin will be installed and managed by NTT. Plugins are subject to NTT's approval in its sole and absolute discretion for controlling quality and compatibility. . Pipeline design and/or definition is not included and must contracted separately. . Separation of worker nodes from master node is recommended although not required. . Only pipeline execution for Production environments will be monitored. Alerts will be sent to Client directly. .In some cases, specific alerts can be treated by NTT; requirements must be agreed during the presales phase and included in the SOW.

Gitlab Latest	
Overview	GitLab is a web-based DevOps lifecycle tool that provides a Git-repository manager providing wiki, issue-tracking and continuous integration, and deployment pipeline features, using an open-source license, developed by GitLab Inc.
Setup Activities	Platform level . Setup master node: standalone and HA architectures are supported. . Setup runner node pools . Setup authentication (local if <5 users, external otherwise) . Setup authorization . Setup local users, groups, and namespaces Pipeline level . Additional to tasks in platform level . Creation of pipeline yaml files
Client Request	Platform level . Setup and manage runner node . Change access permissions Pipeline level . Additional to requests in platform level . Creation of new pipelines yaml files . Support with integrating centralized pipeline files into application code repositories . Runner concurrency optimization
Infrastructure Plugins	N/A
Available Monitors	Platform level . OS level monitoring as defined in OS Management service description, for master and worker nodes . Basic application status and availability monitoring . Canary pipeline for infrastructure dependency monitoring. Alerts received and processed by NTT. Pipeline level . Additional to monitoring in platform level . Canary pipeline for application dependency monitoring. Alerts received and processed by NTT. . Pipeline status monitoring for application production pipelines. Alerts will be sent to client directly.
Service Limitation	. Master and worker nodes will always be separated . Gitlab database will reside on an external SQL Database PaaS or Database running on IaaS. Management of those elements is included within Managed CI/CD management price. . Pipeline design and/or definition is not included and must contracted separately. . Pipeline definition files managed by NTT will be made available in a central repository in Gitlab which can be included in Client's application code repository. . Only pipeline execution for Production environments will be monitored. Alerts will be sent to Client directly. If any specific alerts should be treated by NTT, requirements need to be discussed during presales phase.

1.5 Prerequisites

All service levels require that managed services are also contracted for the underlying infrastructure supporting the CI/CD platform.

All service levels require that managed services are also contracted for the underlying infrastructure supporting the CI/CD platform.

(a) **IaaS solutions** (public cloud)- Managed services must be in scope in the SOW for Public Cloud, OS Management and middleware for all supporting servers (code repository, build servers including master

and slave, testing, production, etc.). See related service descriptions such as *Managed Public Cloud (AWS/Azure/GCP)*, *Managed OS* and other related service descriptions for details.

(b) **PaaS solutions** (public cloud-native) - Managed AWS - Core Services, Managed Azure - Core Services or Managed GCP - Core Services must also be in scope in the SOW.

1.6 Cloud native solutions

(a) Supported services in AWS:

(i) AWS CodeCommit

(ii) AWS CodeArtifact

(iii) AWS CodeBuild

(iv) AWS CodePipeline

AWS CodeCommit	
Overview	AWS CodeCommit is a version control service that enables you to privately store and manage Git repositories in the AWS Cloud.
Setup Activities	Platform level . Setup users Git credentials . Create new repositories . Setup repository notifications . Setup access control policies . Setup VPC endpoints Pipeline level . Additional to setup tasks in Platform level . Setup repository triggers . Create pull requests approval rules
Client Request	Platform level . Create and manage repositories . Setup and manage users Git credentials . Setup and manage repository notifications . Setup and manage access control policies Pipeline level . Additional to requests in Platform level . Setup and manage repository triggers . Setup and manage pull requests approval rules
Available Monitors	N/A
Service Limitation	. Client's application code is out of scope of service. NTT can't support the Client in resolving issues within the code repository . Client will receive sufficient permissions to manage the required services

AWS CodeArtifact	
Overview	AWS CodeArtifact is a secure, scalable, and cost-effective artifact management service for software development.
Setup Activities	Platform Level . Setup domains . Setup domain policies . Setup VPC endpoints (on managed VPCs) Pipeline Level . Additional to setup in Platform level . Setup repositories . Setup repository policies . Setup pipeline executions based on AWS CodeArtifact events
Client Request	Platform Level . Create, modify, and delete domains . Update domain policies Pipeline Level . Additional to requests in Platform level . Create, modify, and delete repositories . Update repository policies . Modify pipeline executions based on AWS CodeArtifact events
Available Monitors	N/A
Service Limitation	. Client is responsible of managing the packages within the repositories . Client will receive sufficient permissions to manage the required services

AWS CodeBuild	
Overview	AWS CodeBuild is a fully managed build service that compiles your source code, runs unit tests, and produces artifacts that are ready to deploy.
Setup Activities	Platform Level . Setup VPC endpoint access . Setup IAM service roles Pipeline Level . Additional to setup in Platform level . Create custom build docker images (if required) . Setup new CodeBuild environment . Setup build commands in build project . Provide buildspec.yml for the Client to upload to code repository (See Service Limitation) . Setup webhooks build triggering (See Service Limitation)
Client Request	Platform Level . Setup or update VPC endpoint access . Setup or update IAM service roles Pipeline Level . Additional to requests in Platform level . Update custom build docker image . Update build project environment . Update buildspec.yml file or embedded build instructions
Available Monitors	Platform Level . N/A Pipeline Level . Build job execution failure. Alerts will be sent to client directly.
Service Limitation	. Client is responsible to provide all the steps involved in the build process. . NTT will not have access to Client's code repositories. For complex build processes, a buildspec.yml file must exist in the root of the Client's code repository. In Pipeline Level management, NTT will provide a finished functional buildspec.yml file that Client will commit to their own repository. . NTT will not configure Client's third-party repository webhooks events . Build errors due to failures other than those platforms related will be reported back to the Client to resolve. . If build process requires test and generation of tests reports, these will be created and managed by the Client.

AWS CodePipeline	
Overview	AWS CodePipeline is a continuous delivery service that enables you to model, visualize, and automate the steps required to release your software.
Setup Activities	Platform Level . Setup VPC endpoint access . Setup IAM service roles Pipeline Level . Additional to setup in Platform level . Setup pipeline steps . Setup notifications . Setup manual approval actions and permissions . Creation of image definition file for ECS based deployments (see Service Limitation) . Setup custom actions (see Service Limitation)
Client Request	Platform Level . Setup or update VPC endpoint access . Setup or update IAM service roles Pipeline Level . Additional to requests in Platform level . Modify pipeline steps . Create or modify notifications . Setup or update manual approval actions and permissions . Update of image definition file for ECS based deployments (see Service Limitation) . Update custom actions (see Service Limitation)
Available Monitors	Platform Level . N/A Pipeline Level . Pipeline execution failure. Alerts will be sent to client directly.

Service Limitation	. Third party services configuration is out of scope . Client must provide all pipeline steps required to be configured. . Client must provide any additional code or configuration to integrate with third party services. . NTT will not have access to Client's code repositories. Some actions may require files to be present in the application code repository. Client is responsible to commit any provided file into their code repository. . Any required custom action code will be provided by the Client.

AWS CodeDeploy	
Overview	AWS CodeDeploy is a deployment service that enables developers to automate the deployment of applications to instances and to update the applications as required.
Setup Activities	Platform Level . Setup IAM service roles Pipeline Level . Additional to setup in Platform level . Install CodeDeploy agent . Instance tagging on EC2 instances part of the pipeline . Prepare EC2 AMI for CodeDeploy including roles (see Service Limitation) . Create a custom deployment configuration . Create application . Setup notifications rules on application events . Create deployment group . Create application AppSpec (see Service Limitation) . Create a deployment (via CodePipeline)
Client Request	Platform Level . Setup IAM service roles Pipeline Level . Additional to requests in Platform level . Update CodeDeploy agent . Instance tagging on EC2 instances part of the pipeline . Update a custom deployment configuration . Rename application . Update notification rules . Update deployment group . Update application AppSpec (see Service Limitation) . Update a deployment (via CodePipeline)
Available Monitors	N/A
Service Limitation	. In Pipeline Level management, NTT must be responsible of managing the platform onto which deployment occurs. . NTT will not have access to Client's code repositories. NTT will provide any Application Specification file and Client is responsible to commit any provided file into their code repository. . Using on-premises instances must be validated and defined in the Statement of Work provided. It's not part of the service by default. . Deployment monitoring is done via CodePipeline service.

1.7 Cloud native solutions on GCP

NTT currently provides managed CI/CD services for GCP using the following native PaaS:

(a) Cloud Build

(b) Cloud Deploy

Cloud Build	
Overview	Serverless CI/CD platform.
Setup Activities	Trigger setup. This may include: . RBAC using IAM . Integrations with other services in scope (e.g., Cloud Build) . Small incremental changes to cloudbuild.yaml file provided by the client (e.g., creating or modifying a step) . Only if Pipeline is expressly identified as in scope in the SOW: implementation of a cloudbuild.yaml file based on client requirements
Client Requests	. Changes to existing triggers

Cloud Build	
	. Troubleshooting assistance (e.g., failed builds) . Small incremental changes to cloudbuild.yaml file in use by an existing trigger (e.g., creating or modifying a step) . Only in Pipeline level/tier: refactor a cloudbuild.yaml file based on client requirements
Service Limitations	
Client Responsibilities	. Client must provide NTT with clear build and integration requirements . Client must execute the changes in out-of-scope services required by any integration they request (e.g., Github or Gitlab repositories) . Client is responsible for the development, testing and deployment of the applications that interact with the service, and in general, for their repositories' code

Cloud Deploy	
Overview	Fully managed continuous delivery service.
Setup Activities	Delivery pipeline setup. This may include: . RBAC using IAM . Add target environments . Integrations with other services in scope (e.g., GKE)
Client Requests	. Changes to existing delivery pipeline configuration . Best practices guidance (e.g., deployment strategy) . Troubleshooting assistance (e.g., failed delivery pipeline)
Service Limitations	. NTT is not responsible for application-level issues or bugs, or the impact any of these could have on the service availability or security
Client Responsibilities	. Client must provide NTT with clear delivery pipeline and integration requirements . Client must execute the changes in out-of-scope services required by any integration they request (e.g., Github or Gitlab repositories) . Client is responsible for the development, testing and deployment of the applications that interact with the service, and in general, for their repositories' code

1.8 Prerequisites

All service levels require that managed services are also contracted for the underlying infrastructure supporting the CI/CD platform.

(a) **IaaS solutions** (private or public cloud)- Managed services must be in Scope in the SOW for OS Management and middleware for all supporting servers (code repository, build servers including master and slave, testing, production.). See related service descriptions such as *Managed OS* and other related service descriptions for details.

(b) **PaaS solutions** (public cloud-native) - *Managed GCP - Core Services* must also be in Scope in the SOW.