Architecture Integration Solutions: Student Notes

Class Resources Download:

Mule Runtime Server: https://www.mulesoft.com/lp/dl/mule-esb-enterprise
MCIA Certification:
- https://training.mulesoft.com/certification/architect-integration-level1
- https://training.mulesoft.com/downloads
- https://training.mulesoft.com/oltpublish/cmsres/downloads/MCIA_level1_datasheet.pdf

New Anypoint Platform Account: https://anypoint.mulesoft.com/login/signup
New Dev Level 2 Courses:
https://training.mulesoft.com/course-catalog?results=true&skillLevel=mulesoft.20
Visual VM download: https://visualvm.github.io/download.html
Practice Exam Cert MCIA:
https://training.mulesoft.com/certification/architect-integration-level1/practice-exam
https://training.mulesoft.com/course/architecture-integration-solutions/quiz-diy
Online Exam Preparation Kit:
https://help.learn.mulesoft.com/hc/en-us/articles/360057127674-MuleSoft-Exam-Readiness-Kit

Module 1 - Introduction to Architecture

MuleSoft Catalyst
- https://catalyst.mulesoft.com/
- Catalyst 2.0: https://knowledgehub.mulesoft.com/s
- Github Repository: https://github.com/mulesoft-catalyst

MuleSoft Help: https://help.mulesoft.com/s/
Software Quality Attributes :
- https://iso25000.com/index.php/en/iso-25000-standards/iso-25010?start=0
- https://www.iso.org/obp/ui/#iso:std:iso-iec:25010:ed-1:v1:en
- https://en.wikipedia.org/wiki/ISO/IEC_9126

Architectural Approaches/Models
4+1 View: https://en.wikipedia.org/wiki/4%2B1_architectural_view_model
https://www.cs.ubc.ca/~gregor/teaching/papers/4+1view-architecture.pdf
C4 Model: https://c4model.com/
Architectural Decision Record (How to manage knowledge and historical decisions taken for a project) https://adr.github.io/
Architectural Decision Record (how to document architectural discussions and decisions) https://github.com/adr/madr

Architectural/Diagrams Standards & Tools
Archimate:

- https://www.opengroup.org/archimate-forum/archimate-overview
- https://pubs.opengroup.org/architecture/archimate3-doc/toc.html
- https://www.archimatetool.com/download/

UML: https://staruml.io/
Draw.io: https://draw.io/ also know as https://www.diagrams.net/ , Desktop ver:
https://github.com/jgraph/drawio-desktop
Lucidchart: https://www.lucidchart.com/
Diagram as Code: https://diagrams.mingrammer.com/

Salesforce Architecture Centre
https://architect.salesforce.com/design/diagram-templates/how-to-diagram/
https://architect.salesforce.com/design

OAS (OAS v3 and Swagger v2)
https://github.com/OAI/OpenAPI-Specification/blob/main/versions/3.1.0.md
OAS Linter: https://github.com/Mermade/oas-kit/blob/main/packages/oas-linter/README.md

Markdown Cheatsheet: https://www.markdownguide.org/cheat-sheet/

Event-Driven APIs (Async APIs)
https://blogs.mulesoft.com/news/anypoint-platform/event-driven-architecture-asyncapi/
https://studio.asyncapi.com/?url=https://raw.githubusercontent.com/asyncapi/asyncapi/v2.2.0/examples/simple.yml

Anypoint Datagraph and GraphQL APIs
https://www.mulesoft.com/platform/anypoint-design-center/datagraph

Module 2

Semantic Versioning: https://semver.org/
API Catalog CLI
https://docs.mulesoft.com/exchange/apicat-install-api-catalog-cli
https://blogs.mulesoft.com/news/mulesoft-api-catalog-cli/
REST API Portal Example:
https://anypoint.mulesoft.com/exchange/68ef9520-24e9-4cf2-b2f5-620025690913/covid19-data-tracking-api/minor/3.0/
Async API Specification: https://www.asyncapi.com/
Connect Standalone runtime with control plane: amc_setup.bat -H UUID local-runtime
Mule Domain Projects: https://docs.mulesoft.com/mule-runtime/4.3/shared-resources
Create Custom Connectors: https://docs.mulesoft.com/mule-sdk/1.1/module-structure

HTTP Protocol

https://datatracker.ietf.org/doc/html/rfc7231

Mule 4: What's new? https://docs.mulesoft.com/mule-runtime/4.3/mule-runtime-updates
Thru MFT Connector (FTP behind HTTPS):
https://www.thruinc.com/file-transfer-integration/mulesoft/
https://anypoint.mulesoft.com/exchange/org.mule.modules/thru-transport-connector/minor/2.1/
Exchange query example: *category:"level" = "Select"*
category:"level" = "MuleSoft-Certified"

Anypoint Platform Back Support Policy
https://www.mulesoft.com/legal/versioning-back-support-policy

API Governance
Engine to validate the rulesets
https://github.com/aml-org/amf-custom-validator/blob/develop/docs/validation_tutorial/
https://github.com/mulesoft-labs/amf-validation-example/blob/master/documentation/validation.md
https://a.ml/docs/amf/using-amf/amf_validation
https://a.ml/docs/amf/amf_playground

API Catalog CLI https://www.npmjs.com/package/api-catalog-cli

Module 3

Mule 4 migration tool
https://docs.mulesoft.com/mule-runtime/4.3/migration-intro
https://github.com/mulesoft/mule-migration-assistant

Example/Template how to structure your Mule Maven Project:
https://github.com/mulesoft-consulting/Mule-Maven-HowTo-sources

Dataweave Performance
https://blogs.mulesoft.com/api-integration/strategy/dataweave-performance-demystified/
https://docs.mulesoft.com/dataweave/2.4/dataweave-streaming (STREAMING)
Dataweave Tutorial: https://developer.mulesoft.com/learn/dataweave/tutorial
Scatter-Gather Config:
https://docs.mulesoft.com/mule-runtime/4.3/scatter-gather-concept#scatter-gather-xml-reference
Scatter Gather Pattern:
https://www.enterpriseintegrationpatterns.com/patterns/messaging/BroadcastAggregate.html
List of Patterns: https://www.enterpriseintegrationpatterns.com/patterns/messaging/toc.html

Module 4 - Processing Models

Reactive Programming:
- https://www.reactivemanifesto.org/
- https://www.mulesoft.com/lp/whitepaper/api/reactive-programming

Mule Runtime Execution Threading Pools:
- https://docs.mulesoft.com/mule-runtime/4.3/execution-engine
- https://blogs.mulesoft.com/news/anypoint-platform/threading-model-in-mule-4-3/

Streaming in Mule 4

https://docs.mulesoft.com/mule-runtime/4.4/streaming-about

https://docs.mulesoft.com/mule-runtime/4.4/streaming-strategies-reference

Streaming for DW:

https://docs.mulesoft.com/dataweave/2.4/dataweave-streaming

https://docs.mulesoft.com/dataweave/2.4/dataweave-memory-management

Mule Runtime Download all versions:

https://repository.mulesoft.org/nexus/content/repositories/public/org/mule/distributions/mule-standalone/

REST Architecture Phd Paper Dissertation:

https://www.ics.uci.edu/~fielding/pubs/dissertation/rest_arch_style.htm

SOAP Extensions: https://en.wikipedia.org/wiki/List_of_web_service_specifications

JMS:
- https://en.wikipedia.org/wiki/Jakarta_Messaging#Provider_implementations
- https://docs.mulesoft.com/jms-connector/1.7/jms-examples

Anypoint MQ: https://docs.mulesoft.com/mq/mq-queues

Amazon SQS:
- https://aws.amazon.com/getting-started/
- https://aws.amazon.com/sqs/
- https://docs.mulesoft.com/amazon-sqs-connector/5.11/

Dead Letter Queue

https://docs.mulesoft.com/mq/mq-queues#dead-letter-queues

(Pattern): https://en.wikipedia.org/wiki/Dead_letter_queue

VM Queues: https://help.mulesoft.com/s/article/CloudHub-Persistent-Queues-Explained

Salesforce API Limits:

https://developer.salesforce.com/docs/atlas.en-us.salesforce_app_limits_cheatsheet.meta/salesforce_app_limits_cheatsheet/salesforce_app_limits_platform_api.htm

Batch Processing:

 https://help.mulesoft.com/s/article/Mule-Batch-Process-and-CloudHub-Persistent-Queues

https://docs.mulesoft.com/mule-runtime/4.4/batch-processing-concept#scheduling-strategy

https://docs.mulesoft.com/mule-runtime/4.4/batch-filters-and-batch-aggregator

Competing Consumers Pattern:

https://docs.microsoft.com/en-us/azure/architecture/patterns/competing-consumers

Change Data Capture for DB

https://debezium.io/documentation/reference/stable/connectors/mysql.html

Salesforce CDC:

https://developer.salesforce.com/docs/atlas.en-us.change_data_capture.meta/change_data_capture/cdc_intro.htm

Sample Projects using Queues, JMS, AMQP, MQTT

https://github.com/pedes/mule-rabbitmq-mqtt-amqp

https://github.com/pedes/mule-mqtt-mosquitto

Module 5

Canonical Data Model (CDM)

https://www.bmc.com/blogs/canonical-data-model/#

https://microservices.io/patterns/decomposition/decompose-by-subdomain.html

https://github.com/raml-org/raml-spec/blob/master/versions/raml-10/raml-10.md#object-type

Validation Techniques:

https://cheatsheetseries.owasp.org/cheatsheets/Input_Validation_Cheat_Sheet.html

XML DTD Validation Change:

https://help.mulesoft.com/s/article/Change-of-Behavior-with-DataWeave-Functionality-on-May-4-2021?utm_source=techcomms&utm_medium=email&utm_campaign=FY22_Core

Create Custom Connector: https://videos.mulesoft.com/watch/Nb7nQwz4r7PPLdMKtf6PVh

Vote Idea about TLS + Connectors:

https://help.mulesoft.com/s/ideas#08734000000HgGRAA0

Module 6 - Testing

MUnit:
- https://docs.mulesoft.com/munit/2.3/munit-matchers
- Munit Tutorials: https://developer.mulesoft.com/tutorials-and-howtos
- MUnit Maven Plugin: https://docs.mulesoft.com/munit/2.3/munit-maven-plugin
- DW Assertions: https://docs.mulesoft.com/munit/2.3/dataweave-assertions-library

Integration Testing:
- BAT Tool and Playground: https://anypoint.mulesoft.com/apitesting/playground/
- https://learning.postman.com/docs/running-collections/using-newman-cli/command-line-integration-with-newman/
- https://docs.mulesoft.com/api-functional-monitoring/bat-install-task
- https://docs.mulesoft.com/api-functional-monitoring/bat-example-test-suite
- https://docs.mulesoft.com/api-functional-monitoring/

Module 7 - Deployment Models

Runtime Fabric Self-Managed Kubernetes
- https://docs.mulesoft.com/runtime-fabric/1.11/

- https://training.mulesoft.com/course/operations-runtime-fabric-kubernetes

PCE Private Cloud Edition

https://docs.mulesoft.com/private-cloud/3.0/

MuleSoft Support Terms: https://www.mulesoft.com/legal/support-maintenance-terms

Dedicated Load Balancers

https://docs.mulesoft.com/runtime-manager/lb-create-arm

Deployment to cloudhub (200mb jar size limit)

https://docs.mulesoft.com/runtime-manager/deploying-to-cloudhub

New! Anypoint Flex Gateway

https://docs.mulesoft.com/gateway/flex-gateway-overview

https://www.mulesoft.com/platform/api/flex-api-gateway# (Video Webinar)

https://videos.mulesoft.com/watch/cKMZ4GTLjRDRG1XLizyQjP

https://docs.mulesoft.com/gateway/1.3/flex-local-publish-simple-api

Sample Jenkins File to deploy a mule application

https://github.com/mulesoft-consulting/ci-hello-world/blob/master/mule4/hello-world-api/Jenkinsfile

New Cloudhub 2.0

https://docs.mulesoft.com/cloudhub-2/ch2-config-endpoints-paths#send-application-to-application-requests-within-a-private-space

Publish Assets to Exchange (with Maven)

https://docs.mulesoft.com/exchange/to-publish-assets-maven

Check the documentation how to publish the asset to exchange here:

https://github.com/mulesoft-labs/exchange-documentation-samples/blob/master/pom.xml

https://github.com/mulesoft-labs/exchange-documentation-samples/blob/master/mule-app/README.md

Blog Post: https://dzone.com/articles/publishing-mulesoft-common-assets-or-libraries-to

Video Tutorial: https://www.youtube.com/watch?v=ynvEQQmdBFo&ab_channel=JasonEstevan

Module 8 - Storage, Persistence and State Management

Object Store (Cloudhub OSv2):
- https://docs.mulesoft.com/object-store/osv2-faq
- https://docs.mulesoft.com/object-store/osv2-apis
- https://docs.mulesoft.com/object-store/osv2-guide (search TTL)
- https://help.mulesoft.com/s/article/What-is-the-size-of-the-Mule-HA-Cluster-In-Memory-Grid-Cache
- https://docs.mulesoft.com/object-store/osv2-usage

Storage in a Cluster:

https://docs.mulesoft.com/mule-runtime/4.3/creating-and-managing-a-cluster-manually

Idempotency:

- HTTP Headers for idempotency:
  https://developer.mozilla.org/en-US/docs/Web/HTTP/Headers/ETag

Module 9 - Logging & Monitoring

Log4J2 Config: https://logging.apache.org/log4j/2.x/manual/appenders.html
https://help.mulesoft.com/s/article/CloudHub-Logging-FAQ
Custom Log4J Cloudhub: https://docs.mulesoft.com/runtime-manager/custom-log-appender
Log4J2 with Splunk Example:
https://github.com/splunk/splunk-library-javalogging/blob/main/src/test/resources/log4j2.xml
Monitoring for On-Prem installations: https://docs.mulesoft.com/monitoring/am-installing

Monitoring:
- https://docs.mulesoft.com/monitoring/
- Monitoring API:
  https://anypoint.mulesoft.com/exchange/portals/anypoint-platform/f1e97bc6-315a-4490-82a7-23abe036327a.anypoint-platform/arm-monitoring-query/minor/1.0/console/method/%23140/

Visualizer: https://docs.mulesoft.com/visualizer/
Alerts:
- https://docs.mulesoft.com/monitoring/basic-alerts
- https://docs.mulesoft.com/runtime-manager/alerts-on-runtime-manager

Metrics Toolkit (accelerator):
https://github.com/mulesoft-catalyst/metrics-toolkit
https://videos.mulesoft.com/watch/ZsdujWfd7L1cb7BGyKMjhc
Audit Log Aggregator https://github.com/mulesoft-catalyst/audit-log-aggregators

Further reading:
https://www.splunk.com/en_us/data-insider/devops-research-and-assessment-metrics.html

Module 10 - DevOPS & Automation

Anypoint Platform REST APIs:
https://anypoint.mulesoft.com/exchange/portals/anypoint-platform/
CNCF Landscape of CI/CD servers: https://landscape.cncf.io/?zoom=200
Maven: https://maven.apache.org/guides/getting-started/maven-in-five-minutes.html
Anypoint CLI: https://docs.mulesoft.com/runtime-manager/anypoint-platform-cli-commands
- CLI Commands for API Governance
  https://docs.mulesoft.com/anypoint-cli/3.x/api-governance

How to Login for using REST APIs:
https://help.mulesoft.com/s/article/How-to-generate-your-Authorization-Bearer-token-for-Anypoint-Platform

Postman Collection for Anypoint Platform
https://www.postman.com/mulesoft-api/workspace/mulesoft-platform-apis/documentation/16547909-1e97eed6-ef8c-4d46-9d30-2ff41c8102c5
Tutorial how to use the postman collection:
https://developer.mulesoft.com/tutorials-and-howtos/postman-anypoint-platform-apis-getting-started-tutorial/

Mule Maven Plugin: https://docs.mulesoft.com/mule-runtime/4.3/deploy-to-cloudhub
https://docs.mulesoft.com/mule-runtime/4.3/using-maven-with-mule
Deployment with Maven: https://gist.github.com/pedes/884cb474580bcabcc796fdcd41f8632f
Automation of Deployment with Jenkins
https://workshop.tools.mulesoft.com/alc-workshop/module7/module7_lab4.html

Properties/Secrets Storage: https://devopsrob.com/hashicorp-vault-in-azure-best-practices/
Connected Apps to login instead of users:
https://docs.mulesoft.com/access-management/connected-apps-overview

Tutorial how to automate the deployment of mule apps using Github Actions:
https://mulesoft-labs.dev/codelabs/cicd-with-github-actions/index.html#0

Sonarqube Plugin: https://github.com/mulesoft-catalyst/mule-sonarqube-plugin

Setting Properties at start up
https://help.mulesoft.com/s/article/How-can-I-set-Mule-and-Java-system-properties-at-startup
https://help.mulesoft.com/s/article/How-to-Get-List-of-JVM-Arguments-Passed-to-an-RTF-App-Deployment (properties for RTF)
https://help.mulesoft.com/s/article/How-to-Configure-JVM-Arguments-via-API-to-RTF-Applications

Module 11 - Transactions

Transactions (Local and Global using XA)
https://docs.mulesoft.com/mule-runtime/4.4/transaction-management
Sagas Pattern:
https://microservices.io/patterns/data/saga.html
https://www.cs.cornell.edu/andru/cs711/2002fa/reading/sagas.pdf
Bitronix Tx Manager:
https://docs.mulesoft.com/mule-runtime/4.3/using-bitronix-to-manage-transactions

Module 12 - Reliability

8 Fallacies of Distributed Computing:
https://www.mypassionfor.net/wp-content/uploads/2020/03/8-fallacies-of-distributed-computing-2048x1428.png

Module 13

High Availability: https://docs.mulesoft.com/mule-runtime/4.4/hadr-guide
https://en.wikipedia.org/wiki/High_availability

Disaster Recovery, High Availability, Business Continuity:
- https://docs.mulesoft.com/runtime-manager/cloudhub-hadr
- https://docs.mulesoft.com/runtime-manager/cloudhub-networking-guide#regional-services
- https://aws.amazon.com/about-aws/global-infrastructure/regions_az/
- https://docs.mulesoft.com/runtime-manager/cluster-about
- https://docs.mulesoft.com/mule-runtime/4.3/mule-high-availability-ha-clusters

Create & configure cluster with standalone runtimes
https://docs.mulesoft.com/mule-runtime/4.4/creating-and-managing-a-cluster-manually
https://docs.mulesoft.com/anypoint-cli/3.x/server-clusters#runtime-mgr-cluster-add-server

Modules 15&16 - Security

Enforce MFA for all users:
https://help.mulesoft.com/s/article/MFA-requirement-for-all-MuleSoft-Anypoint-Platform-users

Compliance Reports for Anypoint Platform:
https://compliance.salesforce.com/en/services/mulesoft
Support and Maintenance terms of Anypoint Platform
https://www.mulesoft.com/legal/support-maintenance-terms
https://www.mulesoft.com/legal/cloud-offerings-SLA-for-Salesforce-uMSA

New! API Governance
https://docs.mulesoft.com/api-governance/
https://www.mulesoft.com/platform/api/governance-anypoint

VPC FAQ: https://help.mulesoft.com/s/article/CloudHub-Connectivity-FAQ
Unofficial tool for properties encryption: https://secure-properties-api.us-e1.cloudhub.io/
VPC : https://docs.mulesoft.com/runtime-manager/virtual-private-cloud
VPN Connectivity Methods (IPSec Tunnel):
https://docs.mulesoft.com/runtime-manager/vpn-create-arm

Keep Configuration and App properties secure: https://12factor.net/config

Why we need HTTPS? https://howhttps.works/why-do-we-need-https/
Security Framework:
https://owasp.org/www-pdf-archive/OWASP_Application_Security_Verification_Standard_4.0-en.pdf
OWASP Vulnerabilities: https://sucuri.net/guides/owasp-top-10-security-vulnerabilities-2021/
https://owasp.org/www-project-api-security/
https://cheatsheetseries.owasp.org/cheatsheets/
Anypoint Security : https://docs.mulesoft.com/anypoint-security/index-policies (Only for Runtime Fabric)
Community Encryption Tool: https://secure-properties-api.us-e1.cloudhub.io/
Official JAR to encrypt properties:
https://docs.mulesoft.com/mule-runtime/4.4/secure-configuration-properties#secure_props_tool
API Policies: https://docs.mulesoft.com/api-manager/2.x/policies-ootb-landing-page
SonarQube Plugin: https://github.com/mulesoft-catalyst/mule-sonarqube-plugin (Static Analysis Code)
How SSL works on Cloudhub:
https://help.mulesoft.com/s/article/How-to-create-HTTPS-SSL-service-in-Cloudhub

Configure Open ID Connect for APIs
https://docs.mulesoft.com/access-management/configure-client-management-openid-task

JWT Tokens Encryption
https://datatracker.ietf.org/doc/html/rfc7516
https://datatracker.ietf.org/doc/html/rfc7515

Open-source OAuth server
https://www.keycloak.org/
https://github.com/OpenIdentityPlatform/OpenAM

SAML Configuration for Microsoft Azure Active Directory (use this info into the AP)
https://docs.microsoft.com/en-us/azure/active-directory/fundamentals/auth-saml

Anypoint Transit Gateway
https://docs.mulesoft.com/runtime-manager/tgw-attach-arm
https://docs.mulesoft.com/runtime-manager/tgw-about
References from AWS
- https://docs.aws.amazon.com/vpc/latest/tgw/transit-gateway-appliance-scenario.html
- https://aws.amazon.com/premiumsupport/knowledge-center/dx-configure-dx-and-vpn-failover-tgw/
- https://docs.aws.amazon.com/vpc/latest/tgw/tgw-transit-gateways.html

Security Architecture Frameworks

https://owasp.org/www-project-samm/
https://owasp.org/www-project-application-security-verification-standard/ (ASVS)
https://www.nist.gov/cyberframework