Course orientation on Cloud Services Architecting Practices

Min-Yuh Day, Ph.D, Associate Professor
Dept. of Information Management, Tamkang University

http://mail.tku.edu.tw/myday

2020-03-05
淡江大學108學年度第2學期
課程教學計畫表
Spring 2020 (2020.03 - 2020.06)

• 課程名稱：雲端服務架構實務
  (Cloud Services Architecting Practices)
• 授課教師：戴敏育 (Min-Yuh Day)
• 開課系級：資管四P (TLMXB4P) (M2436) (2790)
• 開課資料：選修 單學期 2 學分
  (2 Credits, Elective)
• 上課時間地點：週四 Thu 9, 10 (16:10-18:00) B113
課程簡介

- 雲端服務架構實務課程主要介紹：AWS 技術基礎和在 AWS 上建立架構。
- AWS技術基礎介紹 AWS 產品、服務和常見解決方案。
- 在 AWS 上建立架構內容涵蓋在 AWS 上建置 IT 基礎架構的基礎。
- 解決方案架構師如何透過了解 AWS 服務來優化對 AWS 雲端的使用，及如何讓這些服務符合雲端解決方案。
- AWS 雲端最佳實務與建議的設計模式，協助學員思考在 AWS 上架構最佳 IT 解決方案的程序。
Course Introduction

• This course, **Cloud Services Architecting Practices**, introduces **AWS Technical Essentials** and **Architecting on AWS**.

• In **AWS Technical Essentials**, students will learn about AWS products, services, and common solutions.

• **Architecting on AWS** covers fundamentals of building IT infrastructure on the AWS platform.

• Students will learn how to optimize the AWS Cloud by understanding how AWS services fit into cloud-based solutions.

• In addition, students explore AWS Cloud best practices and design patterns for architecting optimal IT solutions on AWS.
課程目標

• 根據 AWS 推薦的架構原則和最佳實踐做出架構決策。
• 了解利用 AWS 服務讓您的基礎設施具備可擴展性、可靠性和高可用性。
• 利用 AWS 託管服務提高基礎設施的靈活性和彈性。
• 提高基於 AWS 的基礎設施的效率，以提升性能並降低成本。
• 使用架構完善的框架改進採用 AWS 解決方案的架構。
Course Objective

• Make architectural decisions based on the AWS-recommended architectural principles and best practices.
• Explore leveraging AWS services to make your infrastructure scalable, reliable, and highly available.
• Leverage AWS managed services to enable greater flexibility and resiliency in an infrastructure.
• Make an AWS-based infrastructure more efficient in order to increase performance and reduce costs.
• Use the Well-Architected Framework to improve architectures with AWS solutions.
週次 (Week)  日期 (Date)  內容 (Subject/Topics)
1  2020/03/05  Course orientation on Cloud Services Architecting Practices: AWS Solutions Architect Overview
2  2020/03/12  Automating Your Infrastructure
3  2020/03/19  Decoupling Your Infrastructure
4  2020/03/26  Designing Web-Scale Media
5  2020/04/02  清明節補假 (放假一天)
6  2020/04/09  Well-Architected Framework
週次 (Week)  日期 (Date)  內容 (Subject/Topics)
7  2020/04/16  Well-Architected Pillar 1 - Operational Excellence
8  2020/04/23  Well-Architected Pillar 2 - Security
9  2020/04/30  期中考試週
10 2020/05/07  Well-Architected Pillar 3 - Reliability
11 2020/05/14  Well-Architected Pillar 4 - Performance Efficiency
12 2020/05/21  Well-Architected Pillar 5 - Cost-Optimization
13 2020/05/28  Troubleshooting,
             Design Patterns and Sample Architectures
14  2020/06/04  畢業考試週
15  2020/06/11  教師彈性補充教學
教學目標之教學方法與評量方法

• 教學方法
  • 講述、討論、發表、實作、體驗、模擬

• 評量方法
  • 測驗、討論、實作、報告
學期成績計算方式

• 期中評量：30.0％
• 期末評量：30.0％
• 平時評量：40.0％ (課堂參與及報告討論表現)
教材課本與參考書籍

• 教材課本 (Textbook)
  • Slides
  • AWS Academy Cloud Architecting (AWS ACA), AWS Academy
  • AWS Academy Cloud Foundations (AWS ACF), AWS Academy
• **References**
  • **AWS Certified Solutions Architect – Associate**
  • **AWS Certified Cloud Practitioner**
  • **AWS Technical Essentials**
    • [https://aws.amazon.com/training/course-descriptions/essentials/](https://aws.amazon.com/training/course-descriptions/essentials/)
  • **Architecting on AWS**
    • [https://aws.amazon.com/training/course-descriptions/architect/](https://aws.amazon.com/training/course-descriptions/architect/)
  • **AWS Cloud Practitioner Essentials (Second Edition)**
    • [https://aws.amazon.com/training/course-descriptions/cloud-practitioner-essentials/](https://aws.amazon.com/training/course-descriptions/cloud-practitioner-essentials/)
Available AWS Certifications

**Professional**
Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud

**Associate**
One year of experience solving problems and implementing solutions using the AWS Cloud

**Foundational**
Six months of fundamental AWS Cloud and industry knowledge

https://aws.amazon.com/certification/
AWS Certified Cloud Practitioner

• This certification provides individuals in a larger variety of cloud and technology roles with a way to validate their AWS Cloud knowledge and enhance their professional credibility.

• This exam covers four domains, including cloud concepts, security, technology, and billing and pricing.

https://aws.amazon.com/certification/certified-cloud-practitioner/
AWS Certified Solutions Architect – Associate

• This certification validates your ability to effectively demonstrate knowledge of how to architect and deploy secure and robust applications on AWS technologies.

• This exam is for anyone with at least one year of hands-on experience designing available, cost-efficient, fault-tolerant, and scalable and distributed systems on AWS.

AWS Academy and Certifications

• **AWS Academy Cloud Architecting (ACA)**
  • **AWS Certified Solutions Architect – Associate (SAA-C01)** (2020/05/28)

• **AWS Academy Cloud Foundations (ACF)**
  • **AWS Certified Cloud Practitioner (CLF-C01)**

[https://aws.amazon.com/training/awssubscription/](https://aws.amazon.com/training/awssubscription/)
### AWS Certified Cloud Practitioner (CLF-C01)

<table>
<thead>
<tr>
<th>Domain</th>
<th>% of Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain 1: Cloud Concepts</td>
<td>26%</td>
</tr>
<tr>
<td>Domain 2: Security and Compliance</td>
<td>25%</td>
</tr>
<tr>
<td>Domain 3: Technology</td>
<td>33%</td>
</tr>
<tr>
<td>Domain 4: Billing and Pricing</td>
<td>16%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

## AWS Certified Solutions Architect – Associate (SAA-C01)

<table>
<thead>
<tr>
<th>Domain</th>
<th>% of Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain 1: Design <strong>Resilient</strong> Architectures</td>
<td>34%</td>
</tr>
<tr>
<td>Domain 2: Define <strong>Performant</strong> Architectures</td>
<td>24%</td>
</tr>
<tr>
<td>Domain 3: Specify <strong>Secure</strong> Applications and Architectures</td>
<td>26%</td>
</tr>
<tr>
<td>Domain 4: Design <strong>Cost-Optimized</strong> Architectures</td>
<td>10%</td>
</tr>
<tr>
<td>Domain 5: Define <strong>Operationally Excellent</strong> Architectures</td>
<td>6%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
</tr>
</tbody>
</table>

• Domain 1: **Cloud Concepts**
  
  • 1.1 Define the AWS Cloud and its value proposition
  • 1.2 Identify aspects of AWS Cloud economics
  • 1.3 List the different cloud architecture design principles
AWS Certified Cloud Practitioner (CLF-C01)

• Domain 2: Security and Compliance
  • 2.1 Define the AWS shared responsibility model
  • 2.2 Define AWS Cloud security and compliance concepts
  • 2.3 Identify AWS access management capabilities
  • 2.4 Identify resources for security support

Source: https://aws.amazon.com/certification/certified-cloud-practitioner/
• Domain 3: Technology
  • 3.1 Define methods of deploying and operating in the AWS Cloud
  • 3.2 Define the AWS global infrastructure
  • 3.3 Identify the core AWS services
  • 3.4 Identify resources for technology support

Source: https://aws.amazon.com/certification/certified-cloud-practitioner/
• Domain 4: **Billing and Pricing**
  • 4.1 Compare and contrast the various pricing models for AWS
  • 4.2 Recognize the various account structures in relation to AWS billing and pricing
  • 4.3 Identify resources available for billing support

AWS Certified Solutions Architect – Associate (SAA-C01)

• Domain 1: Design Resilient Architectures
  • 1.1 Choose reliable/resilient storage.
  • 1.2 Determine how to design decoupling mechanisms using AWS services.
  • 1.3 Determine how to design a multi-tier architecture solution.
  • 1.4 Determine how to design high availability and/or fault tolerant architectures.

Source: https://aws.amazon.com/certification/certified-solutions-architect-associate
• Domain 2: Define **Performant** Architectures
  • 2.1 Choose performant storage and databases.
  • 2.2 Apply caching to improve performance.
  • 2.3 Design solutions for elasticity and scalability.

Domain 3: Specify Secure Applications and Architectures

- 3.1 Determine how to secure application tiers.
- 3.2 Determine how to secure data.
- 3.3 Define the networking infrastructure for a single VPC application.
• Domain 4: Design **Cost-Optimized** Architectures
  • 4.1 Determine how to design cost-optimized storage.
  • 4.2 Determine how to design cost-optimized compute.

• Domain 5: Define **Operationally-Excellent** Architectures
  • 5.1 Choose design features in solutions that enable operational excellence.

AWS Academy Cloud Architecting (ACA)

• AWS ACA Prerequisites
  • Completion of Academy Cloud Foundations (ACF) or equivalent experience.
  • Working knowledge of distributed systems.
  • Familiarity with general networking concepts.
  • Working knowledge of multi-tier architectures.
  • Familiarity with cloud computing concepts.

Source: https://aws.amazon.com/training/awsacademy/
AWS Academy Cloud Architecting (ACA) Course Overview

- Module 0 (Optional): AWS Service Review
- Module 1: Course Welcome and Overview
- Module 2: Designing the Network
- Module 3: Designing for High Availability – Section 1
- Module 4: Designing for High Availability with Scaling – Section 2
- Module 5: Automating Your Infrastructure
- Module 6: Decoupling Your Infrastructure
- Module 7: Designing Web-Scale Media

Source: https://aws.amazon.com/training/awsacademy/
AWS Academy Cloud Architecting (ACA) Course Overview

• Module 8: Well-Architected Framework
• Module 9: Well-Architected Pillar 1 - Operational Excellence
• Module 10: Well-Architected Pillar 2 - Security
• Module 11: Well-Architected Pillar 3 - Reliability
• Module 12: Well-Architected Pillar 4 - Performance Efficiency
• Module 13: Well-Architected Pillar 5 - Cost-Optimization
• Module 14: Troubleshooting
• Module 15: Design Patterns and Sample Architectures

Source: https://aws.amazon.com/training/awsacademy/
# AWS Compute

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon EC2</td>
<td>Virtual servers in the cloud</td>
</tr>
<tr>
<td>Amazon Elastic Container Service</td>
<td>Run and manage docker containers</td>
</tr>
<tr>
<td>AWS Batch</td>
<td>Run batch jobs at any scale</td>
</tr>
<tr>
<td>AWS Lambda</td>
<td>Run code without thinking about servers</td>
</tr>
<tr>
<td>AWS Wavelength</td>
<td>Deliver ultra-low latency applications for 5G devices</td>
</tr>
<tr>
<td>Amazon EC2 Auto Scaling</td>
<td>Scale compute capacity to meet demand</td>
</tr>
<tr>
<td>Amazon Elastic Kubernetes Service</td>
<td>Run managed Kubernetes on AWS</td>
</tr>
<tr>
<td>AWS Elastic Beanstalk</td>
<td>Run and manage web apps</td>
</tr>
<tr>
<td>AWS Outposts</td>
<td>Run AWS infrastructure on-premises</td>
</tr>
<tr>
<td>Amazon Elastic Container Registry</td>
<td>Store and retrieve docker images</td>
</tr>
<tr>
<td>Amazon Lightsail</td>
<td>Launch and manage virtual private servers</td>
</tr>
<tr>
<td>AWS Fargate</td>
<td>Run containers without managing servers or clusters</td>
</tr>
<tr>
<td>AWS Serverless Application Repository</td>
<td>Discover, deploy, and publish serverless applications</td>
</tr>
<tr>
<td>VMware Cloud on AWS</td>
<td>Build a hybrid cloud without custom hardware</td>
</tr>
</tbody>
</table>

Source: [https://aws.amazon.com/](https://aws.amazon.com/)
AWS Database

Amazon Aurora
High Performance Managed Relational Database

Amazon DynamoDB
Managed NoSQL Database

Amazon DocumentDB (with MongoDB compatibility)
Fully managed document database

Amazon ElastiCache
In-memory Caching System

Amazon Managed Apache Cassandra Service
Managed Cassandra-compatible database

Amazon Neptune
Fully Managed Graph Database Service

Amazon Quantum Ledger Database (QLDB)
Fully managed ledger database

Amazon RDS
Managed Relational Database Service for MySQL, PostgreSQL, Oracle, SQL Server, and MariaDB

Amazon RDS on VMware
Automate on-premises database management

Amazon Redshift
Fast, Simple, Cost-effective Data Warehousing

Amazon Timestream
Fully managed time series database

AWS Database Migration Service
Migrate Databases with Minimal Downtime

Source: https://aws.amazon.com/
AWS Storage

Amazon Simple Storage Service (S3)
Scalable Storage in the Cloud

Amazon F5x for Lustre
High-performance file system integrated with S3

AWS Backup
Centralized backup across AWS services

CloudEndure Disaster Recovery
Highly automated disaster recovery

Amazon Elastic Block Store (EBS)
EC2 block storage volumes

Amazon FSx for Windows File Server
Fully managed Windows native file system

AWS Snow Family
Physical devices to migrate data into and out of AWS

Amazon Elastic File System (EFS)
Fully managed file system for EC2

Amazon S3 Glacier
Low-cost Archive Storage in the Cloud

AWS Storage Gateway
Hybrid Storage Integration

Source: https://aws.amazon.com/
AWS Networking & Content Delivery

- **Amazon VPC**
  Isolated Cloud Resources

- **Amazon Route 53**
  Scalable Domain Name System

- **AWS Cloud Map**
  Application resource registry for microservices

- **AWS Transit Gateway**
  Easily scale VPC and account connections

- **Amazon API Gateway**
  Build, Deploy, and Manage APIs

- **AWS PrivateLink**
  Securely Access Services Hosted on AWS

- **AWS Direct Connect**
  Dedicated Network Connection to AWS

- **Amazon CloudFront**
  Global Content Delivery Network

- **AWS App Mesh**
  Monitor and control microservices

- **AWS Global Accelerator**
  Improve application availability and performance

Elastic Load Balancing
Distribute incoming traffic across multiple targets

Source: [https://aws.amazon.com/](https://aws.amazon.com/)
# AWS Security, Identity & Compliance

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWS Identity &amp; Access Management</td>
<td>Manage User Access and Encryption Keys</td>
</tr>
<tr>
<td>Amazon GuardDuty</td>
<td>Managed Threat Detection Service</td>
</tr>
<tr>
<td>AWS Artifact</td>
<td>On-demand access to AWS compliance reports</td>
</tr>
<tr>
<td>AWS Directory Service</td>
<td>Host and Manage Active Directory</td>
</tr>
<tr>
<td>AWS Resource Access Manager</td>
<td>Simple, secure service to share AWS resources</td>
</tr>
<tr>
<td>AWS Shield</td>
<td>DDoS Protection</td>
</tr>
<tr>
<td>Amazon Cognito</td>
<td>Identity Management for your Apps</td>
</tr>
<tr>
<td>Amazon Inspector</td>
<td>Analyze Application Security</td>
</tr>
<tr>
<td>AWS Certificate Manager</td>
<td>Provision, Manage, and Deploy SSL/TLS Certificates</td>
</tr>
<tr>
<td>AWS Firewall Manager</td>
<td>Central Management of Firewall Rules</td>
</tr>
<tr>
<td>AWS Secrets Manager</td>
<td>Rotate, Manage, and Retrieve Secrets</td>
</tr>
<tr>
<td>AWS Single Sign-On</td>
<td>Cloud Single Sign-On (SSO) Service</td>
</tr>
<tr>
<td>Amazon Detective</td>
<td>Investigate potential security issues</td>
</tr>
<tr>
<td>Amazon Macie</td>
<td>Discover, Classify, and Protect your Data</td>
</tr>
<tr>
<td>AWS CloudHSM</td>
<td>Hardware-based Key Storage for Regulatory Compliance</td>
</tr>
<tr>
<td>AWS Key Management Service</td>
<td>Managed Creation and Control of Encryption Keys</td>
</tr>
<tr>
<td>AWS Security Hub</td>
<td>Unified security and compliance center</td>
</tr>
<tr>
<td>AWS WAF</td>
<td>Filter Malicious Web Traffic</td>
</tr>
</tbody>
</table>

Source: [https://aws.amazon.com/](https://aws.amazon.com/)
AWS Cost Management

- **AWS Cost Explorer**
  Analyze Your AWS Cost and Usage

- **AWS Budgets**
  Set Custom Cost and Usage Budgets

- **AWS Cost and Usage Report**
  Access Comprehensive Cost and Usage Information

- **Reserved Instance Reporting**
  Dive Deeper into Your Reserved Instances (RIs)

- **Savings Plans**
  Save up to 72% on compute usage with flexible pricing

Source: [https://aws.amazon.com/](https://aws.amazon.com/)
AWS Services

• Amazon **EC2**
  • Virtual servers in the cloud

• Amazon **Simple Storage Service (S3)**
  • Scalable storage in the cloud

• Amazon **Aurora**
  • High performance managed relational database

• Amazon **DynamoDB**
  • Managed NoSQL database

• Amazon **RDS**
  • Managed relational database service for MySQL, PostgreSQL, Oracle, SQL Server, and MariaDB

Source: [https://aws.amazon.com/](https://aws.amazon.com/)
AWS Services

• AWS Lambda
  • Run code without thinking about servers

• AWS Elastic Beanstalk
  • Run and manage web apps

• Amazon VPC
  • Isolated cloud resources

• Amazon Lightsail
  • Launch and manage virtual private servers

• Amazon SageMaker
  • Build, train, and deploy machine learning models at scale

Source: https://aws.amazon.com/
Summary

- 雲端服務架構實務課程主要介紹：
  AWS 技術基礎和在 AWS 上建立架構。
- AWS 技術基礎介紹 AWS 產品、服務和常見解決方案。
- 在 AWS 上建立架構內容涵蓋在 AWS 上建置 IT 基礎架構的基礎。
- 解決方案架構師如何透過了解 AWS 服務來優化對 AWS 雲端的使用，及如何讓這些服務符合雲端解決方案。
- AWS 雲端最佳實務與建議的設計模式，協助學員思考在 AWS 上架構最佳 IT 解決方案的程序。
Contact Information

戴敏育 博士 (Min-Yuh Day, Ph.D.)
專任副教授
淡江大學 資訊管理學系

電話：02-26215656 #2846
傳真：02-26209737
研究室：B929
地址：25137 新北市淡水區英專路151號
Email：myday@mail.tku.edu.tw
網址：http://mail.tku.edu.tw/myday/