

REQUEST FOR APPROVAL TO USE W-DESIGNATION

LSC # 16-160
Action AP-4/13/17

COVER SHEET: Request for Approval to Use W-Designation

TYPE I. PROFESSOR COMMITMENT

Professor _____ Phone _____

Writing Workshop? (If not at IUP, where? when?) _____

Proposal for one W-course (see instructions below)

Agree to forward syllabi for subsequently offered W-courses?

TYPE II. DEPARTMENT COURSE

Department Contact Person Pankaj Chaudhary Phone 357-2601

Course Number/Title IFMG 471 - Data Center and Cloud Computing Fundamentals

Statement concerning departmental responsibility
Proposal for this W-course (see instructions below)

TYPE III. SPECIFIC COURSE AND SPECIFIC PROFESSOR(S)

Professor(s) _____ Phone _____

Course Number/Title _____

Proposal for this W-course (see instructions below)

SIGNATURES:

Professor(s) Jan A Rodger (James Allen Rodger)

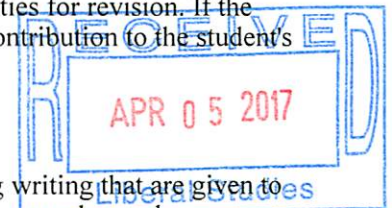
Department Chairperson Pankaj Chaudhary

College Dean Ravi Clong

Director of Liberal Studies Edel Heilly Gail Schmitt UCC

COMPONENTS OF A PROPOSAL FOR A WRITING-INTENSIVE COURSE:

- I. "Writing Summary"--one or two pages explaining how writing is used in the course. First, explain any distinctive characteristics of the content or students which would help the Liberal Studies Committee understand your summary. Second, list and explain the types of writing activities; be especially careful to explain (1) what each writing activity is intended to accomplish as well as the (2) amount of writing, (3) frequency and number of assignments, and (4) whether there are opportunities for revision. If the activity is to be graded, indicate (5) evaluation standards and (6) percentage contribution to the student's final grade.
- II. Copy of the course syllabus.
- III. Two or three samples of assignment sheets, instructions, or criteria concerning writing that are given to students. Limit: 4 pages. (Single copies of longer items, if essential to the proposal, may be submitted to be passed among LSC members and returned to you.)



Please number all pages. Provide one copy to Liberal Studies Committee.
Before you submit: Have you double-checked your proposal against "The Liberal Studies Committee's Most Frequently Asked Questions"?

I. WRITING SUMMARY – IFMG 471: Data Center and Cloud Computing Fundamentals

IFMG 471: Data Center and Cloud Computing Fundamentals, is proposed as a “W” course for the (Information Technology) IT track in the ISDS Department. This course will be offered in the Spring semester of each year and it is the capstone course in the IT track. Students taking this course are expected to be juniors or seniors and would be primarily ISIT majors and some MIS minors.

1. WRITING TO DEMONSTRATE INTEGRATED LEARNING AND COMPREHENSION

Students will be introduced to various concepts related to Data Centers and Cloud Computing through lectures, research papers, practitioner literature, and text books assigned for course. After reading and attending lectures covering materials corresponding to a particular course objective, students will summarize their learning in a topical essay 3 to 4 pages in length. These essays may involve response to short problem descriptions and/or cases related to the course objectives. Summaries will involve drawing and then interpreting the business processes using the Visio software tool. The use of using diagrams is expected to force the student to concentrate on the concepts involved in utilizing symbolism in their writings. Students will write at least five reports which will contribute to 20% of the overall course grade. These reports will be given as homework assignments.

2. WRITING TO DEMONSTRATE CRITICAL THINKING

Descriptive short answer essay questions will appear on each examination and will constitute at least 30% of the grade on the examination. Clear and well organized answers to these questions will be expected. These questions may involve answers to short problems/mini-cases.

3. STATISTICAL TECHNICAL REPORTS.

Performance monitoring of the data centers is data intensive. Such data may relate to the failure rates of hard drives of a particular capacity made by a particular vendor with a particular platter configuration. Monitoring may also involve comparison of such data across vendors, capacities, and configurations. The statistical technical reports will involve using secondary data on a particular aspect of a Data Center operation to identify problems and their solutions, and suggestions for improvement of reliability and performance. These reports should be written to make a business case for whatever the recommendation is being forwarded and may involve some financial and organizational analyses. Reports will contain statistical results which would need to be presented clearly and precisely. Since a report is written to forward a business case it is important that the statistics do not become the sole overwhelming focus. At most two data sets will be provided to the students to analyze and present their findings. The reports are expected to be between 7 to 8 pages long. These statistical technical reports will constitute 15% of the final grade.

4. RESEARCH PAPER.

This type of writing is very different from the above forms of writing, as it involves the scientific method. As students progress through the course they will become familiar with some contemporary issues related to data centers and cloud computing. These issues may range from being technical to being business related. Students will select a topic with the help of the instructor and prepare a research report in the form of a journal article. The structure of this research paper will follow the scientific method. The report will consist of a title, keywords, abstract, introduction, analysis, results, conclusions, recommendations, future issues and references. References will be both rigorous and relevant to the topic being examined. Student will develop the paper in an incremental fashion with at least two feedback updates from the instructor.

Summary Chart for Writing Assignments*

A. Writing Assignments IFMG 41: Data Center and Cloud Computing					
Assignment Title	# of Assignments	# of total pages	Graded (Yes/No)	Opportunity for Revision (Yes/No)	Written Assignment represents what
Homework Assignments	4-5	3-4	Y	No	20%
Exam Essay Questions	2	2	Y	No	13.5%
Statistical Technical Report	1-2	7-8	Y	Yes	15%
Research Paper	1	10-15	Y	Yes	20%
Totals					68.5%

B. Examinations (Complete only if you intend to use essay exams/short answers as part of the required number of pages of writing.)			
Exams	Approx.% of exam that is essay or short answer	Anticipated # of pages for essay or short answer, or approx. word count	Exam constitutes what % of final course grade
1.	30	2	20
2.	30	2	25
3.			
Totals			45

**Total writing assignments should contain at least 5000 words (approximately 15-20 typed pages) in two or more separate assignments; written assignments should be a major part of the final grade—at least 50% or more.*

II. COURSE SYLLABUS FOR IFMG 471: Data Center and Cloud Fundamentals

IFMG 471 Data Center and Cloud Computing Fundamentals

(3c-01-3cr)

Prerequisites: IFMG 254 and IFMG 360

I. Catalog Description

Introduces the building and managing of data centers as cloud on the network. Focuses on the fundamentals regarding data center system configuration, networking, storage and application. Examines different kinds of cloud service and delivery model. Discusses the management of data center security.

II. Course Objectives

By the end of the class, students should be able to:

1. Comprehend data center fundamental concepts and operation model
2. Acquire knowledge about the special networking and storage technology for data centers
3. Examine cloud security management issues
4. Analyze different kinds of cloud services
5. Understand cloud architecture settings
6. Express themselves in a writing intensive venue that showcases their decision making skills

III. Course Outline

1. Data center basics
2. Cloud –enabling technology in a data center
3. Special networking and storage for cloud computing
4. Cloud computing services
5. Cloud service delivery model
6. Data center security
7. Cloud service security
8. Cloud service cost metrics and pricing model
9. Service quality metrics
10. Cloud computing infrastructure

IV. Evaluation Methods

Writing intensive homework assignments. These will be based on material discussed in class and other published sources. Five essays each dealing with one of the course objectives.	20%
Examinations. Two in-class exams and a final exam all of which count equally. Examinations consist of short-answer, analysis, and what-if questions.	45%
Statistical Technical Report(s)	15%
Research Paper	20%

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A: 90% and above; B: 80% and above but less than 90%; C: 70% and above but less than 80%; D: 60% and above but less than 70%; F: Below 60%

V. Course Attendance Policy

In accordance with University policy, individual faculty will denote an attendance policy on specific course syllabi.

VI. Required Textbook(s), Supplemental Books and Readings

Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zaigham Mahmood
(Prentice Hall, Hardcover, 528 pages, ISBN: 9780133387520)

VII. Special Resources

No special resource requirements. All the software needed is provided free or already subscribed by the ISDS department. This software is installed in the ISDS lab which is used for the course.

VIII. Bibliography

1. Cloud Data Centers and Cost Modeling: A Complete Guide To Planning, Designing and Building a Cloud Data Center 1st Edition by Caesar Wu (Author), Rajkumar Buyya ISBN-13: 978-0128014134 , ISBN-10: 012801413X Morgan Kauffman
2. Data Center Handbook 1st Edition by Hwaiyu Geng (Author) ISBN-13: 978-1118436639 ISBN-10: 1118436636 Wiley
3. The Art of the Data Center: A Look Inside the World's Most Innovative and Compelling Computing Environments 1st Edition by Douglas Alger (Author) ISBN-13: 978-1587142963 ISBN-10: 1587142961
4. Data Center Virtualization Fundamentals: Understanding Techniques and Designs for Highly Efficient Data Centers with Cisco Nexus, UCS, MDS, and Beyond 1st Edition by Gustavo A. A. Santana (Author) ISBN-13: 978-1587143243 ISBN-10: 1587143240 Cisco
5. Data Center Fundamentals by Mauricio Arregoces (Author), Maurizio Portolani (Author) ISBN-13: 978-1587050237 ISBN-10: 1587050234 Cisco
6. CCNA Data Center (200-150, 200-155) Official Cert Guide Library 1st Edition
7. by Chad Hintz (Author), Cesar Obediente (Author), Ozden Karakok (Author), Navaid Shamsee (Author), David Klebanov (Author), Hesham Fayed (Author), ISBN-13: 978-1587205958 ISBN-10: 1587205955 Cisco
8. Industry Playbook Data Center Colocation: Everything you need to know when buying and selling data center colocation services Paperback – January 8, 2014 by Sean Patrick Tario (Author) Delta Force
9. On time-sensitive revenue management in green data centers Sustainable Computing: Informatics and Systems, Volume 14, June 2017, Pages 1-12 Huangxin Wang, Jean X. Zhang, Bo Yang, Fei Li
10. FSQCN: Fast and simple quantized congestion notification in data center Ethernet Journal of Network and Computer Applications, Volume 83, 1 April 2017, Pages 53-62 Chang Ruan, Jianxin Wang,

Wanchun Jiang, Jiawei Huang, Geyong Min, Yi

11. Service reliability modeling and evaluation of active-active cloud data center based on the IT infrastructure. *Microelectronics Reliability*, In Press, Corrected Proof, Available online 22 March 2017 Xiaoyang Li, Yue Liu, Rui Kang, Lianghua Xiao

III. ASSIGNMENT SAMPLES

Sample essay questions for examinations

1. Over the past 3 years, a cloud service has been unavailable for a total of 36 hours, primarily due to a denial of service attacks. Additionally, the physical server hosting the cloud service crashed once. It took the cloud provider 4 days to replace the physical server and for the cloud service to become operational again. Based on these statistics over the past 3 years, please explain the availability rating of the cloud service.

 2. A cloud provider is deploying a new SaaS product comprised of a cloud service. As part of the deployment, the cloud provider wants to publish a service level agreement (SLA) that provides an availability rating based on its estimated availability over the next 12 months. First, the cloud provider estimates that, based on historical data of the cloud environment, there is a 25% chance that the physical server hosting the cloud service will crash and that such a crash would 2 days before the cloud service could be restored. It is further estimated that, over the course of a 12 month period, there will be various attacks on the cloud service, resulting in a total of 24 hours of downtime. Based on these estimates, please explain the availability rating of the cloud service that should be published in the SLA.

 3. Over the past two years a cloud service consumers have made 24,531 attempts to invoke a cloud service's reporting capability. Of those attempts, 22,904 resulted in the successful execution of this capability. Based on these statistics, please explain the reliability rating of the cloud service's reporting capability.
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Sample Questions for Homework Assignment Essay

Essay 1

Company A

Company A's IT department has a hosting platform specifically for systems used by the company's large marketing department. This platform provides critical, high-availability hosted IT resources and services. However, the IT department has started to receive complaints about the time it takes to start new marketing campaigns, primarily due to how long it takes to provision new servers within this platform. Also, as a result of a recent set of mergers and acquisitions, the consumers of the services hosted by this platform have become more distributed, with service consumers accessing services from a large variety of locations, and with increasingly different types of devices. In response to these complaints, Company A is considering using a cloud-based hosting platform. Please describe which specific characteristics of a cloud will be helpful for Company A to address its problems?

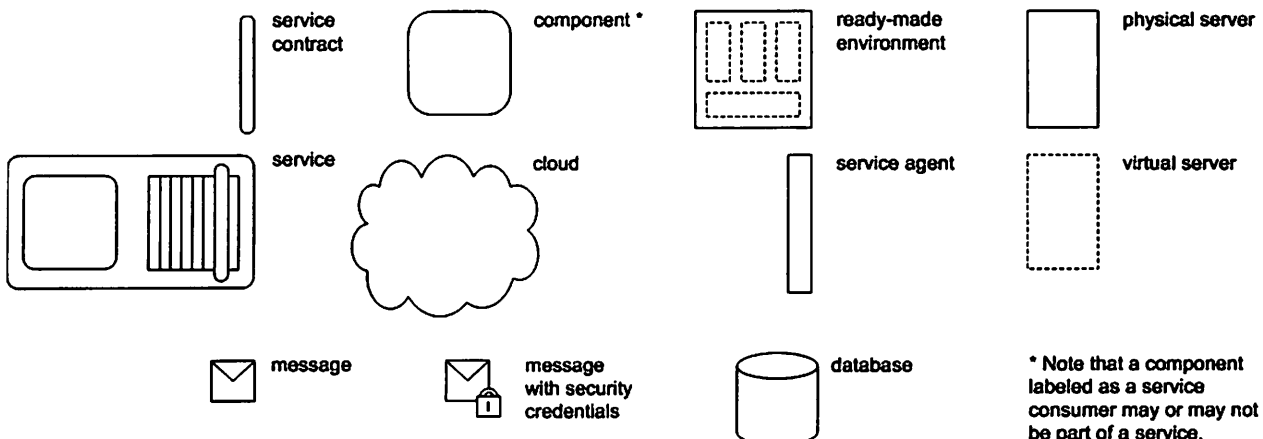
Company B

Company B is an IT hosting company that provides a range of shared services used by a wide variety of customers. One of Company B's customers is Company A. Specifically, Company A's marketing department has been using a service hosted by Company B's on-premises environment. The service provides functions for conducting public surveys. Recently, Company A complained about Company B's billing practices and the reliability of its hosting environment. Company B currently charges all of its customers a flat fee, regardless of how much or how frequently a given customer uses the service. Furthermore, the public survey service has been repeatedly attacked and has therefore not always been available for Company A and other customers.

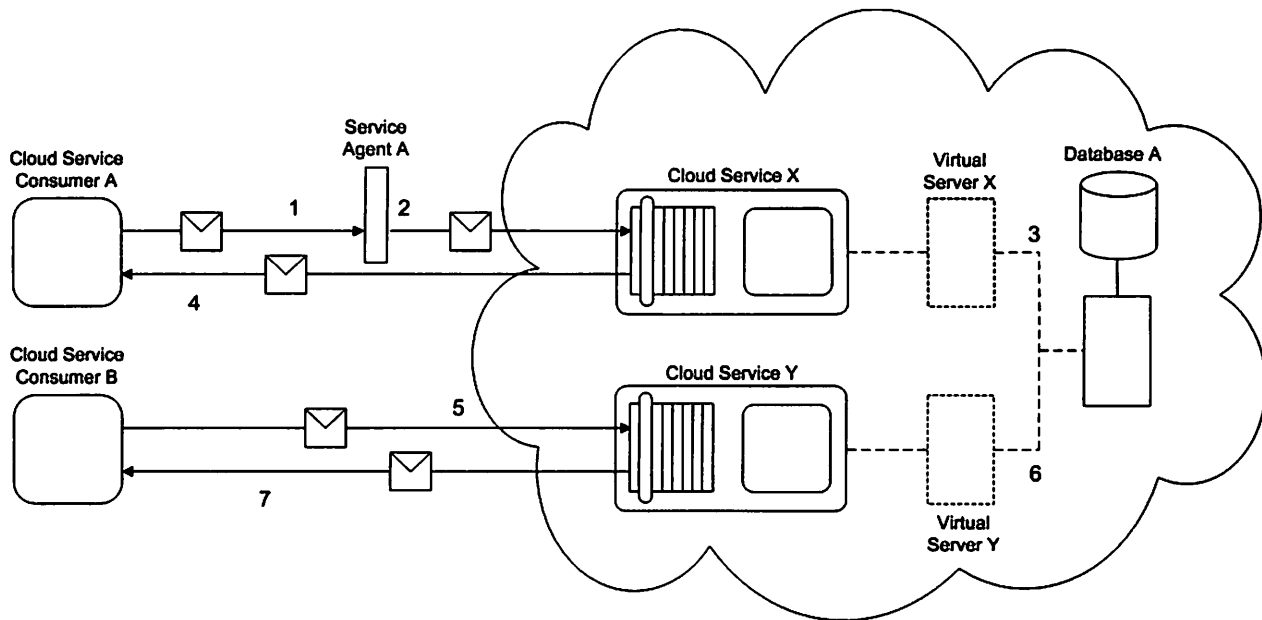
In response to the complaints from Company A, Company B is considering using a cloud-based hosting platform. Please describe which specific characteristics of a cloud will be helpful to address Company B's problems?

Essay 2

Questions use the simplified symbol notation below to limit the symbols to a subset of the overall legend.



Question 1: Cloud Security Mechanisms



Cloud Service Consumer A sends a message to Cloud Service X (1), but it is first intercepted by Service Agent A (2) before actually being forwarded to Cloud Service X. Cloud Service X is hosted on Virtual Server X. Whenever an IT resource on Virtual Server X is accessed, the physical server that hosts Virtual Server X writes a log entry into Database A. After processing the request, Cloud Service X replies to Service Consumer A with a response message (4).

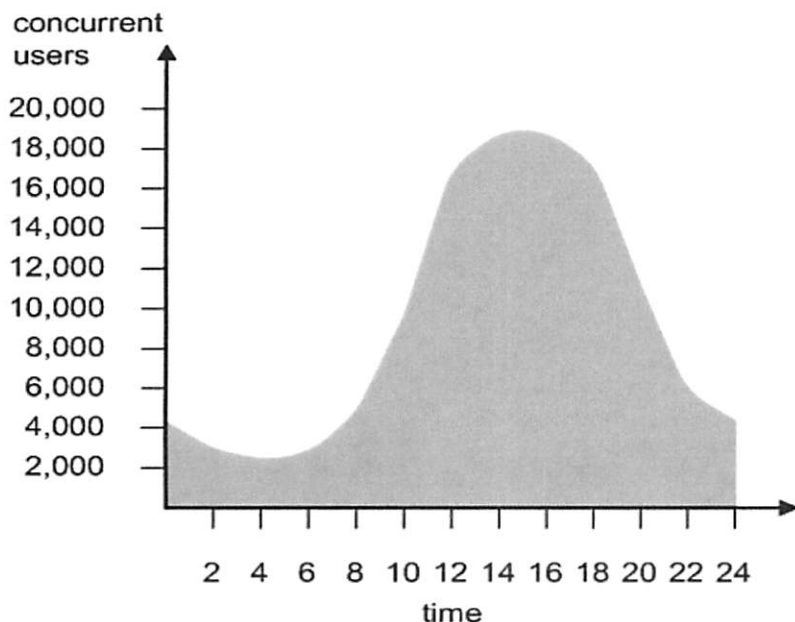
Cloud Service Consumer B sends a message to Cloud Service Y (5), which is hosted by Virtual Server Y. This virtual server is hosted by the same physical server as Virtual Server X and therefore when Cloud Service Y is accessed, a log entry is again written into Database A (6). After processing the request, Cloud Service X replies to Service Consumer A with a response message (7).

After being in use for several weeks, Cloud Service Consumer B unexpectedly shuts down. An investigation reveals that a response message sent by Cloud Service Y contained malicious data that successfully attacked and disabled Cloud Service Consumer B and its underlying implementation.

Write a statement that describes a legitimate source of the malicious data.

Sample Question for Statistical/Technical Report

You are the IT manager of a start-up company. Your team has recently built a new Web service that requires a hosting environment comprised of multiple servers. Based on predicted usage estimates, your team produces the following chart illustrating the anticipated number of concurrent users over a typical 24-hour period.



You ask your team to perform an up-front and on-going cost comparison with the following assumptions:

- the purchase cost of one physical server is \$14,000
- the leasing cost of one virtual server from a cloud provider is \$2,000 per month
- the on-premise physical server and the leased virtual server can each support 8,000 concurrent users
- to support the maximum number of predicted concurrent users, three servers will be required

Based on these assumptions and based on approximate usage values from the preceding graph, the estimated concurrent usage over an average 24 hour period results in the following values for the number of virtual servers required:

- 10 hours with 1 virtual server
- 4 hours with 2 virtual servers
- 10 hours with 3 virtual servers

Based on these statistics and assumptions, your team produces the cost following comparison table:

	cloud computing solution	on-premise solution
up-front costs (one-time)	\$1,200	\$62,400
hardware purchase	\$0	\$42,000
software purchase	\$0	\$15,000
labor costs	\$1,200	\$4,400
ongoing costs (monthly)	\$8,900	\$7,200
hardware usage	\$6,000	\$0
bandwidth usage	\$1,200	\$0
hosting costs	\$0	\$1,800
insurance costs	\$0	\$600
licensing costs	\$700	\$1,800
labor costs	\$1,000	\$3,000

Upon reviewing the compared costs, you realize that your team did not consider the possibility of scaling the virtual servers to accommodate the daily fluctuation in concurrent users.

You therefore decide to adjust the *cloud computing solution* column of the comparison table by taking the following additional factors into account:

- the quantity of virtual servers required during different periods of an average day
- an increase of \$1,200 in labor costs to configure the scaling parameters

Complete the following table by adding the adjusted amounts based on the aforementioned considerations. (Note that, for the purpose of this exercise, the on-going licensing and labor costs remain unchanged.) Write a description of your conclusions and recommendations based on the table findings.

	cloud computing solution	on-premise solution
up-front costs (one-time)		\$62,400
hardware purchase		\$42,000
software purchase		\$15,000
labor costs		\$4,400
ongoing costs (monthly)		\$7,200
hardware usage		\$0
bandwidth usage		\$0
hosting costs		\$1,800
insurance costs		\$600
licensing costs		\$1,800
labor costs		\$3,000