

Cambridge Judge Business School

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Cambridge Centre for Risk Studies 2017 Risk Summit

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# THE CLOUD: ARCHITECTURE & LOSS POTENTIAL

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Centre for  
**Risk Studies**



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# Overview



The Risks of Cloud Computing



What is Cloud Computing?



Cloud Architecture

+ Strengths

- Vulnerabilities

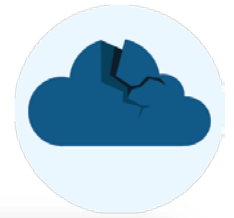


Modelling Potential Risks Case Study



Take Home Messages

# The Risks of Cloud Computing



## How protected is your business from catastrophic failures in the cloud?

BY DAAN PEPLUN

Business.com / Storage / Last Modified: June 9, 2017

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The cloud is increasingly a part of business, and any failure in distributed infrastructures could result in a potentially costly downtime.

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Cloud computing is a reality that most businesses today are facing. While there are still holdouts — especially businesses that have security and data sovereignty issues — the cloud will be prevalent to practically all businesses in the mid-term. In fact, if the early nineties and aughties were all about having an online presence as the minimum requirement for brands, then the next five years are all about businesses completing

their cloud migration.

## Can we trust cloud providers to keep our data safe?

By Matthew Wall  
Technology of Business editor

29 April 2016 | Business

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## Former NSA tech chief: I don't trust the cloud

RSA Conference hears warnings about trusting cloud services

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By Tim Greene  
Executive Editor, Network World | MAR 4, 2010 12:00 AM PT

## RACONTEUR CLOUD FOR BUSINESS

### ING INNOVATION SHADOWS

Can shadow IT bring us outside the cloud?

### 06 CATASTROPHIC STARTUPS INTO THE RAIN: Amazon

The cloud is a small business's best friend, with the pros and cons continuing to expand

### 06 WATCH OUT FOR THAT CLOUD FOR CLOUD: Amazon

Nothing ever ends in the cloud, you just should be sure you, too, don't go too far

### 06 WE BIRDS NEED A FRIEND FOR OURS & OURS FOR YOU

Cloud computing may need to team up with a local partner to crack the Chinese market

## Companies say for techies

much to offer businesses of accelerating with companies a variety of providers

These corporations often have large IT departments with plenty of in-house expertise to handle the deployment of cloud services. However, smaller businesses, on the other hand, may need advice to help them find the right cloud provider and ensure they receive support in the event of service outages.

Some experts argue that businesses go to the cloud primarily because of their strong reputation for helping companies migrate seamlessly to the cloud. However, van Alstede, vice president for North America at IT services provider Compugen, says, "One of the benefits many businesses opt for a single-cloud provider is the ease that they represent a 'safe port of harbor'."

"However, many cloud customers still focus on trying to identify and implement the cloud service that meets their needs. Many cloud providers have become the industry choice because of the perception of the greater ease of migration to a single provider."

However, smaller players are seeking an opportunity to offer a unique service for companies without strong in-house expertise. And that's where managed cloud or IaaS and SaaS come into play. The biggest players in managed cloud are all upping the stakes in changing rapidly and the biggest players in SaaS are all upping the stakes in changing rapidly.

"The other players have given up fighting the race for the top," he says. "The race is now a contest of attrition, with the large-as-a-providers step into provide the right kind of support for companies."

But he cautions that companies have had a difficult experience with the managed cloud and smaller companies offering to host services in the cloud and managing the services offered by the biggest players. One of the biggest players in managed cloud is Amazon, which has the most cloud providers that address a wide variety of services. A big trend has been for organizations to use a variety of cloud providers. This opens the way for operators who help businesses manage the multi-cloud system. Damon Harkins, managing director of cloud management service SaaS company, says, "A report from Gartner last week shows that 40% of IT leaders are planning on an average of eight different cloud services."

"That's the kind of complexity of what we see in the market," he says.



The most important thing is for businesses to define their goals for cloud computing before they make a decision about which services to use

Mr. David, there's a big competition to be won in the cloud. It's not just about the price, but about the quality of the service. It's not just about the price, but about the quality of the service. It's not just about the price, but about the quality of the service.

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THE BUSINESS TIMES  
CLOUD EXPO EUROPE  
ACROSS THE GLOBE  
NORTH AMERICA  
EUROPE  
ASIA  
AFRICA  
MIDDLE EAST

DAVID BENSLEY  
Specialist author on software engineering and operations management. He is a regular contributor to the Business Times and other leading business publications.

PETER CHEN  
Senior analyst and author of the book 'The Cloud Effect: How the Cloud is Changing the Way We Work'.

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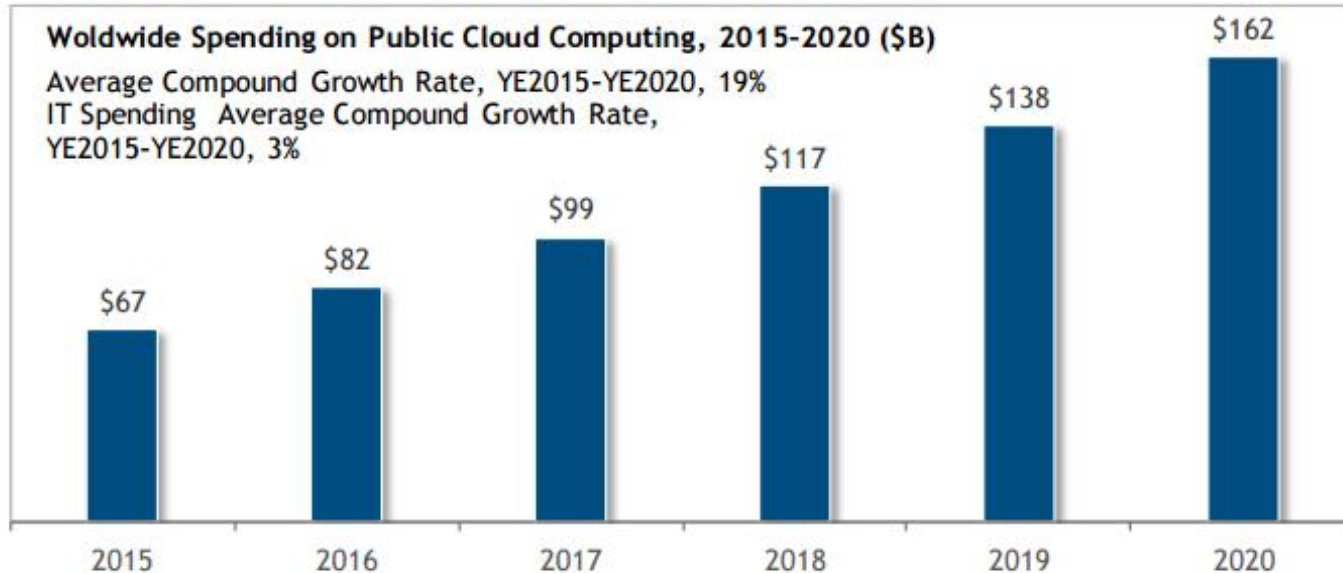
DAVID HARRISON  
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# The Risks of Cloud Computing



## The Rapid Growth of Cloud Computing, 2015-2020



Source: IDC, 2016

# The Risks of Cloud Computing




- Availability rating:
  - Amazon Elastic Cloud Compute: 99.9974%
    - Total down time: 2.41 hours
  - Google Compute Engine: 99.9815%
    - Total down time: 4.46 hours.
- What does 'down time' mean for cloud clients?
  - Loss estimates for **1 Day** based on Annual Revenue from advertising:

 \$100 Million

 \$82 Million

 \$28 Million

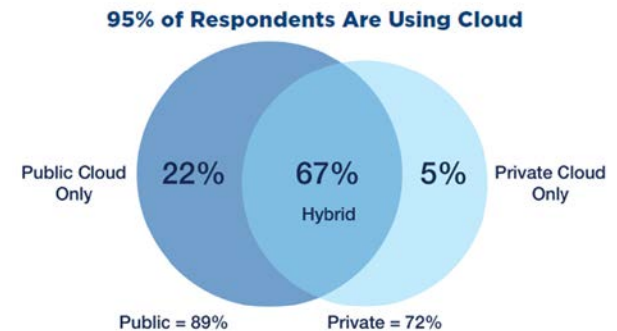
 \$12 Million

 \$12 Million

# The Risks of Cloud Computing



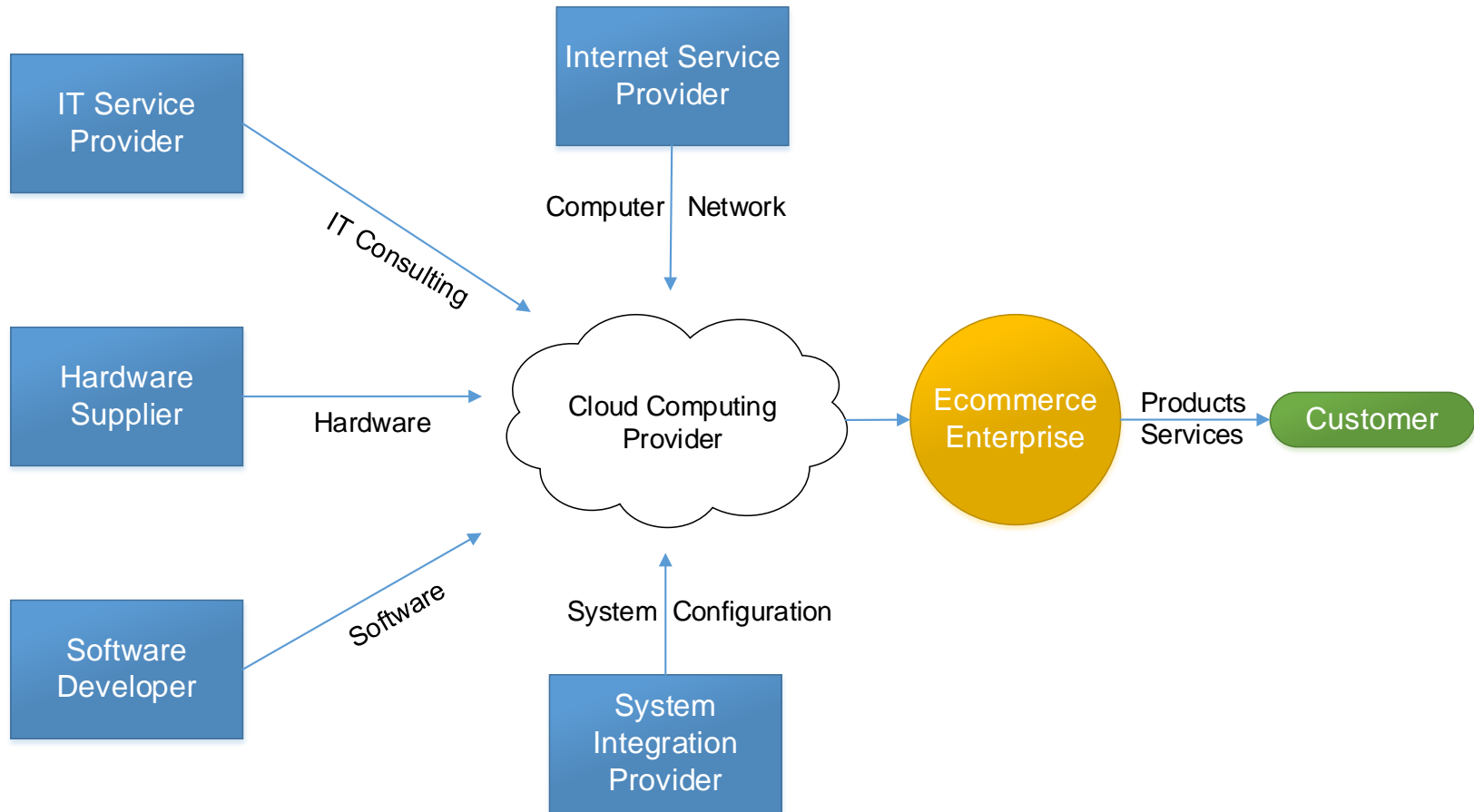
- Causes of Cloud Outages
  - **Cybercrime**
    - Fastest growing cause of cloud outages.
      - 22% of outages in 2015.
  - **Faulty Software**
    - Poor optimization = Down time
      - Lengthy reboots, defective load balancers, etc.
  - **Failing Hardware**
    - ‘The Cloud’ is a physical place
      - Age of infrastructure



Source: RightScale 2017 State of the Cloud Report

***Increasing dependence on ‘The Cloud’ makes it essential to understand the risks associated with cloud computing***

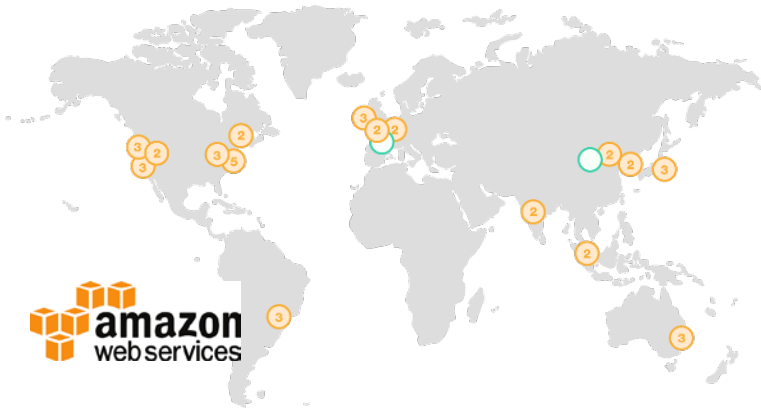
# What is Cloud Computing?



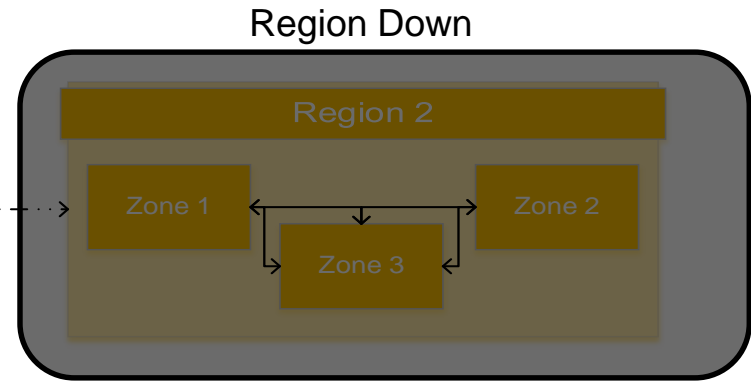
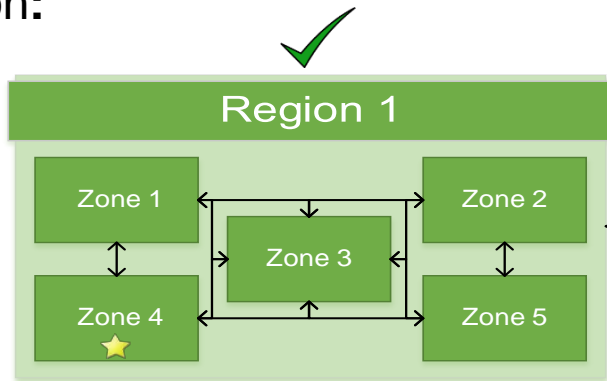
# Cloud Architecture: Strengths



Redundancy:



Isolation:



↔ Low Latency Links  
 ← · · · · · → Communication over public internet.

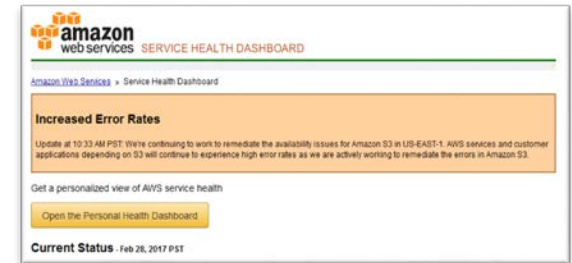
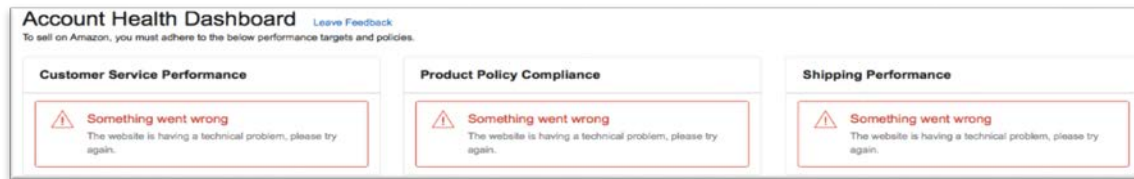


# Cloud Architecture: Weaknesses

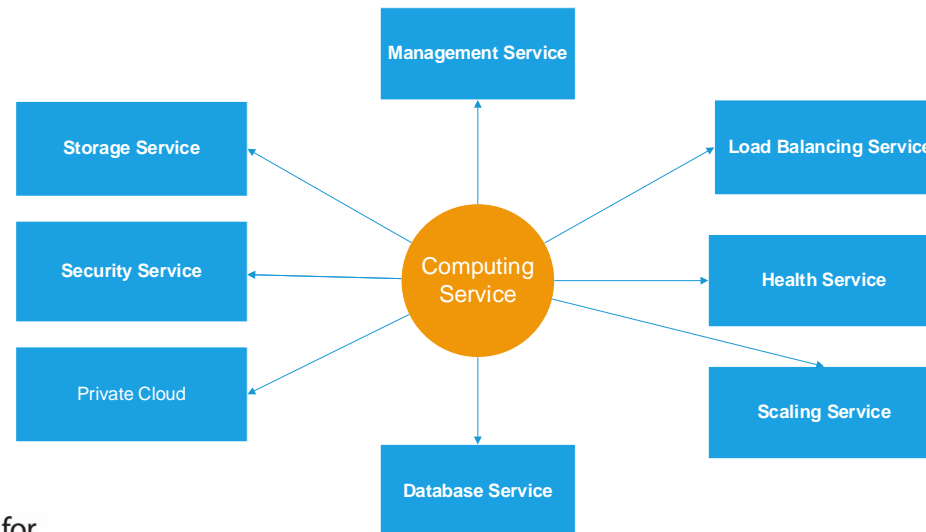


## Single Endpoints:

- If there is only a single endpoint for a service, regardless of where the service is available, the service will be lost if the endpoint is lost.



## Interdependent Services:



# Modelling Potential Cloud Risk



## Company Information Needed:

- Name: **CRS Travel Booker**
  - *Revenue, employees, etc.*
  
- Cloud Provider
  - *Services & regions*
  
- Industry
  - *Services*
  
- Locations: Headquarters, Offices, Clients
  - *Regions*
  
- Cloud initiation
  - *Regions*

## CRS Travel Booker



# Modelling Potential Cloud Risk



## Company Cloud Risk Profile:

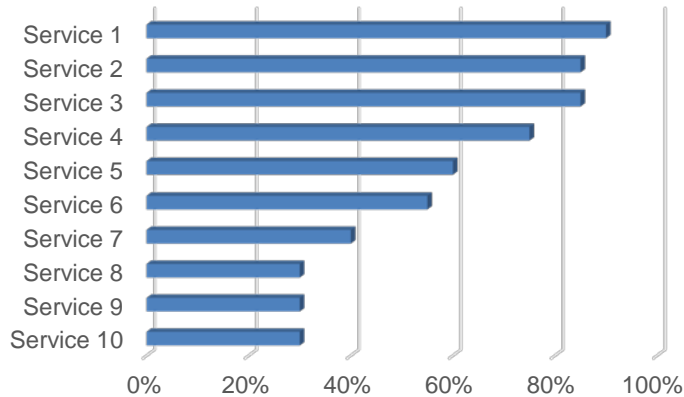


CRS Travel Booker

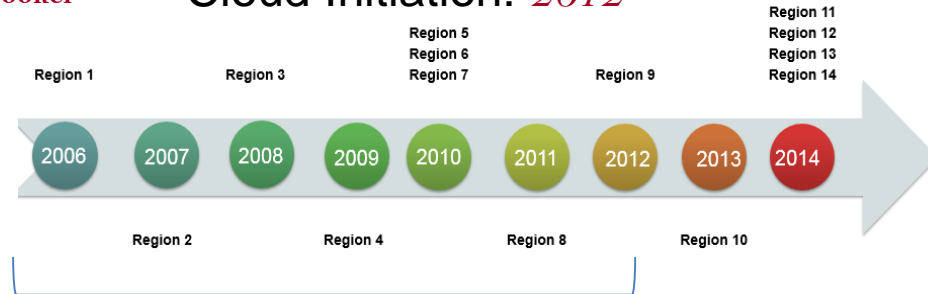
- Name: *CRS Travel Booker*  
 – Total Revenue: \$260,7000,000 USD

- Cloud Provider: *Cloud Provider 1*  
 – 14 Regions, 100 Services

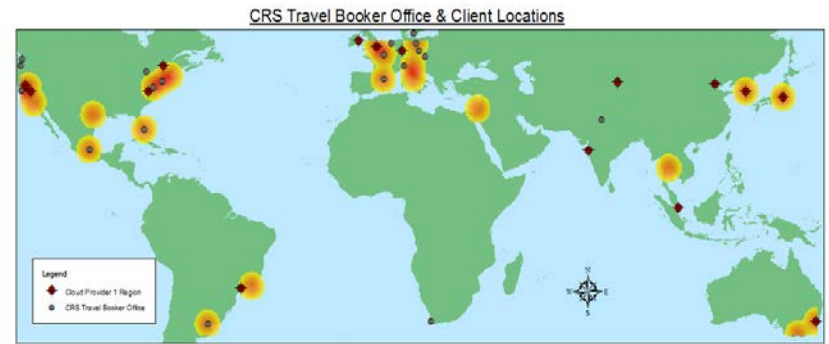
- Industry: *IT-Software*



- Cloud Initiation: *2012*



- Office & Client Locations:



This is a Kernel Density Map depicting the global office & client locations for CRS Travel Booker. The density of client locations is depicted by the shaded areas, with darker hues relating to higher densities.

– *Regions 1, 2, 3, & 4*

# Modelling a Cloud Outage

## Scenario

- 'Cloud Provider 1' experiences down time in its 3 oldest regions: **Region 1, Region 2, & Region 3** due to a slow re-boot of system. The Regions are down for 6 – 12 hours.

## Impact on CRS Travel Booker

- 3 out of 4 of CRS Travel Booker's regions are offline
- Losses: Total revenue from 3 down regions
  - CRS' 4<sup>th</sup> Region is still up and running, but CRS Travel Booker's Cloud Design focused on isolation and forgot about redundancy.

## Potential Loss Estimates for CRS Travel Booker

Region 1 is responsible for 29% of total revenue: \$8,600

Region 2 is responsible for 24% of total revenue: \$7,000

Region 3 is Responsible for 26% of total revenue: \$8,000

– % revenue is based on customers served in that region

| Region   | 1 Hour   | 6 Hours   | 12 Hours  |
|----------|----------|-----------|-----------|
| Region 1 | \$8,600  | \$52,000  | \$103,000 |
| Region 2 | \$7,000  | \$43,000  | \$85,600  |
| Region 3 | \$8,000  | \$47,000  | \$94,000  |
| Total    | \$25,000 | \$142,000 | \$282,600 |

# Take Home Messages



- The services and cost effectiveness provided by Cloud Providers has caused tremendous growth in Cloud Industries in the past decade.
- With increases in dependency on the Cloud comes increases in Risk
- The best Cloud strategies focus on isolation and redundancy.
- We can use what we know about dependency, loss potential, and cloud architecture to model potential risks.

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