

# Course Introduction

SWEN-343



# Welcome



Software Engineering  
Rochester Institute  
of Technology

# Goals for the Course

Prepare you for real world

- Be ready to work with diverse systems

- Diverse teams

- Work with teams (intra team)

Create & Maintain Enterprise apps



How is this course different!?



# What I Expect

Open & Honest discussions

How do you learn best

Speak up

We can cover things not on syllabus



# Course Resources

## Mycourses

Homeworks

Project Deliverables

Put things in the right dropbox => “Assignments”

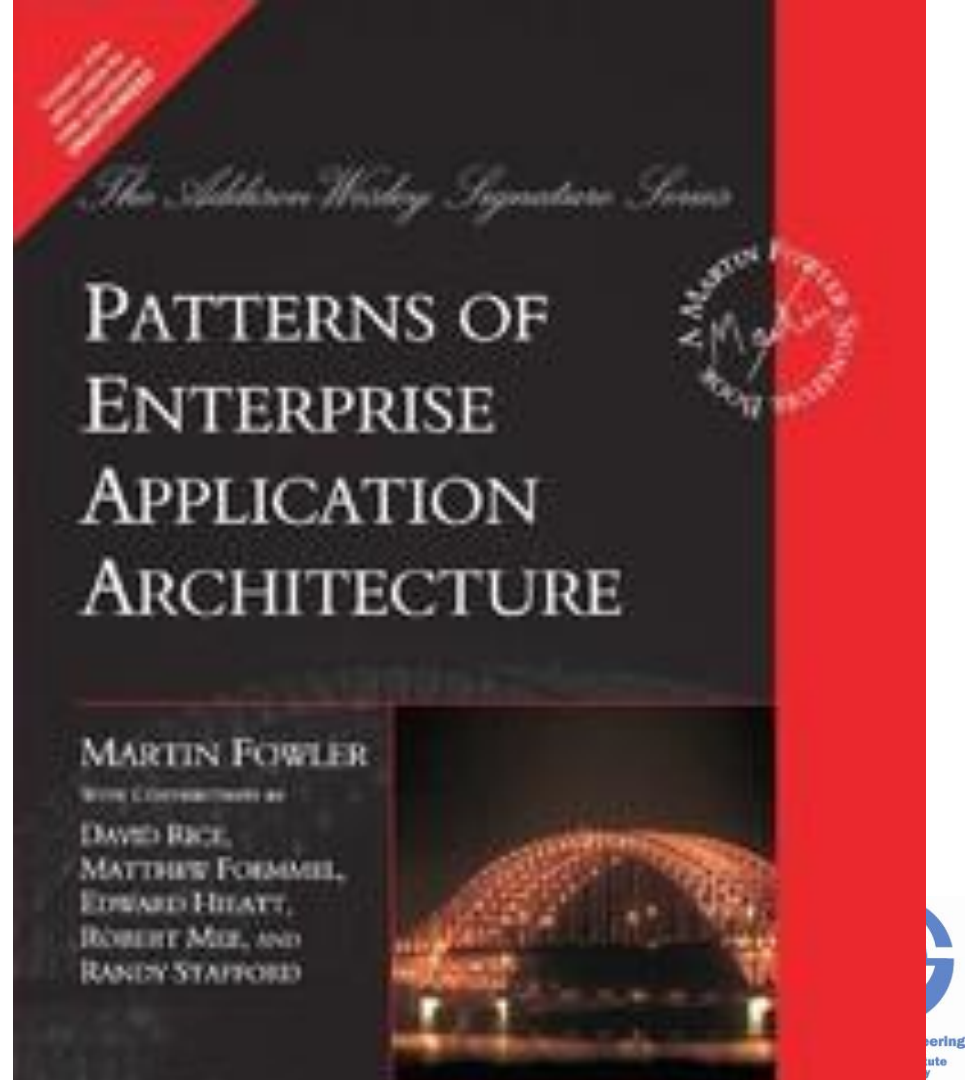
“Surprise” quizzes

(Tech Blitz and/or team “Research”)



# Textbook

Fowler's PEAA  
BUY IT!



# Grading

Grading outline is on course website  
Reserve right to tweak at any time





# Office Hours

Where do I find them?

When should you reach out?



# Course Website (one-stop-shop)

<http://www.se.rit.edu/~swen-343/>



# Project Teams

~6 teams

Formed over the weekend

A survey will be made available – follow  
mycourses link



# Enterprise Systems

SWEN-343



# Lecture Objectives

- Understand what characterizes a system as an “enterprise system”
  - Provide an **architectural** perspective of an enterprise system
    - Begin to look at typical architectural patterns that address the needs of an enterprise information system
    - Begin to plant **design structure** concepts and approaches into our thinking
- ❖ We will revisit and evolve this over the term

**PAYCHEX**<sup>®</sup>



NaviNet

EXTRA<sup>+</sup>TRADE



?



experian<sup>®</sup>



NYSE Euronext<sup>SM</sup>

# What does it mean to be “Enterprise”?

“Enterprise software is an overarching term for any software used in large organizations (whether business or government). It is considered to be an essential part of a computer-based information system, and it provides business-oriented tools such as online payment processing and automated billing systems.”

- Just **one** definition



Not just a large application with lots of data  
and code

Can be a small app - 1 class

Not typical





# What does it mean to be Enterprise?

→ Not GUI over DB (GoD)

Complex **data**, and lots of it

Complex **functionality**, and lots of it

**Business rules** and logic that fail all test of logical reasoning

Perceptual integration of **legacy** and evolution to “next” generation

**Applications** are important to the business: **mission critical (ilities)** Lots of quality requirements: scalability, security, availability, performance, integratability, etc.



# What does it mean to be Enterprise?

## Examples

Company human resources, investment and cost analysis, credit scoring, insurance processing, supply chain management, customer sales and service, health information systems, cost accounting and reporting, business data analysis, etc.

## Non-examples

automobile engine control, word processors, elevator controllers, chemical plant controllers, telephone switches, operating systems, compilers, *games*, etc.



# Characteristics of Enterprise Apps

Hundreds of inter-related classes and data tables with complex flow logic

Persistent data

Shared between separate applications/modules, often in different companies

Across program runs

Often persistent for years

Highly structured ← → Unstructured

Concurrent, distributed access by multiple types of users

Lots of user interaction screens for each type of user

Lots of data in disparate data sources

Gigabytes is a modest system

Terabytes/[Petabytes](#) is common



Enterprise != Just for business  
Enterprise != Large application  
Enterprise != “Boring” application

Enterprise = Needs of organization vs. person  
Enterprise = Aspect of information system



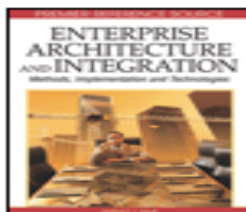
# Design Challenges

“*technogeeks*”,

Too often, as *technologists*, we get enamored with the technology (.NET, Java Enterprise Edition, AJAX, Ruby on Rails, Node, Web Services, etc.) and we think that is what makes our applications complex ***/cool/top-notch/best-in breed***

We over-engineer and under-engineer our systems  
ERP software is no different, but often magnified  
-> No silver bullet, but one of the goals of the course is to address this.





## Enterprise Architecture and Integration: Methods, Implementation and Technologies

by Wing Lam and Venky Shankararaman (eds)

IGI Publishing © 2007 (304 pages)

ISBN:9781591408871

Providing case studies that illustrate best practices, this book takes a holistic view of enterprise integration and describes innovative methods, tools, and architectures with which organizations can systematically achieve enterprise integration.



add to folders



purchase hardcopy

### Table of Contents

#### Enterprise Architecture and Integration—Methods, Implementation, and Technologies

##### + Preface

#### **Section I - Business Requirements and Organizational Modeling**

##### + Chapter I - Dissolving Organisational and Technological Silos—An Overview of Enterprise Integration Concepts

##### + Chapter II - Success Factors and Performance Indicators for Enterprise Application Integration

##### + Chapter III - ...and the Social Matters

##### + Chapter IV - Precontract Challenges—Two Large System Acquisition Experiences

#### **Section II - Business Process Management**

##### + Chapter V - Process Integration Through Hierarchical Decomposition

##### + Chapter VI - Using a Standards-Based Integration Platform for Improving B2B Transactions

##### + Chapter VII - The Changing Nature of Business Process Modeling—Implications for Enterprise Systems Integration



# Other Typical Challenges

Long lasting

Cannot just re-write everything

Must live with bad decisions

How can you predict where you will be in 5 years?

Death march style projects

Diverse technology

Lots of moving parts

How do these challenges affect

Your design?

Development?

Other areas?....



# What we will cover in this class

ERP Architecture

Organization issues

Maintenance

Procurement

Enterprise & the cloud

Devops

Legacy Integration





# Quiz - Enterprise or Non-Enterprise?

Sublime (text editor)

Your 261 Django/Spark application

Sales management system

Slack

iPhone messaging app



# Quiz - Enterprise or Non-Enterprise

Sublime (text editor)

Your 261 Django/Spark application

Sales management system - **Yes**

Slack - **Yes**

iPhone messaging app - **Could be PART of  
one**

# Five exabytes of disk storage ship in 2010

Revenues up across the board for all major storage vendors, IDC says

By Lucas Mearian

March 4, 2011 12:45 PM ET

 Comments (0)  Recommended (3)

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Computerworld - Last year, hard disk drive manufacturers shipped 5,127 petabytes of storage capacity, a 55.7% increase over 2009, according to a report released Friday by market research firm IDC. A [petabyte equals](#) 1 million gigabytes, and 1 exabyte equals 1,000 petabytes.

In the fourth quarter of 2010 alone, worldwide external disk [storage](#) systems revenues saw year-over-year growth of 16.2%, or just under \$6.1 billion, according to IDC's [Worldwide Quarterly Disk Storage Systems Tracker](#).

In the fourth quarter of 2010, the total disk storage systems market grew about \$8.3 billion in revenue, representing 14.3% growth year over year.

# 2019

## AN SSD REVOLUTION “RULER” FORM FACTOR



Intel® Optane™ SSDs and Intel® 3D NAND SSDs in the “ruler” form factor will come to market in the near future.

Memory and Storage / SSD - Intel® Solid State Drives / Intel® Solid State Drives for Data Centers / Intel® SSD DC P4500 Series

# INTEL® SSD DC P4500 SERIES

(8.0TB, Ruler PCIe\* 3.1 x4, 3D1, TLC)

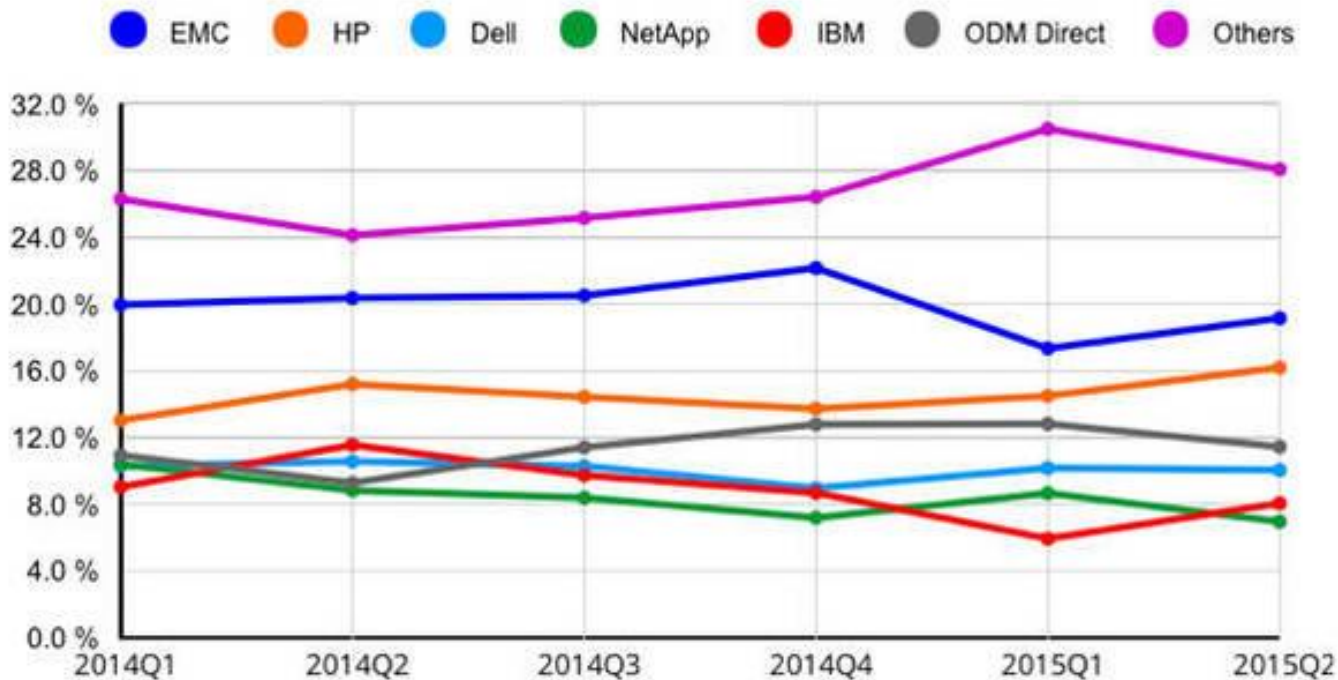


Add to Compare

From \$1,799.99



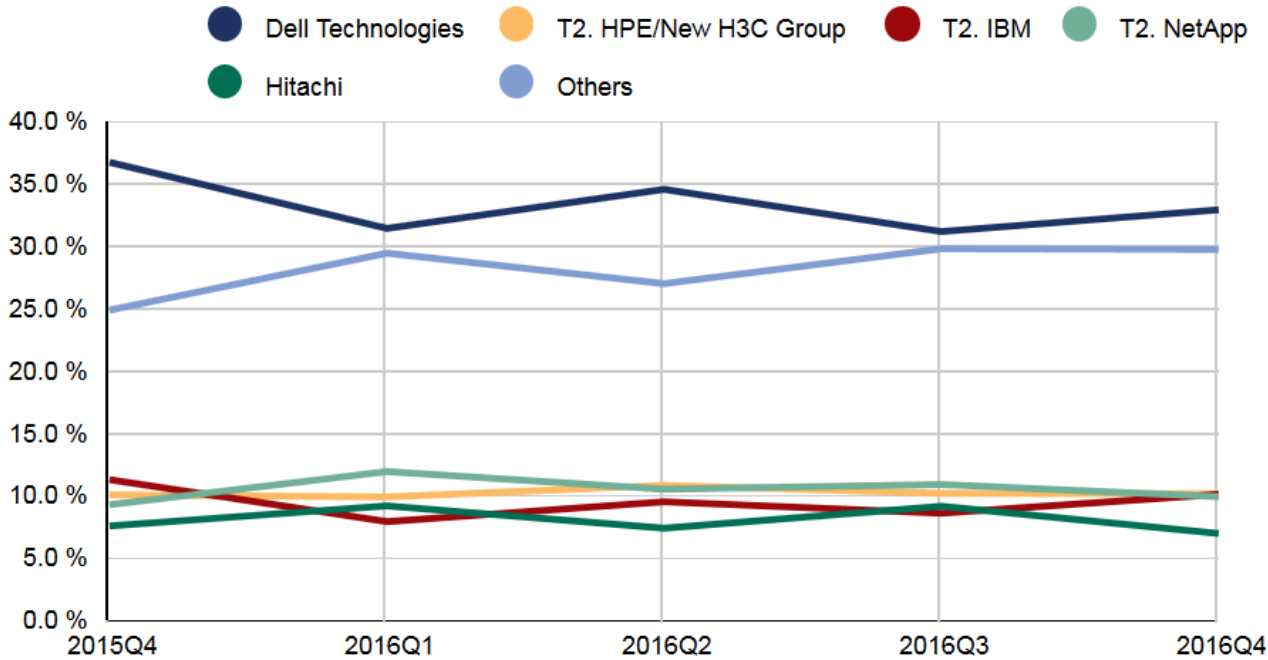
## Worldwide Total Disk Storage Systems Market, Top 5 Vendors Q1 2014 - Q2 2015 (shares based on Revenue)



Source : IDC Worldwide Quarterly Disk Storage Systems Tracker Q2 2015 (September 2015)

# IDC: Worldwide Enterprise Storage Market Sees Decline in 4Q

**Worldwide Total External Enterprise Storage Systems Market, Top 5 Vendors Q4 2015 - Q4 2016 (shares based on Revenue)**

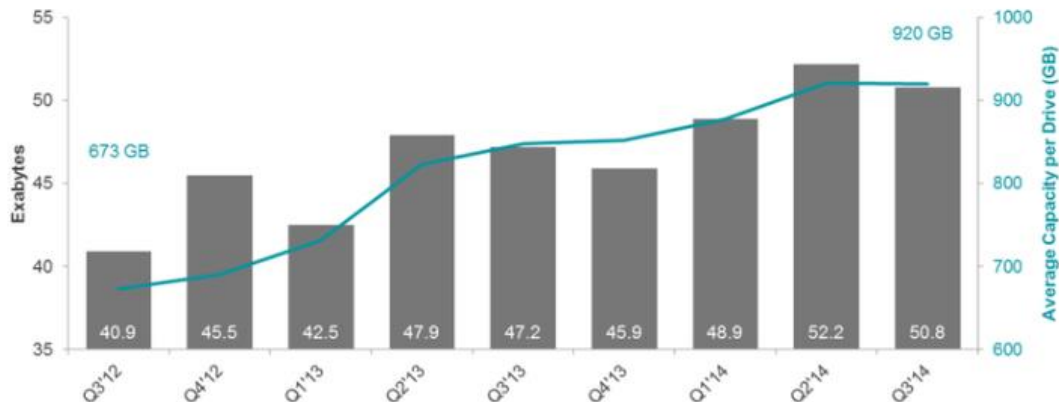


\*Dell Technologies represents the combined revenues for Dell and EMC  
\* HPE/New H3C Group represents the combined revenues for HPE and New H3C Group  
Source : IDC Worldwide Quarterly Enterprise Storage Systems Tracker Q4 2016

## Seagate Q3: 50.8 exabytes shipped | April 29, 2014 -- 20:41 GMT (13:41 PDT) |

Storage player Seagate saw average selling prices jump and that propelled earnings above expectations. Revenue was light in the fiscal third quarter.

### Exabytes Shipped and Average Capacity per Drive



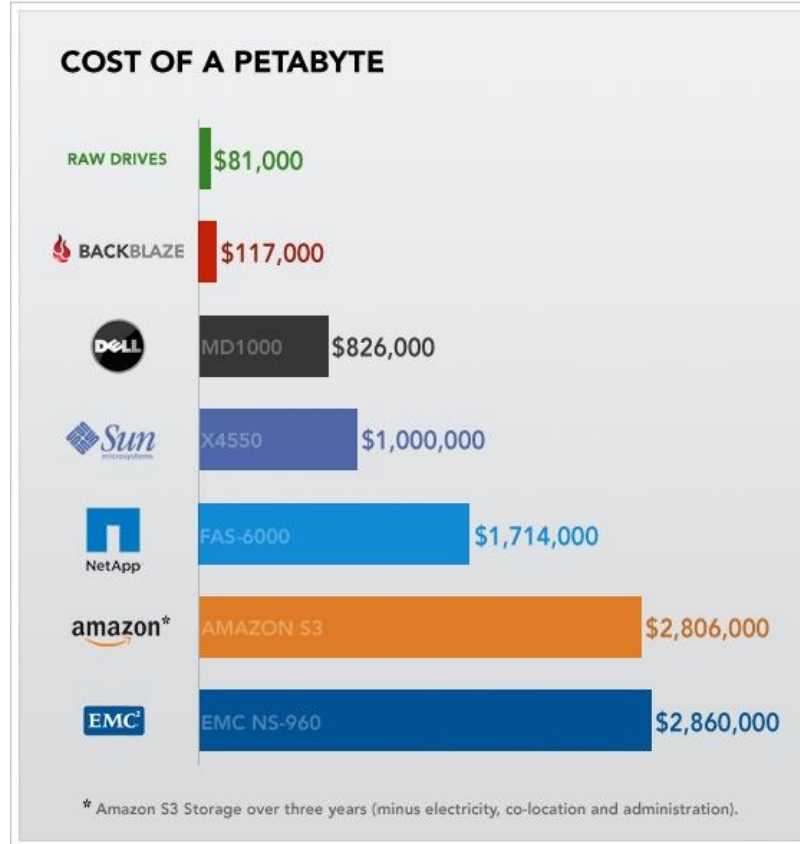
Overall, storage shipments were up 8 percent from a year ago to 50.8 exabytes.

Wall Street was expecting Seagate to report non-GAAP earnings of \$1.25 a share on revenue of \$3.42 billion.

**Apple Q4 2014  
hardware sales:  
iPhone strong, and  
strongest ever Mar**



# 2009



# 2016



## **Petarack™**

One Petabyte, Expandable to 5.4PB  
of Raw Data Storage, in a Single Rack

Storage Systems That Expand  
as Your Business Grows.

High Availability SAN \$299,000



# 2017

## PETARACK™

One Petabyte, Expandable to 7.2PB of Raw Data Storage, in a Single Rack

High Availability SAN \$299,000



# 2018

## PETARACK™

One Petabyte, Expandable to 8.6PB of Raw Data Storage, in a Single Rack

High Availability SAN \$299,000



### RESOURCES

#### Available Similar Technology



AberSAN ZXP4



AberSAN ZXP4 HA



[Product Related Video](#)



[Petarack Spec Sheet](#)

# 2019

## Petarack™

One Petabyte, Expandable to 8.6PB of Raw Data Storage, in a Single Rack

High Availability SAN \$299,000

vmware®  
READY



[Product Video](#)

[Spec Sheet](#)

# HP, Dell are winners in disk storage shipped in Q3

December 7, 2014

“IDC said the total worldwide disk storage systems factory revenue grew 5.1% year over year to nearly **\$8.8bn** during the third quarter of **2014**. Total disk storage systems capacity shipped was 25 exabytes. New capacity shipments grew 42% year over year during the quarter.” - [ITEuropa](#)

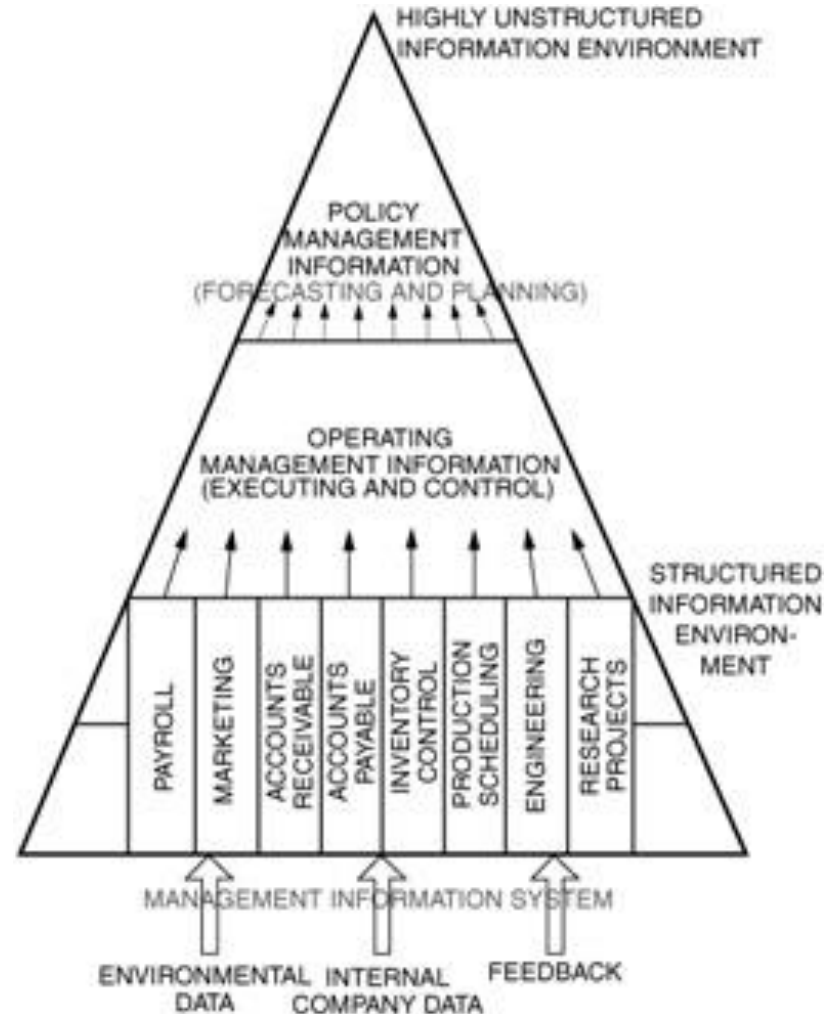
# Worldwide Enterprise Storage Market Sees Decline in Fourth Quarter

March, 2017

## *Flash-Based Storage Systems Highlights*

The total All Flash Array (AFA) market generated almost \$1.7 billion in revenue during the quarter, up 61.2% year over year. The Hybrid Flash Array (HFA) segment of the market continues to be a significant part of the overall market with \$2.5 billion in revenue and 38.4% market share.

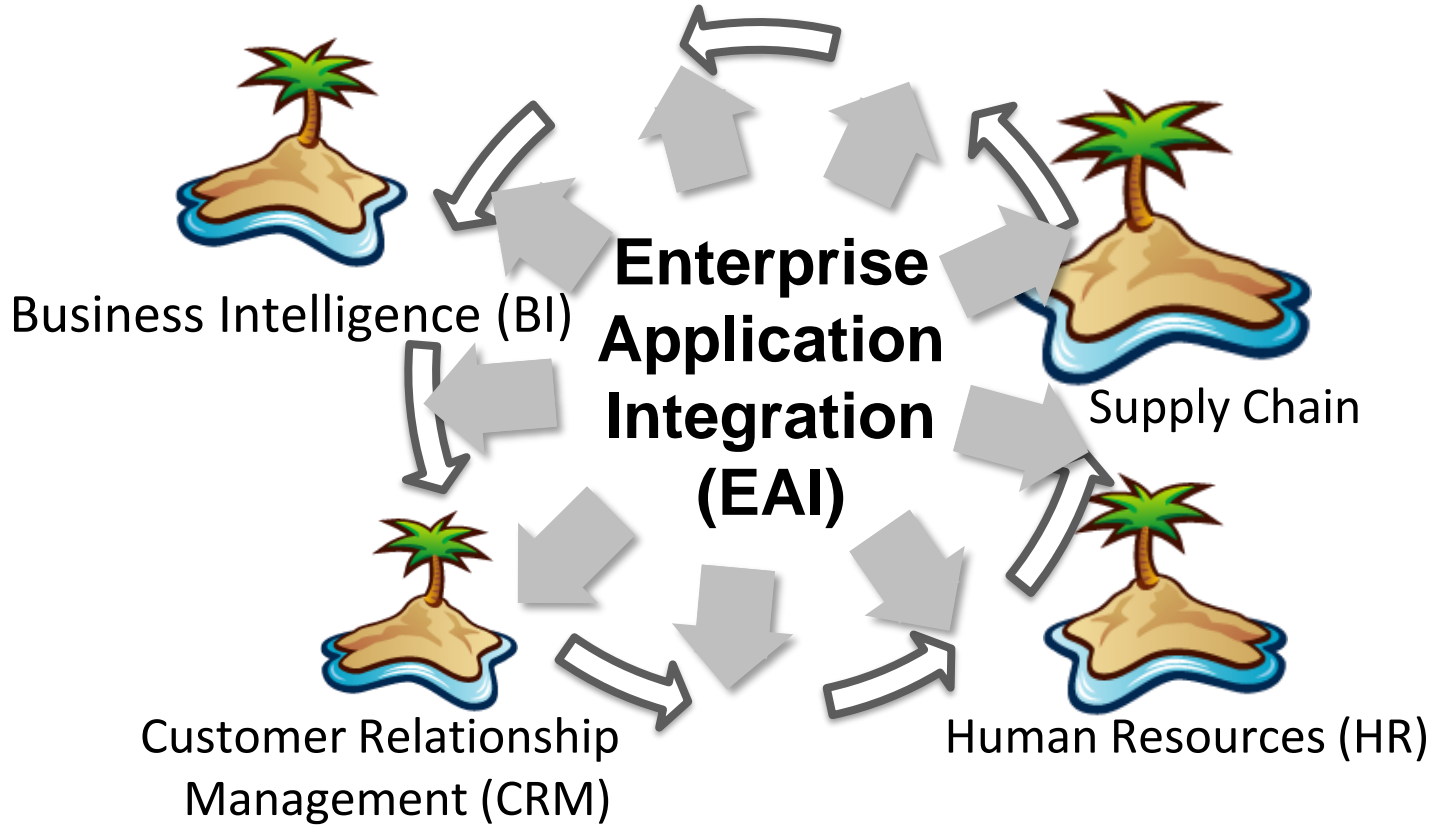
# Information Environment



[Chorafas, *Enterprise Architecture and New Generation Information Systems*]



# Islands of Automation or Application Silos



# Layering

A core concept of ERP

Be thinking about this as you design your project

How does it affect coupling & cohesion?

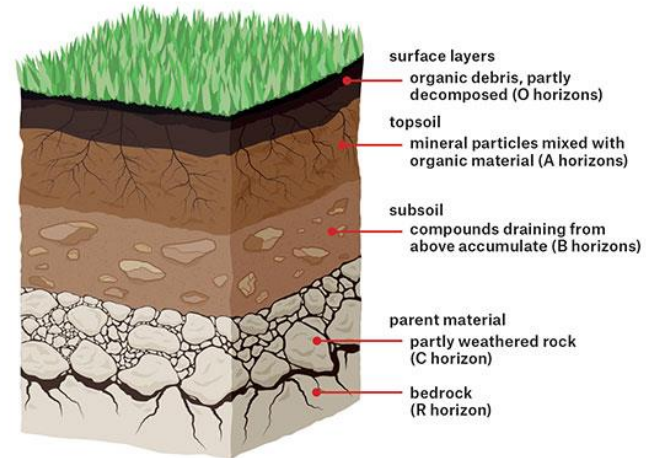


# What is Layering?

Break apart complicated software systems.

Layered almost like a cake/soil strata

Each layer rests on top of another layer



# Activity (post-individual assignment)

In self formed teams of 3-5, create a short jingle/rap/poem about “Enterprise Software”

Some points you may focus on include:

- What is it

- What is it not

- What are some examples

Use internet/books.

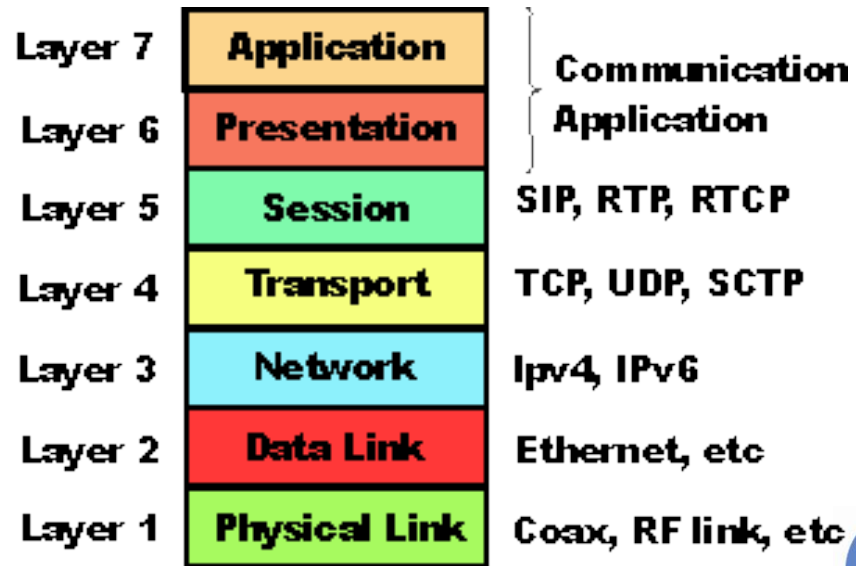
What separates “Enterprise” from just another large application?



# Layers

Where else have you seen this?

*Services provided by lower layers are used by those above.*



# Why layers?

Why are they important in Software Engineering?



# Principle Layers

Presentation

Domain/Business Logic

Data



# Layering Drawbacks

Cannot properly encapsulate everything.

Could harm performance/complexity.

Difficult to decide what layers to have, and what each should be responsible for.

