

# Sports Management Information Systems

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# Introduction

- We are in the information age
- The availability of technology has brought forth a new problem domain – how do we manage the nearly limitless amount of information?
- Solution: In the broadest term, information technology. More specifically, we look at the use of Information Systems

# Information Systems

- **What is an information system?**

A system that is designed to capture, transmit, store, retrieve, manipulate, and or display information used in one or more business processes.

- **Information Systems are central to Information Technology**

# History

Time Period	Conception of Information	Information System	Purpose
1950-1960	Bureaucratic Requirement	Electronic Accounting Machine	Speed Accounting & Paper Processing
1960-1970	General Purpose Support	MIS	Speed & General Reporting Requirements
1970-1980	Customized Management Support	DSS & ESS	Improve, Customize Decision Making
1985-2000	Strategic Resources Competitive Advantage Business Foundations	Strategic System	Promote Survival and Prosperity of Organization

- Now, IS covers a broad spectrum of application domains
- The scope and complexity of IS's today vary from small utility systems, to complex mission-critical enterprise level systems.

# Examples of Information Systems:

- Geographic Information Systems
- Library Information Systems
- Learning Information Systems
- Enterprise Information Systems
- Management Information Systems

# Information Systems in Society

- The most common use of Information System is for business management purposes – Management Information Systems (MIS)
- With the push for I.T. to be the backbone for businesses, MIS's have been extensively researched as a highly effective tool for management, audit & control of information within a business.

# Current Technologies

- The technology to use is highly dependant upon the architecture of the Information System
- Global cooperation requires a completely neutral and platform independent architecture
- The main technology leading this push is XML – an extensible markup language

# Basic Example:

```
<TeamInfo>
  <TeamID> 255 </TeamID>
  <TeamContact>
    <ContactName> Camilo Rostoker </ContactName>
    <ContactEmail> camilo@scottsdale.ca </ContactEmail>
  </TeamContact>
  <TeamWins> 9 </TeamWins>
  <TeamLosses> 3 </TeamLosses>
  <TeamRoster>
    <Player>
      <PlayerID> 2845 </PlayerID>
      <PlayerName> Jack Kanaska </PlayerName>
    </Player>
    <Player>
      <PlayerID> 3283 </PlayerID>
      <PlayerName> Billy Bob </PlayerName>
    </Player>
  </TeamRoster>
</TeamInfo>
```

# Information Systems for Sports Organizations

- In particular, this presentation will focus on the analysis and design of an Information System for sports organizations.
- A sports organization is like any other small business - it contains:
  - business processes, information management and control
  - provide a product to its customers

# Information Systems for Sports Organizations

- Therefore an IS for a sports organization can potentially:
  - improve information management, leading to more efficient business processes
  - reduced administrative workload
  - improved access to information for both management and members
  - Provide highest Quality of Service (QoS) to the members of the league

# Objectives & Goals

- Model organization structure and key administrative activities
- Be useful not only to management, but also to members of the organization
- Improve administrative efficiency
- Reduce administrative workload
- Improve communication between management and members
- Contribute to success of organization's continued growth and development
- Provide useful tools & services to both management and members of the league
- Increase member satisfaction
- Improve Quality of Service (QoS) to members of the organization

# Available Solutions

- **LeagueWorks Software**  
<http://www.leagueworks.com>
- **Analyzer Software**  
<http://www.analyzersoftware.com>
- **EventScores**  
<http://www.EventScores.com>
- **All American SportsWare**  
<http://www.allamericansportsware.com/>

# WebCoach – A Sports Management Information System

- An all-in-one solution to sports league management
- A prototype IS demonstrating parts of solutions to the specified requirements
- Been in continuous development for over 2 years

# History of WebCoach

- Original concept began when serving on RUFDC executive board
- Now, it's RUFDC's primary tool, and along with league website, are a major reason for the continued growth and development of the league
- A perfect environment for the analysis and design of such a system.

# Analysis & Design

- Analysis and Design from a Software Engineering perspective
- Software Engineering: “used to narrow the gap between the given problem and their solutions.”
- Little documented work on SE approaches to SMIS

# Requirements Analysis

- 3 main steps in requirements analysis:
  1. Requirements Elicitation – understanding the problem at hand
  2. Requirements Specification \*
  3. Requirements Validation and Verification

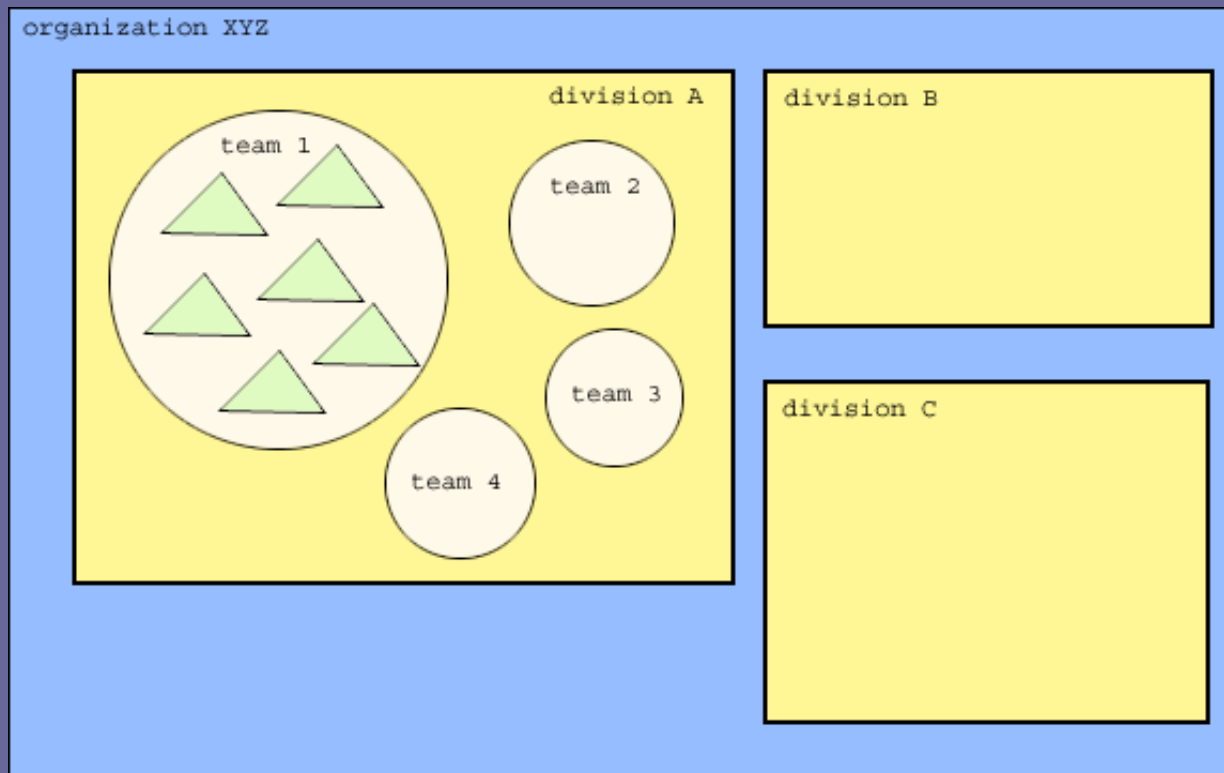
# Requirements Elicitation

Understanding the problem at hand:

- Issues in providing efficient administration due to lack of process, resources, people, money, etc.
- Issues in communication between administration and member base
- Result: inability to provide quality service to members of the league, waste of available resources, little organizational growth

# Requirements Specifications

- Obtaining Requirements Specifications:  
Decompose system into subsystems



# Subsystems Specifications

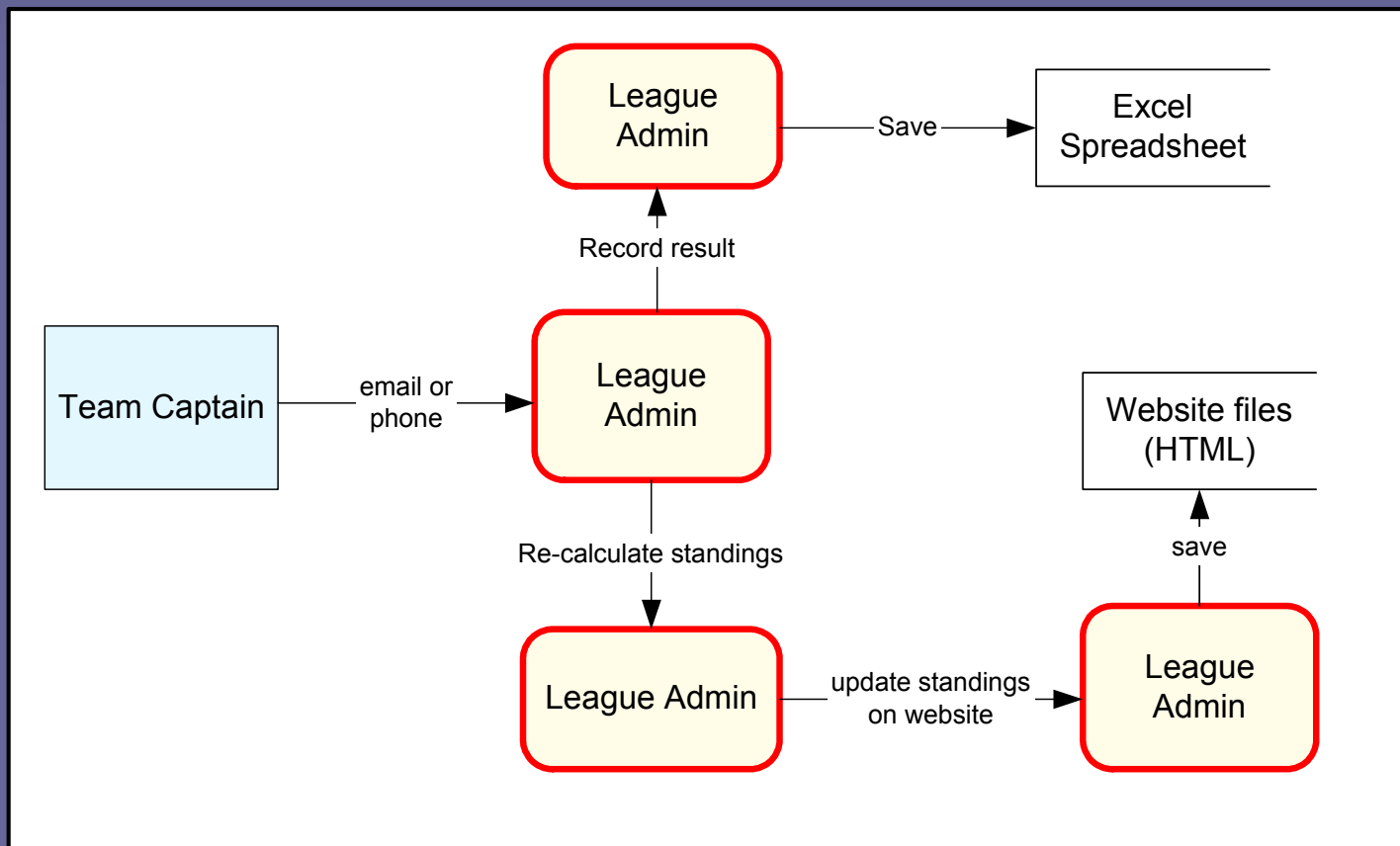
- Different requirements for:
  - Public & Guests
  - Team Administrators
  - League Administrators
  - System Administrators
- Generic Requirements

# Process Models

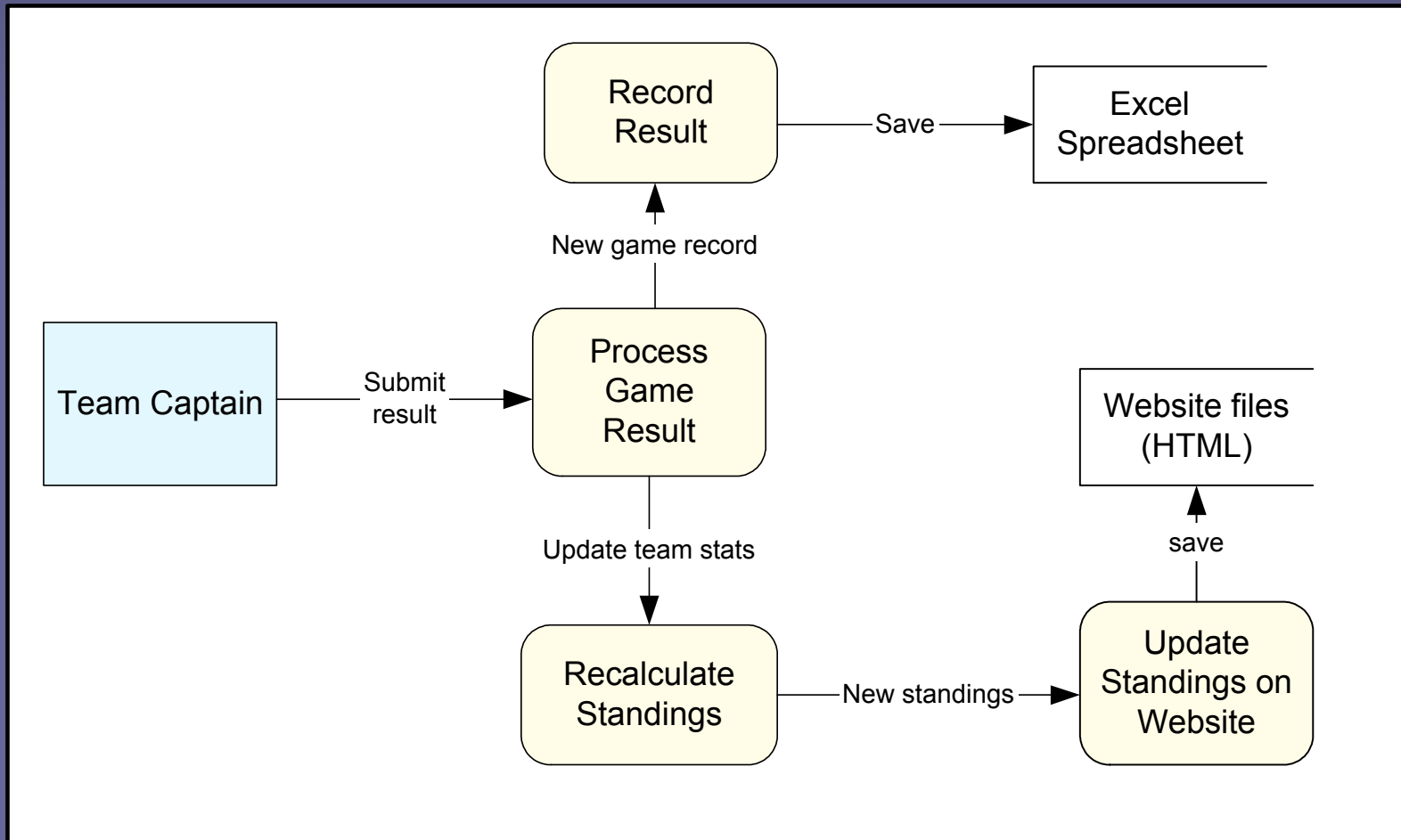
- In developing a system model, there are 3 steps required:
  1. Analyze current business processes and obtain the physical model of it
  2. Obtain logical model of current system from physical model
  3. Create improved logical model of target system

# Physical Model

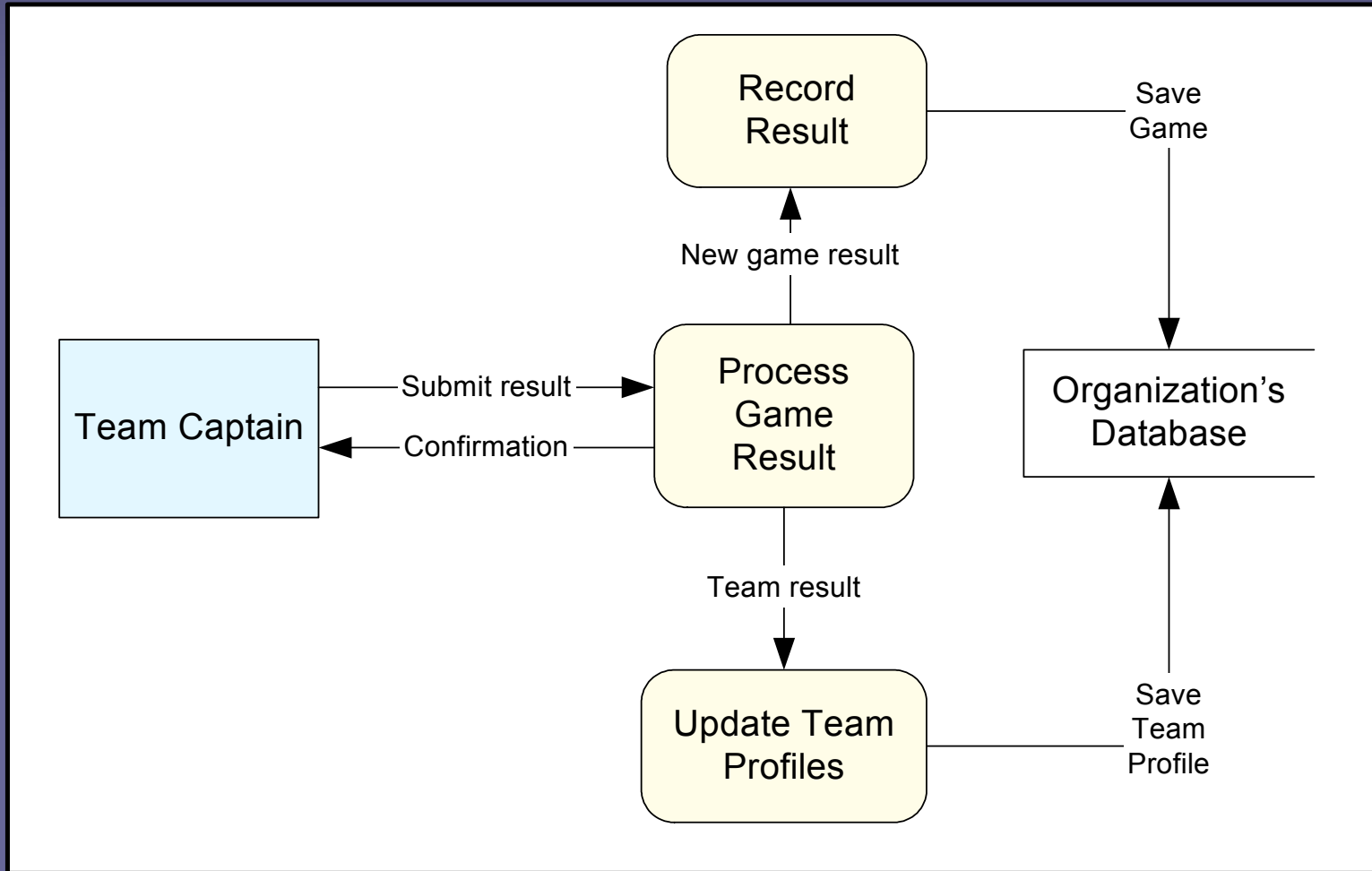
- Sample Process – Submitting & Recording Game Results



# Logical Model # 1



# Logical Model # 2



# Development Process Model

- Combination of incremental and prototype
  - Incremental: have released 3 working version of the system, each one containing new and improved functionality
  - Prototype: system is meant to demonstrate the usefulness and functionality

# Design Issues

## Architecture

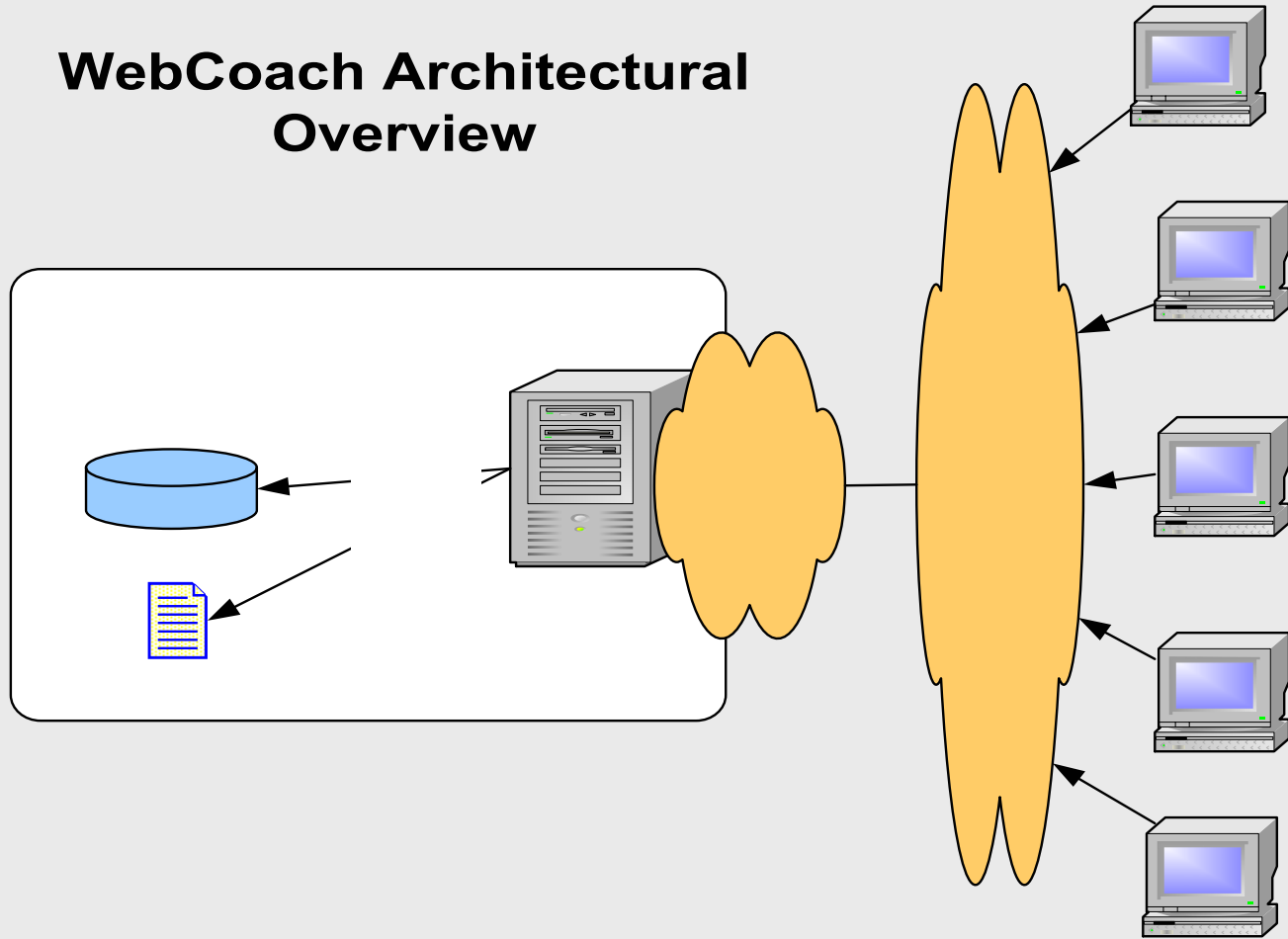
- Languages & Environment
- Data Store and Retrieval
- User Interface
- Concurrency
- Exception/Error Handling

## Other Considerations

- Flexibility
- Scalability
- Portability
- Testability
- Performance

# Architectural Overview Diagram

## WebCoach Architectural Overview



# Language & Environment

- Main development language: Perl
- Advantages:
  - Convenient for web-based systems and prototypes
  - Easy to learn and use for simple applications
  - Scripting language → does not need to be compiled
  - Portable → can be ported to other systems, including Windows
- Disadvantages:
  - Slow, must be processed by interpreter first
  - Lack of support for object-oriented analysis & design
  - Hard to debug, no visual IDE's
- Other development languages: JavaScript, D/HTML, CSS
- Environment: currently on a Linux Red Hat system, running Apache web server

# Data Storage & Retrieval

- Main data is stored on a Database
- Also use plain-text files for some less frequently accessed data
- Database:
  - MySQL
  - DBI, a Perl API for MySQL
- MySQL DBMS is a free product, is reliable, so a good choice for prototype implementations of Information Systems

# User Interface

- Displayed using dynamically generated HTML
- Graphically and visually enhanced using CSS, icons, color schemes, etc.
- Layout resembles typical webpage format for easy navigation (ie: menu on left)
- Language (ie: text, labels, buttons) is clear and informative, to help even the most technically challenged people
- Appearance can be partially customized by the league admin
  - Good for matching existing website or league theme
  - However, this causes some problems. Issues on level of customization that should be provided
- Enhanced for Internet Explorer, however still works with Netscape. Other browsers may not be compatible.

# Concurrency

- Very important due to the amount of potential concurrent accesses
- Perl interpreter – spawns new process to handle each new request
- MySQL DBMS - provides record locking support for concurrency control
- Files – all access to files use a file locking mechanism to signal shared or exclusive locks on files
- Concurrency is hard to test
- Not so crucial now, but will become more critical as number of users increase and additional functionality is added, such as online payments, etc.

# Exception/Error Handling

- Some checking done on client-side (ie: input validation) using JavaScript
- How to deal with:
  - System Errors
  - Other non-system errors
- Provide facilities for error and bug reporting

# Flexibility

- Since system is designed to be used by various sports organizations, it is important for the system to be flexible enough to suit particular league needs.
- For example, the league admin can customize their system using the “Preferences” page
  - Can customize such settings as:
    - appearance,
    - Main page content options
    - Game modes
    - Message footers
- Also, since the system is essentially displayed like a web-page, it can be integrated into existing sites, or run stand-alone in its own window

# Scalability

- Any system that expects an increase in use should be scalable.
- Should be able to handle a few users, or thousands of users.
- MySQL is designed for scalability and can easily handle thousands of records in a single table.
- Design of the database itself is also important.

# Portability

- Portability is a key design consideration, especially when prototyping
- Technologies used for WebCoach prototype allow for easy portability across platforms
- Presentation Logic (UI) is on client side, so don't need to worry about that
- DB access logic is standard SQL, so should port to various other DBMS's

# Testability

- Some modules of the systems can be tested manually, with immediate results
- Allows for convenient testing of functionality by created “mock” leagues and simulating inputs and possible user actions
- Currently have a few leagues using the system
- However some test can only be incurred with continuous use and extended time

# Performance

- Doesn't need to be lightning quick, but shouldn't run unnecessarily slow either, or users will become annoyed with the system
- Current system is fairly slow, due to:
  - Server hardware
  - Network connection
  - Perl interpreter
  - Efficiency of algorithms

# Security

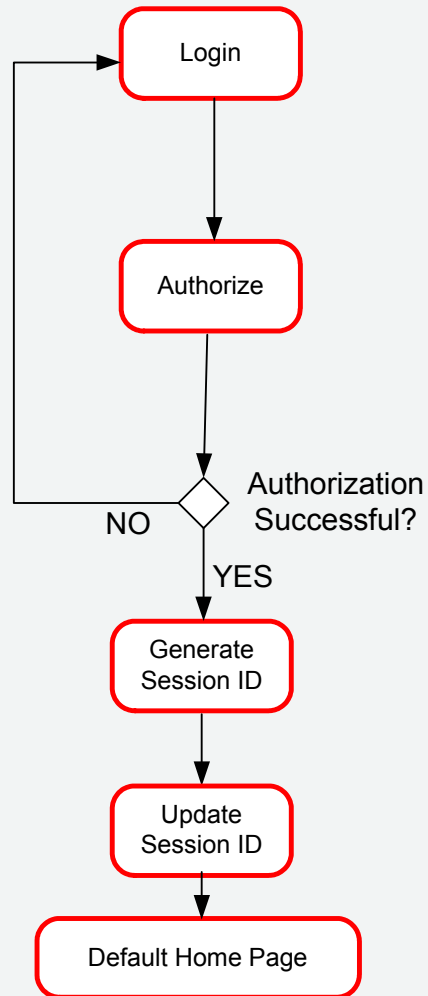
- Need to secure system against malicious hackers
- Keep the organizations (and members) data confidential (as outline in WebCoach Privacy Policy)
- Currently, data stored on WebCoach is not highly sensitive (ie: no credit card information or other important person info)
- However, future additions may require higher security, or just the ability to guarantee confidentiality will require higher security

# Session Management

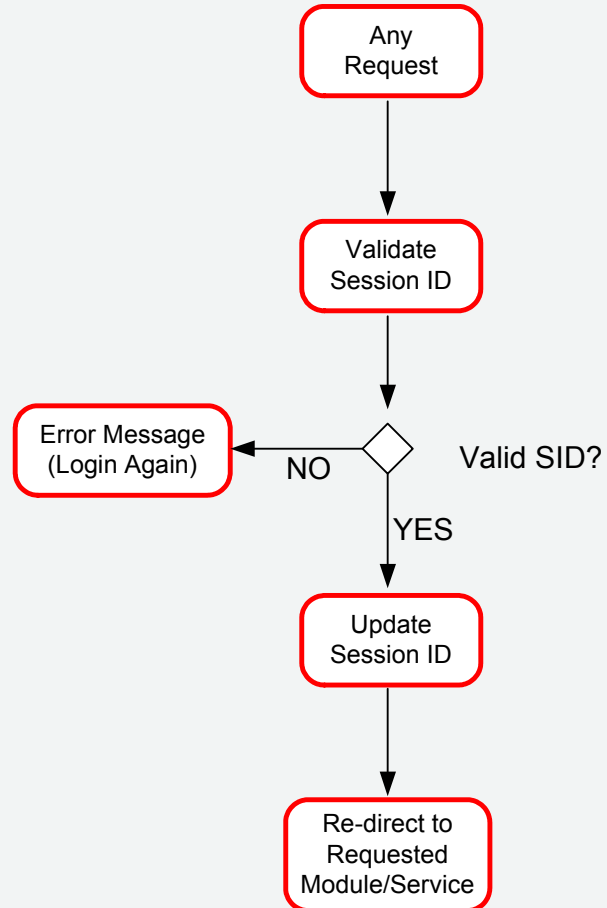
- For example, a major security feature of WebCoach is Persistent Session Management
  - Uses concept of Session ID (SID), a unique number that remains with a user for the entire period of his/her session on the system
  - Internally, SID is linked to users information, such as username, password, account information, session information, etc.
  - Password is NEVER displayed on the screen at any point
  - Time tracking within the SID allows for "Idle Time" expiry of sessions
  - Can determine when and where user last logged on from

# Session Management

## Login Request



## Any other Request (User is already logged in)



# Evaluation

- Need some criteria to from which to evaluate.
- Methods of Evaluation:
  - Based of previously set goals and objectives of target system
  - Based on feedback
    - Random comments and feedback
    - Results from recent survey

# Issues With Current Design

- Maintenance
  - Dev site uses the same database as public site...should use a mirrored copy of the DB instead
  - Version and module upgrading not automatic
    - Have to manually copy over code and make minor modifications to script to include new modules
    - Should be an automated process to discover new modules
  - No automated database backups

# Issues With Current Design

- Security

- Perl, easy to hack unless properly coded
  - code is probably full of vulnerabilities
  - Would need an experienced security consultant/analyst to review code and overall design
- MySQL privileges
  - Current design uses only one account to access the DB
  - Permission and access controlled by program through authorization

# Looking Forward

Ideal situation for a production-ready WebCoach would include:

- Modifying design to fix a few of the flaws
- Implementing on an Enterprise Application Server using Java technology
- Would allow the integration of cutting-edge Java technologies such as:
  - XML, including SOAP
  - Java Servlets & Java Server Pages (JSP)
  - Enterprise JavaBeans (EJB)
  - JDBC
- Java would be faster, very secure, more reliable, potential to include more complex functionality

# Conclusion

- WebCoach was conceived because there was a need for it – a problem without a solution
- WebCoach has several issues with it, but also contains many positive aspects
- WebCoach has been a learning experience for me → experience with analysis, design and implementation of extensive information system

# WebCoach Demo



[www.webcoach.ca](http://www.webcoach.ca)  
[info@webcoach.ca](mailto:info@webcoach.ca)

# References

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