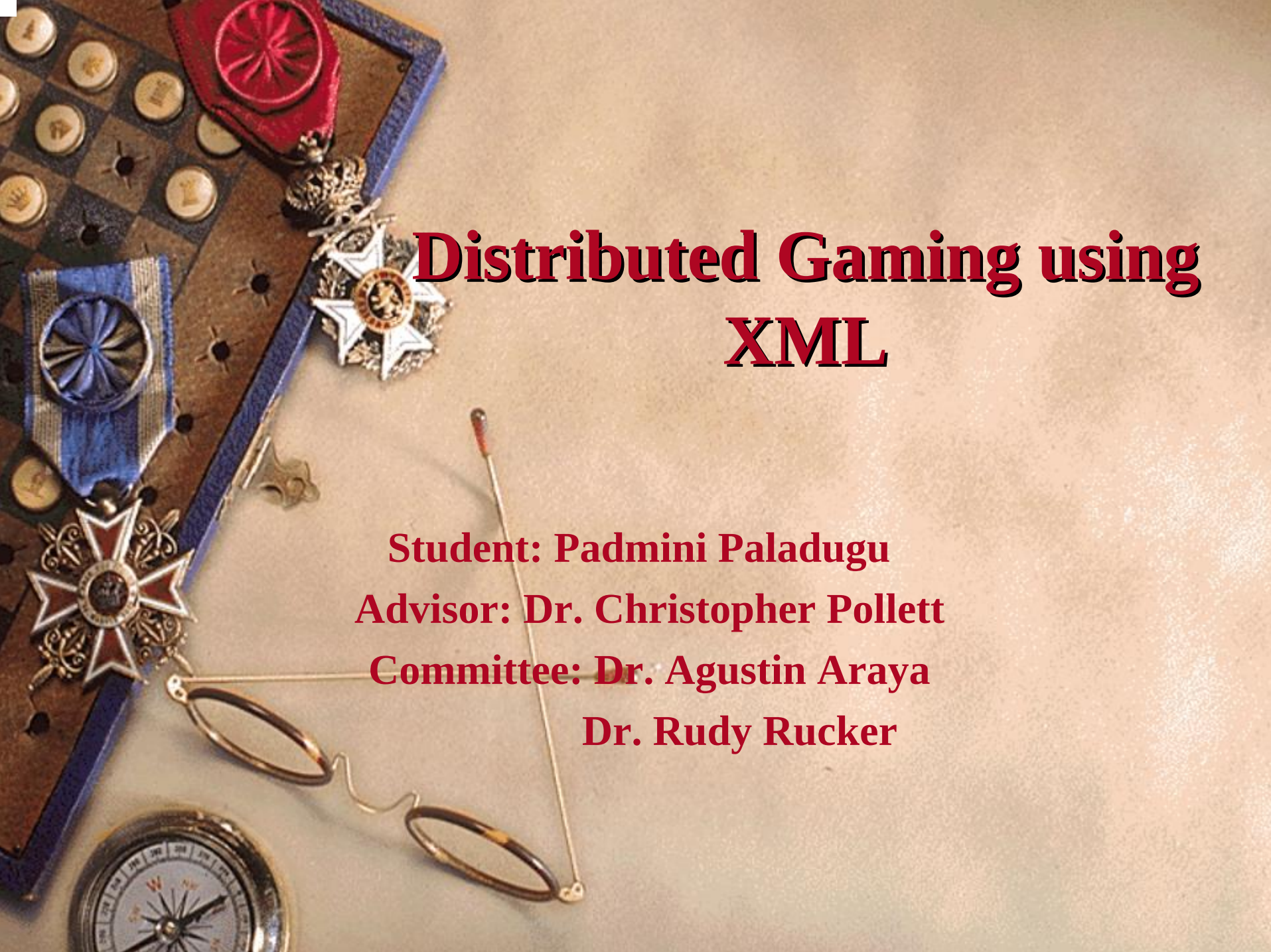

Distributed Gaming using XML

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Outline

- Introduction
- Requirements
- Design and Implementation
- Usability Testing
- Conclusion

Introduction

- General problems associated with designing distributed games on PDAs
  - communication between game players
  - maintaining consistent state between players and central database
  - managing the data of multiple players in the database simultaneously
- To facilitate distributed gaming, technologies like Palm OS, Bluetooth, eXtensible Markup Language (XML), and Oracle are widely used.

Introduction (cont'd)

- Palm OS concepts
  - Palm OS allows sharing of data between Palm devices using Infrared and Bluetooth communication
  - Palm networking allows users to connect to the remote database using Palm OS Net library
  - Palm Conduits synchronize data between applications on the Palm device and the Palm desktop
- Data interchange between Palm devices and the Palm desktop on a host computer is best handled by XML messages

Requirements

- **Purpose - To provide a distributed, multiplayer gaming application for Palm OS enabled wireless PDAs.**
- **Scope – To implement a more sophisticated game, *Palm Maya*, on wireless devices using Palm OS, Bluetooth, XML and Oracle 9i XML Database.**
  - ***Palm Maya* is a remake of the classic card board game *Magic: The Gathering*. It is a simple card trading game, scaleable to varying levels of difficulty.**

Requirements (cont'd)

- The *Palm Maya* play takes place between at least two players on two different Palm devices
- There are two types of cards: Lands and Animals
  - Land cards are used to pay for the Animal cards. The cost of a Land card is always one unit
  - Each Animal card has an image with three properties: cost, power, and toughness

Requirements (cont'd)

- **Rules of the Game**
  - **Each turn the player needs to draw a card from the deck.**
  - **The player may play one land card during a turn.**
  - **The player can play more than one animal card as long as he has sufficient number of land cards to pay for them.**
  - **The player need not pay again for the animal card, which has already been played in the previous turn.**

Requirements (cont'd)

- There are four different phases in the game:
  - Draw
  - Play
  - Attack and Block (Combat)
  - Beam and Receive

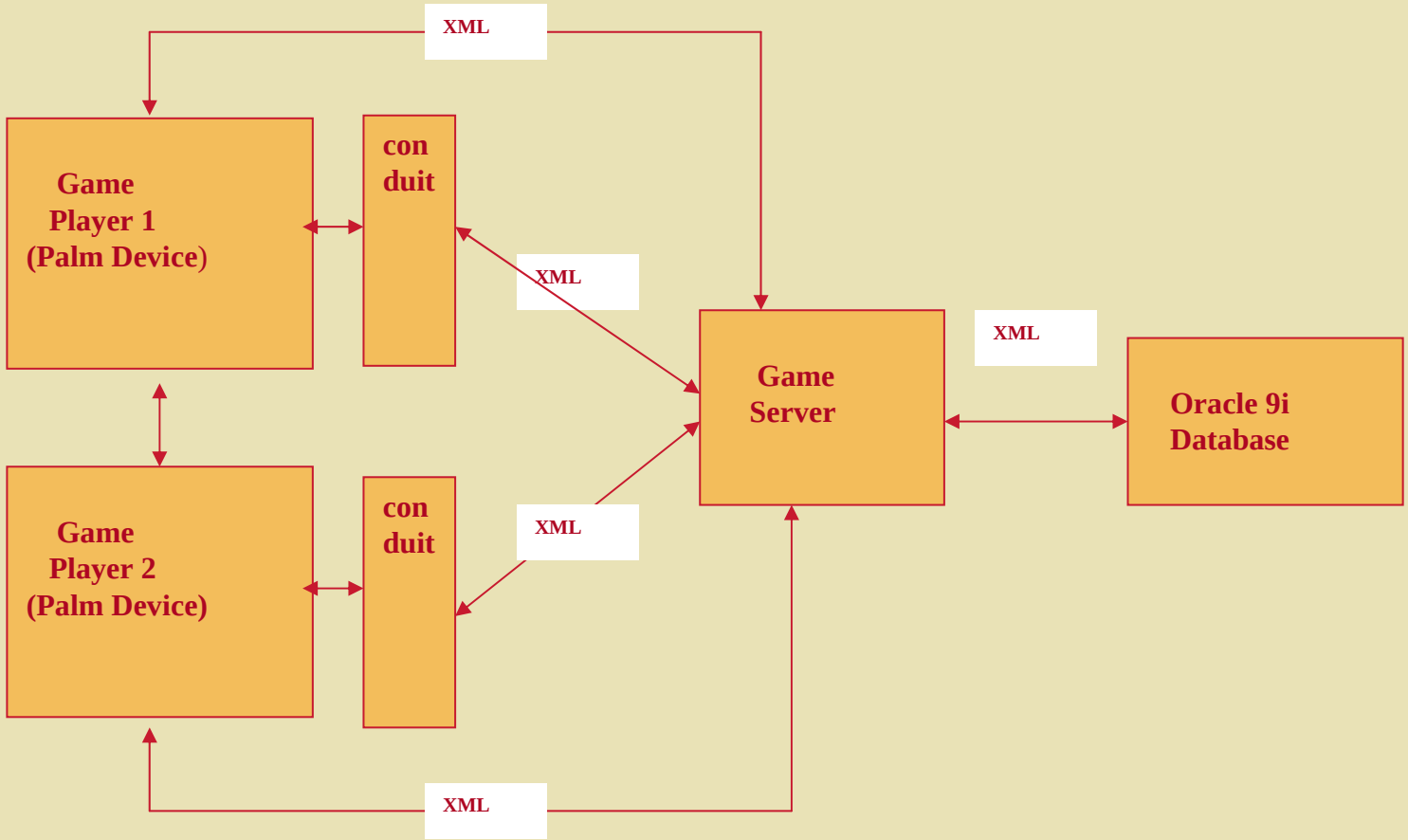
Requirements (cont'd)

- **Operating Environment**

Application	Operating Environment
Game	Cygwin, Palm SDK and PRC tools on MS Windows. (Palm OS)
Conduit	Visual Studio, Conduit Development Kit (CDK) , Palm Desktop, and Hotsync Manager on MS Windows.
Game Server	Java 1.4.1 or higher installed on Windows.
Database	Oracle 9i

Design and Implementation

- System Architecture



Design and Implementation (cont'd)

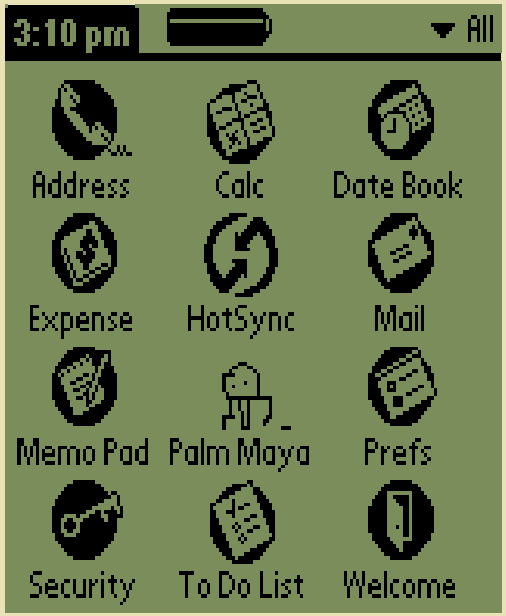
- Game Server
  - Create Deck
    - Existing User
    - New User
  - Update Score
    - Verify Signature
  - Retrieve Top Five Scores

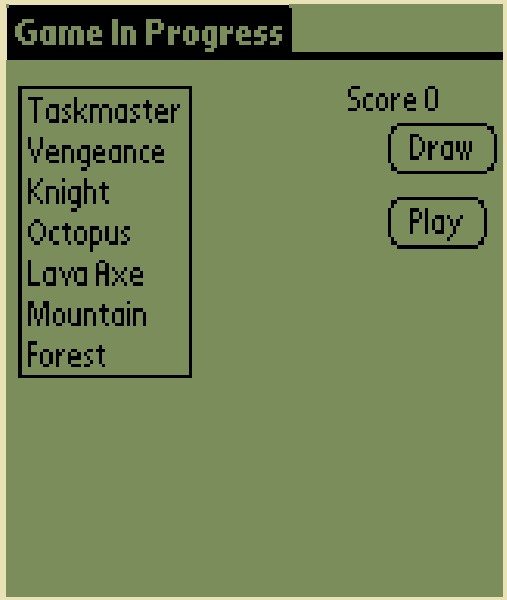
Design and Implementation (cont'd)

- **Observer Pattern: Game Server is implemented using observer Pattern**

Design and Implementation (cont'd)

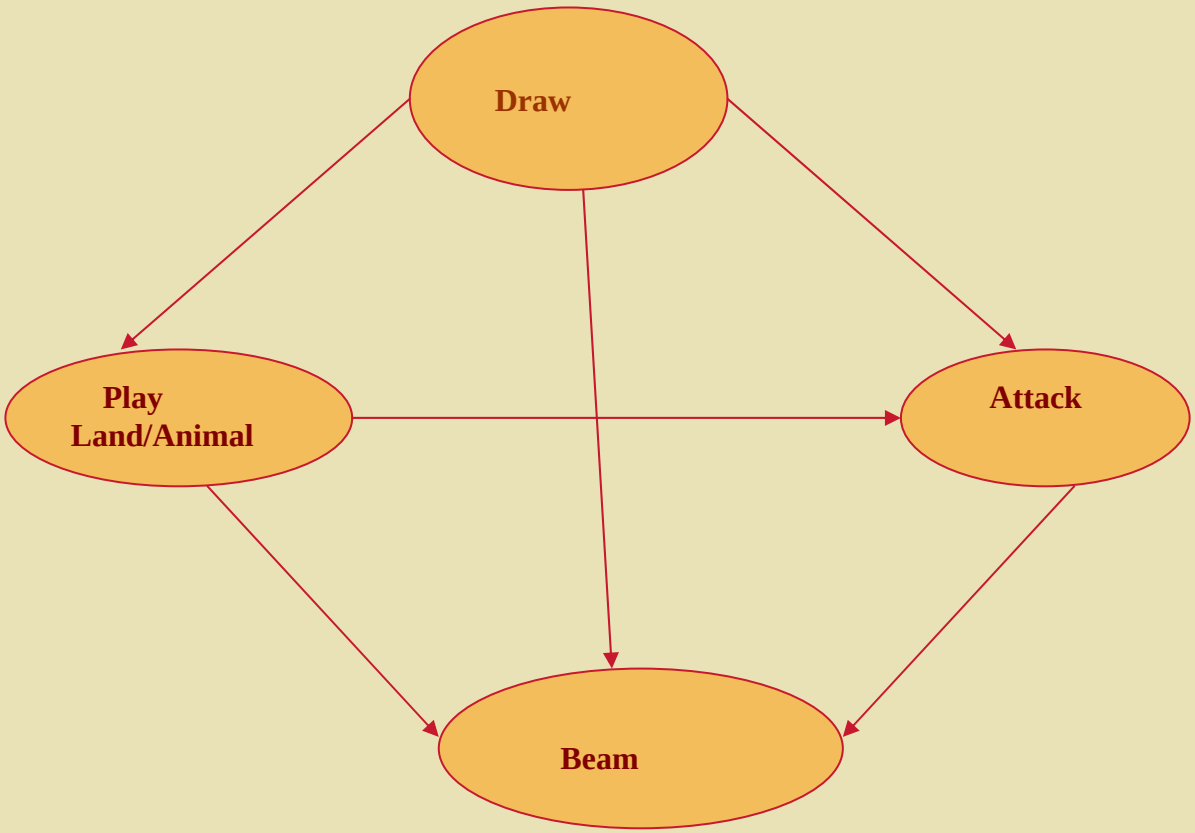
- ***Palm Maya* Game**
  - **Each player's application will start with an initial set of seven cards known as Handset**
  - **Handset consists of both Land cards and Animal cards**





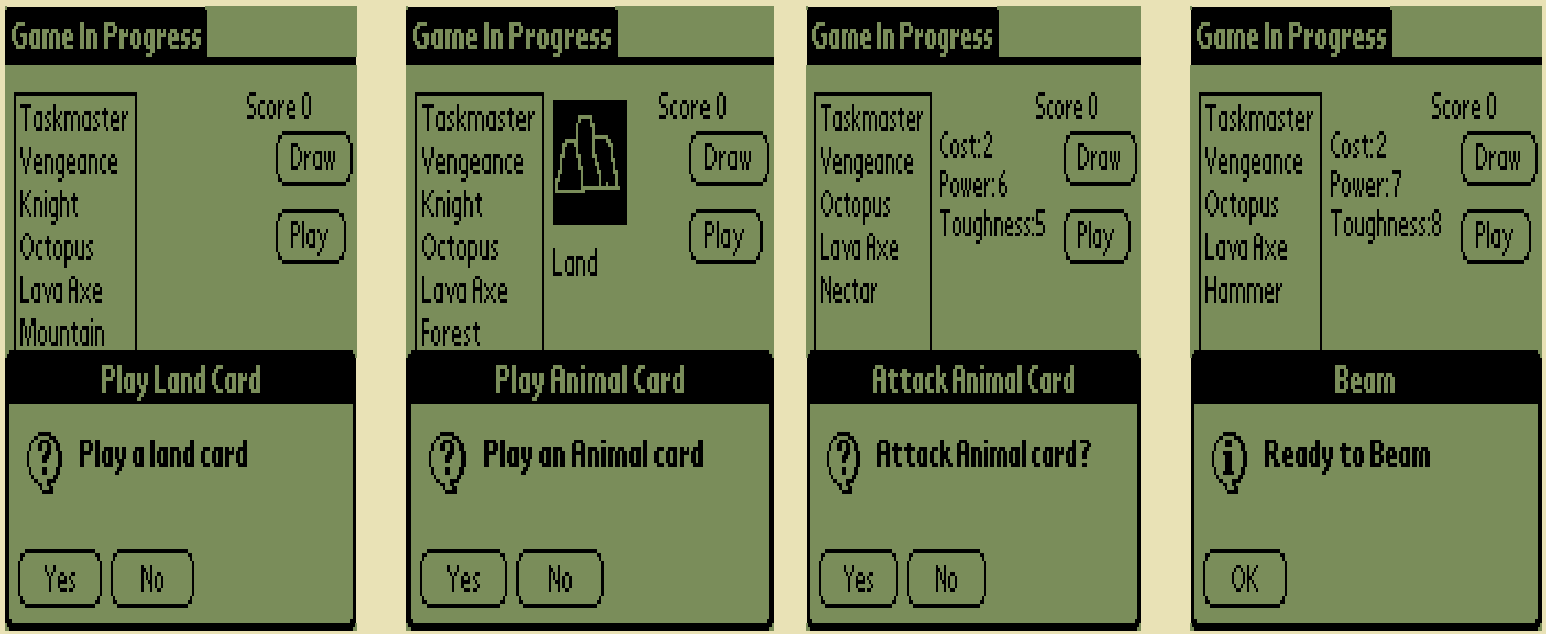
Design and Implementation (cont'd)

- **State- based Pattern: Palm Maya game is implemented using state-based pattern**



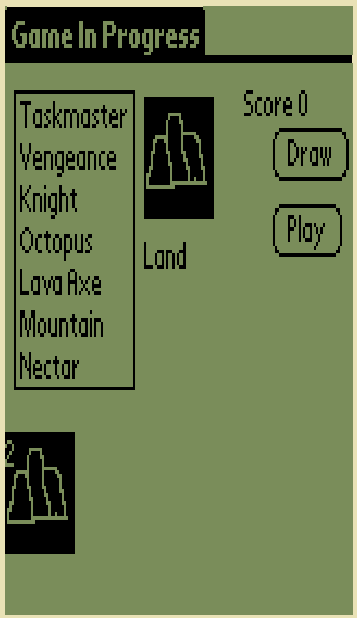
Design and Implementation (cont'd)

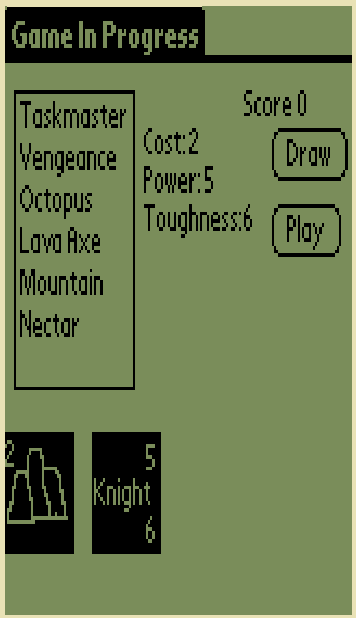
- **Draw State**
  - **Draws a card from the deck and added to the Handset**
  - **Draw state decides the next state in the game**

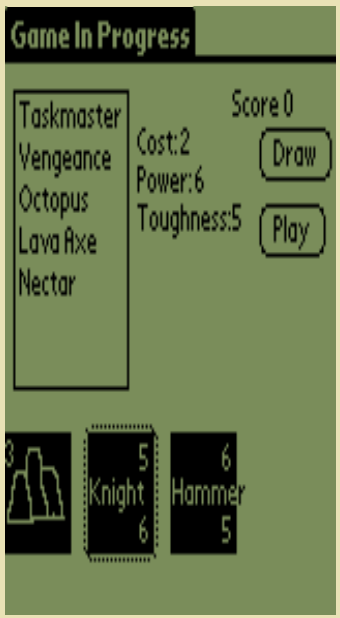


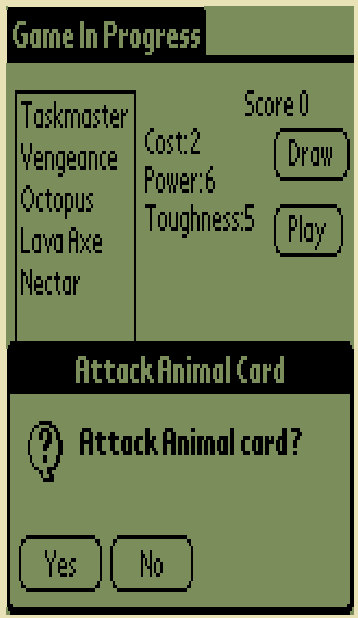
Design and Implementation (cont'd)

- **Play State**
  - **The player can play only one Land card from the Handset**
  - **The player can play more than one Animal card from the Handset**



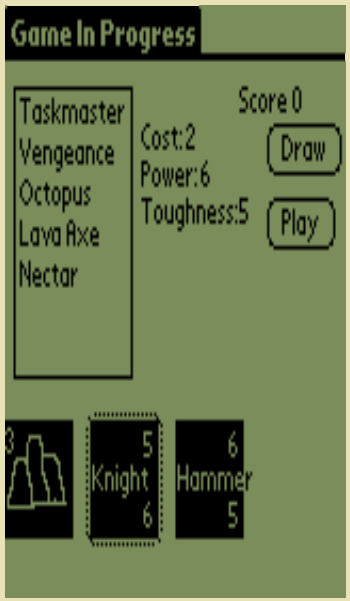


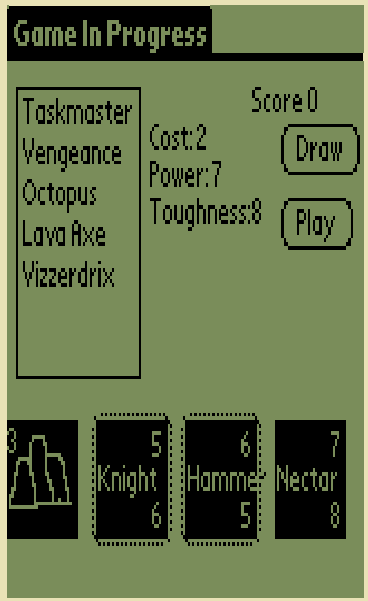


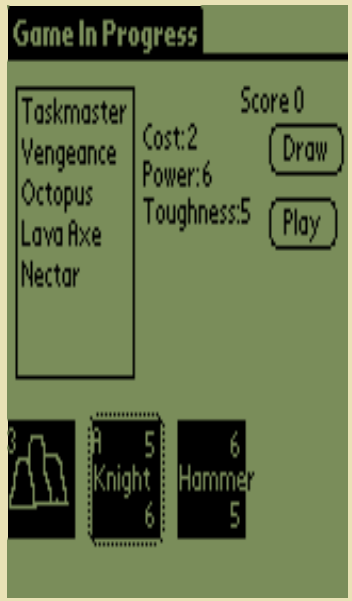


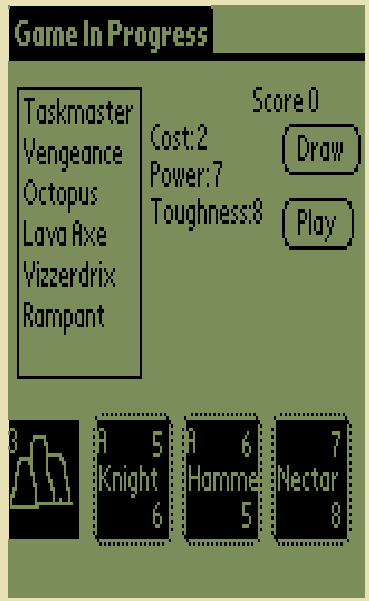
Design and Implementation (cont'd)

- **Attack**
  - **Player can attack with Animal cards that he had played in the previous turn**
  - **Player can attack with a single Animal card or multiple Animal cards**



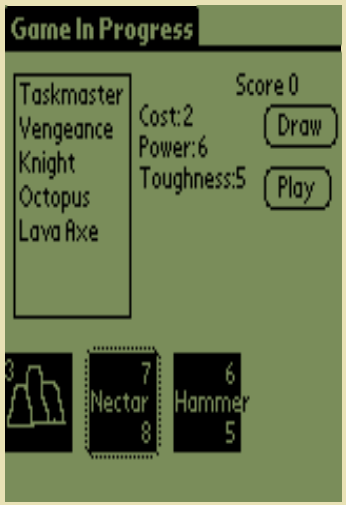


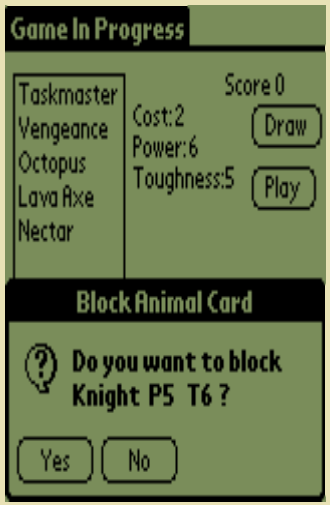


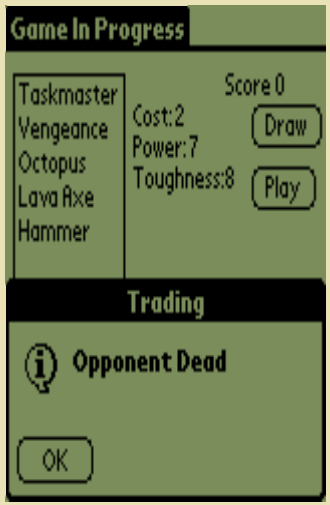


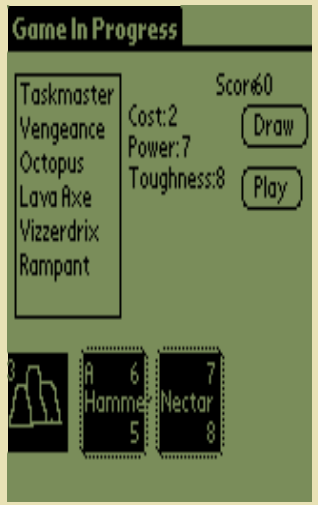
Design and Implementation (cont'd)

- **Block**
  - Opponent can block with a single Animal card or multiple Animal cards
  - If the opponent is willing to block, trading will occur between players
  - If the opponent is not willing to block, player's score will be incremented









Design and Implementation (cont'd)

Trading Pattern: This pattern is implemented in the "Attack and Block phase" of the *Palm Maya* Game.

Trading Condition	Result
1. (P1>T2) and (P2>T1) 2. (P1==T2) and (P2==T1) 3. (P1<T2) and (P2<T1)	Both Players cards will be dead
1. (P1>T2) and (P2<=T1) 2. (P1>=T2) and (P2<T1)	Blocking Player's card will be dead
1.1. (P1<=T2) and (P2>T1) 2. (P1<T2) and (P2>=T1)	Attacking Player's card will be dead

Design and Implementation (cont'd)

- **Beam and Receive**
  - **A player communicates with the other player through Bluetooth or Infrared communication**
  - **Beam to other player**
    - **To indicate that it is the receiving player's turn**
    - **To send Animal cards and messages in the Attack and Block phase**
  - **Receive different modes from other player**
    - **N - To indicate that it is the receiving player's turn**
    - **A - To indicate that other player is attacking**
    - **CB - To indicate that opponent cannot block the attacking Animal**
    - **OD - To indicate that opponent is dead**
    - **D - To indicate that Attacking player is dead.**

Design and Implementation (cont'd)

- **Additional Game Features**
  - **Update Score: If trading does not occur during the Attack and Block phase, the attacking player will get the score according to attacking player's Animal card power**
  - **Help Menu : The players should play the game according to the rules provided in the help menu**
  - **Top Five Scores: The Game Server will retrieve the top five scores from the database and then sends it back to the player in XML data format through Internet**
  - **Quit the game: The player can quit the game at any stage of the game**
  - **Trivial Signature Scheme: Signature scheme is implemented to maintain the game security.**

Design and Implementation (cont'd)

Multi-channeling:

- **This pattern is implemented in the Game Conduit and the Game modules to provide communication between the Game Server and the Palm device**
- **The Game Conduit provides communication through the Palm Cradle and Hotsync Manager**
- **The Game Module provides the same through a mobile phone (and Palm OS network library)**

Usability Testing

- To test the distributed gaming system developed in this project, we have selected three groups of users with various backgrounds
- User group1 – Extensive
- User group2 – Average
- User group3 – Minimal
- Average time for playing the game (to complete the deck) is approximately 60 minutes.

Challenges

- Game Conduit transfers large amount of data between Palm device and Game Server.
- Communication between players achieved through IR and Bluetooth beaming.
- Accomplished navigation between the different game states by implementing the State-based pattern.
- Achieved communication between Palm devices and the Game Server by implementing the Multi-channeling pattern.

Enhancements

- Implemented a trivial signature scheme to maintain the game security. Later, one can plug-in a more sophisticated signature scheme to provide a higher level of security.
- User interface of the game can be enhanced by providing more graphics and animations.
- Each animal card has only three properties based on which the players play with each other during the attack and block phase. We can add more properties to the animal card to increase the toughness of the game.

Any Questions?