GENTE: A generic board-game addressing cooperation and conflict in territorial management from the context of core behavior analysis

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CPR/Cooperation Dilemmas

According to the “tragedy of the commons” hypothesis, as a rational being, a user of a common pool resource tries to maximize his/her own benefits by increasing individual resource extraction. If every actor follows the same rationale, the resource will eventually be overexploited or depleted and will not be able to generate any social benefit in the long term. This problem represents a cooperation dilemma among common pool resource’s (CPR) users where everyone has to extract less and “sacrifice” from their individual short-term benefits in order to improve the social benefits in the long term. Many renewable natural resources, the fisheries, pastures, forestry, groundwater, and others such as biodiversity, the atmospheric ozone and the global atmosphere are common pool resources.

[Castillo and Saysel, 2005]

An iterated prisoner's dilemma

- The cooperation dilemma over common pool resources that Castillo and Saysel speak to can also be considered as an iterated Prisoner's Dilemma; where a resource (such as trust) may be shared or exploited and where an individual's actions, over time, have a consequential impact on each stakeholder's ability to share or exploit that resource.

- We are developing a number of games that include this cooperation dilemma. GENTE is the first of these games, and acts as a prototype for our efforts as both an experimental game and a software implementation on a new and evolving platform.

An iterated prisoner's dilemma

- Our focus was primarily upon something abstract; a game focused on small decisions made in a competitive context. By this we meant a game that would allow us to use the pressure and context of a competitive game to look at how human agents react in an open-ended cooperative dilemma.

- We needed to model a game that would provide two types of competition: between teams and between resources. In the case of GENTE, as in an iterated prisoner's dilemma, teamplayers compete over trust; but within the evolving context of team competition (the overall game).

Game Design

- We began with Gary Gabriel's game, PENTE, invented in 1978.

- Played by two players, on a large Go board, each in direct competition with the other.

- Game has no concept of "free-loading", "defection" or "cooperation"; just a complex configuration of pieces on a competitive board whose topology can be modified through "captures" by the opposing player.

- The game itself is zero sum; there can only be one winner.

- We realized that we could only inherit a few concepts from the game in order to build something suitable for research.

Game Design

- GENTE is played on a 19 by 19 grid; differing from the traditional GO board by allowing pieces to be placed in the center of each square, as opposed to traditional play which requires placement on intersecting vertices.

- The first player must occupy the center square, marked on our board by a small red star.

- Four players are active and divided into two teams, “HOT” and “COLD.”

- Stones are colored to fit our team metaphor. Hence, our colors are green, blue, red and yellow.

Game Rules

- The winner of the game is the first player to achieve three “trias”; or the first team to form two mixed “tesseras.”

- A tria means three stones of the same color adjacent to one another (in a row, a column, or diagonal).

- A tessera means four stones of the same team colors adjacent to one another (in a row, a column, or diagonal).

- Similar to PENTE, opposing players can block tria or tessera formation by interrupting the grouping with one of their own colored stones.

- Winners are determined in GENTE by a combination of adjacent stones in sets smaller than those required by PENTE and with the notable innovation of allowing two players to contribute to team tesseras.

Players

- Our targeted players initially were the stakeholders and participants from the Tablón watershed in La Sepultura.

- We wanted to engage these players in their own environment; playing versions of our game on the tabletop and getting detailed recordings of player interactions.

- We also desired to engage stakeholders that were not present in the reserve itself, but working kilometers away, sometimes at quite a distance.

- We hoped most of all to engage a mixture of players; stakeholders playing in La Sepultura along with those far away in Tuxtla Gutiérrrez, San Cristóbal de Las Casas, or Mexico City.

Requirements

- Create a networked, scalable system for playing in a virtual space.

- Write software tailored specifically to GENTE, but something also applicable to other games that we saw ourselves building in the future.

- Something that would work as both a game with real participants (human players) and something that could also be played by agents; either on their own, or as a multi-agent system (MAS).

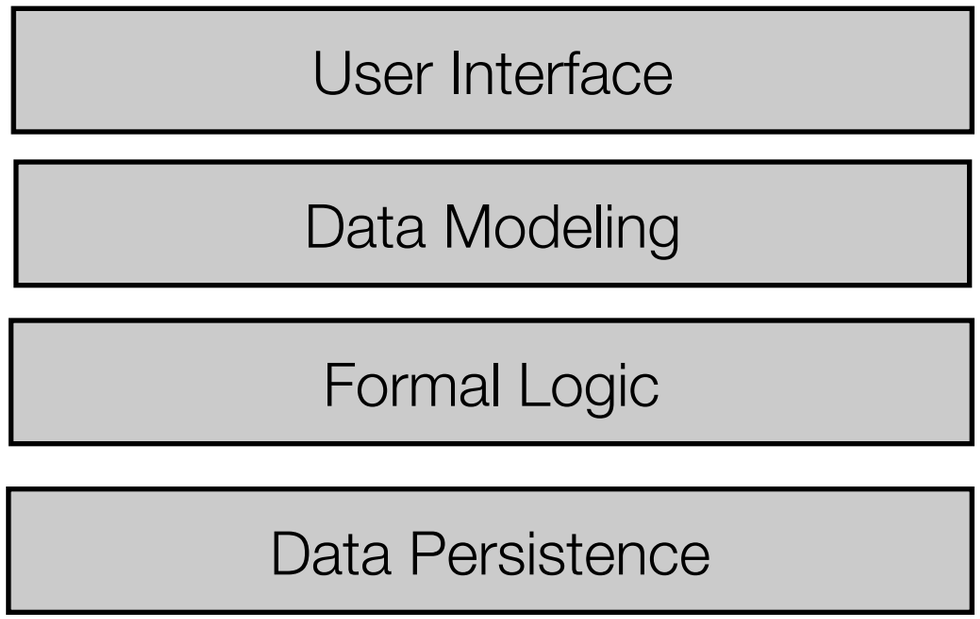
- Persistent data, so we could analyze what happened in our games later.

Our Approach

- Participate on the Network in a standards-based, scalable fashion.
- Data available for offline analysis through any database and data-mining tool.
- Allow researchers to work with logical rules, not code, in a format they are familiar with (or may easily learn).
- Provide an open scripting framework for modeling and user interaction, taking advantage of available technologies.

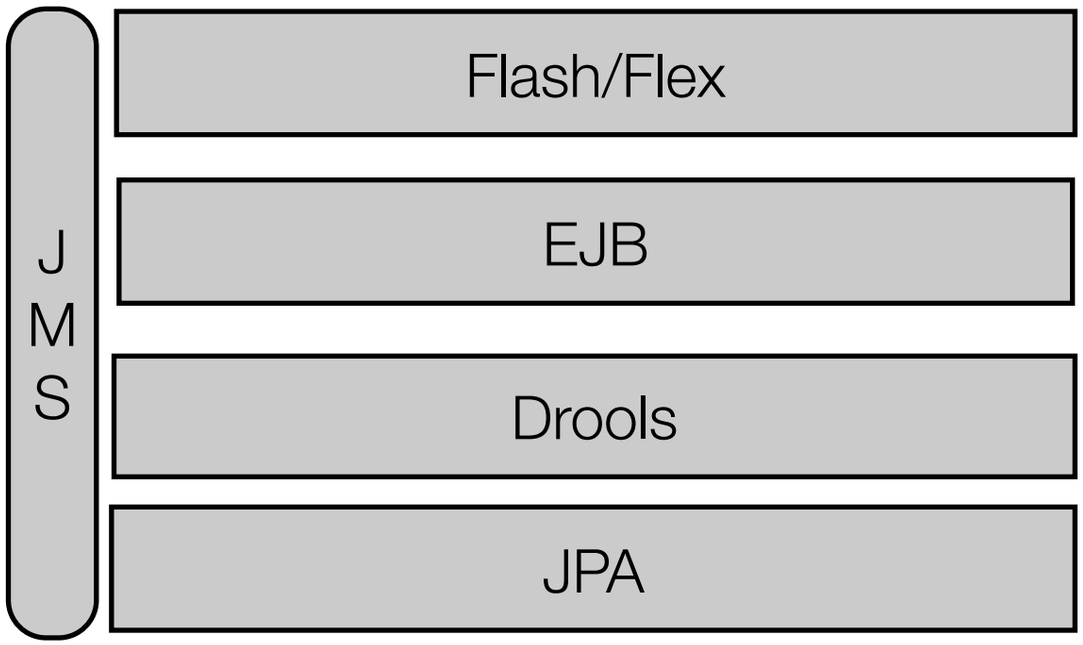
Implementation

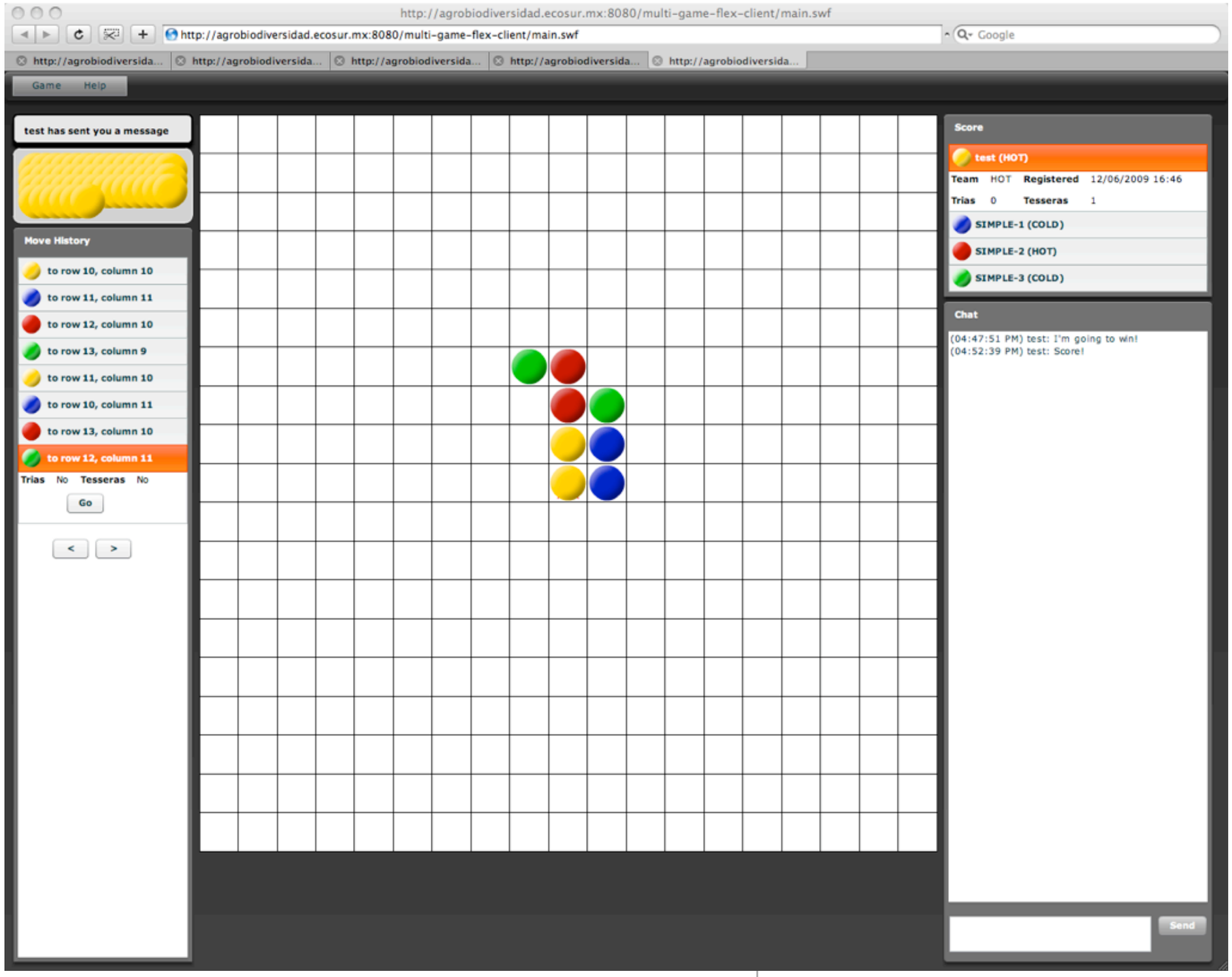
- Stack is segregated into 4 discrete layers
- Allows experts to concentrate upon their domain



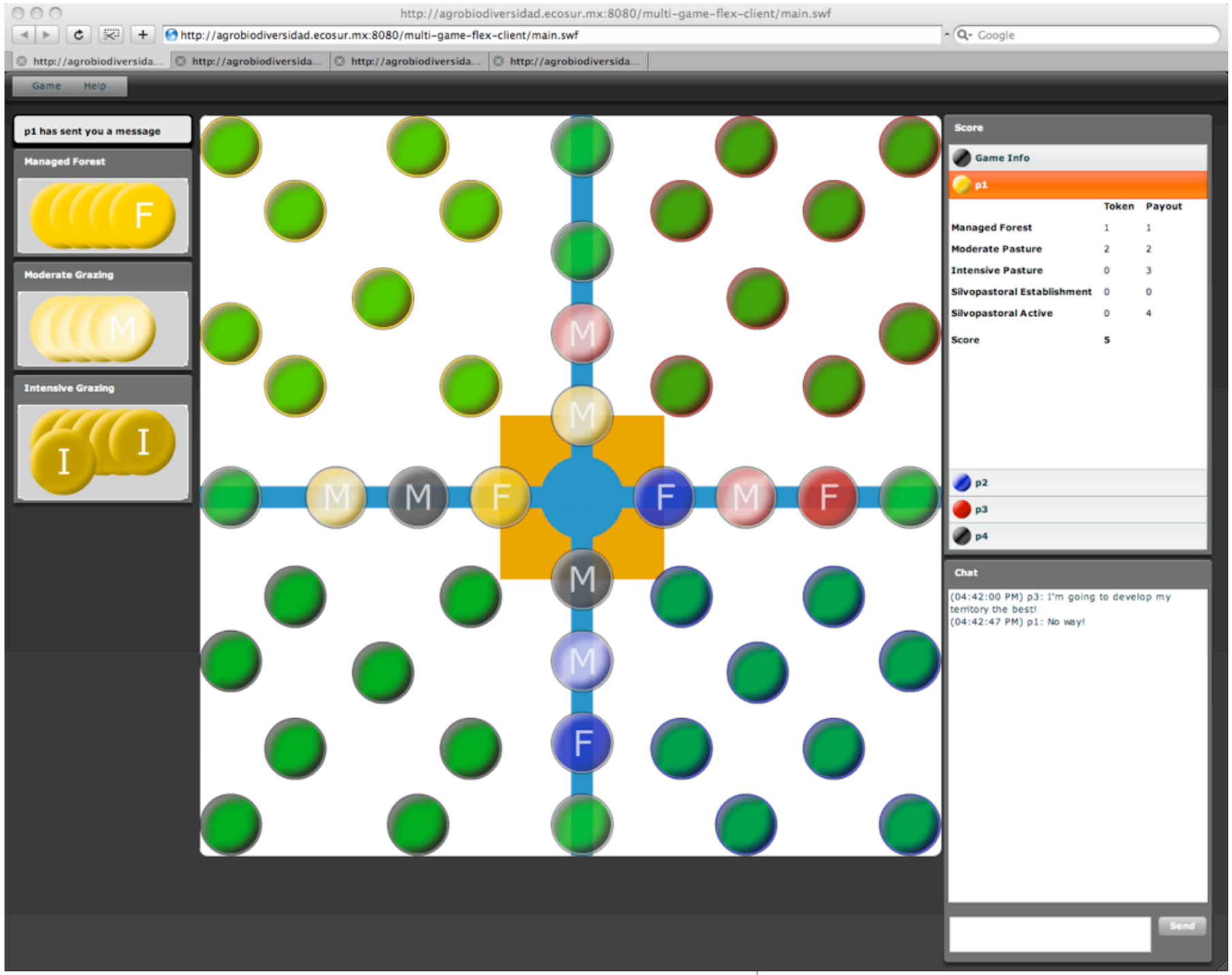
Implementation

- Flash/Flex for a rich internet application (display)
- EJB3/JPA for concurrency/ modeling
- JMS for asynchronous messaging
- Drools rules engine for game logic
- JPA for persistency storage




http://agrobiodiversidad.ecosur.mx:8080/multi-game-flex-client/main.swf
Game
Help
test has sent you a message
Move History
to row 10, column 10
to row 11, column 11
to row 12, column 10
to row 13, column 9
to row 11, column 10
to row 10, column 11
to row 13, column 10
to row 12, column 11
Trias No Tesseras No
Go
Score
test (HOT)
Team HOT Registered 12/06/2009 16:46
Trias 0 Tesseras 1
SIMPLE-1 (COLD)
SIMPLE-2 (HOT)
SIMPLE-3 (COLD)
Chat
(04:47:51 PM) test: I'm going to win!
(04:52:39 PM) test: Score!
Send

GENTE



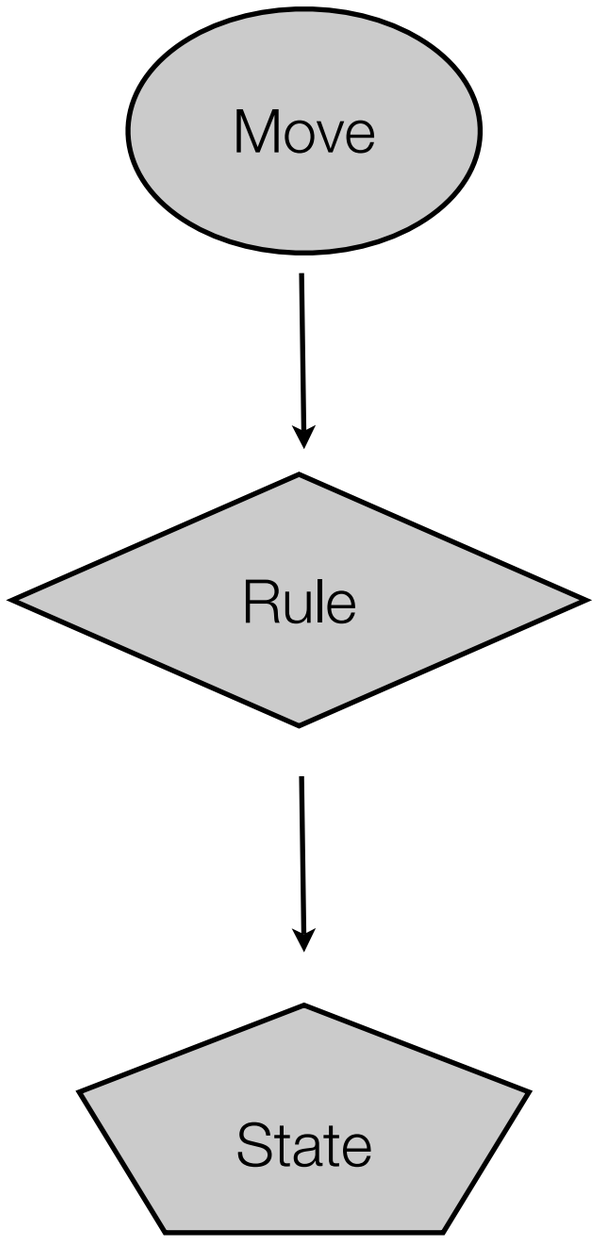
MANANTIALES

Demo

Rules Language (DRL)


```
rule "score"
    agenda-group "evaluate"
    salience 2
    no-loop true
when
    game  : PenteGame (state == GameState.PLAY)
    move  : PenteMove (player.turn == true, status == Status.MOVED)
then
    int score = scorePlayer (move);
    PentePlayer player = (PentePlayer) move.getPlayer ();
    if (score == 5) {
        PentePlayer teammate = getPartner (player);
        teammate.setPoints (score);
    }
    player.setPoints (score);
    modify (move) { setPlayer (player) }
end
```

Under the covers



- Player makes a move in the UI
- Move is sent to EJB to be evaluated by the rules engine
- Move is evaluated by the rules
- Rules change move's state, which is either further evaluated or returned to the caller

Drools Rule Engine

- Game logic is expressed as rules in Drools Rule Language (DRL)
    - Mix of Java syntax with simple, basic logic
- Domain Specific Languages Available (DSL)
    - Plain language expressions (English, Spanish, etc.) mapped to rules DRL
- Rules can be compiled from other formats, besides DRL/DSL (XML, CliPS)

Future

- Public Release of platform and games on GitHub (October, 2009)
    - The “MultiGame” project
- Extending to Mobile
    - Mobile Phones
        - New UI implementations (Apache Trinidad project)
    - Databases and Application Servers in the field
- Game Discovery, Inheritance and Dynamic Creation

Questions