Creation of Custom-made Serious Games with User-generated Learning Content

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NetGames 2014
INTRODUCTION
Creating Serious Games

GAME CONCEPT

Philip Mildner – NetGames 2014
Combining Fun and Learning

Entertainment Game

HTML5 Elements
DATA STRUCTURE
Mini Game

- Defines data structure for learning games
- JSON Schema
- No game logic contained

```json
"htbgame": {
  "type": "object",
  "properties": {
    "phrase": {
      "title": "Phrase",
      "type": "string"
    },
    "buzzwords": {
      "type": "array",
      "items": {
        "title": "Winning buzzwords",
        "type": "string"
      },
      "minItems": 1,
      "maxItems": 4,
      "uniqueItems": true
    }
  }
}
```
Serious Content

- Holds information of a mini game instance
- Data dependent on Mini Game

Phrase: "Member of The Beatles"
Winning buzzwords:
{"John Lennon", "Paul McCartney"} 

Phrase: "Cities in Japan"
Winning buzzwords:
{"Tokyo", "Kyoto", "Nagoya", "Nara"} 

Question: "Biggest City in England?"
Answers:
{"London", true},{"Manchester", false},{"Liverpool", false} 

Phrase: "Famous Dish in Japan"
Winning buzzwords: {"Sushi"}
Learning Container

- Groups Serious Content
- Two-level hierarchy – E.g., Lecture, chapter
- Visible to players

**Japan**

Phrase: "Cities in Japan"
Winning buzzwords: "Tokyo", "Kyoto", "Nagoya", "Nara"

Phrase: "Famous Dish in Japan"
Winning buzzwords: "Sushi"

**Cities around the World**

Phrase: "Cities in Japan"
Winning buzzwords: "Tokyo", "Kyoto", "Nagoya", "Nara"

Question: "Biggest City in England?"
Answers:
{"London", true}, {"Manchester", false}, {"Liverpool", false}
Adding new content

Creating new game types

- Define Mini Game schema and score rule
- Design HTML5 game including logic
- Upload game and schema

Adding learning content

- Enter Serious Content in created forms
- Create/modify Learning Container
- Play
# Backend Overview

## Web-based Authoring Tool

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Belonging to</th>
<th>Comment</th>
<th>Action Bar</th>
</tr>
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<tbody>
<tr>
<td>52</td>
<td>Computer Games ...</td>
<td>Memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Trivia</td>
<td>Word Domination Quiz</td>
<td>Free General Knowledge Trivia Questions</td>
<td></td>
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<tr>
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<td>Darmstadt</td>
<td>Word Domination Quiz</td>
<td>Fragen für die GameDays 2013-Rallye</td>
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<tr>
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<td>ACGN</td>
<td>Word Domination Quiz</td>
<td>Questions from the &quot;Advanced Computer Networks&quot; course</td>
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<tr>
<td>76</td>
<td>Mannheim</td>
<td>Word Domination Quiz</td>
<td>Fragen über Mannheim</td>
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<td>ACGN: Intro</td>
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<td>Introductory questions for the advanced computer networks course.</td>
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<tr>
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<td>Word Domination Quiz</td>
<td>Questions about MAC protocols and Wireless Lan</td>
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<tr>
<td>79</td>
<td>ACGN: Routing</td>
<td>Word Domination Quiz</td>
<td>Questions for the advanced computer networks course. This is a C ...</td>
<td></td>
</tr>
<tr>
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<td>RWTH 5G-EZW</td>
<td>Word Domination Quiz</td>
<td>Trivia example (subject: English/general) in conjunction with a s ...</td>
<td></td>
</tr>
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<td>Protocols</td>
<td>Memory training</td>
<td></td>
<td></td>
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<tr>
<td>87</td>
<td>Protocols, Grouping</td>
<td>Group game</td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>Mannheim Test</td>
<td>Combination Test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Statistics

## User DB

## Sandbox
Add new Serious Content

Step 1
Add basic information on serious content

Phrase
Cities in Japan

Winning buzzwords
Tokyo

Winning buzzwords
Kyoto

Winning buzzwords
Nagoya

Winning buzzwords

Submit
Cities in Japan

Nagoya  Check!
Game Overview

- Tower Defense game
- 3 levels, 5 towers
- 3 upgrade levels
- 18 waves per level
- Story-driven
Integration of Learning Content

Primary resource: Credits
• Build/upgrade towers
• Increased by defeating enemies, decreased when used
• Session-based

Secondary resource: Knowledge
• Unlock tower upgrades
• Persistent, level-based
• Increased by playing learning games
VIDEO DEMO
Which of the following IP addresses is a valid IPv4 address?

- 162.257.0.200
- 127.0.0.1
- 93.204.83.66
Mini Games

1. With __, computer applications can send messages, in this case referred to as datagrams, to other hosts on an Internet Protocol (IP) network without prior communications to set up special transmission channels or data paths. (Answer: UDP)

2. UDP provides __ for data integrity, and port numbers for addressing different functions at the source and destination of the datagram. (Answers: checksums)

3. Time-sensitive applications often use __ because dropping packets is preferable to waiting for delayed packets, which may not be an option in a real-time system.

4. Web browsers use __ when they connect to servers on the World Wide Web, and it is used to deliver email and transfer files from one location to another.

Which of the following IP addresses is a valid IPv4 address?

- 162.257.0.200
- 127.0.0.1
- 93.204.83.66

Which item does not match the others?

- SSL
- UDP
- Telnet
- HTTP

Time left: 194
Points: 8
Remaining: 5

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Mini Games, continued
DISCUSSION
Ease of Use

Adding Learning Content
- Choose from available mini games
- Prototype: 8 Mini Games
- No game design or implementation

Creating new Mini Games
- Define Data structure
- HTML5 game requires programming skills
- No changes to backend or client necessary
Learning vs. Playing

- Player has to actively trigger Mini Games
- Learning content necessary to win game
- No connection between game scenario and learning content
Conclusion

- Game applicable to arbitrary topics
- Extensible through new Mini Games
- Ready-to-use prototype

- Outlook
  - User study, evaluation
  - More mini games/game clients
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