Virtual Humans in Serious Games

Kickoff Contextproject 2014-2015

Tygron Serious Games for Urban Planning

- Tygron is an online 3D multiplayer gaming platform for urban communities.
- Communities can generate and maintain their realistic multiplayer games to experiment, plan and negotiate better solutions for city designs and development projects.

Client asks:

Can we replace human players by virtual humans?

Serious Game (Tygron Engine)

Client asks:

Can we replace human players by virtual humans?

Contextproject Virtual Humans for Serious Games says:

Yes we can!

Connector (Web2EIS): Percepts & Actions

Connector: Percepts & Actions

Etc….

Virtual Human 1

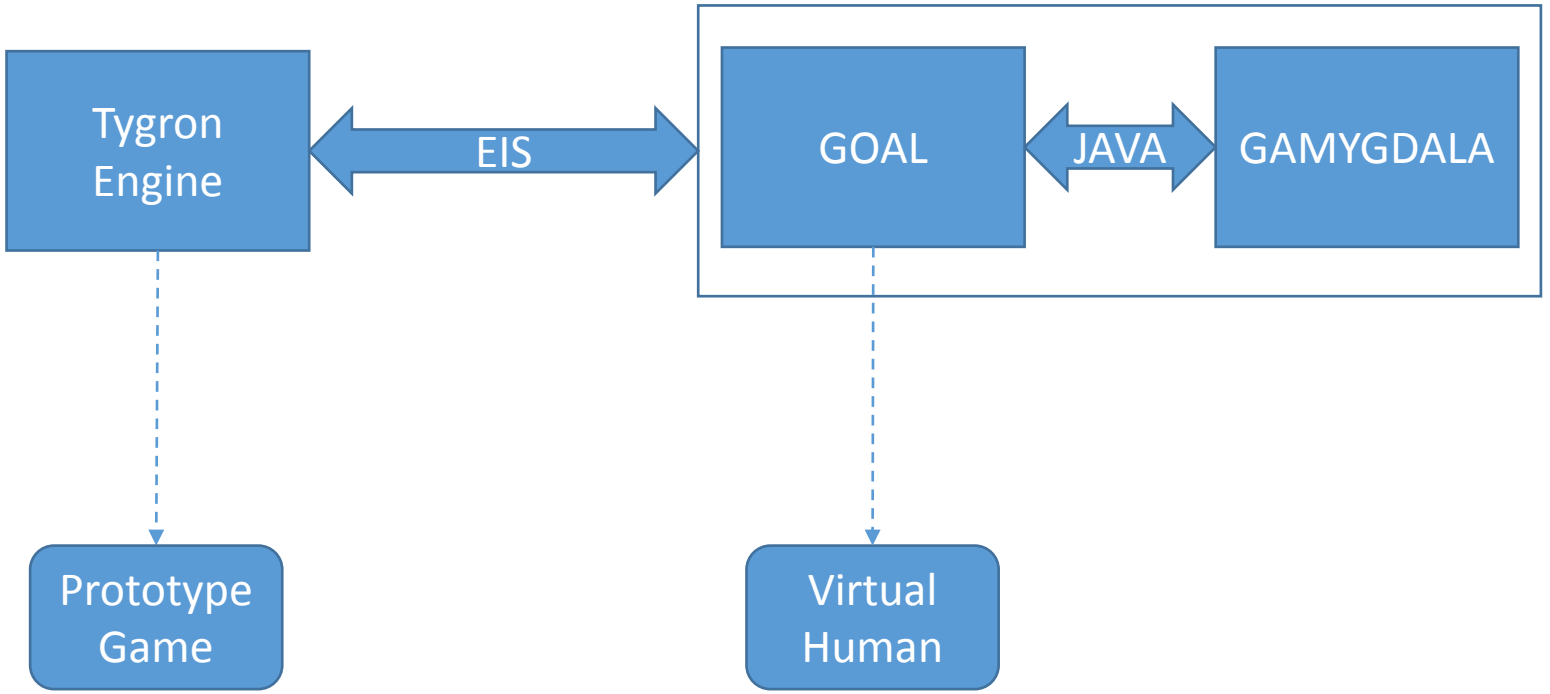
Virtual Human 2

Implementing a Mind

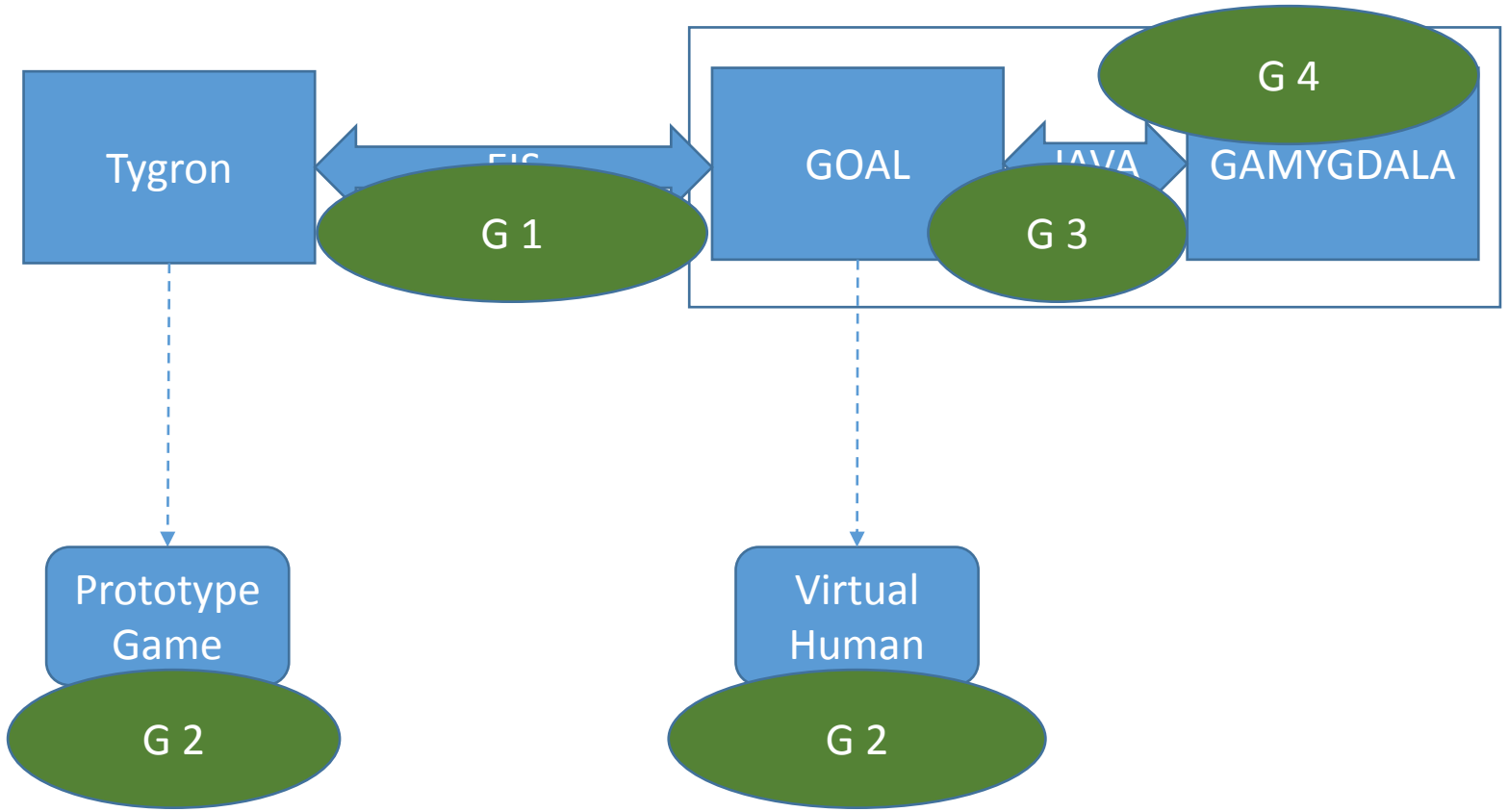
Decision Making (GOAL)

Emotion (Gamygdala)

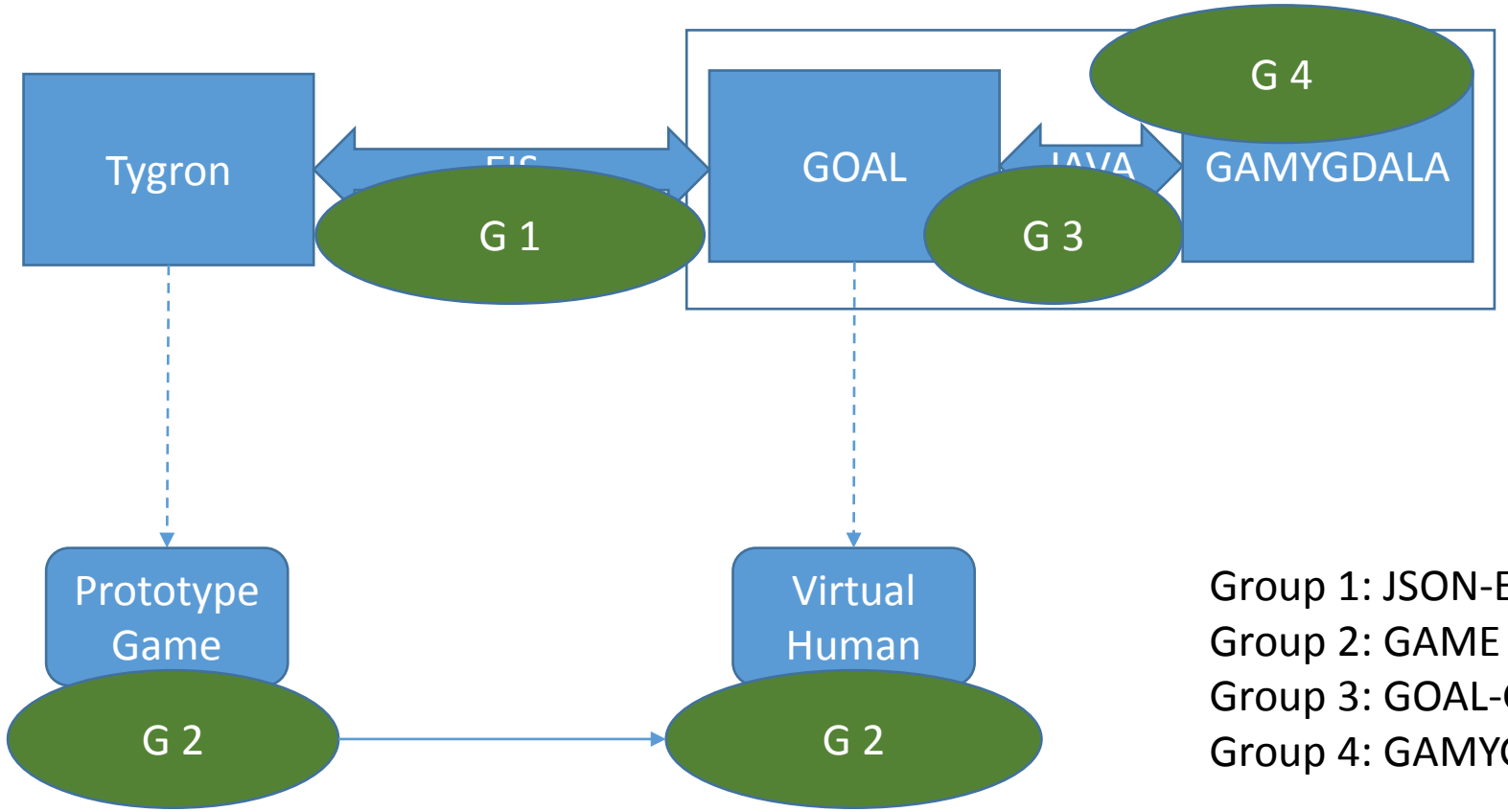
Project overview



Project overview

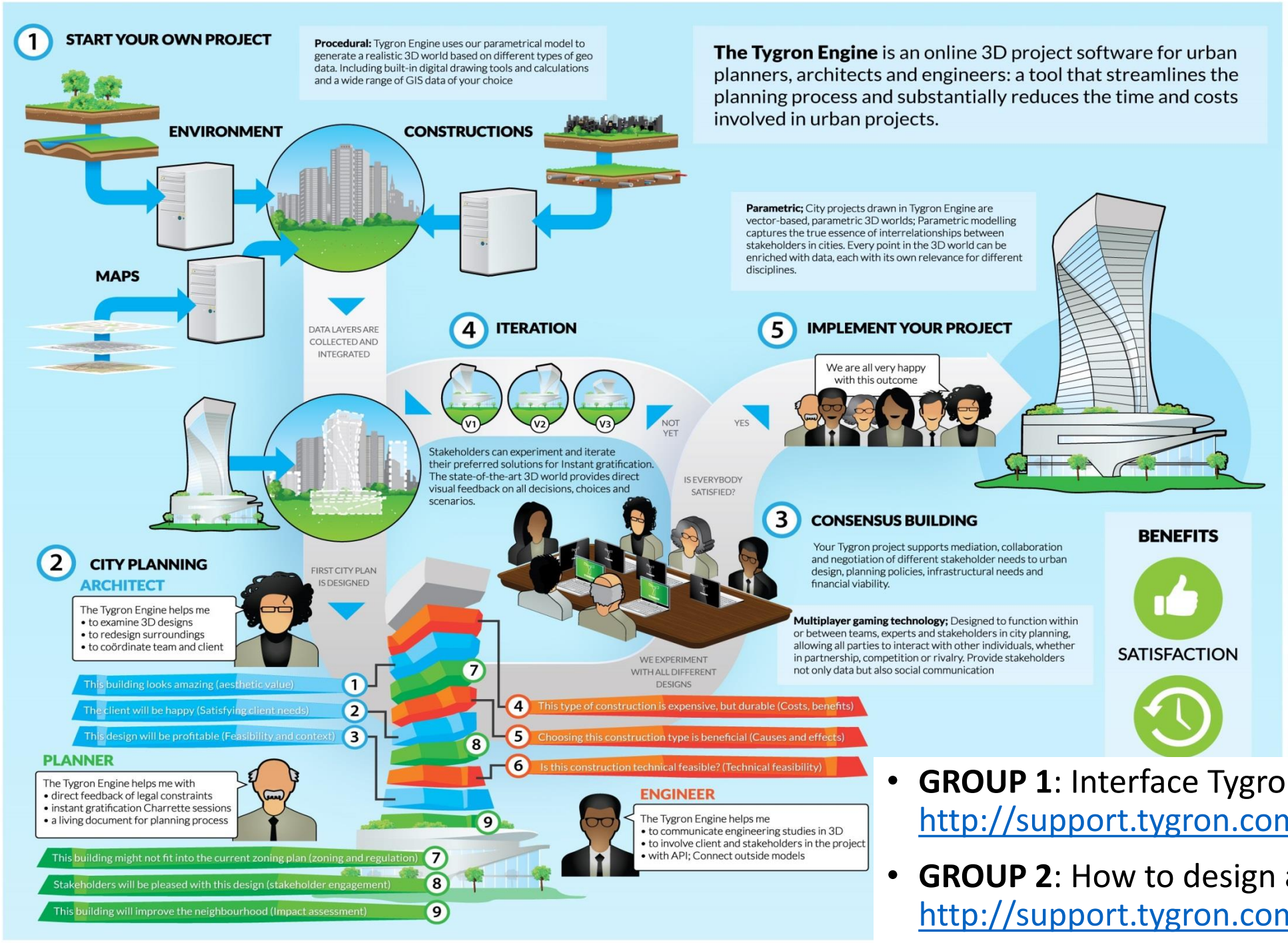


Project overview



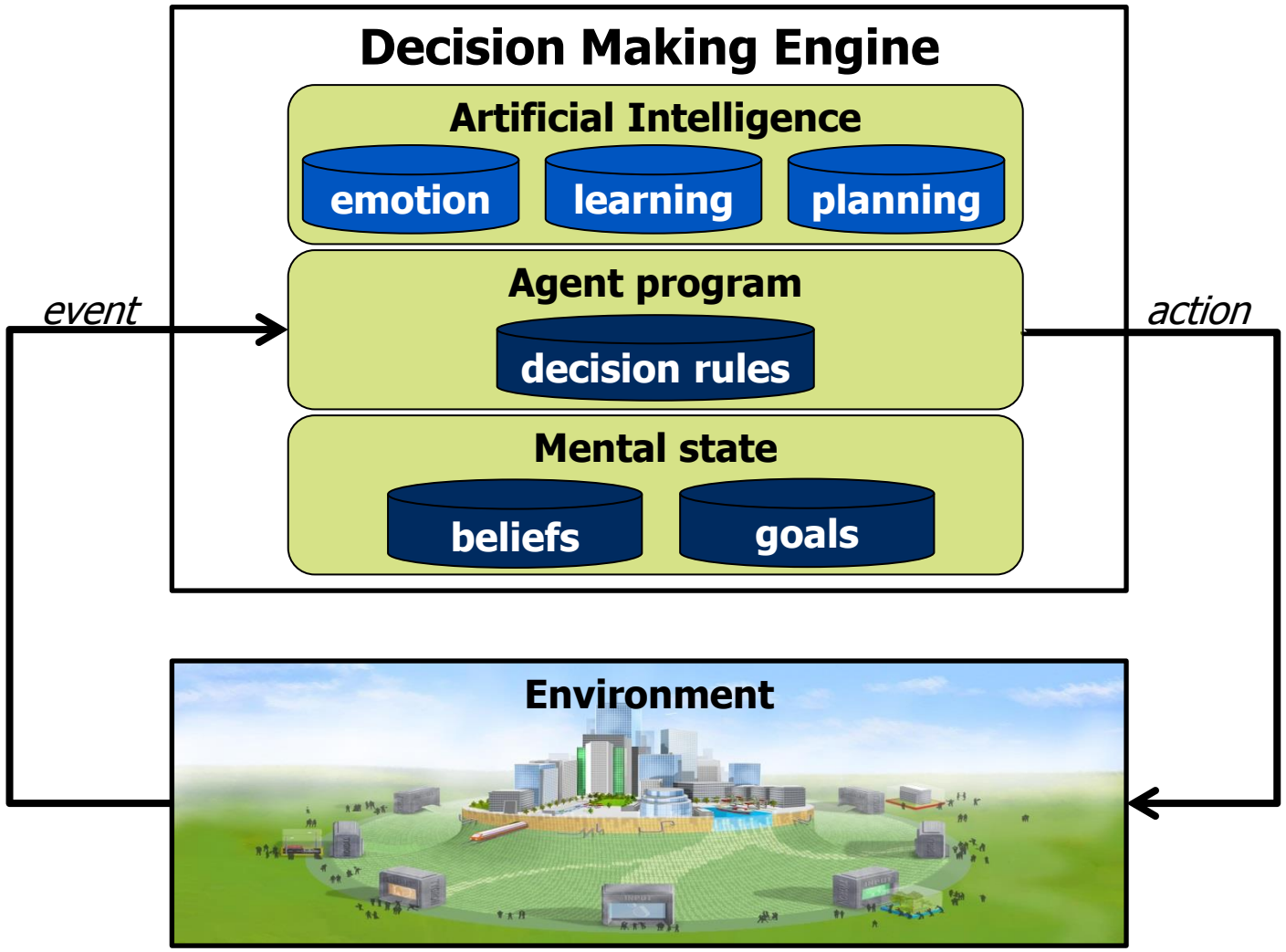
Group 1: JSON-EIS-GOAL
Group 2: GAME + Virtual Human
Group 3: GOAL-GAMYGDALA INTEGRATION
Group 4: GAMYGDALA PORT+PLUGIN

Tygron Engine



- **GROUP 1**: Interface Tygron Engine 2.0.0 Beta http://support.tygron.com/wiki/Version_2.0.0_BETA
- **GROUP 2**: How to design a serious game? See: http://support.tygron.com/wiki/Where_to_Start

GOAL agent programming language



GOAL:

High-level programming language for programming **decision** logic of **cognitive agents** that derive their choice of **action** from their **beliefs and goals**.

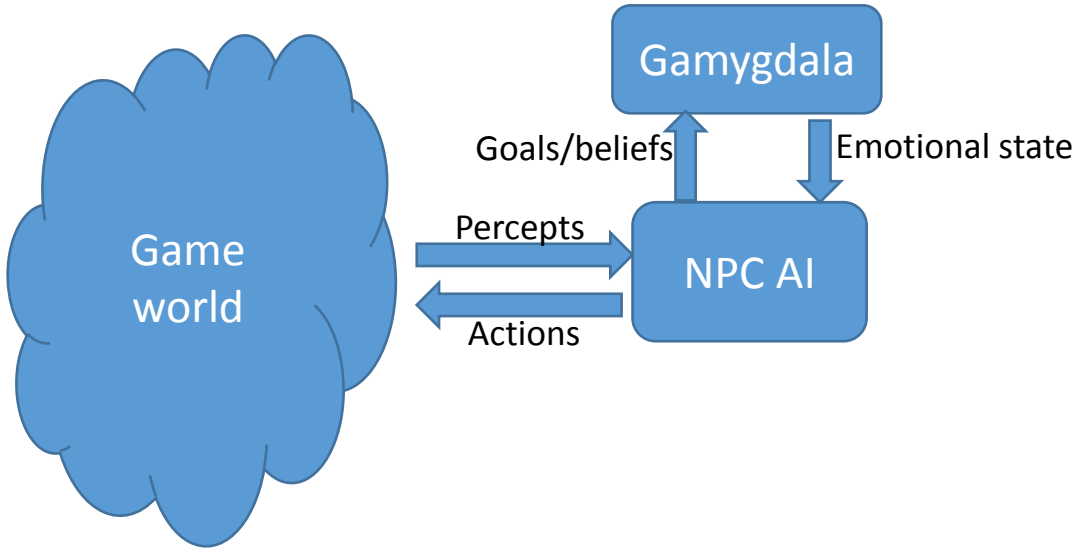
- **GROUP 2**: How to design a virtual human? Implement virtual human in GOAL. See: http://ii.tudelft.nl/trac/goal
- **GROUP 3**: How to integrate GOAL with GAMYGDALA in the GOAL cycle. See: http://ii.tudelft.nl/trac/goal https://github.com/broekens/gamygdala

GAMYGDALA emotion simulation

- Pluggable emotion engine for NPCs
- Black-box scalable emotional assessment
- AI-independent module
- Based on emotion psychology

- **GROUP 4**: How to provide a GOAL with an emotion plugin based on GAMYGDALA. See:
  https://github.com/broekens/gamygdala
  http://ii.tudelft.nl/trac/goal

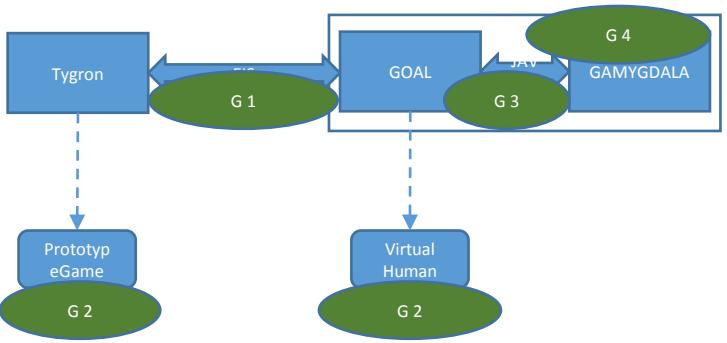
```
adding goal: village destroyed, utility = -0.9,
    owner = self
adding belief: village surrounded, likelihood =
    0.6

Decaying...
Updating...
Recalculating...
recalculating belief: village surrounded
affected goal: village destroyed, valence = 1
desirability: -0.9 <- 1 x -0.9
goal likelihood: 0.8 <- (1 x 0.6 + 1) / 2
delta goal likelihood: 0.8 <- 0.8
emotion intensity: 0.72 <- abs(-0.9 x 0.8)
adding FEAR: 0.72
```



Project overview

Group 1: JSON-EIS-GOAL

- Develop simple EIS game (e.g. pacman)
- Define game interface
  - What GOAL actions/percepts are needed?
  - RQ: What additional logic is needed to enable these?
- Implement JSON-EIS-2-GOAL
  - Start with basic actions
  - Follow up with actions that need additional game logic
  - …repeat iteratively



Group 2: Virtual Human

- Develop test game
- Define mental level abstractions
  - How do you play the game?
- Virtual Human Player
  - Define simple player strategy Start with implementing simple reactive strategy
  - Then emotionally influenced reactive strategy

Group 3: GOAL-2-GAMYGDALA INTEGRATION

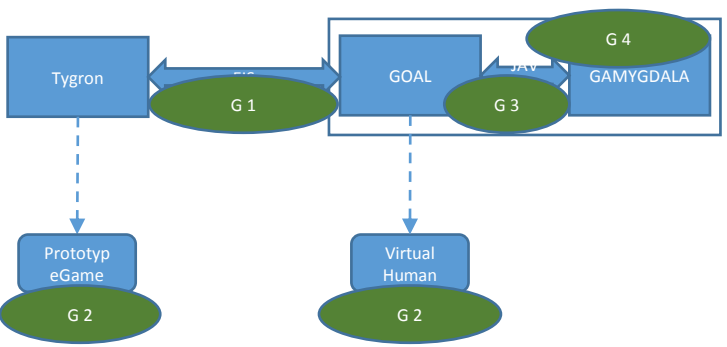
- Develop Jscript-based Emotional game.
- Develop GOAL-2-GAMYGDALA integration
  - Investigate GOAL cycle
  - GAMYGDALA goal binding
  - Then GOAL mental state 2 GAMYGDALA event binding (what is goal congruence)
  - Implement KB rules for congruency + link these rules to goals in goal (is a problem)

Group 4: GAMYGDALA JAVA PLUGIN

- Simple Goal Plugin usable from within a GOAL agent program (ex. calculator).
- Port GAMYGDALA to JAVA
- Develop GOAL-2-GAMYGDALA interface
  - Action/percepts based integration (similar to Jscript interface but in the action/percept interface of GOAL)
  - Simple appraisal module in GOAL
  - Advanced full GAMYGDALA appraisal module

Planning (SCRUM-BASED)

	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9
Group 1	Seminars	Develop simple EIS game	First contact GOAL-EIS-JASON	Basic GOAL actions/percepts	Advanced actions	Advanced actions	…		
Group 2	Seminars	Develop test game	…	Simple reactive strategy Virtual Human	Advanced strategy	Advanced emotional strategy	…		
Group 3	Seminars	Develop Jscript emotional game	Investigate GOAL reasoning cycle	Implement Gamygdala -GOAL goal binding (e.g. on drop)	Implement simple EMO MENTAL STATE binding based on congruency	KB-based knowledge rules for goal congruency	…		
Group 4	Seminars	Develop simple action/percept based plugin	Port GAMYGDALA to JAVA	action/percept based integration of gamygdala	Simple appraisal module in GOAL based on actions/percepts	Full gamygdala appraisal module.	…		



Approach

- SCRUM-based …
  - Every Monday weekly deliverables
  - Every Friday *review meetings* per group
  - Client asks for functions
  - You decide what to implement when.

- Management
  - **You are responsible**
  - One manager per group (decide TODAY in class)
  - One overall project manager (decide TODAY in class)
  - Weekly *progress meetings* with clients (Koen, Joost and SA), and project managers

Roles

- Client
  - Koen is the GOAL stakeholder
  - Joost is the GAMYGDALA stakeholder
  - SA (tba) represents Tygron stakeholder
- Project manager: (Tom Harting)
  - Represents all of you and
  - manages client expectations
  - Voices concerns / unclarities
- Group managers
  - Represents interest of group and make sure
    - GROUPS TALK TO EACH OTHER WHEN NEEDED!!
    - Project manager has all info he/she needs.
    - Leads weekly *review meeting*
    - Provides relevant input for weekly *progress meeting*
  - Group 1 (JSON-EIS-GOAL): BB groep 2 (Paul v d Knaap)
  - Group 2 (Virtual Human): BB groep 1 (Paul Verkooyen)
  - Group 3 (GOAL-GAM-INT): BB groep 4 (Yannick Verhoog)
  - Group 4 (GAM-PORT-PLUGIN: BB groep 3 (Tom Harting)

Agenda

- Coming Friday 9:00 at Tygron in The Hague
- Back at 11:45 for seminar Serious Gaming (Michael Bas) in Delft

- Planned client meetings:
  - Thursday April 30 10:00-11:30
  - Friday May 22 10:00-11:30
  - Friday June 5 10:00-11:30
  - Friday June 19 10:00-11:30

- Every Friday: mail to Joost and Koen with **brief progress summary**. In case any important decisions need to be made, consult client!

Notes and info

- Work + seminars in INSY lab at 2nd floor AT LEAST during the scheduled slots
- Koen (n.a. week 4.3) and Wouter (12th) will be available for questions about GOAL
- Joost is available for questions about GAMYGDALA
- Maxim Knepflé will be available for questions about serious games
- Student Assistant and first line support: Erwin van Eyk

- Communication is always through group manager.
  - Which means the group manager must UNDERSTAND THE ISSUES!!!
  - Important issues known already:
    - Usefull level of abstraction for GOAL actions/percepts for a Tygron game
    - Binding of GOAL goals and mental state to GAMYGDALA goals and events

Product Vision

Group 1: JSON-EIS-GOAL

- Which actions and percepts are needed by virtual human?

Group 2: Game & Virtual Human

- How to design a virtual human for a serious game?

Group 3: GAM-GOAL-INTEGRATION

- How to integrate emotions in the GOAL reasoning cycle?

Group 4: GAM-PORT-PLUGIN

- How to provide goal with emotion plugin support?

And: how does it all come together?

Look for literature that can help you answer these questions

Material and sources

- Github:
  - https://github.com/broekens/gamygdala
  - https://github.com/goalhub
  - https://github.com/eishub

- Papers and websites (see BB for all):
  - Alexandru Popescu, Joost Broekens, and Maarten van Someren (2014). GAMYGDALA: an Emotion Engine for Games . *IEEE Transactions on Affective Computing, 5(1),* 32-44
  - Hindriks, Koen V. "Programming rational agents in goal." *Multi-Agent Programming:*. Springer US, 2009. 119-157.
  - GratchEtAl2002 Creating Interactive Virtual Humans - Some Assembly Required
  - Hindriks, K., van Riemsdijk, B., Behrens, T., Korstanje, R., Kraayenbrink, N., Pasman, W., & de Rijk, L. (2011). Unreal Goal Bots. In F. Dignum (Ed.), *Agents for Games and Simulations II* (Vol. 6525, pp. 1-18): Springer Berlin Heidelberg.
  - www.joostbroekens.com/gamygdala
  - http://ii.tudelft.nl/trac/goal/
  - http://www.tygron.com/