Challenges and Expectations in RoboCupRescue

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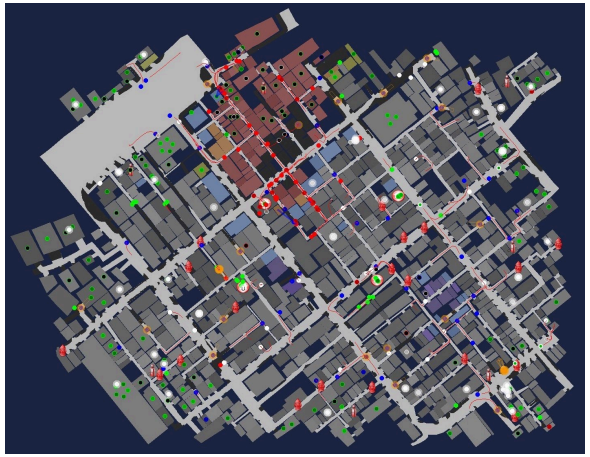
RoboCup and Disaster Relief

RoboCup: A Big AI and Robotics Project

More than 3,000 participants from over 40 countries !

Soccer

Rescue



@Home, etc …

Major Differences between Soccer and Rescue

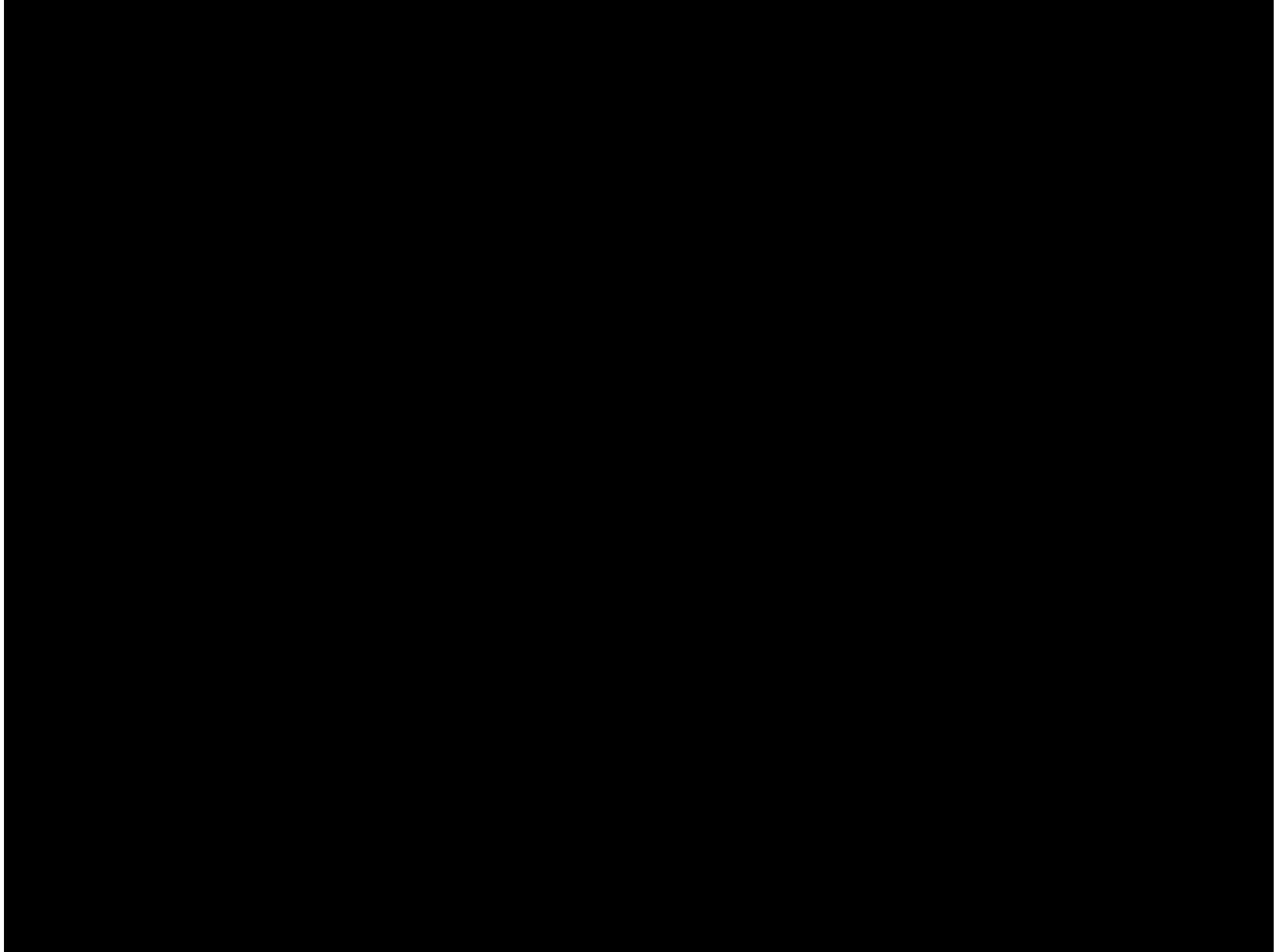
The results of soccer cannot be applied directly to rescue.

	Soccer	Rescue
The Number of Agents	22 (11 vs 11)	Unspecified large number
Types of Agents	FW, MF, DF, GK (generally)	Many types Fire brigades, Fire Offices, Police forces, Police Offices, Ambulance Teams, Ambulance Centers, Civilians…, etc.
Abilities of Agents	The same abilities, except for GK	Different abilities for each type
Control	Autonomous Decentralized Control	Combination of Centralized and Decentralized control

Rescue is a more complex problem than soccer.

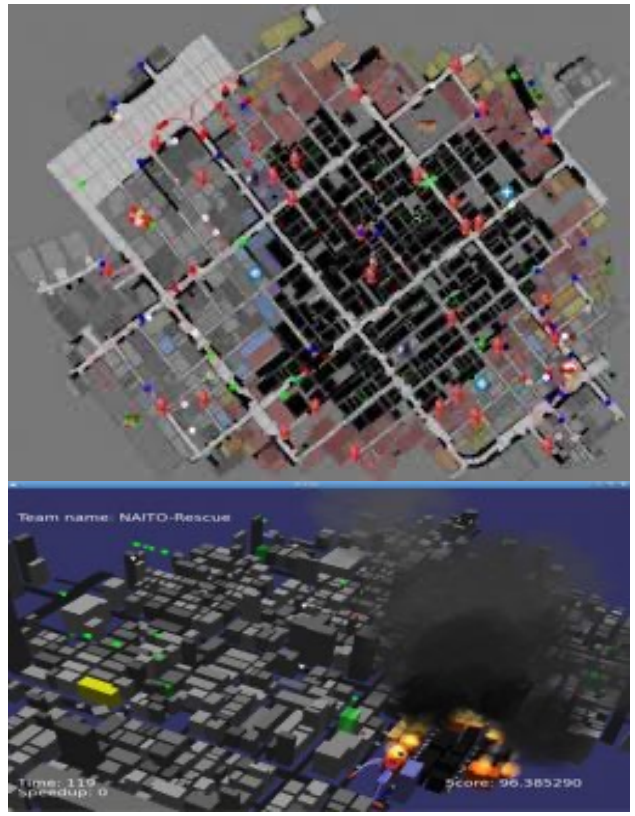
Promotion movie of RoboCupRescue

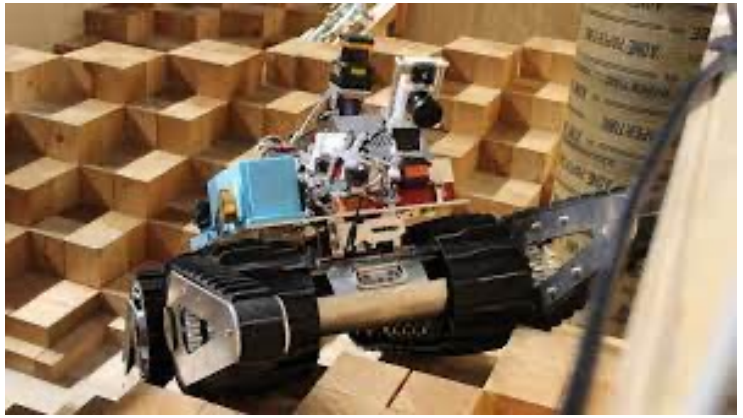
by Geo Technical lab and Zenrin, Japan



RoboCupRescue

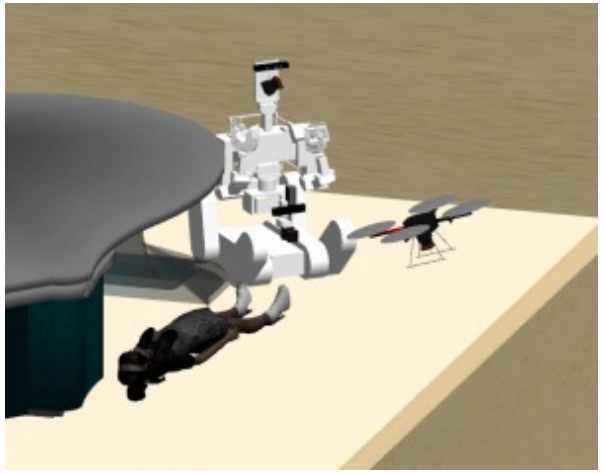
Simulation League, Agent Competition (2000～)





Robot League (2001～)

Simulation League
Virtual Robot Competition (2006～)



The Roadmap of RoboCupRescue in Starting

～2000.6　Open Prototype Simulator in Public and Call for Participants
(Hakodate Japan Open, ICMAS Boston, Melbourne RoboCup WC, etc.)

～2001.8　1st Research Evaluation Conference

～2005.4　Full-Scale Simulation

～2020　Contribution in Real Disaster Fields

～2050　Mighty Rescue Robots in Practice
Contemporary ‘Thunderbird’ for S&R
(Satoshi Tadokoro, ICRA2000)

Disaster Relief Problem

Rescue Platoons

Rescue

Heterogenous
Decentralized
Strategy

Disaster struck area

Info. Gathering /Sharing

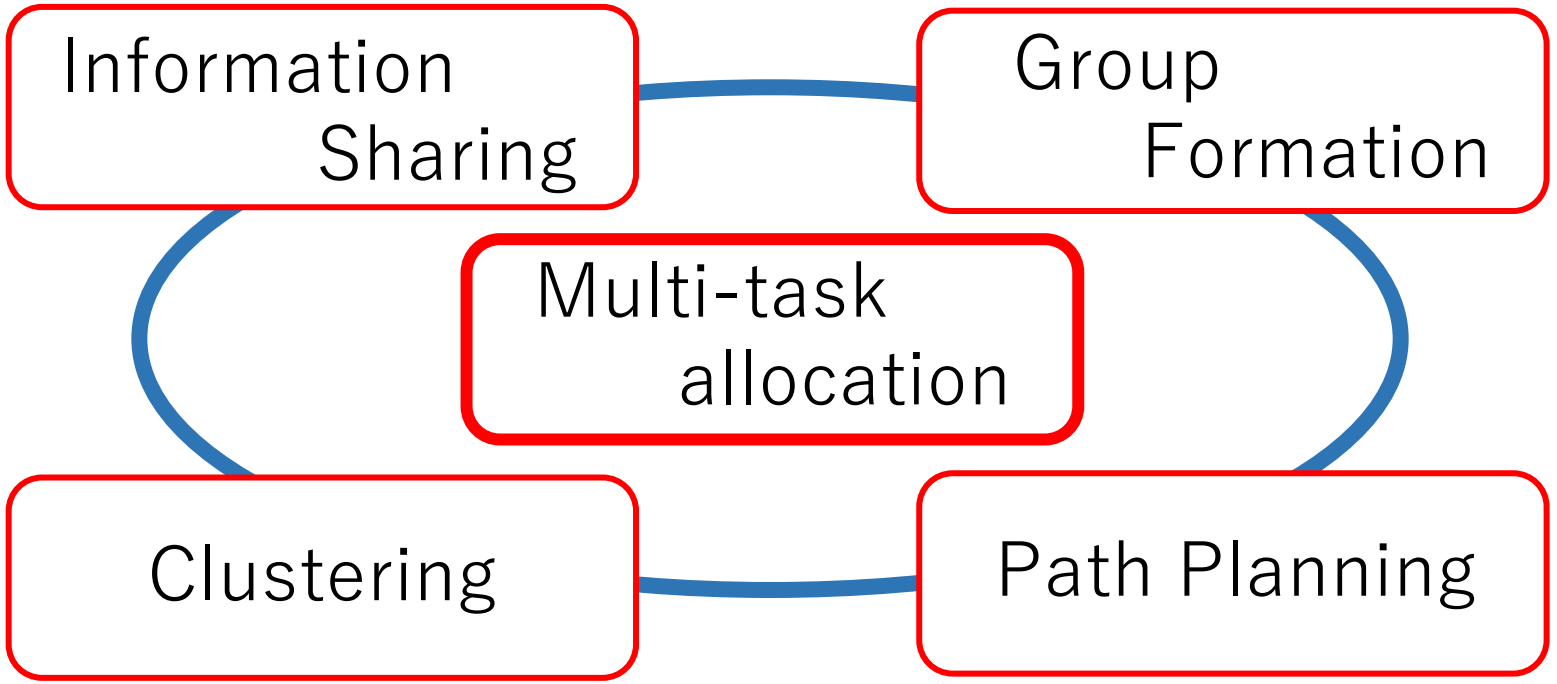
Multi-task allocation

Cooperative Protocols

…

Current Issues in RRS

Under Centralized and Decentralized Control



Partial observation, local (not global) communication

Major Challenges in RRS (Agents)

Project Challenge

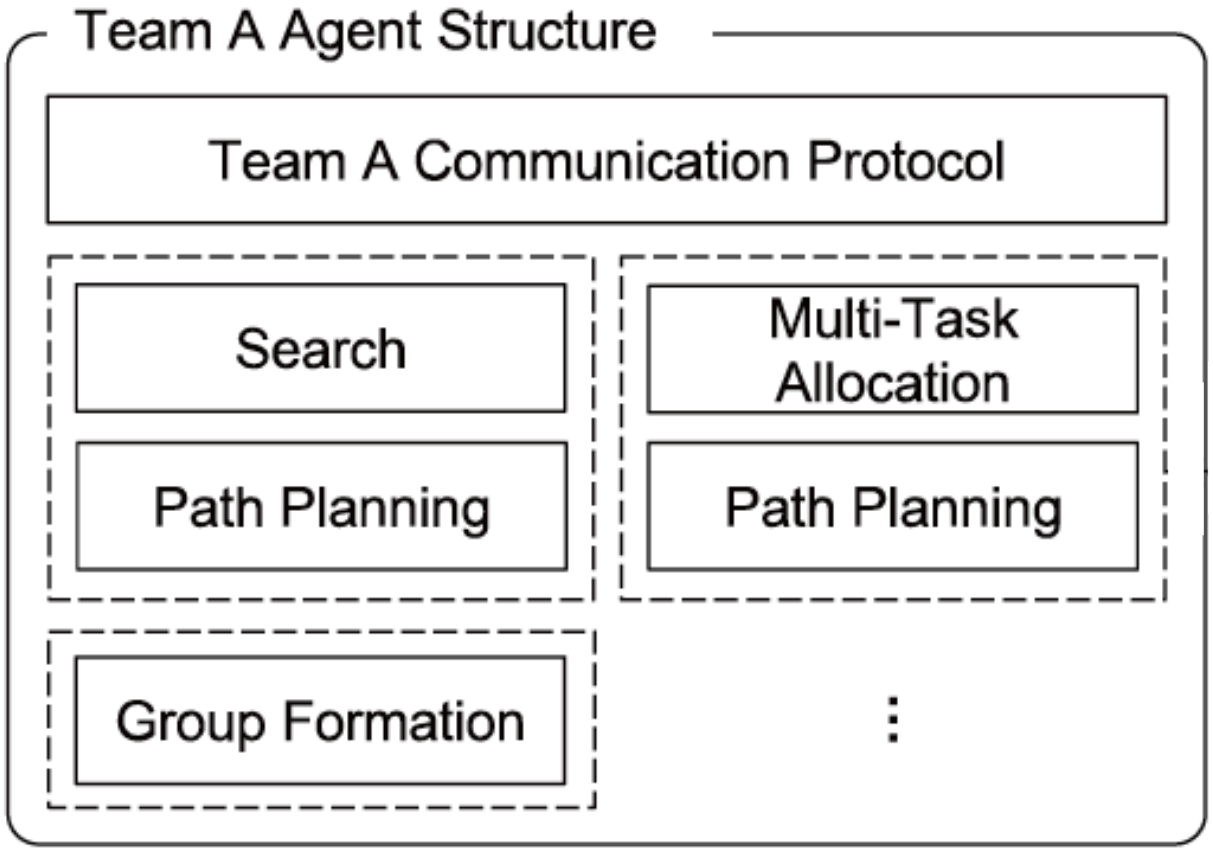
- Centralized/Decentralized Control and Management
  - ➡ Full/Partial/No communications
- Centralized/Decentralized Multi-Task Allocation (Now)
  - ➡ Focus on rescuing civilians

Infrastructure Challenge

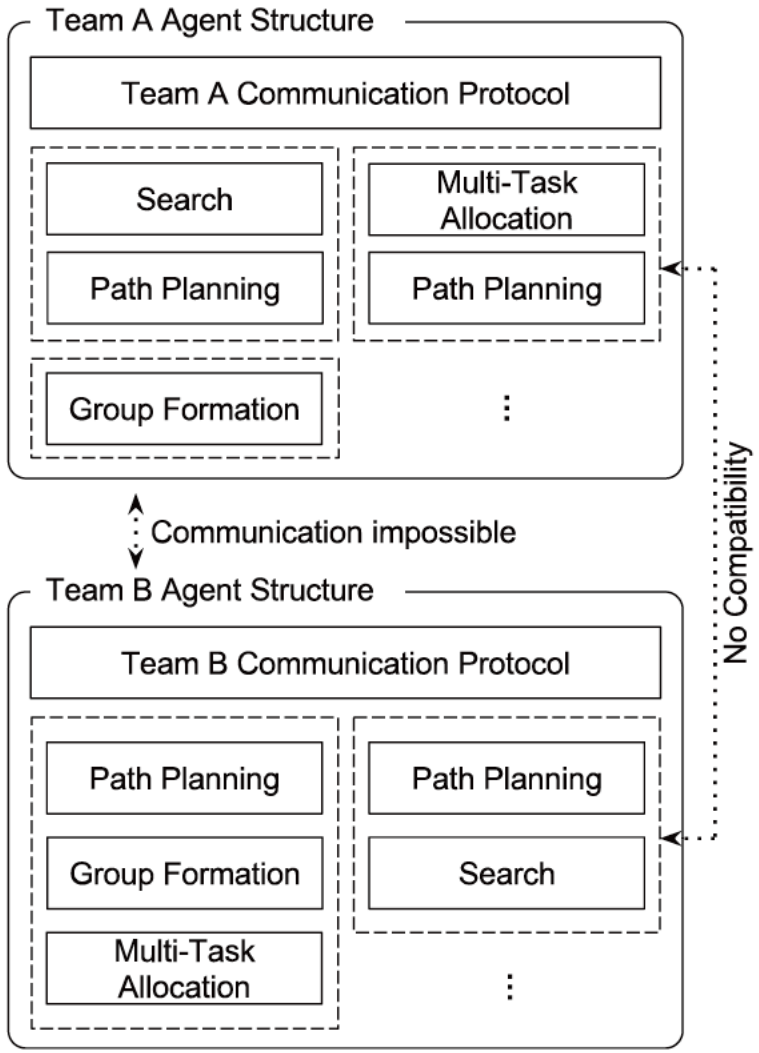
- Component Sharing
- Benchmarks for teams and the scientific community
- Reference teams to support entrance in the competition as well as the development of learning approaches
- Reusability of teams code for researches and competitions
- Integration of agent and virtual robot competition

Agent Development Framework (ADF)

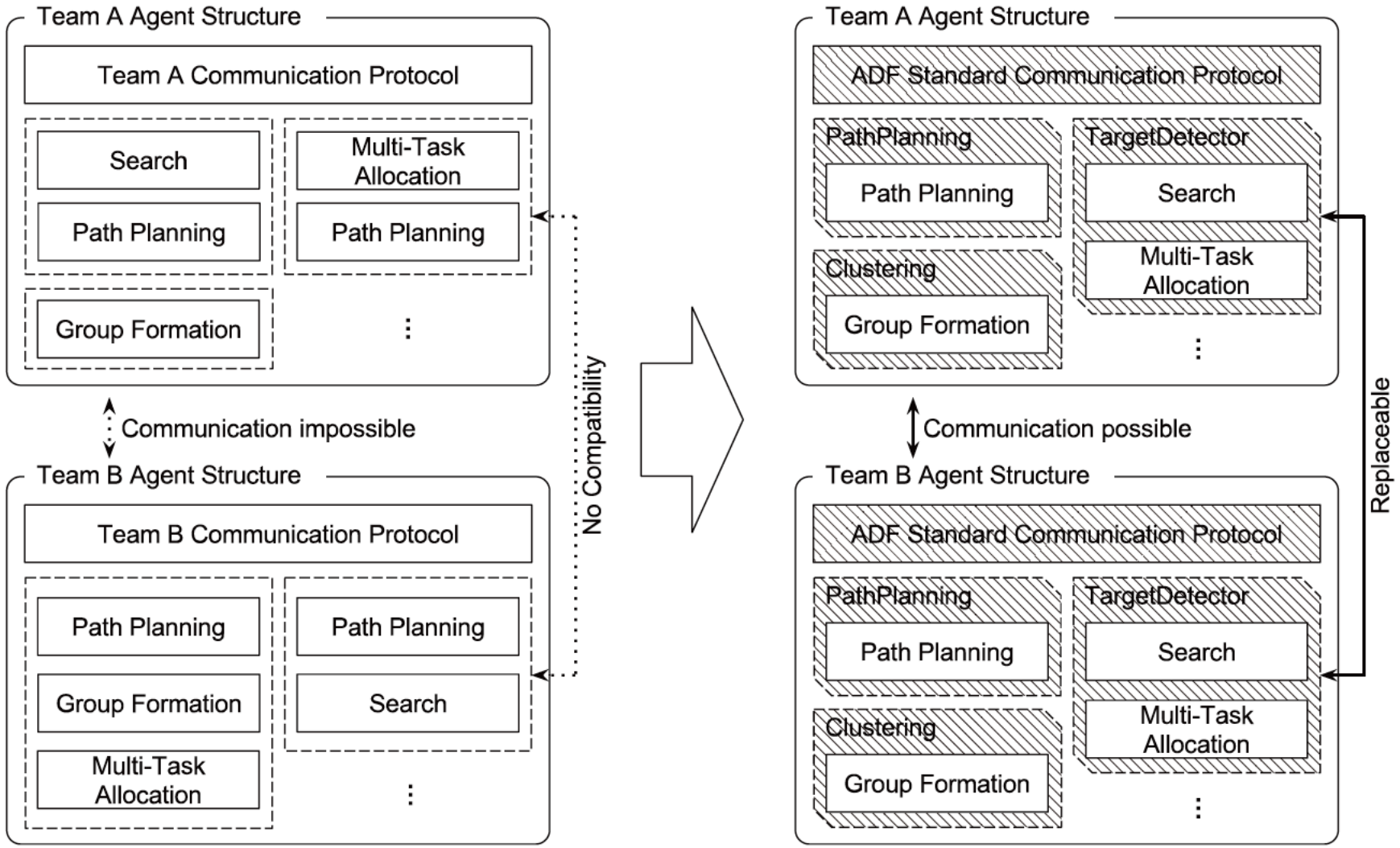
Normal agent structure before ADF



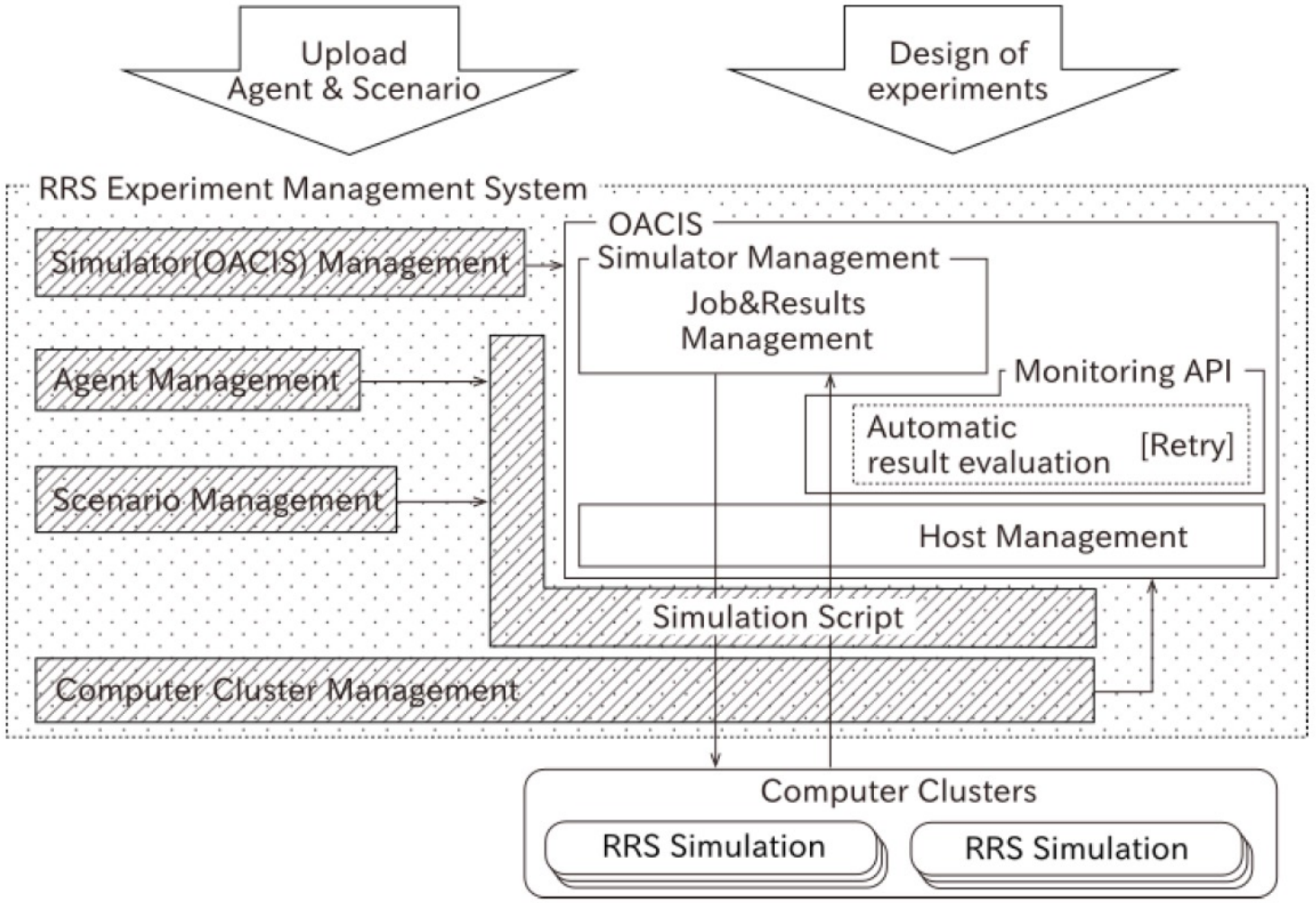
Agent Development Framework (ADF)
Combinations with other teams



Agent Development Framework (ADF)



Simulation Management System (RRS-OACIS)

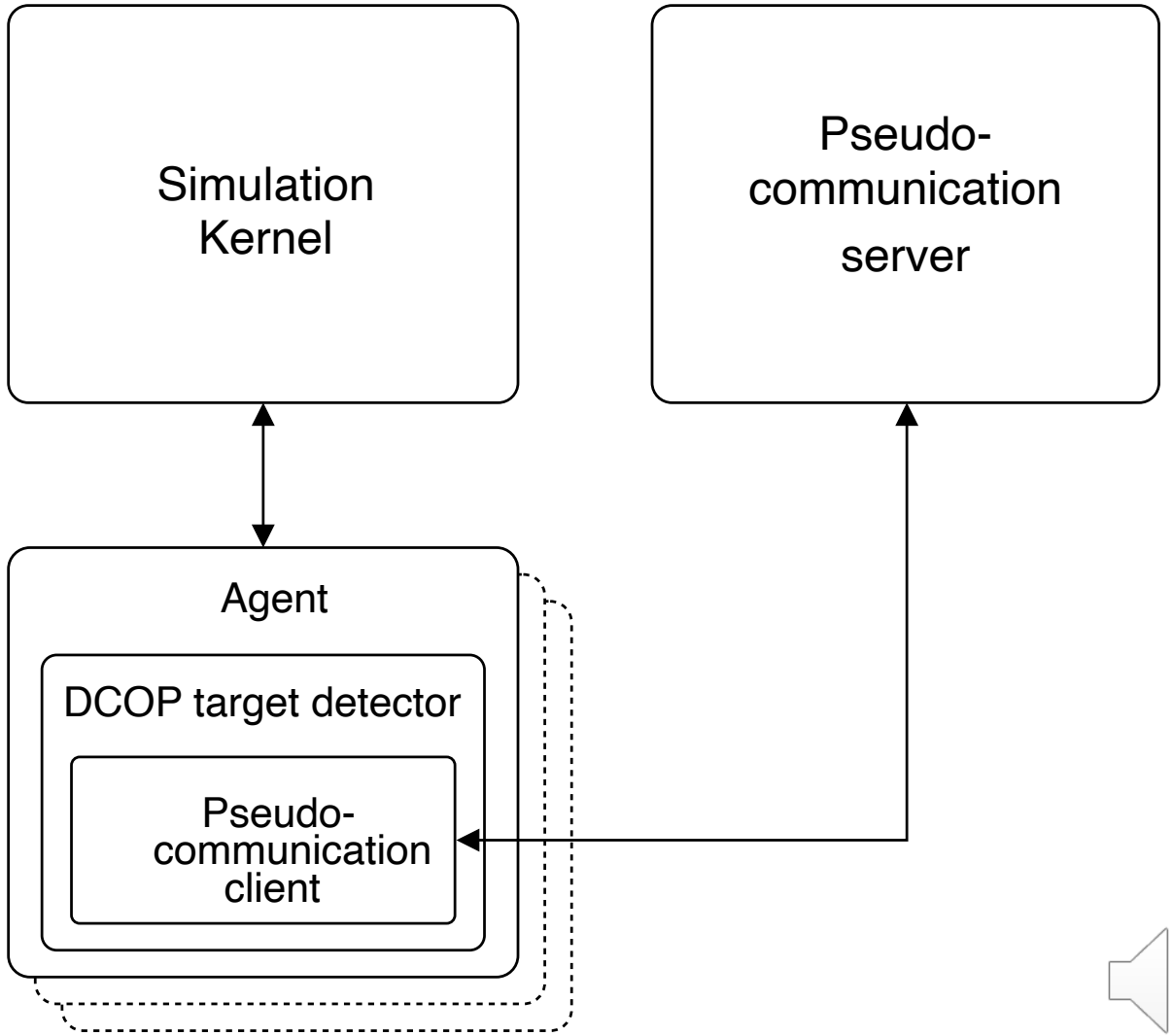


DCOP Module for Rescue Simulation

Multi-Task Allocation in RRS

modelization

Distributed Constraint Optimization Problem (DCOP)



3D Viewer for RRS

Expectations for Future

- Linking RoboCupRescue with other competitions
  - It is important to be aware of how our results will be used in the end, and to have concepts that takes into account their relationships.
    - Consideration of collaboration between agent and virtual robot competitions
- Contributions to real world
  - Making a challenge an activity needed in the actual disaster area and the field is effective.
  - Not only the scenario immediately after the disaster, but also the scenario after a while after the disaster is good.
- Academic challenge
  - Actively take on academic challenges and promote the League.

Thank you