Abstract—The statement of Multi-Agent technology is to solve the complex distributional real world problems, and develop the large-scale smart software system, which is in the dynamic and indefinite environment, vigorous and healthy. The intellectualized management experiment platform is an effective tool to enhance the organization's decision scientific nature, the accuracy and highly effectiveness, save the costs and the circumvention risks, and promote the competitiveness. The paper proposed an intelligent decision simulation experiment system (IDSES), which is based on the multi-Agent technology. It carries on the simulation to the discrete event of the management activity in the real world, and it has characteristics of complexity distributional, dynamic and environmental uncertainty, and so on, it is a large-scale simulation experiment platform. The paper elaborates this system's architecture and ultra strong experimental ability in detail. It designs functions and structures of the involved Isomerism Agents, which are more than 20 kinds, and it gives the work flow diagram of the planning subsystem. The IDSES is based on the Internet. Composed with the traditional simulation, it has expanded the functions of strategy gambling and the machine plan, and it will completely integrate the plane (decision-making) from the operation level to the strategic level into the experiment system, using the method of person - machine interaction, the person - person interacting and the person - machine - network interaction to achieve the experiment effect of program planning, the program evaluation, the comparing and choosing of program and the strategy gambling simulation , it has outstanding features of integrated, visualized, intellectualized and open.

Keywords-management experiment; system simulation; intelligent decision; multi-Agent technology; system design

I. INTRODUCTION

The management experiment has an extremely important role for Organizational decision, such as improving design to reduce costs, measuring decision-making to risk-averse, heightening efficiency to shorten the cycle, simulating reality to lessen material consumption.

With the scale increasing huge and the structures increasing complex of human research object, organizational decision contents difficulty the increasing demands by people experience and traditional technology only. Simulation technology is built on the concept of experimental. Because the constraints of time and money, an institution has been unable to bear the risks from failure when it should decide to use a new design or new strategies, at this time, the simulation technology can help us to reduce the risk of failure.

Decision-makers can know the feasibility of the design or strategy through the situation of virtual reality by computer, thereby make wise decision. The technology of United States, Japan and other developed countries is leading in management experiment and computer simulation, such as WINTNES, FLEXSIM, RaLC and other tools have been developed one after another, but these simulation tools are used mainly for operating level such as physical planning and process simulation. The main simulation method of these tools includes mathematical simulation, vector graphics and three-dimensional model. These tools possess some flexibility and visual effect, however, the degree of intelligence and integration is low, and function is simple. And the competition from the modern organization is increasing lean that they might loss opportunity because a mistake, so an intelligent decision experiment platform is critical for the organizational decision with science and effective. IDSES apply synthetically cloud computing and a number of new technologies in modern artificial intelligence, such as multi-agent technology, natural language processing, machine learning, knowledge discovery and so on, possess more intelligent, open, integrated and comprehensive than the function of traditional simulation systems.

II. ABILITY AND STRUCTURE OF IDSES

The IDSES is the development and breakthrough of managing experiment methodology and the computer simulation technology. This system may apply in the operating decisions of enterprises, the government management decision, the army directing decision, colleges and universities education training domains and so on.

A. System Capability

1) The formulation of each kind of solution. Using this system's plan subsystem, the user may input the questions to be solved, the parameters of the question, and anticipated targets in the man-machine contact surface. The system searches the similar question on the database and the Internet, and finds optimal solutions according to the parameter and the goal and gives less than three simulation results. If not found or the user feels unsatisfied, it may carry on the machine plan. The system constructs solutions on the basis of question category, parameter, goal and existing logics, and the user may use system compiler to edit logics. The user may make the revision to the plan.

2) Appraisal of each kind of solution. Using this
system's appraisal subsystem, the user may draw up the plan; input the implementation environment parameter, the anticipated target in the man-machine contact surface. The system carries on the classification and the standardization to the plan (transforms system approval data format), carries on the logical reasoning simulation according to the appraisal logic under the environment parameter which the user provides and carries on the comparison with the user’s goal, and it gives the measuring results. The user may edit the appraisal logics, request the system to search the similar plan on the database and the Internet and carries on the logic reasoning to compare and to give the comparison conclusion, the user makes the plan revision according to the conclusion.

3) Choices of each kind of solution. Using this system's policy-making subsystem, the user may input the multi-wrap solution in the man-machine contact surface (to be directly carried on by the 3D modeling, the 2D modeling or text description) and the targets which the plan needs to display. The system carries on the simulation on the basis of the solution, the environment parameter proposed by the user, and carries on the quantitative analysis to the targets which are cared by the user, gives the divided target experiment conclusion and the total performance experiment conclusion to be chosen by the user.

4) Strategy gambling of each kind of solution. Using this system's gambling subsystem, the user may carry in-line resistance or the man-machine resistance (by on-line resistance primarily). The user draws up the good solution using the man-machine contact surface according to the step input, the system carries on the simulation to the strategy according to certain logic rules and all resources, then will feedback the adjudicated statement to the user, the various users make the plan of next step according to the situation and then implement. When the gamble achieves the finishing condition, the system feedback all quarter’s simulation results of victory and defeat, profit and loss. This method is suitable for military struggle gambling and the enterprise management gambling, may examines organization's strategy feasibility and the probability of victory and defeat.

B. System Structure
  1) Four functional subsystems
     a) The plan subsystem: Take plans Agent as the core, through the machine plan and the artificial plan, issues the system structure and the function plan and the optimized goal in the constraints, and gives the simulation result feedback to the user.
     b) The appraisal subsystem: Take appraises Agent as the core, carry on the simulation, infer and give the improvement comment and the feasible target to the plan

unifying the rule, logic and the information.

   c) The decision-making subsystem: Take decision analysis Agent as factor under and so on core, through to 2 sets of above plans in goal, cost, environment, match restraints carries on the comparison inference and the simulation survey, puts forward the choice proposal.

   d) The gambling subsystem: Take gambles Agent as the core, through the man-machine or on-line simulation gambling, under certain referee rule, carries on the appraisal and the ruling to the strategy achievements, examines the strategy strain capacity.

2) Four kinds of databases
   a) The material database: it is used to save and provide the source material which the graph simulation needs;
   b) The knowledge database: it is used to save and provide the expert knowledge which the experiment rule, the management knowledge and the information data the experiment needs;
   c) The logic database: it is used to save and provide the work logic which the experiment needs;
   d) The example database: it is used to save and provide tests same or similar case which the successful model and the experiment need.

3) Four-layer Agent architectures
     Functions level: Including 9 kinds of Agents, which fulfill the surface function of the system.
     a) Person-machine Interface Agent: The reactive type, which is used to gain the information, provide the conclusion and the explanation mechanism to the user, and request user input required information [2].
     b) Plan Agent: The mixed type, which is used to accept the user’s the plan experiment to establish the plan restraint, the planning model and the plan territory, and integrate various duties Agent the plan result, form the total plan document.
     c) Evaluation Agent: The mixed type, which is used to accept the user’s appraisal experiment to establish the appraisal indicator system and the test collections care about the goal to the decision scheme user to carry on the comparison appraisal and the logic reasoning appraisal form the appraisal plan.
     d) Decision analysis Agent: The mixed type, which is used to accept the user’s decision analysis experiment to establish the policy-making restraint, the simulated target and the choosing mechanism, compares and analyses each kind of plan which the user submits, forms the policy-making opinion.
     e) Gambles Agent: The mixed type, which is used to accept the user’s gambling experiment to establish the referee model, the inference mechanism and the gambling restraint, it decide each kind of plan which the user
submits, and form the gambling result.

f) Explaining Agent: The mixed type, which is used for the experimental result to carry on essential, reasonable to the movement process explanation, gives the user the result feedback for the man-machine contact surface Agent output [3].

g) Manual intervention Agent: The reactive type, it is used when the resources are insufficient, starts the corresponding procedure, intervenes processing by the user.

h) Restraining Agent: The reactive type, which is used to solve restraint satisfaction in the decision experiment process, mainly solves the common and restraint problems.

i) Reasoning Agent: Namely the inducing equipment, the mixed type, depends upon the expert knowledge and the strategy carries on the fact deduction to the machine plan, gives the improvement comment to plans Agent.

Action level: Including 9 kinds of Agents, it is used to realize the system’s operating function.

a) Duty Agent: The mixed type, accepts the question and the parameter through upper formation Agent, in plans under the Agent control, carries on the question according to various projects Agent ability and the condition to decompose, the task allocation for corresponding project Agent, simultaneously collects project Agent the plan sub-document feedback for to plan Agent.

b) Goal Agent: The reactive type, through gambles Agent to accept the question and the parameter, seeks for on-line gambling goal and the strategy on the LAN and WAN and feeds back for gambles Agent.

c) Strategy Agent: Same duty Agent, it is only different in control and the transmission object, and the final form is different.

d) Project Agent: The mixed type, is the main body to complete the experimental duties, undertakes the concrete experimental duties. Each project Agent will act according to ability which reads to decide whether to accept the experimental duties or determination experimental duties some part, may carry on the consultation, the inference in the experiment process with other project Agent to cooperate to obtain the experimental result. Project Agent may grow next work Agent. From top to bottom the question abstract degree reduces unconcealing, the following level is the preceding level refinement and launches, macroscopically displays for a succession of question solution moves[4].

e) Work Agent: The mixed type, is the foundation unit to complete experimental duties, according to the obtained sub-question and the parameter, use related information to product foundation experimental result and gives feedback to project Agent.

f) Information Agent: The reactive type, is responsible for each kind of information which collects first-level Agent to need and carries on the feedback, possible need many information Agent to complete the different task and to carry on the consultation and the cooperation.

g) The natural language processing Agent: The mixed type, which is used to process the user in the experiment system contact surface input and the system output large-scale real text, carries on the information retrieval filtration and the information extraction, transforms the system recognition the succinct standard data by the generation of core Agent processing.

h) Simulation Agent: The reactive type, it is used for the standardization decision scheme to carry on mathematics process simulation and to calculate and outputs result.

i) The graph simulating Agent: The reactive, it is used for the simulation process to realize the visualization performance with the suitable graph (two-dimensional, three dimensional), simultaneously has the spatial parameter and the behavior parameter computation function.

Communication level: Communication Agent, the reactive type, which is used to realize the function of system communication and the data’s lining up. It processes the knowledge about information service and other Agent request, and provides the registration for the Agent, correspondence which is based on the news, provides the functions of matching for the news providers and explanation processing [5]. Corresponds Agent carry on the news through the route repeater or the service provider related information will inform directly the request service Agent, when having the full information in the situation, the Agent may direct communication alternately.

Resources level: Including 6 kinds of Agents, which are used to realize management function of the system data.

a) The material base managing Agent: The reactive type, which is responsible for the element materials storehouse, the management maintenance, the source material combination and the source material movement.

b) The knowledge base managing Agent: The mixed type, is responsible for knowledge library's maintenance, the knowledge's comparison and renewal and based on the knowledge inference work.

c) The logical base managing Agent: The mixed type, is responsible for the maintenance of logical storehouse, logic transfer, the logical match and inference work which is based on the logical.

d) The example base managing Agent: The mixed type, is responsible for the retrieval, the match, the
revision, the multiplying of the model storehouse, and other functions, which are based on the case-based reasoning corresponding function. Through carrying on the multiplying to the past good solution result, might enhance to the new question solution efficiency.

e) The long range data mining Agent: The mixed type, which is used to carry on his long range data when the local data is deficient, examines the data with the data conflict and the redundancy resolution.

f) Examines Agent: The reactive type is responsible for the data examine.

III. DESIGN ON THE AGENT STRUCTURAL OF IDSES

There are some differences of type and structure, because functions and roles are distinctive in IDSES. Some Agent are used reactive type so that is improved the response speed and is reduced the difference of development; other are used mixed type so that is improve their intelligence for solve more complex problems. The figure 1 shows the Agent structure of each layer that having different type and representative features such as planning Agent, simulation Agent, Long range data mining Agent and communication Agent in the four-layer architecture of Agent of the system.

IV. PROCESS DESIGN OF IDSES

The workflow of each subsystem in IDSES is different, because each subsystem exists some different at experimental methods, purpose and process. The process design of planning subsystem as shown in Figure 2 (flow diagram of other subsystems to omit due to the space is limited).

V. CONCLUSION

Combining the management Experiment methodology and studying to existing computer simulation tools, the Paper presents an intelligent simulation experiment platform which based on internet parallel computing and multi-Agent technology and explains system design. As cross-cutting areas of the computer simulation, artificial intelligence and management experiment, IDSES takes heterogeneous Agent creative and collaborative of Agent group as a protagonist of decision experiment and system simulation with creative and effectively improves the degree of the management experiment method and computer simulation technology, intelligence, complicating speed and integration level. The system provides sufficient flexibility and friendliness so that users needn’t to importation with format and more manual intervention. The design and Development of IDSES upgrades the traditional system simulation technology for operation management to strategic management level, and will lead the study of Chinese management experiment that independent existence and slow development into the era of Internet and Agent, at the same time will also cause more extensive research about the management experiment and systems simulation in the field of system engineering.

REFERENCES

Figure 1. The design of key Agent

Figure 2. The flow diagram of planning subsystem