

Conceptual modeling method of communication network in air defense combat simulation

Zhan Qian¹, Fan Rui²

1. Ordnance Engineering College, Shijiazhuang, 050003.

2. The Academy of Armored Forces Engineering, Beijing, 100072.

Abstract: The development of information technology greatly promote the development of communication network, how to planning, construction, use of the communication network is a hot topic nowadays. Provides a method for the research of communication network modeling and simulation, the establishment of an appropriate model is one of the key. How to describe the model, which makes the model easy to understand, and exchange modify, reduce the differences between technical personnel and application personnel, is to provide tool support must be considered in the modeling problem of the. UML language with its unique advantages for modeling, this paper discusses the basic method, establish the communication network conceptual model using UML language procedures, that established by UML The conceptual model of communication network is feasible and can meet the needs of subsequent simulation and analysis.

Abstract: communication network; conceptual model; Unified Modeling Language

Introduction

Air defense is an important part of modern warfare, under the support of information technology, cooperative ability to further strengthen the air defense weapons unit. In simulation of air defense combat, distribution of forces in weapons, equipment, security aspects have different levels of research, has made remarkable achievements, in order to further study and performance requirements the communication network in the air, to further improve the air defense simulation and actual similar degree, introducing communication network elements in air defense battle is a problem to be solved.

In order to make full use of air defense simulation results have been introduced, the communication elements in air defense combat simulation system in the conceptual modeling problem of a basic work is the communication network, so as to modelers, developers to form a unified understanding of the communication network, this paper to solve this problem, explores its conceptual modeling method.

1. Modeling method based on UML language

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UML (Unified Modeling Language) is a kind of object oriented modeling for system analysis and design language. The language concept clear, concise graphical modeling notation, clear structure. It provides the definition of model elements and the standard object-oriented representation, and the representation of the law, making the rule-based modeling on the system, establish a clear relationship between the conceptual model and the executive body, is conducive to the realization of the concept model and computer simulation model in the construction of ideological line.

In accordance with the specification of UML in modeling, conceptual model description, including environment, entity, task, activity and interaction (EEMAI) and other aspects. The communication network, the external operating conditions by the environment described by static structure entity description, dynamic behavior and the main function of the action, task and interaction are described. These basic modeling elements in the communication system as the core task, to describe the basic concepts and their relations.

This paper, focusing on the entity, task, activity, modeling the three aspects of interaction description are discussed.

2. Entity modeling analysis and description

The entity is one of the most important concepts in the conceptual model, with information, and the identification of people, objects or concepts. In the communication network, including entity node, link and network, and the nodes can be subdivided into switching node, relay node, terminal node; link can be subdivided into optical fiber, twisted pair, coaxial cable. Short wave, microwave and satellite links; network is the "node + link" communication sub components according to a certain topological structure of the network entity.

Generally speaking, the formal description of entities including entity identification, attribute description and relationship description of three parts. The first step is to identify the entity entity description; entity attribute is the basic sign of substantive differences with other entities; the entity relationship contains two static and dynamic.

2.1 Node description

The node is one of the basic elements used in network modeling. The node category and its position in the conceptual model.

In the communication network in the conceptual model, nodes exist as an abstract entity. Such as the exchange node, terminal node entity based on inheriting Abstract node attributes, and the specific protocol associated after the implementation of specific data processing functions.

It should be said that the air defense combat simulation, the introduction of communication network elements, node types used in relatively small, with the performance parameters of various aspects of the structure and configuration of the knowledge acquisition is relatively easy. As an entity, in addition to public property with the entity node has its own attributes, can be according to the performance of induction care. The air defense combat simulation

Generally speaking, the understanding of the requirements of high reliability simulation of communication network is more comprehensive, which are used in the simulation of the number of attributes will be lower than the reliability ratio of the simulation. The diversity of simulation needs, can not be given for all entity attribute simulation requirements, need to according to the characteristics of simulation are extracted and expansion.

2.2 Link description

Links are basic network entities, including media that connect different hosts, terminals, or networks, such as twisted pairs, coaxial cables, microwaves, fiber optics, satellites, etc. the property sets of the links are relatively simple.

2.3 Communication network topology description

The topology of the network belongs to the category of entity relationship, describing the connection between node and link. Network topology is divided into: tree, ring, mesh, star, bus, and ring type satellite network. In essence, the network can also be regarded as an entity, the node, link the agreement and compounded.

In the network analysis and description, is generally from the top of analysis, and then consider each subnet topology. In the description, to focus on the concept of interface. From the functional perspective, the interface is transmitted between the network middleware. Each sub network can have their own unique topological structure, respectively the network is described, then the network is connected through the interface, and connected to the network and can be used as a more advanced network subnet interface connected with it.

3. Modeling, analysis and description of tasks

The task is action or operation of one or more entities to reach a purpose to perform a task. After the decomposition, the final performance of small operations.

Task is to describe the activities, including activities and activities of the target, can be broken down into sub tasks. The layer decomposition is an effective method to describe the tasks. In the description of the communication protocol, the task performance for agreement to complete the function, task decomposition function decomposition. In the description of communication process that can be decomposed into the communication process of each step.

Task description is mainly used in the UML case. In the conceptual model of the formal description, can put the case for the task of high-level description, case is the visualization of the conceptual model of high-level tasks, it helps to understand the relationship between tasks and task, task and trigger.

The trigger task is an entity in the conceptual model, the general performance in the communication network terminal, request to be transmitted all the data. The trigger is not equivalent to the general task executor. Communication network can trigger and executor of the same or different, according to the needs.

Task relation description consists of three parts: relation description between task and task, description of relation between task and trigger, description of relation between trigger and trigger

A description of a task using a use case diagram is a high-level description that helps to understand the overall implementation of the task and is useful for task analysis. The details of the task execution are reflected in the process description

The basic task of communication network is the transmission of all kinds of information. During the transmission, the reliability and security of communication are guaranteed. The main tasks of communication network include network planning, communication service, network dynamic management and so on.

4. Modeling, analysis and description

In the description of activities before the first definition requires action. Action is to change or transfer an event

caused by natural or human forces. For example, the mobile communication, perception, monitoring and so on.

Activity is defined as "entity + action", the action can also be classified according to the level of abstraction, and according to the different levels of abstraction can be decomposed, the abstract action decomposition for specific action. Therefore, in the description of the activity, action reasonable decomposition is an important content of action is described. Is to enhance the reusability, actions and entities are the two basic elements, is an important guarantee for the reuse of the new action can be based on the existing action on the composite by itself can also be added to the existing set of movements for reuse; the two is to provide the necessary information for combat simulation, the simulation used in the development of the information warfare detailed, The reliability of simulation results is higher, the same action, factors affected the implementation of the different execution results are also different, which requires a reasonable description of the action. The action of communication network is mainly to the communication action is extended, including control, receiving, sending, and management.

A detailed description of action description into action description and action process and state of the two steps. A detailed description of the specific action is that in the process of action according to the simulation needs, depending on the simulation purpose and needs. Actions include simple attribute and complex attribute, can be described by using UML. The simple attribute can be directly described in the properties bar, complex property can be constructed by using the Category attribute type identification and action of paradigmatic relations association. Detailed descriptions of the attribute information of action logic view in UML.

5. Interactive modeling analysis and description

The interaction for entities, activities and activities, homework and assignments or entity, activity, operation concept relation between body truthfully message passing between the input and output, etc., it displays for sending or receiving.

The conceptual model in communication network, including: interactive forwarding, sending and receiving entity. Through the implementation of specific tasks will be interactive, interactive different types imply different kinds of entities. Each task must use interaction Description Description. Description of interactive content mainly includes: sender, receiver the contents of the message, the message name, and send the order of the messages.

Determine the message content and message order is mainly based on the process description for a task, interaction occurs according to different process, information exchange process to determine the message content and message order.

UML description of the interaction is mainly in the sequence diagram. Describe the steps for interaction:

- (1) establish a sequence diagram for each high-level task;
- (2) for each high-level task, the corresponding process tree is found;
- (3) in order to check every node tree, followed by record executive process and different information exchange of information exchange, according to the determined message name, category and content;
- (4) describe these messages in a sequence diagram

Conclusion

In the air, the communication network is very important for the collaborative ability generated by means of simulation, so the introduction of communication network elements in simulation of air defense combat, the establishment of the corresponding model, an effective method of air defense the whole ability of the. UML language as a normative description of the model, can help clarify ideas in modeling and analysis of personnel to establish the communication network in the conceptual model, and provides a good platform for users and technical staff, so that both sides know to be unified, so as to improve the efficiency and rationality of the communication network of air defense combat, but also for all kinds of communication network itself provides Feasible scheme.

Reference

1. Zhao Chungang, UML practical basic course [M]. Beijing: Peking University press, 2013.
2. Cao Yuhua, Cai Youfei. Military conceptual model and its modeling method [M]. Beijing: People's press, 2003.
3. Sun Yuhu, Bai Yanqi, Zhang Xuemin. A military concept formatted description method of [J]. computer simulation, 2013,30 (9): 18 - 21.
4. Xue Qing, Zhang Wei, Wang Ligu. Equipment Combat Simulation [M]. Beijing: Ordnance Engineering Press, 2006.