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Suspention and Resumption of Network Experimental Environments

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Technologies that are not verified enough have the possibility of including problems. The problem might negatively affect real environments. Therefore, new technologies must be tested for problems before introducing them. To find problems, experimental environments which are similar to real world environments are necessary. Such experimental environments for network technology should be constructed with actual computers and networking equipments. Because networks are constructed with various equipments. After fixing problems of network technologies, experiments must be carried again. Therefore, experimental environments are used lot times. Often, there is needed to reproduce the same experimental environment. To construct experimental environments, experimenters must do a lot of work. For example, experimenters must install software on computers and set up networks. This task becomes more difficult as the experimental environment gets complicated. Therefore, experimenters have to do a lot of work to construct experimental environments. To keep experimental environments for repeated experiments reduces work to construct them many times. But it is not easy. Because in order to keep large and many experimental environments, we need immeasurable costs.

If it is possible to suspend and resume experimental environments, experimenters would need to construct experiment environments less often.

Therefore, I propose the system that suspends and resumes experimental environments. The proposed system reduces experimenter's work and cost of experiment equipment.

A variety of experiment support systems were proposed and operated. Experiment support systems are composed of actual nodes and software to support the experiment. Experiment support software enables automatic experiments. Experiment support software's configurations for a certain experiment can be reuse in other experiments. But the granularity of operations in experiment support software has limitations. Also, high level of proficiency is needed to use experiment support software. Therefore, experimenters often construct experimental environment manually. In that case, the experimenter must construct experimental environment again, when he does the same experiment.

The proposed system can suspend and resume experimental environments in experimental support system's equipment. Using proposed system and other experiment support software, experimenter can do his work more easily. In addition, to generate configuration for the experiment support software from the experimental environment, the experimenter can do an automatic experiment.

This thesis describes the design, the implementation and the evaluation of the proposed system.

In design, features which are "suspended" and "resumed" are explained. Required elements to suspend and resume are network configuration, software and history of experiment. Two resume methods are provided, "Equivalent resume" and "Flexible resume". In "Equivalent resume", all suspended elements are resumed. In "Flexible resume", several suspended elements are resumed. The flexible resume provides functions of reusing, recycling and composition of the suspended experimental environment. In addition, the proposed system suspends network configuration as vendor independent information. Therefore, the proposed system provides multivendor suspend and resume function for the network. Software is suspended and resumed as a diskimage or a file archive in the proposed system.

In evaluation, individual functions of the proposed system and experimentation using the proposed system were tested. We verified that the suspend and resume function perfomed correctly. Moreover, the proposal

system provided reusing, recycling and composition of the suspended experimental environment. Then the function to generate configuration for the experiment support software from the experimental environment was tested.