LNS LINAC CONTROL SYSTEM: STATUS REPORT

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Abstract

In Laboratory of Nuclear Science Tohoku University, the electron linear accelerator control system was renewed to the system that COACK[1] was implemented as kernel in 2001. At first, there were any troubles in the system. Afterward by having corrected client program and tuned COACK server, instability disappeared, and the system has been working well. This paper reports some correction points that remove malfunction of the system, information about using Windows 2003 Server as COACK system, and extension of control system by improvement of LNS Linac.

TROUBLE ON COACK

Trouble that caused instability to the system did not occur when the system began operation. However, communications traffic to the server increased in amount because a lot of devices were installed after that. Infrequently, it caused the following problems to the system.

- Extreme increase in number of ReplyController.
- Mismatch of the session ID between Clients and Server.

First problem has occurred when a large amount of reply command in short time saved from one client. When a large amount of reply command in short time saved, number of executed ReplyController exceeds a limitation. In this case, COACK executes plural handling components of necessary number to process. This component is called ReplyController. However, the phenomenon that execution number reaches at a burst to the limitations was confirmed. In this condition, when COACK was stopped, components which not stopped was in the server.

Second problem, with relation to the first problem, has occurred when a large amount of command from some clients was generated. This phenomenon remained a rare event, and it is thought that generating a number of commands is involved in both problems. When the second problem occurred, impossible client program to reexecute remained because the access point of session which managed by the server changed to the different ID. For recovering of the problem, the server need reboot, and it influences to all over the control system. We were able to know that to prevent it by ingenuity of operation is possible.

TO SOLVE THE PROBLEM

Fundamental solution of this problem is fixing of bugs on COACK. However, fixing bugs soon is difficult because cost is needed. Therefore, the next two approaches were adopted.

Client program correction

When new control system was constructed using COACK, new component [2] was created for reduction of programming load. At this time, reconnection function was installed to recover it when session cut off. However, we have understood that DCOM, used as communication function of COACK, also has a connection management function. The method is as follows.

DCOM uses an efficient pinging protocol and detects the client to be still active whether or not. DCOM sends the message periodically and it judges the disconnection if it is not answers more than 3 times. If the network recovers before the timeout interval, DCOM re-establishes connections automatically. [3] In this function, even if the connection time-out in the COACK session management was caused by increasing of the network traffic, the connection is recovered by sending command. In most cases, the connection can be maintained by DCOM recovery function. At this time, if another reconnection function is also worked concurrently, some sessions of same ID may exist occasionally. Then, system will not be stable. This time, it was thought that reconnection function of the component became cause. Therefore, all reconnection function was made to stop.

Adjustment of COACK client property

Commands received on DCOM Stub are stored in RequestQue temporarily and is taken by Command Executer and is carried to the Decoder Chain. Commands on Decoder Chain are taken by Command Director and are processed. The results are preserved in the ReplyQue and are returned to the client by Reply Controller. Reply Controller can start to multiple, and Reply Manager manages it. Reply Controller is started on prescribed number when COACK start. The number of executable Reply Controller can be increased and decreased according to number of Reply Commands in ReplyQue. In this time, it was confirmed that Reply Controller was started to limit by extreme increase of commands. When this state was continued, it was started over limit. Under such a condition, some Reply Controller remained, and it was impossible to make stopped on the standard COACK manager. This may be bags of COACK but we have not identified it. However, it is necessary to restart COACK with sequence other than method described in the manual. As this solution, the interval of the sending command of each client was set in 200ms or more.

USING WINDOWS XP OR WINDOWS 2003 SERVER AS COACK SERVER

With the advent of Windows 2003, COACK will be installed on it. At this time, modification of property on it is needed. We describe it below.

A problem on default installer of COACK Kernel.

When COACK was installed using default installer, there is a problem that queue is not created. The improvement of the installer is not reflected in the distributed COACK package yet. Therefore, to make five queues, described below, by manually is necessary.

RequesQue
RequestLogQue
ReplyQue
ReplyLogQue
SchedulingQue

About authentication.

Security of Windows2003 is enhanced. In case of using Windows2000, if ID and Password is same, authentication succeeds even if they belong in the different Domain. Windows 2003, however, fails. (The case of default installs) It depends on an enhancement definition of a
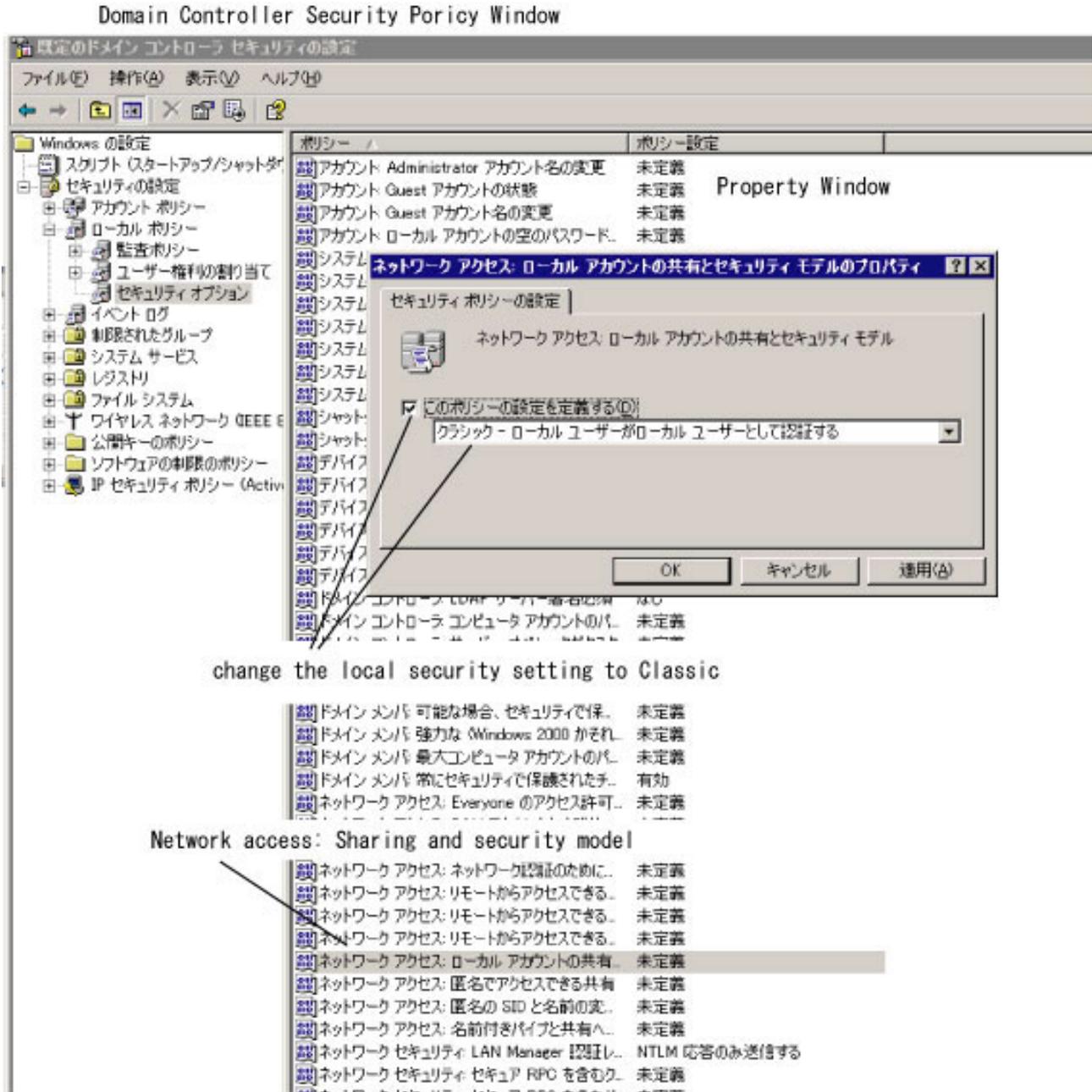

Figure 1: Example of change policy of the Domain Controller Security Policy.

local security policy in the Windows2003. Authentication succeeds as this property is changed as follows and shown in figure 1.

How to change. (From the MSDN Library.)

From the Start menu, choose Control Panel.

In Control Panel, double-click Administrative tools.

In the Administrative tools window, double-click Local Security Policy.

In the Local Security Policy window, select Local Policies.

In the Policies column, double-click Network access: Sharing and security model for local accounts.

In the Network access: Sharing and security model for local accounts dialog box, change the local security setting to Classic and click OK.

Close all windows.

Gate valves. (2)

Q Magnet. (1)

Steering Coil. (1)

Profile Monitor (2)

Core Monitor (2)

Ion Pump (3)

Software is addition of devices to the COACK Device Class and modification of client program for vacuum control.

SUMMARY

COACK is stable by modification of the client program and tuning of traffic between clients and the server. Furthermore, COACK is workable also on the Windows2003 and XP environment without problems.
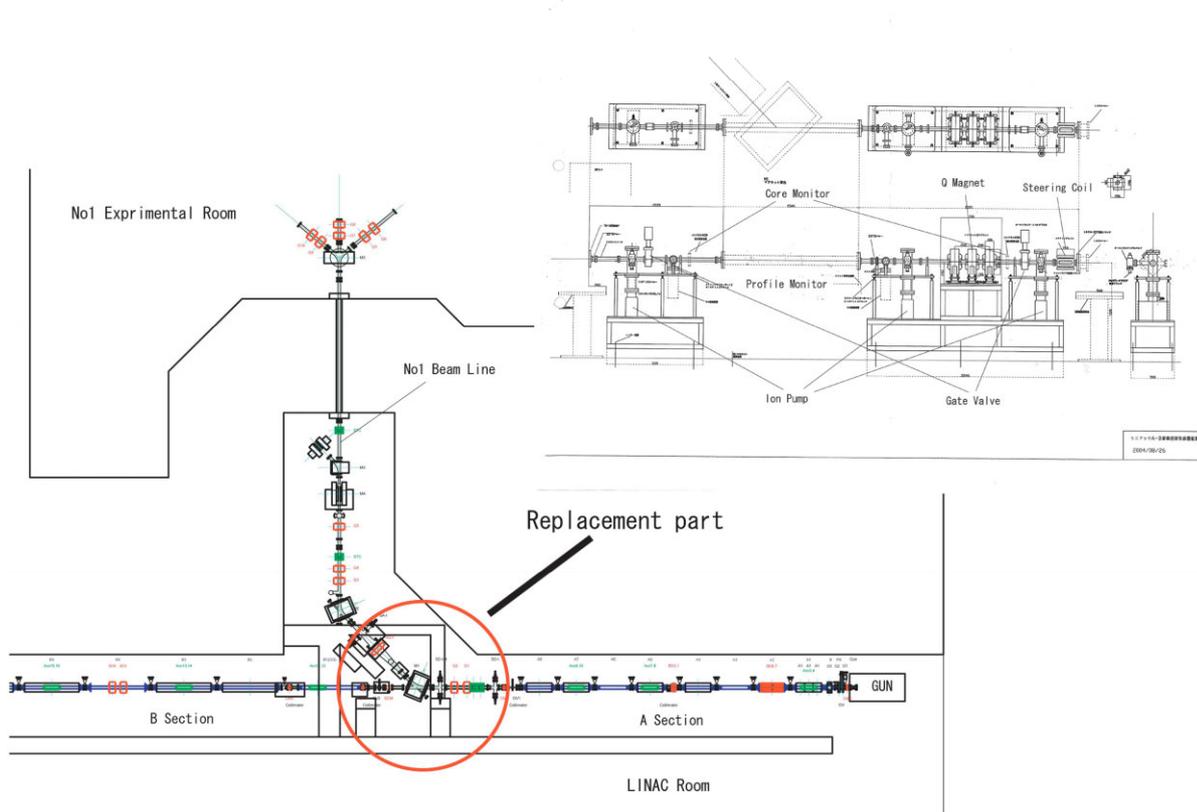

Figure 2: Replacement part and schematic of the equipment.

RECENT OF LNS

We have replaced vacuum chamber between a low-energy section and a high-energy section. This purpose is improvement of vacuum chamber pressure, and measurement of exact parameter for improvement of transport efficiency of the accelerator. The equipment renewed is as follows and shown in figure 2.

Vacuum chamber at the end of A section and the start of B section of accelerating tube.

REFERENCES

[1] I.Abe, et al., "Recent Status of COACK and It's Function", PCaPAC2000, Hamburg, Germany.

[2] Y. Shibasaki et al., "New Control System of the LNS Linac", PCaPAC2002, Frascati, Italy

[3] Microsoft, MSDN Library