Department of Administration
Department of Finance

MAPS Scheduled Batch Processing Audit

September 1998

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Financial Audit Division
Office of the Legislative Auditor
State of Minnesota

98-52

Senator Deanna Wiener, Chair
Legislative Audit Commission

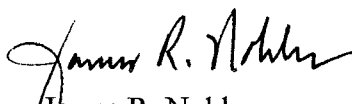Members of the Legislative Audit Commission

Ms. Elaine Hansen, Commissioner
Department of Administration

Mr. Wayne Simoneau, Commissioner
Department of Finance

We have audited selected areas related to the Minnesota Accounting and Procurement System's (MAPS) scheduled batch processing, as further explained in Chapter 1. We emphasize that this has not been a complete audit of all aspects of MAPS or of scheduled batch processing activities performed by the Department of Administration's Intertechnologies Group (Intertech) or the Department of Finance. Our audit scope focused on the security of the scheduled batch environment provided by Intertech and controls that prevent unauthorized changes to the MAPS job stream. The following Summary highlights the specific audit objectives and our conclusions. We discuss these issues more fully in the individual chapters of this report.

We conducted our audit in accordance with the *Government Auditing Standards*, as issued by the Comptroller General of the United States. These standards require that we obtain an understanding of management controls relevant to the audit. These standards also require that we design the audit to provide reasonable assurance that the Department of Administration and the Department of Finance complied with the provisions of laws and regulations that are significant to the audit. Management of the Department of Administration and the Department of Finance are responsible for establishing and maintaining the internal control structure and for compliance with applicable laws and regulations.

This report is intended for the information of the Legislative Audit Commission and the management of the Department of Administration and the Department of Finance. This restriction is not intended to limit the distribution of this report, which was released as a public document on September 18, 1998.

James R. Nobles
Legislative Auditor

Claudia J. Gudvangen, CPA
Deputy Legislative Auditor

End of Fieldwork: July 8, 1998

Report Signed On: September 15, 1998

SUMMARY

Department of Administration
Department of Finance

MAPS Scheduled Batch Processing Audit

Public Release Date: September 18, 1998   No. 98-52

Agency Background

The Department of Administration's Intertechnologies Group (Intertech) operates the state's primary data center. Intertech also maintains the software that is used to control access to its mainframe computers and manage scheduled batch processing. Ms. Elaine Hansen serves as the commissioner of the department.

The Department of Finance maintains the state's accounting system, commonly referred to as the Minnesota Accounting and Procurement System (MAPS). The MAPS software runs on a mainframe computer at Intertech. However, information system professionals in the Department of Finance design and test most of the MAPS computer programs. Mr. Wayne Simoneau serves as the commissioner of the department.

Audit Scope and Conclusions

Scheduled batch processing is a special type of computing environment that requires little or no user interaction. Most of the state's major computer systems rely on a large overnight batch stream to perform critical business functions. For example, the nightly batch stream for MAPS contains hundreds of jobs that run from approximately 4 PM to 3 AM.

During this audit, we analyzed scheduled batch processing procedures at both Intertech and the Department of Finance. We designed our work to determine if Intertech was providing state agencies with a secure environment for their scheduled batch processing. We also analyzed the MAPS job stream to determine if there were controls to prevent unauthorized changes to computer programs.

We feel that Intertech provides state agencies with a secure environment for their scheduled batch processing. However, many state agencies, including the Department of Finance, run their scheduled batch jobs from an unsecured environment. This creates a serious security exposure that could result in disruptions to critical government services or the widespread destruction of data. We also found significant weaknesses in the MAPS program change control procedures. Specifically, most information system professionals in the Department of Finance have complete and unfettered access to nearly all MAPS data and computer programs. We do not feel that this level of security clearance is appropriate or necessary. Finally, we found one documentation shortcoming that Intertech needs to address to avoid making unauthorized changes to agency batch streams.

The Department of Finance and the Department of Administration agree with the findings in this report. The agencies' written responses to this report detail their corrective action plans.

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Audit Participation

The following members of the Office of the Legislative Auditor prepared this report:

Claudia Gudvangen, CPA   Deputy Legislative Auditor
Chris Buse, CPA, CISA   Information Systems Audit Manager
Carl Otto, CPA, CISA   Team Leader
Dale Ogren, CPA, CISA   Senior Auditor
Chege Ngigi, CPA, CISA   Senior Auditor

Exit Conference

We discussed the issues in this report with the following staff of the Department of Administration and the Department of Finance on September 3, 1998:

Doug Schneider   Assistant Commissioner, Department of
                            Administration
Mike Ladd   Assistant Commissioner, Department of Finance
John Chesnutt   MAPS Director, Department of Finance

Chapter 1. Introduction

Scheduled batch processing is a special type of computing environment that requires little or no user interaction. Interactive processing, on the other hand, is an environment where a computer responds to commands as soon as a user enters them. Most scheduled batch processing occurs at night. This helps preserve valuable computing resources during the day for interactive users.

The primary unit of work in a scheduled batch environment is referred to as a "job." A scheduled batch job can consist of a single computer program or a collection of computer programs. Some jobs run on specific dates or at certain times, while others only execute after the successful completion of a predecessor job. A collection of interrelated and dependent batch jobs is commonly referred to as a "job stream." Figure 1-1 is an example of a job stream for a computerized business system. This computer system's job stream contains three separate jobs, each of which contain one or more computer programs.

Figure 1-1
Components of a Job Stream for a Computerized Business System
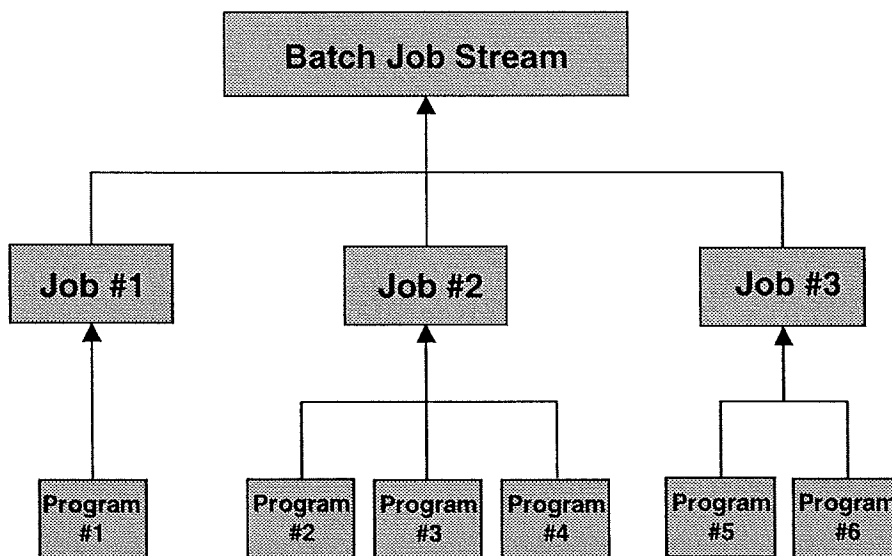
Source: Auditor prepared.

Most of the state's major computer systems rely on a large overnight batch stream to perform critical business functions. For example, the batch job stream for the Minnesota Accounting and Procurement System (MAPS) contains hundreds of jobs. The MAPS batch stream typically starts around 4:00 p.m. and finishes processing around 3:00 a.m. The computer programs in this job stream perform a variety of mission-critical business functions for the state. Examples

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include, recording revenue and expenditure transactions from state agency subsystems and generating payments to vendors. As illustrated in Figure 1-2, approximately 69 percent of the state's fiscal year 1998 expenditures, or $12.8 billion, was posted to MAPS through special batch stream interfaces. Interactive users of the system entered the remaining 31 percent of the state's fiscal year 1998 expenditures.
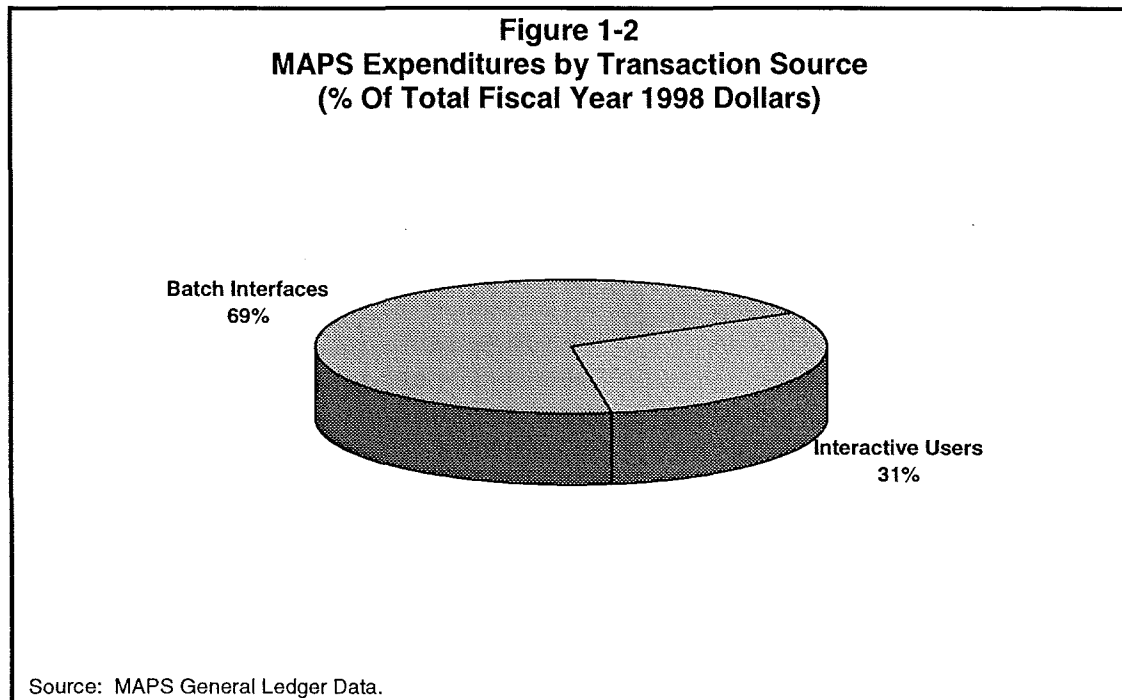
Figure 1-2
MAPS Expenditures by Transaction Source
(% Of Total Fiscal Year 1998 Dollars)

Source: MAPS General Ledger Data.

The Department of Administration's Intertechnologies Group (Intertech) operates the state's primary data center, which houses four large mainframe computers. Intertech also maintains the software that is used to manage scheduled batch processing and control system access. Information system professionals in state agencies develop and test batch jobs for their computerized business systems. When testing is complete, agencies have Intertech move these jobs into a secure production environment.

During this audit, we analyzed scheduled batch processing procedures at Intertech and the Department of Finance. We designed our work to answer the following two questions:

- Is Intertech providing state agencies with a secure environment for their scheduled batch processing?

- Does the Department of Finance have controls to prevent unauthorized changes to the MAPS job stream?

Chapter 2 discusses the scope of our work and conclusions reached on Intertech's scheduled batch environment. In Chapter 3, we discuss controls over the MAPS job stream.

Chapter 2. The Scheduled Batch Environment at Intertech

Chapter Conclusions

The Department of Administration's Intertechnologies Group (Intertech) provides state agencies with a secure scheduled batch environment. However, some state agencies do not use this environment for their scheduled batch processing. Agencies that run scheduled batch jobs from uncontrolled environments create a serious security exposure for all computer systems and data at Intertech.

Intertech moves scheduled batch jobs into its secure environment on behalf of agencies. However, Intertech does not maintain a list of agency information system professionals who have the authority to initiate these program migrations. Without this documentation, Intertech could inadvertently make unauthorized changes to agency batch streams.

Intertech uses a special software package called CA7 to help manage its scheduled batch environment. Intertech programs CA7 to run some batch jobs at predefined dates and times. Other batch jobs only run after the successful completion of a predecessor job. In addition to these workload management features, CA7 provides Intertech with a variety of useful reports and job tracking information. At the time of our audit, there were 6,509 batch jobs in the CA7 database.

Intertech uses a software package called ACF2 to control access to its mainframe computers and data. ACF2 protects against the unauthorized destruction, disclosure, modification, or use of data. The software acts as an extension of the computer's operating system and protects all data by default. ACF2 will not permit a user to access data unless the data owner explicitly authorizes that access. These explicit authorizations are defined in ACF2 security "rules."

Audit Objective and Methodology

Scheduled batch jobs perform mission-critical business functions and often need extremely high security clearances. Therefore, it is very important to have strong controls over the scheduled batch environment. With this in mind, we designed our work to answer the following question:

- Is Intertech providing state agencies with a secure environment for their scheduled batch processing?

To answer this question, we interviewed Intertech's information system professionals who manage the scheduled batch environment. We also interviewed Intertech's ACF2 security

officers. Finally, we analyzed CA7 data and studied the ACF2 rules that control access to scheduled batch jobs.

Conclusions

Intertech provides state agencies with a secure scheduled batch environment. However, as discussed in Finding 1, a large percentage of the state's scheduled batch jobs are run from outside this secure environment. Finding 2 discusses one documentation weakness that came to our attention.

1. Some scheduled batch jobs run from outside Intertech's secured environment.

At the time of our audit, approximately 23 percent of the state's scheduled batch jobs were initiated from an unsecured "test" environment. As discussed in Chapter 3, many of these jobs are owned by the Department of Finance and are part of the MAPS batch stream. However, we also found other agencies that run scheduled batch jobs from this unsecured environment as well.

A special type of computer program, written in IBM's Job Control Language (JCL), initiates each scheduled batch job. As illustrated in Figure 2-1, it is extremely important to prevent unauthorized changes to JCL programs because they contain an ACF2 logonID that gives each job its security clearance. JCL programs also list the specific name and location of all the other computer programs that must execute within each job. Unauthorized changes to any of these JCL program components could result in serious disruptions of critical government services or the widespread destruction of data.
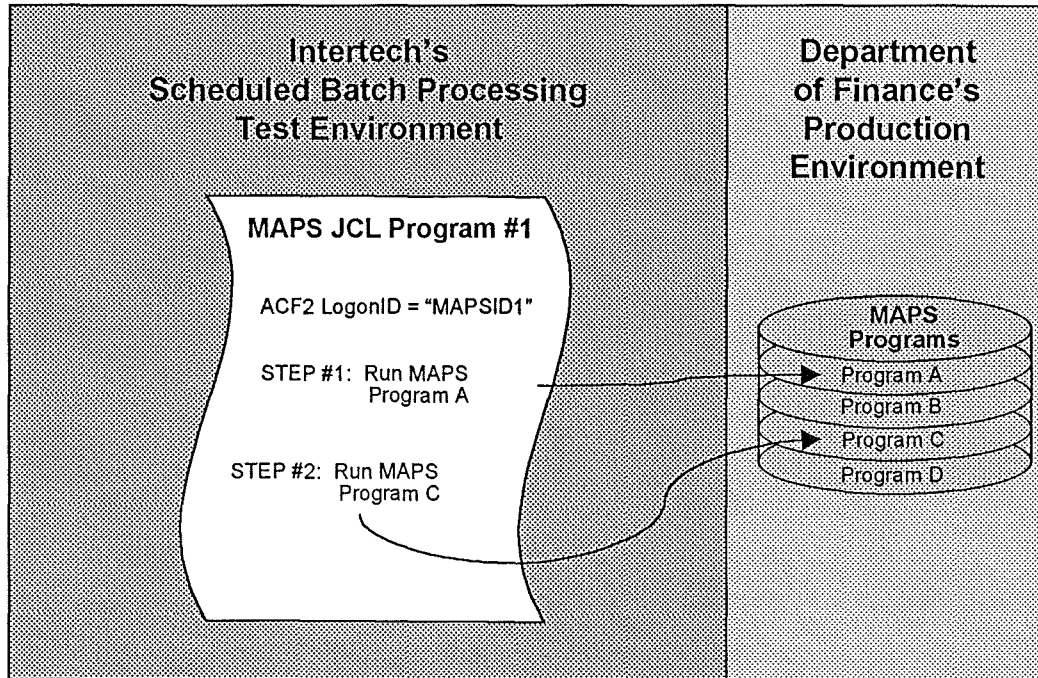
Intertech will not move an agency's scheduled batch jobs into its secure production environment until they comply with certain documentation standards. However, agencies can run their scheduled batch jobs from the test environment on a temporary basis until they meet the more rigorous production standards. We reviewed CA-7 documentation for all the test environment jobs and found many that have been running in there for extended periods. In fact, many critical MAPS jobs have run out of the unsecured test environment hundreds of times.

Recommendation

- *Intertech should only run scheduled batch jobs from secure environments.*

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Figure 2-1
Critical Components of a JCL Program

Intertech's Scheduled Batch Processing Test Environment	Department of Finance's Production Environment

MAPS JCL Program #1

ACF2 LogonID = "MAPSID1"

STEP #1: Run MAPS Program A

STEP #2: Run MAPS Program C

MAPS Programs
Program A
Program B
Program C
Program D

Source: Auditor Prepared

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2. **Intertech does not have formal procedures to control changes to production batch streams.**

Intertech controls the secure production environment that houses agency job streams. As instructed by agencies, Intertech moves scheduled batch jobs into this environment and makes changes to existing jobs. However, Intertech does not maintain a list of agency information systems professionals who have the authority to initiate these production batch stream modifications. Instead, Intertech's information system professionals rely on informal relationships that have been established with state agencies over time.

It is important to document specific agency liaisons for each production batch stream. This documentation will help Intertech ensure that it only makes authorized batch stream changes. Documentation will also help prevent future disruptions in the batch job migration process, should key Intertech employees leave state service.

Recommendation

- *Intertech should document specific agency liaisons that must approve changes to each production batch stream.*

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Chapter 3. Controlling the MAPS Batch Stream

Chapter Conclusions

*The Minnesota Accounting and Procurement System (MAPS) batch stream is
at risk. Most jobs in the MAPS batch stream run from an unsecured
environment. Also, information system professionals in the Department of
Finance have complete and unfettered access to nearly all MAPS programs and
data. The Department of Finance needs to take immediate action to remedy
these security weaknesses.*

Information system professionals in the Department of Finance are responsible for writing and
testing the computer programs that become part of the MAPS job stream. Developing computer
programs for large systems like MAPS is very complex. Agencies need strong controls to ensure
that individual employees cannot perform all aspects of the development process. Agencies also
need strong security controls to protect business data and computer programs from unauthorized
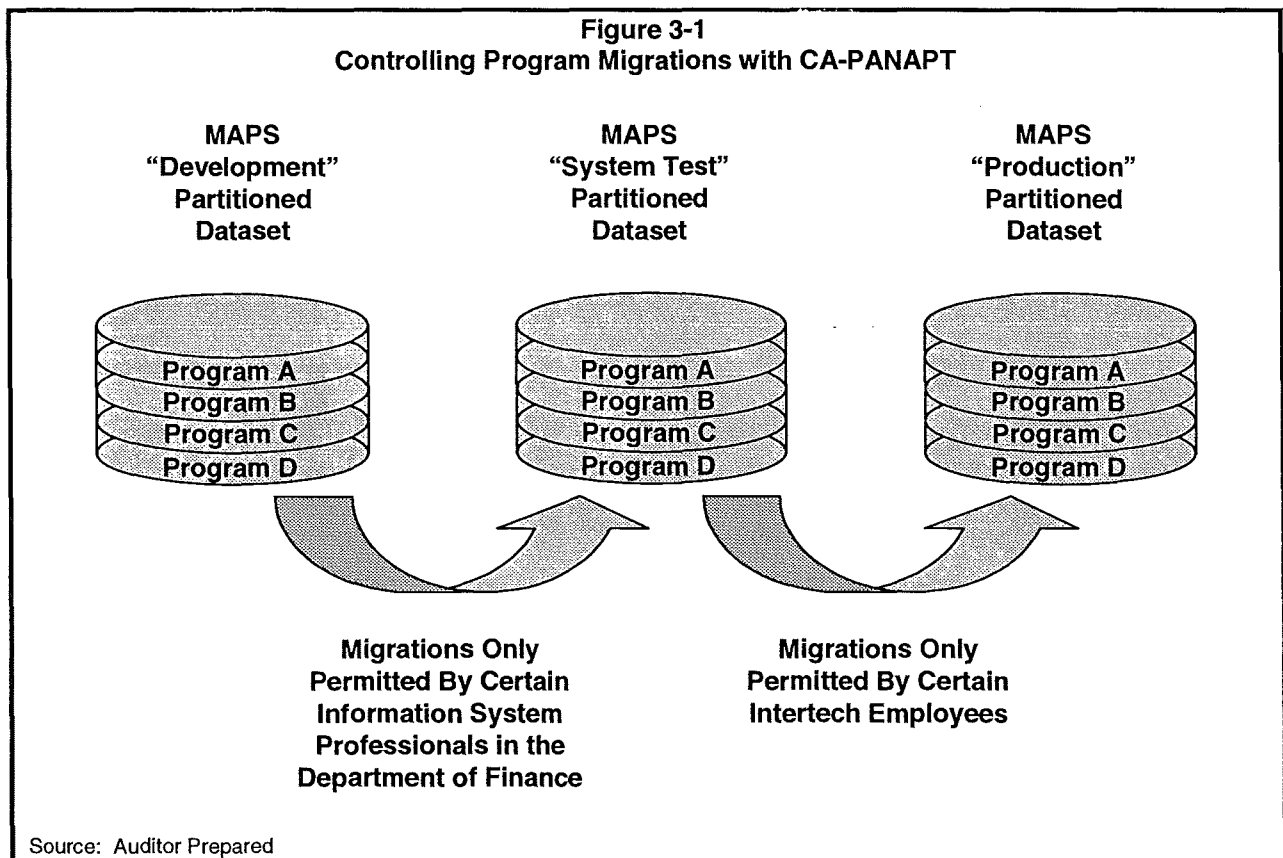changes.

The Department of Finance has written procedures to control the MAPS development process.
This process begins when an employee documents a system deficiency in a Problem Report.
After confirming the existence of the problem, the department prioritizes the Problem Report and
allocates staffing resources. The department then studies the problem in detail and describes the
necessary system changes in a Functional Modification Description (FMD). Business and
technical managers must approve the FMD before information system professionals can translate
its contents into a Detailed Design Specification (DDS). A DDS explains the exact changes that
must be made to the MAPS computer programs. Business and technical managers also must
approve the DDS before programmers code and test the software changes. This initial coding
and testing of specific computer programs takes place in a special "development" environment.
The department then subjects the software changes to exhaustive testing in a separate "system
test" environment. System testing is the final checkpoint before the department migrates the
software changes into the "production" MAPS environment. Users of MAPS interact with
production programs and data. MAPS scheduled batch jobs also use programs and data that
reside in the production environment.

The department also uses software to control the development process. The department stores
most MAPS computer programs in a special type of file called a "partitioned dataset." The
development, system test, and production MAPS environments all have their own partitioned
datasets. Each of these partitioned datasets can contain one or more computer programs. The
department uses a software package called CA-PANAPT to control the migration of programs
through these various environments. CA-PANAPT will currently let most of the department's
information system professionals move programs to the development environment. However,

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only a limited number can move programs to the system test environment. Likewise, CA-PANAPT will only let certain Intertech employees migrate programs to the MAPS production environment. These CA-PANAPT restrictions help the department ensure that individual employees cannot perform all aspects of the development process. Figure 3-1 illustrates how the department uses CA-PANAPT to control MAPS program migrations.

These CA-PANAPT program migration controls rely on the proper implementation of ACF2, the state's mainframe security software. Specifically, ACF2 must prevent unauthorized updates to the development, system test, and production partitioned datasets from outside CA-PANAPT. Users that have clearance to directly update these partitioned datasets without using CA-PANAPT can circumvent important program migration controls.

Figure 3-1
Controlling Program Migrations with CA-PANAPT

MAPS "Development" Partitioned Dataset

MAPS "System Test" Partitioned Dataset

MAPS "Production" Partitioned Dataset

Program A
Program B
Program C
Program D

Migrations Only Permitted By Certain Information System Professionals in the Department of Finance

Migrations Only Permitted By Certain Intertech Employees

Source: Auditor Prepared

Audit Objective and Methodology

Our audit focused on the Department of Finance's batch stream development procedures for MAPS. Specifically we designed our work to answer the following question:

- Does the Department of Finance have controls to prevent unauthorized changes to the MAPS job stream?

To answer this question, we interviewed information system professionals from the Department of Finance and the Department of Administration. We also analyzed several jobs in the MAPS

batch stream. Finally, we reviewed ACF2 security rules that govern access to critical partitioned datasets.

Conclusions

The Department of Finance does not have effective controls to prevent unauthorized changes to the MAPS job stream. As discussed in Finding 3, most information system professionals in the department have complete and unfettered access to all MAPS production programs and data. Also, as discussed in Finding 1, many jobs in the MAPS batch stream run from an unsecured environment.

3. **The Department of Finance is not protecting critical MAPS programs or data from unauthorized changes.**

Most of the department's information system professionals have more clearance than they need to complete their job responsibilities. In fact, most can change or delete all programs and data in the MAPS production environment. This extremely high level of security clearance gives information system professionals the ability to circumvent the department's CA-PANAPT program migration controls.

We also found that approximately 60 percent of the jobs in the MAPS batch stream run from an unsecured "test" library. As explained in detail in Finding 1, this practice could result in the disruption of critical government services or the widespread destruction of data.

Recommendations

- *The department should only give employees the security clearance that they need to fulfill their specific job responsibilities.*

- *The department should work with Intertech to secure all jobs in the MAPS batch stream.*

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September 9, 1998

James R. Nobles, Legislative Auditor
First Floor South, Centennial Office Building
658 Cedar Street
St. Paul, MN 55155

Dear Mr. Nobles:

Our response to issues raised at the exit conference held last week with Department of Administration InterTech staff and members of your office is as follows:

1. *ITG should only run scheduled batch jobs from secure environments.*

   InterTech utilizes a test environment to: ensure a "job" meets documentation standards; correct a processing problem; and/or enable customers to make necessary modifications. Once a job runs successfully in test, and meets standards, InterTech moves it into production mode.

   "Test libraries" will continue to be used for these preliminary purposes, but InterTech will secure the environment in the January 1999 time frame using a new release of ACF2 (6.2).

   The feature of ACF2 called "member level security in PDSs" will allow InterTech to control access to individual jobs in the test library. More specifically, access to particular applications in the test library (i.e., MAPS jobs in UCC7.JCLTEST) can be limited to the people defined by the agency and the necessary ITG staff. Multiple agencies' jobs can continue to share the test library, but can be accessible only by staff defined by the agency.
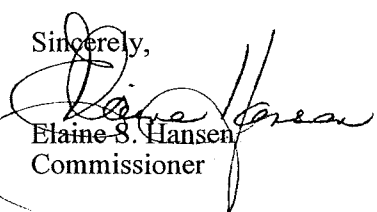
   The January implementation of ACF2's new release is the result of: 1) the time needed for ITG security staff to test and implement the new feature, and, 2) the time necessary to communicate with the agencies and get lists of staff authorized to access their jobs in the test library. While the issue was raised in the context of MAPS, it is equally applicable to the rest of ITG's customers and will be implemented for all of them.

   The Legislative Auditor's findings will be used to further explain ITG's security enhancements. The ITG security unit will set up the member level security capability for the test library. The Application Processing Support unit will work with the agencies to get their lists of authorized staff. Member level security will be implemented an agency, or application, at a time starting with MAPS in January. Agencies will be responsible for keeping their lists of authorized staff current, but InterTech will periodically verify and validate the authorizations.

2. *ITG staff should document specific agency liaisons that must approve changes to each production batch stream.*

   As mentioned above, InterTech will contact customer agencies, asking them to more formally authorize specific individuals in their agency to make control changes to production batch streams. To be successful, it is InterTech's hope that when problems arise with production streams during night processing, agency contacts will be accessible and that will prevent negative effects on state business operations.

Sincerely,

Elaine S. Hansen
Commissioner

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State of Minnesota
Department of Finance

September 8, 1998

Mr. James Nobles
Office of the Legislative Auditor
Centennial Office Building
St. Paul, MN 55155

Dear Mr. Nobles:

Thank you for the opportunity to respond to the audit report titled "MAPS Scheduled Batch Processing Audit". Our agency is committed to maintaining effective security processes and internal controls, and your audit provides a valuable review of our system processes and controls.

The following is our response to the individual recommendations.

1.   The department should only give employees the security clearance that they need to fulfill their specific job responsibilities.

The Department of Finance has designated five operational type employees the security necessary to run the MAPS production environments. In addition, security syntax will be closely looked at and modified to ensure these employees are the only ones with the appropriate production security. Employees in our programming and support units who need job specific security clearance will be given unique clearances. John Chesnutt, the departments' MAPS director, has been assigned to ensure these actions are taken within the next two weeks.

2.   The department should work with Intertech to secure all jobs in the MAPS batch stream.

The necessary efforts to do this have been in progress for the past year. We have directed Dal Hertz, the departments' MAPS Operational Supervisor, to move these efforts to a higher work effort priority. Dal indicates this effort can be completed by the end of December 1998.

We will, working through the departments' Information Service system managers, continue to stress the importance of keeping security issues a high priority in our work efforts.

Sincerely,

Wayne Simoneau,
Commissioner of Finance

Michael Ladd,
Assistant Commissioner Information Services

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