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To: The Honorable Ralph Northam, Governor of Virginia
The Honorable Luke E. Torian, Chair, House Appropriations Committee
The Honorable Janet D. Howell, Chair, Senate Finance and Appropriations Committee

From: Emily S. Elliott, Director
Department of Human Resource Management (DHRM)

Nelson P. Moe, Chief Information Officer
Virginia Information Technologies Agency (VITA)

Background

DHRM and VITA respectfully submit this report pursuant to Item 81(L) of the 2020 Amendments to the 2019 Appropriation Act, which provides:

> "The Department of Human Resource Management shall work with the Virginia Information Technologies Agency to develop a pilot program, beginning in July of 2019, utilizing a currently available electronic platform, to track and evaluate the productivity contract staff when teleworking or working in an office that is not part of the agency for which they work or for which they have a contract. The Departments shall identify specific executive branch agencies which have a significant number of such contractors and work with these agencies to develop the pilot project. The Departments shall report to the Chairmen of the House Appropriations and Senate Finance Committees on the results of the pilot program by November 15, 2020."

Executive Summary

The state of emergency due to COVID-19 has demonstrated beyond doubt the critical nature of remote work capabilities and resulted in an unprecedented scale of remote work in Virginia government. Remote work comes with challenges, including how to manage employees and

contractors who are not in the same physical location as their manager. It should be noted that these same challenges can exist whether an employee is onsite or offsite. Remote work reinforces the need to manage by results achieved not by line of sight.

There is no one-size fits-all approach for management of remote workers. Productivity is context-specific, and managers must understand the work being done, be aware of how that work is done (including tools and methods used to do the work), and be able to review work product and assess results effectively. Managers must meet many interpersonal and management challenges, including engaging with personnel, team building, establishing processes and workflows, staying informed about work progress, and providing any necessary course corrections.

In accordance with the above budget language, DHRM and VITA collaborated to conduct a pilot study that used existing technology to compile certain network and system activity data on selected contractors at three agencies over multiple months. VITA personnel then normalized that data and transmitted it monthly to agency contacts, conferring with them to confirm that the data was useful and identify whether agencies wanted any additional information. Agencies found the data to be generally helpful but only part of managing remote work. Agencies did not observe activity suggesting fraud, waste, or abuse in the course of the pilot.

DHRM and VITA will continue to monitor the marketplace and evaluate available information, best practices, and tools. Mandatory employee monitoring tools raise a number of serious questions, from human resources to legal compliance and information security, and information available at this point does not suggest that such tools would be of benefit.

DHRM and VITA recognize the challenge of effective management of remote workers. DHRM is expanding available training and resources for remote management. VITA has prioritized tools for remote connectivity and interaction. Contracting strategies focused on effective and flexible remote work, such as deliverable-based contracting (rather than hourly or time and materials), will play an important role. The Commonwealth's existing protections against fraud, waste, and abuse remain available in a remote work environment.

Report

Pursuant to the above budget language, DHRM and VITA identified four agencies with contractors for whom participation in the pilot would most likely garner helpful results: the Department of Medical Assistance Services (DMAS), the Virginia Department of Transportation (VDOT), VITA itself, and the Department of Social Services (DSS). These agencies were selected because each had contractors who worked remotely (not in the agency's offices), billed using a time and materials based statement of work, and had been issued a Commonwealth asset.

DSS later withdrew from the pilot after determining that the contractors it identified for inclusion billed based on deliverables and milestones, not based on time and materials. The pilot went forward with the remaining three agencies.

Data collection and analysis for the pilot

The pilot was based on a data collection and analysis process using existing technology, coordinated by VITA's Director of Security Architecture and Incident Management, who (due to the nature of information security investigations work) is familiar with collection and analysis of data regarding technology-based activities of personnel.

The pilot focused on a sampling of contractors who submit time and materials (hourly) invoices to the participating agencies and used existing tools to collect data that would help agencies evaluate the contractors' network access and system usage activities in relation to their invoices.

To initiate the data collection process, each agency was required to provide the full name and COV-supplied email address for all contractors to be included in the pilot. The user authentication identities for each contractor was determined by referencing metadata in the COV Active Directory authentication database and the remote network access records stored in the remote network access portal.

The data collection process then extracted logged events from the primary user interaction points of the Commonwealth network, including the Commonwealth Active Directory user authentication system, the Commonwealth remote network access portal, and the Commonwealth Internet access gateway. All logged events were extracted from the centralized log collection server on a weekly basis and normalized to ensure consistency between extractions. Once normalized, the data was provided to the respective agencies on a monthly basis for evaluation. A conference call was held each month with the agency contacts to ensure that the data sets were useful and to determine if additional information was required for the pilot.

Data analysis for this pilot was based on a progressive methodology in which one data source was used to refine and clarify the information contained in the next data source. The analysis process began with the logged data from the COV remote network access portal (Virtual Private Network (VPN) connection). The data contained in this data set allowed each agency contact to determine which days each contactor accessed COV assets remotely, the length of time each contactor was connected to the COV network, and the geographic location of each contractor during the remote connection.

The remote network access dates were used as a filter to select the associated system authentication data from the COV Active Directory user authentication system. The data contained in this data set allowed each agency contact to determine which COV systems were accessed on the remote work dates as well as the length of each system access. The system name in this data set also allowed the agency contact to determine what type of system was accessed and what level of user permissions were used during the system access.

The system authentication data was then used to evaluate the Internet access data to determine the business relevance of websites accessed during the contractor's remote access. The data contained in this data set allowed each agency contact to determine which websites are accessed, the category of each website accessed, and the amount of data transferred from each website. The amount of data transferred and the order in which a website was accessed in relation to other websites allowed each agency contact to differentiate between a website accessed as part of the

initial user request (*e.g.*, advertisement or affiliate link) or a website explicitly accessed by the user.

Data was collected and provided to the participating agencies from July 2019 through February 2020. The system authentication data and the Internet access data contained all user actions for the month regardless of user location.

Although calendar variations and different contractor job functions and work environments make a difference in the amount and type of data generated, the agencies in this pilot each received thousands of events (data points) of contractor activity each month. In total, the pilot logged and provided agencies with records of 1,476,400 events. By agency, the breakdown was 505,788 events for VITA, 738,720 for VDOT, and 337,892 for DMAS. By type, that total comprises 18,535 VPN access events, 333,219 Active Directory authentication events, and 1,124,646 Internet activity events.

Participating Agency Comments: DMAS

Contractor Use and Work Assessment

This DMAS pilot effort took into consideration nine different contractors working with the agency. The contractors chosen for the pilot were selected based on the criteria that the majority of their work was to be done remotely. DMAS uses many different types of contractors (Business Analysts, Testers, Project Managers, Developers, and others) to address the ebb and flow of work load. The majority of contractors in the Information Management Division fall within the purview of system development and project management.

DMAS determined that the use of developers would be most beneficial for the pilot. The Project Management contractors' workload encompasses a good deal of coordination of meetings, working with project management tools found locally on their systems and critical thinking and collaboration.

DMAS received web proxy logs (including sites visited and corresponding dates, times and duration of visitation) and systems access information (inclusive of log- on and log-off times, which accounted for the duration of access, and remote system access). DMAS also received VPN access information, which serves as the primary tool for remotely accessing the network. VPN access information is particularly telling as the state workforce moved to full telework due to the COVID-19 state of emergency.

The contractors were contained within one area associated with Web Development efforts for DMAS. The hiring manager reviewed each contractors' data and assessed the data's accuracy in relation to overall project success and productivity.

Conclusions

The pilot did not identify any significant issues related to contractor work or the successful progress and completion of projects.

The web proxy log information was particularly telling in ensuring the Commonwealth's assets were being utilized for work purposes. However, in today's environment, search engines, YouTube, and other vehicles for information gathering on the Internet can be vital when researching issues, finding solutions, and demonstrating appropriate structure and logic associated to various development methods. On occasion, the use of the Internet may have been for general entertainment, but this use appeared to be limited and within the acceptable limit of Agency policy. As a result, the pilot was useful in confirming contractor diligence and reiterating awareness of the monitoring capabilities of the Commonwealth.

As noted earlier, other job functions such as planning, program development, brainstorming, regular meetings, and other aspects take place apart from the technology that was being monitored. While this work can be justified and reviewed with regular status reports and timekeeping, it is not necessarily reflected in information that is automatically logged and monitored. The logged information can be beneficial as a part of contractor management – the use of the information to ensure adherence to contracted job responsibilities prompted the hiring manager to more closely and accurately monitor job performance. The pilot's work was most beneficial in jobs related to system development. The monitoring proved particularly helpful when performing contract evaluations and monitoring of contractors to ensure proper use of time, associated time tracking and appropriate use of the Commonwealth's assets.

Participating Agency Comments: VDOT

Contractor Use and Work Assessment

VDOT staffing levels of classified staff are legislatively regulated. To complete the mission-critical requirements of the information technology division, VDOT uses staff augmentation contractors acquired through the VITA Continent Labor Program contract. Staff augmentation contractors represent 60% of the VDOT Information Technology Division workforce.

Most of VDOT's contractor staff work at a VDOT location and so were not eligible for participation. Only 18 staff were consistent teleworkers and all were selected for participation in this study. Other contractors occasionally telework; however, the infrequent nature of their telework schedule did not meet the participation criteria.

VITA provided VDOT with detailed logging data on the contractors participating in the study, including: VPN connectivity (login date/time, logout date/time, location), systems accessed (servers, access date/times, activity descriptions), and web proxy logs (application, application type, access date/time, data transmitted, web service used).

VDOT compared the logging data provided by VITA to the anticipated work behavior of the contractor. The team validated that the contractor work locations and access date/times matched expected work behavior, as well as ensured that the systems and websites accessed were ones that matched the contractor's assigned work. The team validated whether the hours of VPN connectivity were reasonable given the number of hours billed by the contractor on the designated day, as well as whether the amount of data transmitted and received was reasonable given the contractor's job role and assigned duties.

Conclusions

The pilot did not identify any significant issues related to contractor work or the successful progress and completion of projects. VDOT supervisors regularly manage the quality of work products produced by the contractors. The log data provided by VITA confirmed that contactors were working on the duties that they have been assigned and that the hours charged to the Commonwealth were reasonable for the work produced.

The VDOT contractors participating in the pilot had many roles including project manager, business analyst, application developer, database administrator, system architect, and application tester. VDOT operates in an agile software development environment and the work performed is highly collaborative. That means that much time is spent in virtual meetings and phone calls. What VDOT learned from the pilot is that it is very difficult to monitor collaborative time. We learned from the logs that the contractors were accessing the various collaborative platforms (such as Google Suite, SharePoint Online, and Microsoft Teams) and working appropriately. This data provided additional assurances to VDOT that our contractors were productively engaged.

During the course of the pilot, several potential concerns were raised about contractors accessing sensitive or confidential data. Many IT staff, including VDOT contractors, have elevated privileges and can access sensitive data on critical infrastructure and personally identifiable information (PII). We assured the contractors participating in the pilot and their supervisors that their keystrokes and the actual sensitive data that they may view were not being logged or captured. If that were not the case – if the data captured for monitoring contractors included keystrokes or screenshots, for example – VDOT's data confidentiality posture would be placed at risk.

Participating Agency Comments: VITA

Contractor Use and Work Assessment

The VITA IT team successfully piloted a contractor review methodology for three types of teleworking contractors. The managers and their director were able to clearly identity if the staff was productive and worked the hours as reported when teleworking. Overall, the pilot was successful and resulted in several useful findings to help managers gauge work productivity and track billed hours.

VITA has three main types of hourly billed contractors who telework at least one day a week: Project Managers, Developers and Server Administrators. VITA selected six contractors for inclusion in the pilot, including each of the above types and representing approximately 25% of contractors serving VITA's Digital Innovation & Technology group.

Aside from the data provided in this pilot, VITA management utilizes several different methods to evaluate whether contractors are working as recorded on their timesheets, including:

- Daily telework plans and end of day completion notes
- Daily and weekly service request, ticketing, and devOPS product/tasks completion
- Virtual attendance to staff meetings, team calls, and planning sessions

- Reviewing individual contractor Google calendars

All of the above are used together to assess employee's productivity and accurate time reporting.

For the pilot, VITA management supplemented the above supervision tools with three additional types of data:

- System Access Logs (Description, Last Time, Source User and Device Accessed)
- Web Surfing Logs (URL, Source User, Category, Application, Last Time, Bytes Sent, Bytes Received, Top Level Domain Name)
- VPN Logs (Event Type, Source User, Description, First Time, Last Time)

Conclusions

Overall, management could reliably assess whether contractors were productively working and map it directly back to hours worked and reported. However, there were subtle differences in how individuals work and in the individual contractor types that are notable.

VITA noticed several technical issues during its participation in the pilot. The following list summarizes each issue and thoughts about possible ways to mitigate in the future:

- Some contractors did not use the VPN for various technical reasons, including faster speeds available via their remote work site Internet connection if the traffic is not routed through VPN. Reviewing system access logs is important for activity generally and to address gaps in VPN logs. Additionally, if staff were not on VPN, web work and research may not be shown in logs. This issue can be addressed if staff are asked to stay on the VPN while working.
- Staff who logged non-planned or spontaneous meeting events on their calendars were much easier to assess. For example, staff who logged their non-planned phone calls or meetings, especially if they were longer than 30 minutes, helped tremendously with assessment of gaps. To facilitate assessment, teleworking staff could be asked to log longer phone calls, research time, hangout sessions and all out of office, town hall phone calls or other work not logged on their computer.
- The location of user IP can vary on hotspots, with non-dedicated IP addresses, or by an Internet service provider's network setup and routing. Management should be mindful that location is relative and may not be accurate at all times.
- Because modern websites often incorporate elements from different companies or domains, web surfing logs can contain ads and hidden content that do not represent user choices. When reviewing web log files, it is important to review time stamps. For example, a visit to Yahoo might show up as multiple page visits that in fact were just viewing a single article on devOPS, all within 2 minutes.
- Some staff have multiple accounts for various reasons, not just one. It is critical to ensure that management is reviewing all the staff person's account including regular user accounts as well as administrative accounts.

VITA also made observations related to different types of contractor work:

- Project Managers
    - Most project managers do not access servers or code repositories. Instead, the managers relied on Google Calendar and pulling system access logs for collaboration tools such as SharePoint and Team Planner to get a fuller assessment of activity.
    - It was important for project managers to show their accurate calendars for longer phone calls and non-meeting or impromptu planning sessions.
- Developers
    - Work done from administrative accounts will not show up if they are doing work not on the network – for example, installing Cold Fusion on a laptop from a disc or doing remote work into a cloud environment. Encouraging staff to put that type of work on their work calendar or in time billing software can address this gap.
    - Some development work is done locally and VPN may or may not be activated, which would be important for staff to record that on their calendars. Managers can review work completion along with calendaring and access to code repositories as they check in and check out their work.
- System Administrators
    - Some system administrators have multiple accounts. Reviewers should include all of a contractor's accounts when doing a review of timekeeping productivity.

Mandated monitoring software is not a panacea and raises many questions.

DHRM and VITA are open to marketplace offerings that facilitate remote work and management of remote workers. The team will continue to monitor best practices in contractor management and accountability practices to ensure the best proposed solutions are available to Virginia teams. The team continues to review information from other states and private industry about how to meet the challenges of a remote work environment. Managers should remain in communication with remote workers and to understand work progress, and monitoring software can provide some of these services. However, at this point, for various reasons described below, the team does not recommend a monitoring mandate, especially if such a mandate is drawn or promoted with particular tools in mind. DHRM and VITA will work with agencies that want monitoring data, but all parties should use this type of monitoring as supplementary and not a comprehensive tool. Monitoring tools have inherent limitations and raise potential issues, as detailed below.

Collecting the data logged by the Commonwealth's existing tools, or the data that some tools in the marketplace tout as able to be logged (such as records of keystrokes and mouse movements or automated screenshots), does not accomplish the tasks that are essential for managing remote workers, nor does that data give managers a universal or easy way to assess productivity. As a research paper from a leading technology consulting company noted earlier this year, "the concept of 'productivity' is highly context-specific," and work that is not a series of routine tasks often lacks defined standards for measuring productivity, such that "employee productivity monitoring may be a poor fit." At the least, additional contextual analysis would be required to

understand what validity and value may be obtained from data that is collected and measured as a proxy for productivity, such as time spent on tasks and task volume.[1]

At the same time, monitoring tools raise substantial issues, including: legal compliance, information security, procurement, project management, and employee morale.

With respect to legal compliance, a monitoring and data collection mandate (especially for data like keystroke logging or automated screenshots) raises concerns about inadvertent collection and potentially improper storage of personally identifying information, protected health information, tax information, privileged/confidential information, trade secrets, or other sensitive information. Under state and federal law, many categories of such data must be kept segregated and secured from unauthorized personnel. Commonwealth security policies likewise apply different requirements based on data type. It is unclear how software currently on the market complies with such requirements, and any potential monitoring software must be examined fully in consultation with counsel at the Office of the Attorney General before being deployed at a Commonwealth agency.

From an information security perspective, mandated monitoring and data collection creates new risks and vulnerabilities. Software to accomplish monitoring and data collection must be examined for security issues. Such software often requires sensitive, administrative access to the computers on which it is installed, not to mention new channels to transmit monitoring data over the network to wherever it will be stored. Data related to work being done for the Commonwealth likely is Commonwealth data, and putting repositories of such data outside the control of the Commonwealth normally would not be in compliance with security policies.

Procurement concerns emerge from the effects of monitoring mandates. Opposition to monitoring mandates among the business community is widespread, as evidenced by the opposition of an array of business stakeholders to monitoring bills proposed during the 2019 and 2020 Sessions of the General Assembly. Small businesses and other contractors who do not want to wrestle with the complexities and issues created by the use of such software and its collection of data may respond by looking to do business elsewhere, reducing the Commonwealth's options in the market. Monitoring mandates seem likely to increase the costs of procurements by pushing contractors to assume costs (for licensing, operation, and administration of the software, and storage of the data generated by the software) that contractors will simply incorporate into their pricing and pass on to the contracting agencies.

Depending on their provisions, monitoring mandates may fail to encompass many IT projects and many devices that contractors use. Monitoring mandates also do not address the most common IT projects issues (scope, requirements definition, and unexpected challenges or changes), and if imposed without regard for how such issues may have changed projects, such mandates may reduce agency flexibility to deal with such issues.

[1] Gartner, "Getting Value From Employee Productivity Monitoring Technologies for Remote and Office-Based Workers," ID G00723038 (April 29, 2020).

Last but not least, "monitoring for the purpose of improving productivity is rife with ethical challenges. It can easily cross the 'creepy' line and create a toxic work culture."[2] Some attempts by private companies to monitor workers with technology have backfired, making clear that monitoring requires a well-thought out strategy and added communications efforts.[3]

DHRM and VITA are focused on the challenge of ensuring effective remote work, for which many resources are available.

The beginning of the COVID-19 state of emergency in March has reinforced and accelerated state agencies' efforts to make remote work possible and productive.

Over the past year, and in the immediate aftermath of the state of emergency, VITA has prioritized tools for remote connectivity and interaction. VITA has implemented cloud-based services (such as Google email), offered an array of collaboration tools (such as Microsoft Teams and Google's Drive, Meet, and other browser-based applications), and made cloud platforms (such as Amazon Web Services and Microsoft Azure) available. In the month after the state of emergency, VITA was able to expand the Commonwealth's virtual private network (VPN) capacity by 700% and implement a secure alternative to VPN. Increased connectivity and collaboration tools promote employee interaction, both with each other and with Commonwealth network systems, adding to the information available to manage remote workers.

Both DHRM and VITA have increased training and resources for management of remote workers. A 45 page Teleworking 101 Resource Guide was published in April 2020, along with the creation of online resources targeted at both managers and employees. In addition, an online training module is available with a specific focus on how best to manager remote workers. Expanded remote work may continue for some time, and DHRM anticipates continuing to increase remote work management training and communications.

DHRM and VITA also favor adapting contracting strategies for remote work. Deliverable-based contracting (rather than hourly or time and materials contracting) can ensure that the Commonwealth is paying only for actual productivity while simultaneously giving contractors freedom to work in the way that makes sense for them. State agencies already use deliverable-based contracting; increasing use of that contracting strategy would be a sensible and straightforward way to enable flexible remote work while responsibly guarding public resources.[4]

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[2] Gartner, "Getting Value From Employee Productivity Monitoring Technologies for Remote and Office-Based Workers," ID G00723038 (April 29, 2020).

[3] *See, e.g.*, Mark Murphy, Forbes, "Barclays Forced To Stop 'Big Brother' Employee Tracking System After Backlash" (Feb. 21, 2020), at https://www.forbes.com/sites/markmurphy/2020/02/21/barclays-forced-to-stop-big-brother-employee-tracking-system-after-backlash/

[4] Other aspects of state contracts, such as payment schedules and documentation and records access provisions, also can help ensure results, promote accountability, and reduce risk.

Finally, it is important to remember that remote work does not fundamentally change the Commonwealth's existing legal and administrative protections against fraud, waste, and abuse. The Commonwealth has substantial protections that remain available and active in an expanded remote work environment. Problems can be uncovered and contractors held accountable through the Virginia Fraud Against Taxpayers Act[5]; the Office of the State Inspector General's fraud, waste, and abuse hotline; other reviews of state agencies (by entities such as the Joint Legislative Audit and Review Commission and the Auditor of Public Accounts); and state contract provisions.

Conclusion

DHRM and VITA appreciate the opportunity provided by this budget provision to explore how technology may play a role in tracking and evaluating the productivity of remote workers. DHRM and VITA recognize the challenge of effective management of remote workers and will continue to identify resources and strategies to meet the identified challenges.

[5] *See* Va. Code § 8.01-216.1 *et seq*.