ASSESSMENT REPORT
An Agency of City and County of Denver
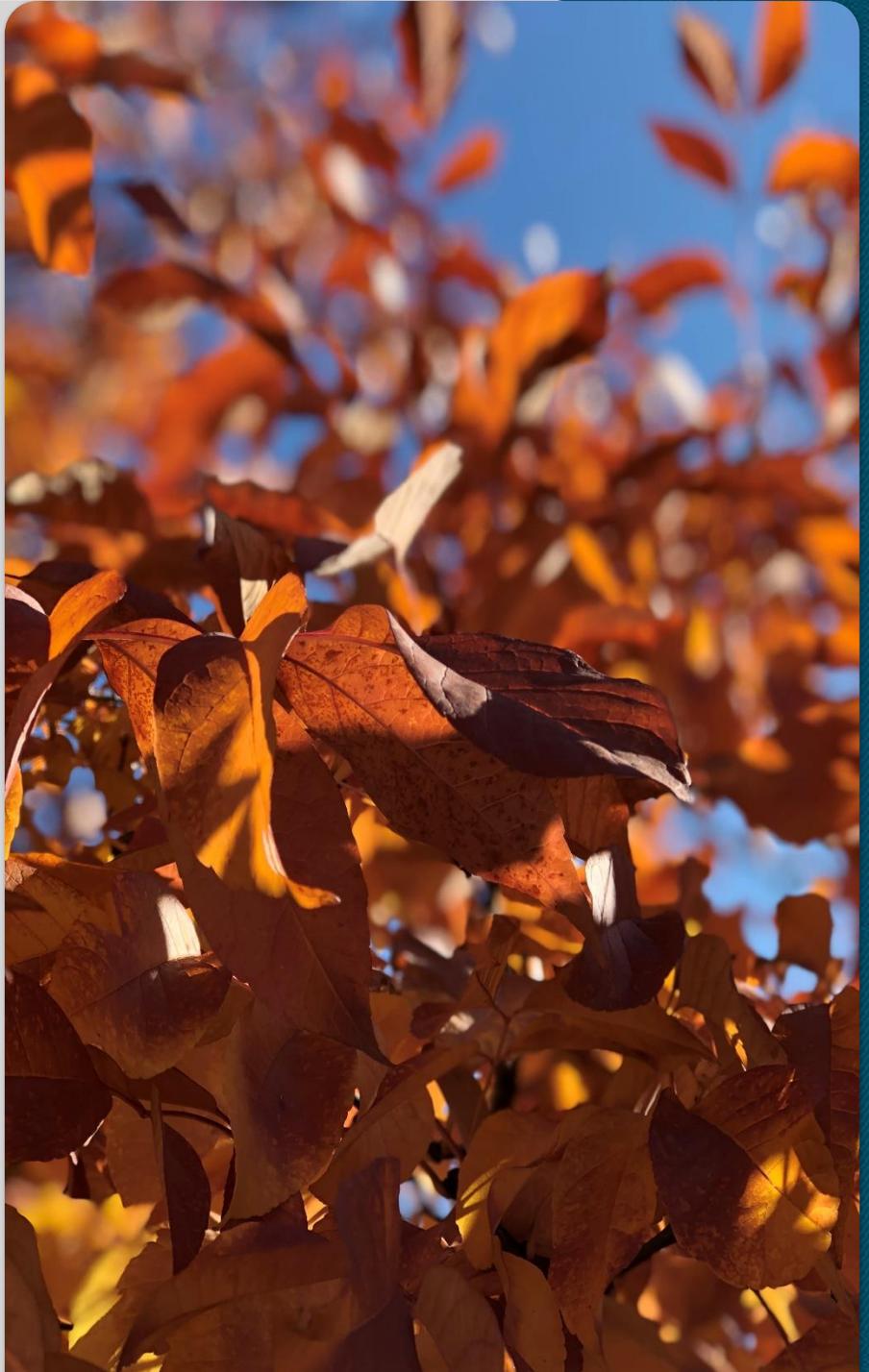### *Software Asset Management Assessment*
November 2017

Office of the Auditor
Audit Services Division
City and County of Denver

Timothy M. O'Brien, CPA
Denver Auditor

The Auditor of the City and County of Denver is independently elected by the citizens of Denver. He is responsible for examining and evaluating the operations of City agencies and contractors for the purpose of ensuring the proper and efficient use of City resources and providing other audit services and information to City Council, the Mayor, and the public to improve all aspects of Denver's government.

The Audit Committee is chaired by the Auditor and consists of seven members. The Audit Committee assists the Auditor in his oversight responsibilities regarding the integrity of the City's finances and operations, including the reliability of the City's financial statements. The Audit Committee is structured in a manner that ensures the independent oversight of City operations, thereby enhancing citizen confidence and avoiding any appearance of a conflict of interest.

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Jared Miller, CISA, CFE, Lead Auditor

Contractors

Deloitte & Touche LLP

Jeff Goodwin, Partner, Risk and Financial Advisory Services

Martin Latz, Senior Manager, Risk and Financial Advisory Services

Dustin Palmer, Manager, Risk and Financial Advisory Services

Christian Pedrosa, Senior Consultant, Risk and Financial Advisory Services

Cady Williams, Consultant, Risk and Financial Advisory Services

You can obtain copies of this report by contacting us:

Office of the Auditor

201 West Colfax Avenue, #705

Denver CO, 80202

(720) 913-5000 ⬩ Fax (720) 913-5247

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Audit report year: **2017**

City and County of Denver

November 16, 2017

AUDITOR'S REPORT

A third party has completed a Software Asset Management Assessment. The assessment found some areas of strength, and some areas that need improvement, which have been communicated to the City's Technology Services department for further evaluation.

This assessment is authorized pursuant to the City and County of Denver Charter, Part 2, Section 1, General Powers and Duties of Auditor.

We extend appreciation to Technology Services and the personnel who assisted and cooperated with us during the assessment.

Denver Auditor's Office

Timothy M. O'Brien, CPA

Auditor

Deloitte & Touche LLP

1601 WeWatta Street
Suite 400
Denver, CO 80202

USA

Tel: +1 303 312 4160
www.deloitte.com

Transmittal Letter

We are pleased to provide this Software Asset Management Assessment performed in accordance with our Statement of Work dated June 15th, 2017 by Deloitte & Touche LLP, as requested by City of Denver Auditor's Office (the "Company").

Our services and deliverables are solely for the Company's benefit, and are not intended to be relied upon by any person or entity other than the Company. The Company should not disclose the services or deliverables, or refer to the services or deliverables, except as specifically set forth in the statement of work.

Our services were performed in accordance with the *Statement on Standards for Consulting Services* issued by the American Institute of Certified Public Accountants (AICPA) and did not constitute an engagement to provide audit, compilation, review, or attestation services as described in the pronouncements on professional standards issued by the AICPA, the Public Company Accounting Oversight Board, or other regulatory body and, therefore, we did not express an opinion or any other form of assurance with respect to our services.

We did not provide any legal advice regarding our services, nor did we provide any assurance regarding the outcome of any future audit or regulatory examination or other regulatory action. The responsibility for all legal issues with respect to these matters, such as reviewing all deliverable[s] and work product[s] for any legal implications to the Company, will be the Company's. It is further understood that management is responsible for, among other things, identifying and ensuring compliance with laws and regulations applicable to the Company's activities.

We look forward to working with you in the future.

Jeff Doodin

Deloitte & Touche LLP

Deloitte & Touche LLP
1601 WeWatta Street
Suite 400
Denver, CO 80202
USA

Tel: +1 303 312 4160
www.deloitte.com

Deloitte.

**Software Asset Management Assessment
City and County of Denver**

Background

Deloitte & Touche LLP (Deloitte) was tasked by the City Auditor's Office (City Auditor) to deliver a Software Asset Management (SAM) assessment of the City and County of Denver technology services department. The nature of the services performed for the City and County of Denver included two phases as described below:

Current State Assessment and Gap Analysis

- Planning and Scoping
    - Develop agreed upon project plan establishing roles and responsibilities, timelines and deliverables
    - Identify and schedule meetings with key stakeholders and conduct initial scoping meetings with selected stakeholders
    - Generate data request list and gather documentation such as organizational charts, and policies and procedures to be reviewed during the engagement
    - Establish overall project governance, cadence meetings, and escalation / remediation process
- Data Gathering
    - Interview key stakeholders to determine the current state of Technology Services SAM capabilities including roles and responsibilities of the SAM team and supporting business unit such as procurement, infrastructure, legal, etc.
    - Gather relevant documentation (i.e., IT Asset Management related documentation, data related to software lifecycle (refer to Figure 1) and work with vendor management teams to obtain vendor spend and entitlement data
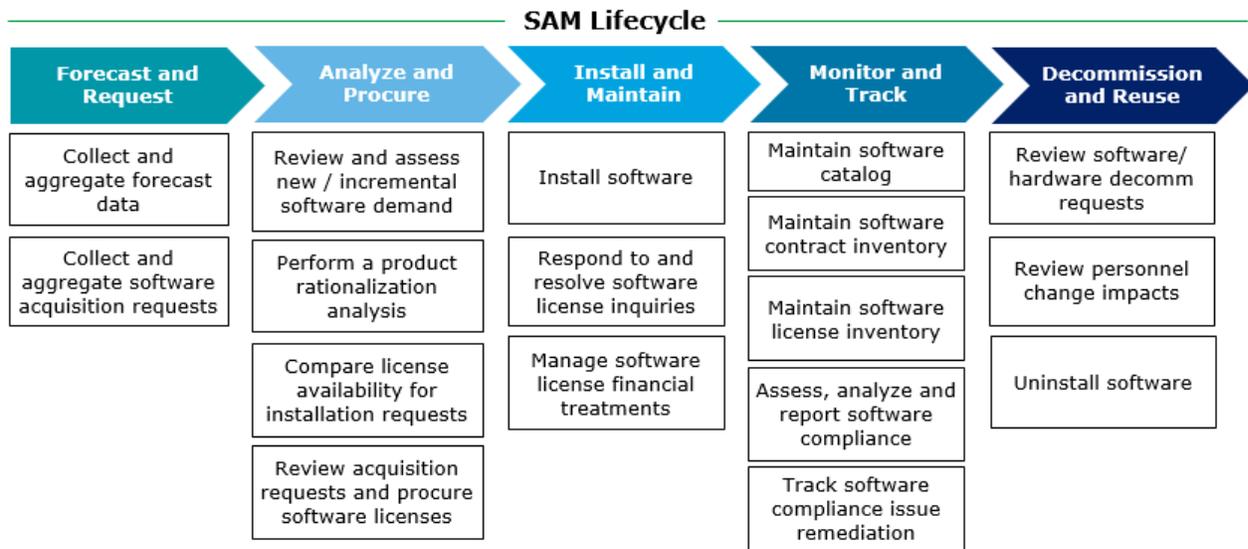
SAM Lifecycle

Forecast and Request	Analyze and Procure	Install and Maintain	Monitor and Track	Decommission and Reuse
Collect and aggregate forecast data	Review and assess new / incremental software demand	Install software	Maintain software catalog	Review software/ hardware decomm requests
Collect and aggregate software acquisition requests	Perform a product rationalization analysis	Respond to and resolve software license inquiries	Maintain software contract inventory	Review personnel change impacts
	Compare license availability for installation requests	Manage software license financial treatments	Maintain software license inventory	Uninstall software
	Review acquisition requests and procure software licenses		Assess, analyze and report software compliance	
			Track software compliance issue remediation	

FIGURE 1 – SAM LIFECYCLE

- SAM Assessment
    - Assess the current SAM environment including, contracting and procurement, software compliance, software deployment, software monitoring and tracking, and software decommissioning
    - Confirm findings with stakeholders and update as appropriate
    - Create gap analysis & provide recommendations
    - Create a gap analysis detailing SAM process and control gaps identified and review the findings with the management team (refer to Figure 2)
    - Compile SAM process control observations and improvement opportunities to address gaps identified for improvement in the immediate and long-term time frame
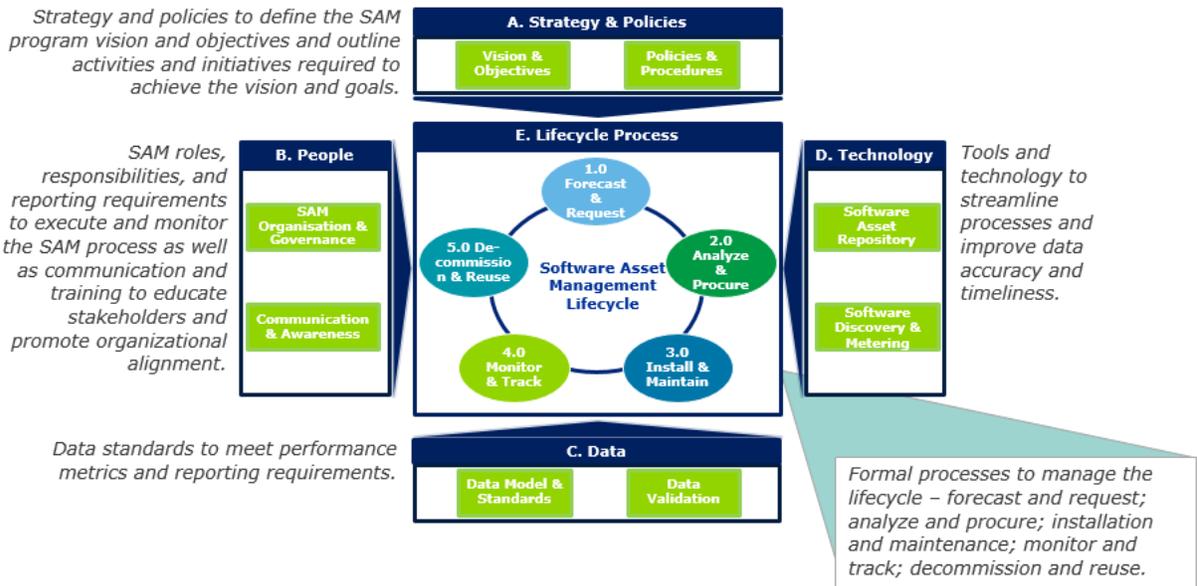
Software Asset Management Assessment

Strategy and policies to define the SAM program vision and objectives and outline activities and initiatives required to achieve the vision and goals.

A. Strategy & Policies
- Vision & Objectives
- Policies & Procedures

SAM roles, responsibilities, and reporting requirements to execute and monitor the SAM process as well as communication and training to educate stakeholders and promote organizational alignment.

B. People
- SAM Organisation & Governance
- Communication & Awareness

E. Lifecycle Process
- 1.0 Forecast & Request
- 2.0 Analyze & Procure
- 5.0 De-commission & Reuse
- Software Asset Management Lifecycle
- 4.0 Monitor & Track
- 3.0 Install & Maintain

D. Technology
- Software Asset Repository
- Software Discovery & Metering

Tools and technology to streamline processes and improve data accuracy and timeliness.

Data standards to meet performance metrics and reporting requirements.

C. Data
- Data Model & Standards
- Data Validation

Formal processes to manage the lifecycle – forecast and request; analyze and procure; installation and maintenance; monitor and track; decommission and reuse.

FIGURE 2 – DELOITTE'S SAM FRAMEWORK

Prioritization and Vendor Baseline Assessment

- Create Vendor Prioritization Framework
  - Gather major software vendor contracts and work with IT and Procurement to gather software spend data in order to analyze and identify the City's highest spend vendors
  - Provide a Vendor Prioritization Framework which includes the highest risk vendors, based on spend data received, audit frequency, and agree upon a selected vendor for baseline exercise
- Contract and Entitlements
  - Conduct a review of software contracts and entitlements and work with IT, procurement, outsourcers, vendors, and resellers to determine the current license, maintenance, & subscription entitlement for agreed upon vendor, the data from which will be used to develop an entitlement assessment
- Discovery & Deployment Validation
  - Collect software installation information and compare entitlement and deployment data leveraging existing tools, or Contractor's scripts if required
  - Conduct completeness & accuracy testing for software inventory records
- Reporting & Recommendations
  - Provide a software baseline assessment that consolidates deployment and entitlement data and review the assessment with the management team
  - Utilize findings from Phase 2 to identify potential savings opportunities, remediation areas to limit compliance exposure, and process improvements

Observations

Below are a selection of observations resulting from the two phases of SAM assessment:

1) The current SAM program has not been integrated with existing discovery sources in order to identify all software deployment, compliance and license positions throughout the City in an automated process.
2) There is a lack of formalized and understood policies and procedures across the SAM lifecycle, and knowledge of software licensing and compliance is inconsistent throughout the organization.
3) There is lack of a well-defined, robust, and automated method of assessing unused or unallocated software licenses in both personal computers and servers.
4) There is uncertainty associated with the compliance of server licenses due to lack of in-house licensing expertise and lack of visibility into software deployment in the datacenter environment.

Recommendations

Below are a selection of recommendations resulting from the two phases of SAM assessment:

1) Accountability and awareness for the SAM mission should be clearly articulated from leadership in order to drive completion of SAM objectives.
2) The software governance function should enable the SAM program to access critical data to carefully report on software compliance, including server access controls to determine completeness of inventory data.
3) Maintain accountability by clearly defining roles, responsibilities, access, and communicating these roles across the organization so as to promote visibility to the mission of the SAM program.
4) Formalize processes and controls around management of phases of the software lifecycle to ensure consistent practice across agencies and Technology Services.

Agency Response

November 07, 2017

Auditor Timothy O'Brien, CPA
Office of the Auditor
City and County of Denver
201 West Colfax Avenue, Dept. 705
Denver, Colorado 80202

Dear Mr. O'Brien,

The Office of the Auditor has conducted a Software Asset Management Assessment.

This memorandum provides a written response for each reportable condition noted in the Auditor's Report final draft that was sent to us on October 17, 2017. This response complies with Section 20-276 (c) of the Denver Revised Municipal Code (D.R.M.C.).

AUDIT FINDING 1

RECOMMENDATION 1 Accountability and awareness for the SAM mission should be clearly articulated from leadership in order to drive completion of SAM objectives.		
Agree or Disagree with Recommendation	**Target date to complete implementation activities (Generally expected within 60 to 90 days)**	**Name and phone number of specific point of contact for implementation**
Agree	1/31/2018	John Pira 720-913-4055

Narrative for Recommendation 1
Technology Services (TS) agrees with the finding. TS will formally approve and communicate ITAM charter across the agencies and departments supported by Technology Services to establish the executive sponsorship and drive completion of SAM objectives.

AUDIT FINDING 2

RECOMMENDATION 2		
The software governance function should enable the SAM program to access critical data to carefully report on software compliance, including server access controls to determine completeness of inventory data.		
Agree or Disagree with Recommendation	**Target date to complete implementation activities (Generally expected within 60 to 90 days)**	**Name and phone number of specific point of contact for implementation**
Agree	1/31/2018	John Pira 720-913-4055

Narrative for Recommendation 2
Technology Services (TS) agrees with the finding. The Information Technology Asset Management (ITAM) Program Charter, once officially approved, will further enable the SAM program to perform software-related compliance activities such as conducting self-audit and inventorying software data by establishing processes to perform risk-based reconciliations.

TS will also perform a cost-benefit analysis to determine whether an additional software management tool should be invested to further enhance the software asset risk management and compliance capabilities.

AUDIT FINDING 3

RECOMMENDATION 3		
Maintain accountability by clearly defining roles, responsibilities, access, and communicating these roles across the organization so as to promote visibility to the mission of the SAM program.		
Agree or Disagree with Recommendation	**Target date to complete implementation activities (Generally expected within 60 to 90 days)**	**Name and phone number of specific point of contact for implementation**
Agree	1/31/2018	John Pira 720-913-4055

Narrative for Recommendation 3
Technology Services (TS) agrees with the finding. As stated in the narrative for Recommendation 1, ITAM Program Charter will be updated to add clarity to define roles, responsibilities, and access control. The charter will be communicated across the

agencies and departments supported by Technology Services to ensure the execution of the SAM mission and objectives.

AUDIT FINDING 4

RECOMMENDATION 3.1 Formalize processes and controls around management of phases of the software lifecycle to ensure consistent practice across agencies and Technology Services.		
Agree or Disagree with Recommendation	**Target date to complete implementation activities (Generally expected within 60 to 90 days)**	**Name and phone number of specific point of contact for implementation**
Agree	1/31/2018	John Pira 720-913-4055

Narrative for Recommendation 4
Technology Services (TS) agrees with the finding. TS manages software lifecycle, such as requesting and installing software, by utilizing Service Now, an Information System Service Management (ITSM) tool. TS will further formalize and document the processes and controls around Service Now and perform spot checking to ensure the processes are consistently followed and enforced.

TS will also perform a cost-benefit analysis to determine whether an additional software management tool should be invested to further enhance the software asset risk management and compliance capabilities.

Please contact John Pira at 720-913-4055 with any questions.

Sincerely,

Scott Cardenas
Chief Information Officer

cc: Valerie Walling, Deputy Auditor, CPA,CMC
        Heidi O'Neil, CPA, CGMA, Director of Financial Audits
        Kevin Sear, CPA, CIA, CISA, CFE, CGMA, Audit Manager
        Christopher Todd, Chief Technology Officer
        Alex Stefanacci, IT Director
        John Pira, IT Manager
        Samantha Shih, IT Compliance Analyst