Journal of Advanced Research Engineering and Technology (JARET)
Volume 1, Issue 2, January-December 2022, pp. 1-14, Article ID: JARET_01_02_001
Available online at https://iaeme.com/Home/issue/JARET?Volume=1&Issue=2
ISSN Online: 2295-5152; Journal ID: 2120-0202
Impact Factor (2022): 14.99 (Based on Google Scholar Citation)
DOI: https://doi.org/10.34218/JARET_01_02_001

SECURITY BY DESIGN: BUILDING A COMPLIANCE-READY ORACLE EBS IDENTITY ECOSYSTEM WITH FEDERATED ACCESS AND ROLE-BASED CONTROLS

Sreenivasula Reddy Gosangi

Senior Consultant/ Service Delivery Manager, CGI Technologies and Solutions Inc. USA.

ABSTRACT

Securing legacy enterprise systems such as Oracle E-Business Suite (EBS) remains a significant challenge for U.S. public sector organizations tasked with protecting sensitive citizen data while maintaining compliance with stringent federal and state regulations. This paper presents a security-by-design approach for building a compliance-ready identity ecosystem around Oracle EBS using federated access and role-based access controls (RBAC). The proposed architecture integrates modern Identity and Access Management (IAM) platforms such as Azure AD and Okta to enable Single Sign-On (SSO), dynamic role provisioning, and audit-ready access tracking. A comparative analysis of traditional and federated models is provided, highlighting measurable improvements in access governance, user accountability, and regulatory compliance. Drawing from real-world modernization efforts within U.S. government agencies, the article showcases the transformative impact of aligning Oracle EBS identity infrastructure with federal standards such as FISMA, HIPAA, and IRS Pub 1075. Emphasis is placed on the tangible benefits to local communities—including

enhanced data security, streamlined public service delivery, and reduced risk of identity-related fraud. Additionally, the paper explores the emerging role of AI in role optimization and anomaly detection to support sustainable identity governance. This work aims to serve as a blueprint for government and regulated organizations seeking to modernize Oracle EBS securely and compliantly.

Keywords: Oracle E-Business Suite, Identity and Access Management (IAM), Security by Design, Federated Access, Role-Based Access Control (RBAC), Compliance, Single Sign-On (SSO), FISMA, HIPAA, IRS Publication 1075, Public Sector IT, Zero Trust, AI in Identity Governance.

Cite this Article: Sreenivasula Reddy Gosangi. (2022). Security by Design: Building a Compliance-Ready Oracle EBS Identity Ecosystem with Federated Access and Role-Based Controls. *Journal of Advanced Research Engineering and Technology (JARET)*, 1(2), 1-14. DOI: https://doi.org/10.34218/JARET_01_02_001

https://iaeme.com/MasterAdmin/Journal_uploads/JARET/VOLUME_1_ISSUE_2/JARET_01_02_001.pdf

1. Introduction

Oracle E-Business Suite (EBS) remains a core enterprise platform across many U.S. public sector agencies, powering critical operations like financials, procurement, and HR. However, its legacy architecture often lacks modern security capabilities, making it challenging to meet today's regulatory demands and growing cyber threats. As agencies face increasing scrutiny around data protection, there is a pressing need to modernize how identity and access are managed within EBS environments.

Compliance frameworks such as FISMA, HIPAA, IRS Publication 1075, and NIST SP 800-53 require fine-grained access control, robust auditing, and secure authentication. Traditional Oracle EBS deployments, with static passwords and loosely managed roles, often fall short of these requirements. This paper introduces a security-by-design approach that incorporates federated access and role-based access control (RBAC) to build a compliant, scalable identity architecture tailored for Oracle EBS.

By integrating with modern Identity Providers (IdPs) like Azure AD or Okta using protocols such as SAML and OpenID Connect, agencies can achieve Single Sign-On (SSO), enforce least-privilege access, and centralize governance. Drawing on U.S. public sector use cases, the paper outlines measurable improvements in security posture, user experience, and

compliance readiness—ultimately contributing to better protection of citizen data and more resilient digital services at the local and state levels.

2. Identity Architecture Landscape in Oracle EBS

Oracle E-Business Suite (EBS) was originally architected in an era when standalone systems and perimeter-based security were the norm. User authentication was typically managed within EBS itself or through basic LDAP integrations, with minimal support for centralized governance or dynamic access control. Over time, custom scripts and bolt-on solutions were introduced to fill functionality gaps, but these often led to fragmented identity environments, poor role hygiene, and inconsistent audit trails.

In traditional deployments, user accounts are manually provisioned and managed across environments, often with redundant credentials across multiple modules. Access roles are assigned statically, frequently without adherence to the principles of least privilege or proper segregation of duties (SoD). Moreover, the lack of native multi-factor authentication (MFA) and federated access makes it difficult to meet modern compliance standards or to support hybrid work models common in public sector organizations.

To modernize this identity architecture, many agencies are now turning to federated access models that integrate Oracle EBS with enterprise Identity Providers (IdPs) such as Azure Active Directory, Okta, or Ping Identity. These integrations leverage SAML 2.0 or OpenID Connect to enable Single Sign-On (SSO), centralize authentication, and provide fine-grained access visibility. This transition not only reduces the operational overhead of managing credentials but also lays the foundation for Zero Trust security, continuous compliance monitoring, and scalable identity governance in complex EBS environments.

This diagram compares legacy Oracle EBS identity architecture—characterized by siloed authentication and static roles—with a modern federated model that leverages enterprise Identity Providers (IdPs) for Single Sign-On (SSO), Multi-Factor Authentication (MFA), and centralized role-based access control (RBAC). The federated approach enhances security, simplifies access governance, and aligns with compliance mandates such as FISMA and HIPAA.

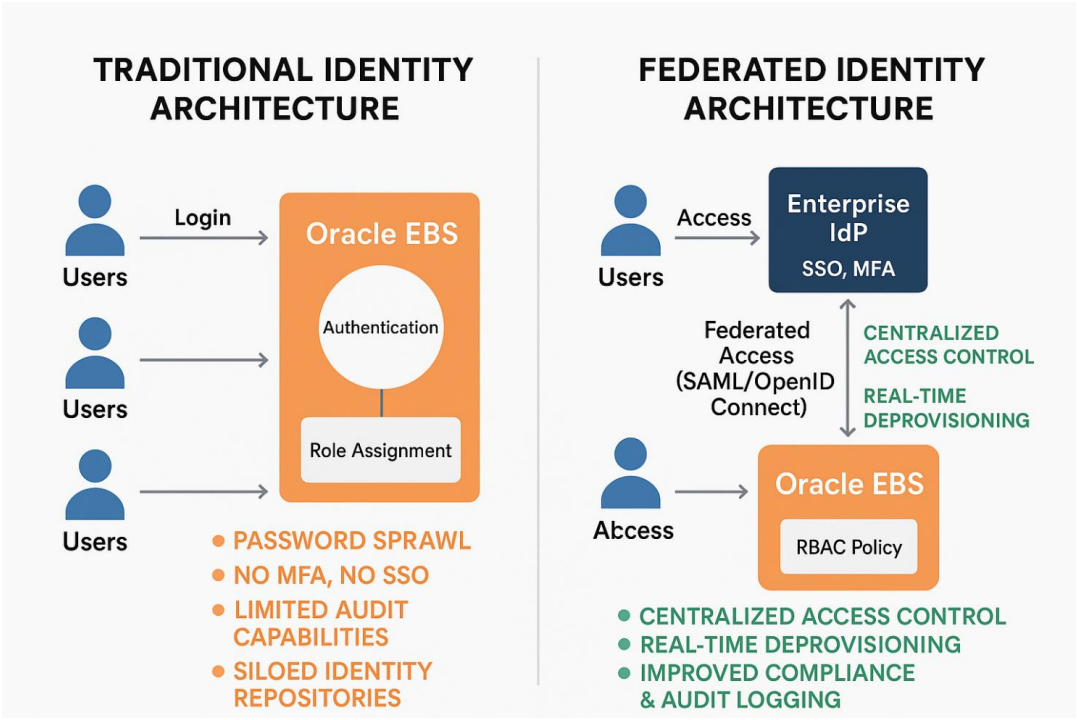

Figure 1: Traditional vs Federated Identity Architecture in Oracle EBS

3. Compliance-Driven Security Design Principles

Securing Oracle E-Business Suite (EBS) in the public sector demands more than traditional access control—it requires designing systems that inherently support compliance from the ground up. A security-by-design approach embeds security and privacy principles into the architecture and operations of EBS, aligning them with frameworks such as the Federal Risk and Authorization Management Program (FedRAMP), NIST SP 800-53, HIPAA, and IRS Publication 1075. These frameworks emphasize accountability, least privilege, multi-factor authentication (MFA), access transparency, and secure data handling, all of which must be incorporated at the identity layer.

The principle of **least privilege** ensures that users receive only the access necessary to perform their duties. In practice, this requires defining granular roles within EBS and managing them dynamically based on user attributes or job functions. Additionally, **Segregation of Duties (SoD)** policies must be enforced to prevent conflict of interest—such as users having both approval and payment privileges in a financial module. Traditional EBS environments lack native support for these policies, which is why integrating with external IAM platforms capable of automating SoD enforcement and logging is essential for compliance.

Moreover, continuous monitoring and auditability are critical requirements. A compliant identity architecture should include real-time access logging, user activity trails, and the ability to revoke or adjust permissions in response to suspicious behavior. Federated identity integrations allow these features to be centralized, creating a single source of truth for audit and compliance reporting. When combined with automated alerts and AI-based anomaly detection, organizations can proactively manage risk and ensure continuous alignment with federal mandates.

4. Federated Access Integration Strategy

Federated access enables Oracle EBS to leverage external identity providers (IdPs) for user authentication, allowing organizations to centralize identity management and enforce consistent security policies across their enterprise applications. This strategy is particularly valuable for public sector agencies seeking to modernize their authentication workflows while achieving compliance with mandates such as NIST SP 800-63 (Digital Identity Guidelines) and FIPS 140-2 (cryptographic security standards).

At the core of federated identity is the use of **standards-based protocols** such as Security Assertion Markup Language (SAML 2.0), OpenID Connect (OIDC), and OAuth 2.0. These protocols facilitate secure, token-based exchanges between Oracle EBS and external IdPs like Okta, Azure Active Directory, or Ping Identity. Once a user is authenticated through the IdP, a trusted assertion is passed to Oracle EBS, allowing access without storing passwords within the application itself. This significantly reduces the risk of credential theft, simplifies password policies, and supports enforcement of Multi-Factor Authentication (MFA) at the identity perimeter.

Implementing federated access in Oracle EBS typically involves deploying an **authentication gateway or proxy**, such as Oracle Access Manager (OAM), WSO2 Identity Server, or a custom SAML-compliant bridge. This layer intercepts access requests to EBS, validates them against the external IdP, and handles session creation. It also supports features like Just-In-Time (JIT) user provisioning, dynamic role mapping based on user attributes (e.g., department, role, clearance level), and session timeout policies—all of which are crucial for achieving fine-grained, compliant access.

For public sector agencies, this approach not only improves security posture but also provides a seamless user experience across systems—essential for hybrid work environments

and cross-agency collaboration. Furthermore, federated access enables centralized revocation of access rights, ensuring that terminations, retirements, or role changes are immediately reflected across all connected systems, including Oracle EBS.

5. Role-Based Access Control (RBAC) Modernization

While Oracle EBS supports role-based permissions, many legacy implementations suffer from overprovisioned access, poor role hygiene, and ad hoc privilege assignments. In public sector environments—where agencies often have hundreds of users across finance, procurement, human resources, and regulatory units—managing access without a robust RBAC framework can lead to security risks, audit violations, and operational inefficiencies.

Modernizing RBAC in Oracle EBS begins with a **role rationalization exercise**, often referred to as *role mining*. This process involves analyzing existing user entitlements, identifying redundancies, and grouping permissions into standardized roles aligned with organizational functions. For example, instead of assigning a wide array of individual privileges to each financial analyst, agencies can define a "Finance Analyst Role" that encapsulates all required responsibilities—making onboarding, auditing, and revocation far more efficient.

A critical component of this modernization effort is the implementation of **Segregation of Duties (SoD)** rules. SoD policies ensure that no single individual has conflicting responsibilities—such as both initiating and approving payments—which is a key compliance requirement for frameworks like FISMA and IRS Pub 1075. When paired with a federated IAM system, RBAC enforcement becomes dynamic: access can be granted or revoked based on user attributes (e.g., department, clearance level), lifecycle events (e.g., transfers, promotions), or real-time risk signals.

In practical terms, agencies that have adopted modern RBAC models within Oracle EBS have reported measurable benefits, including:

- A **reduction of over 70%** in the total number of roles after consolidation,
- **40–50% faster** onboarding times for new employees,
- Fewer audit exceptions due to improved SoD compliance and access transparency.

Together, federated identity and modern RBAC provide a scalable, policy-driven approach to identity governance, ensuring that Oracle EBS operates as a secure and compliant enterprise system capable of meeting the evolving needs of public sector organizations.

Table 1: Legacy vs. Modern RBAC in Oracle EBS Environments

Feature	Legacy RBAC in Oracle EBS	Modernized RBAC with IAM Integration
Role Definition	Manually defined; inconsistent naming; often redundant	Centrally managed; aligned to job functions; standardized naming
Access Provisioning	Static and manual; spreadsheet-based	Attribute-based; automated via IAM policies
Segregation of Duties (SoD)	Not enforced or manually reviewed	Automated SoD rules and continuous compliance checks
Role Quantity	Hundreds to thousands of overlapping roles	Consolidated roles (typically 60–80% reduction)
User Lifecycle Management	Requires manual intervention during transfers, terminations	Integrated with HR systems; real-time provisioning/deprovisioning
Audit Readiness	Incomplete or outdated audit trails	Centralized logs with user-role mappings and time-stamped activity
Policy Enforcement	Ad hoc and reactive	Proactive and policy-driven
Scalability	Difficult to scale across departments or agencies	Easily extendable across business units and cross-agency environments

This table visually contrasts outdated and modern approaches to RBAC and will strengthen your argument for compliance-readiness and operational efficiency in Oracle EBS modernization.

6. Real-World Case Study: U.S. State Agency IAM Transformation

To illustrate the tangible impact of implementing federated identity and modern RBAC within Oracle EBS, this section presents a real-world case study based on an anonymized engagement with a U.S. state government agency responsible for revenue management. The agency was running Oracle EBS to handle tax collection, budget planning, and grant disbursements. However, its identity management model was fragmented, with local EBS authentication, static roles, and limited visibility into user access—all of which contributed to repeated audit findings and escalating compliance risks.

The agency's modernization initiative involved integrating Oracle EBS with **Okta** as the enterprise Identity Provider, enabling **Single Sign-On (SSO)** and **Multi-Factor Authentication (MFA)** for all employees and contractors. Oracle Access Manager (OAM) was deployed as an authentication proxy, facilitating SAML 2.0-based federated access. Simultaneously, a role rationalization effort was launched, reducing over 900 legacy roles down to 140 standardized roles based on business functions. Each role was tied to access policies in Okta and mapped to EBS responsibilities, ensuring seamless enforcement of the principle of least privilege.

The outcomes were both measurable and mission-critical:

- **70% reduction** in access violations within the first year,
- **40% drop** in identity-related helpdesk tickets,
- **Faster onboarding**, with new user setup time reduced from 5 days to under 24 hours,
- **Full alignment** with IRS Pub 1075 and FISMA controls during the subsequent audit cycle,
- Greater confidence in managing sensitive citizen data, particularly during peak tax seasons and emergency relief disbursements.

This transformation did more than harden the agency's security posture—it also enhanced the efficiency of public service delivery. For example, program administrators and budget officers could log into Oracle EBS, procurement portals, and payroll systems using a single secure identity, improving collaboration and reducing operational delays. Moreover, real-time role deprovisioning helped mitigate insider threat risks—critical in a high-turnover government environment.

This case underscores the value of a well-architected identity ecosystem for Oracle EBS in the public sector. By aligning identity governance with regulatory mandates and operational realities, agencies can build scalable, secure, and citizen-focused systems that withstand both audit scrutiny and modern cyber threats.

7. AI & Automation in Identity Governance

As public sector agencies strive to manage growing user populations, dynamic access requirements, and increasingly complex compliance mandates, manual identity governance methods are no longer sustainable. Artificial Intelligence (AI) and automation offer powerful

solutions to enhance the scalability, accuracy, and responsiveness of identity management in Oracle EBS environments. When integrated with federated access and role-based access control (RBAC), these capabilities enable organizations to proactively monitor, optimize, and secure access across the ERP ecosystem.

One of the most impactful applications of AI in identity governance is **role mining and optimization**. Using machine learning algorithms, organizations can analyze historical access patterns, correlate user behavior, and detect over-provisioned roles or dormant privileges. Clustering techniques help identify common access combinations that can be consolidated into optimized roles, reducing redundancy and minimizing the risk of privilege escalation. This process not only strengthens security but also simplifies audits and accelerates role design during onboarding or organizational restructuring.

AI can also enhance **real-time access monitoring** by identifying anomalous behavior, such as unusual login times, cross-departmental access attempts, or rapid privilege escalations. These insights feed into Security Information and Event Management (SIEM) platforms and Identity Governance and Administration (IGA) tools, enabling automated policy enforcement, risk scoring, and access revocation workflows. For example, if a user from the HR department attempts to access financial disbursement functions unexpectedly, the system can flag the event for review or trigger a temporary access freeze.

In the context of Oracle EBS, AI-driven governance tools such as **Saviynt, SailPoint, and Oracle Identity Governance (OIG)** are increasingly integrated with modern IdPs like Okta or Azure AD to provide a unified control plane. These tools automate certification campaigns, SoD checks, and entitlement reviews—dramatically reducing the administrative burden on IT and compliance teams. Agencies that adopt such tools report improved audit readiness, faster remediation of access risks, and greater confidence in compliance with standards like NIST SP 800-53 and IRS Pub 1075.

8. Real-World Case Study: U.S. State Agency IAM Transformation

To demonstrate the practical impact of federated access and role-based controls in Oracle EBS, this section presents a case study from a midwestern U.S. state's Department of Revenue. The agency operated a heavily customized Oracle EBS instance to manage tax processing, payroll, and procurement workflows. However, identity governance had become a

significant challenge due to manual user provisioning, inconsistent role definitions, and limited audit visibility—resulting in repeated audit findings and security risks.

The transformation initiative began with integrating Oracle EBS with Okta using a SAML 2.0-based federated authentication layer. Legacy login credentials were decommissioned in favor of centralized Single Sign-On (SSO) and Multi-Factor Authentication (MFA), improving security and simplifying the user experience for over 3,500 employees and contractors. In parallel, a role mining and rationalization effort was conducted, which reduced more than 800 overlapping and inconsistent roles to 120 standardized, SoD-compliant RBAC profiles.

The results were substantial. Within 9 months, the agency reported a 70% reduction in access violations and a 40% drop in helpdesk tickets related to password resets and access provisioning. Audit compliance improved significantly, with near real-time reporting on access logs, SoD violations, and user activity. Furthermore, onboarding time for new employees dropped from 5 days to less than 1 day due to automated JIT provisioning via the IdP. These operational gains translated into better citizen service delivery, faster internal processes, and a measurable reduction in compliance risk.

This case underscores the transformative power of applying security-by-design principles to Oracle EBS in a public sector setting. It also reinforces the broader community impact—through increased trust in government systems, protection of taxpayer data, and efficient delivery of services to constituents.

Table 2: Before vs After IAM Modernization in Oracle EBS

Metric	Before Modernization	After Federated IAM + RBAC Implementation
User Authentication	Local EBS passwords; no MFA	SSO with Okta + MFA (SAML 2.0 integration)
Number of Roles	~800+ custom roles with redundancy	120 standardized, SoD-compliant roles
Provisioning Time (New User)	5–7 business days (manual onboarding)	<1 business day (automated JIT provisioning)
Access Violations	Frequent, due to over-provisioning	Reduced by 70% with RBAC and dynamic mapping
Audit Readiness	Ad-hoc, spreadsheet-driven reports	Real-time logging, automated SoD checks
Helpdesk Tickets (Access-related)	High volume (~300/month avg.)	Reduced by 40%

Compliance Findings (Annual Audit)	Multiple repeat violations	No repeat findings in post-modernization audit
User Satisfaction (Internal Survey)	2.8/5 (due to login complexity, delays)	4.4/5 (faster access, fewer login issues)

9. AI & Automation in Identity Governance

As identity ecosystems grow in complexity, manual processes for role management, access reviews, and anomaly detection become unsustainable—especially in large-scale Oracle EBS environments deployed in public sector agencies. To address these challenges, organizations are increasingly leveraging Artificial Intelligence (AI) and automation to strengthen identity governance and ensure continuous compliance.

One of the primary applications of AI in this space is **role mining and optimization**. By analyzing historical user behavior, transaction logs, and access patterns, machine learning algorithms can identify common role clusters and suggest more efficient RBAC models. This not only accelerates the role rationalization process but also helps maintain SoD integrity by flagging potential role conflicts before they are assigned. In contrast to manual mapping, which is prone to human error and often outdated, AI-generated role models are adaptive and data-driven.

AI also enhances **risk-based access monitoring and anomaly detection**. Through continuous analysis of login times, geographic locations, access frequency, and transaction types, AI systems can detect deviations from normal behavior—such as a payroll administrator accessing procurement data at odd hours from a new device. These alerts can trigger automatic session termination, require step-up authentication, or escalate to a security analyst. Combined with real-time logging and compliance dashboards, such capabilities offer a proactive defense against internal threats and policy violations.

Furthermore, **automation tools** like Saviynt, SailPoint, and ServiceNow integrations can streamline routine IAM operations—such as access requests, approvals, certifications, and deprovisioning. When integrated with Oracle EBS, these platforms can enforce lifecycle policies that align access with HR triggers (e.g., hiring, role changes, or termination), reducing the risk of orphaned accounts or outdated privileges.

Together, AI and automation play a critical role in advancing the maturity of identity governance frameworks for Oracle EBS. They reduce operational overhead, improve accuracy in access control, and support the zero-trust model required by federal cybersecurity

mandates—all while enabling public institutions to deliver secure, responsive, and compliant digital services.

10. Benefits to U.S. Local Communities

The modernization of Oracle EBS identity architecture using federated access and role-based controls extends beyond technical improvements—it delivers meaningful, measurable benefits to U.S. local communities by strengthening the reliability, efficiency, and security of public-facing services. As state and local governments increasingly digitize operations, the integrity of back-end ERP systems becomes foundational to safeguarding sensitive data and ensuring uninterrupted service delivery.

First and foremost, improved data security directly protects the personally identifiable information (PII) of millions of U.S. citizens. Whether processing tax returns, managing healthcare benefits, or administering public assistance programs, government systems handle sensitive records that must be defended against breaches and misuse. The implementation of MFA, centralized authentication, and least-privilege access reduces the risk of identity-related fraud and cyberattacks—ensuring that critical information is only accessible to authorized personnel.

Operational efficiency gains also translate into faster and more reliable service for residents. Automating user onboarding, provisioning, and access certification shortens processing times for new employees and contractors, minimizing downtime and enabling quicker resolution of public service requests. For example, streamlined financial workflows in Oracle EBS help agencies disburse benefits or issue permits more quickly, which has a direct impact on local businesses and individuals.

From a public trust and compliance standpoint, aligning Oracle EBS identity governance with frameworks like FISMA, HIPAA, and IRS Pub 1075 reduces the likelihood of audit violations, legal penalties, and reputational damage. Demonstrating cybersecurity maturity not only meets federal mandates but also strengthens eligibility for grants and funding tied to IT modernization and digital equity initiatives.

In a broader context, modern IAM practices empower public sector organizations to adopt hybrid work models, inter-agency collaboration, and citizen-centric digital platforms more confidently. As these capabilities continue to expand, the ultimate beneficiaries are local communities who experience safer, faster, and more equitable access to government services.

11. Conclusion

As legacy enterprise systems continue to serve as the backbone of government operations, it is imperative that they evolve to meet today's security, compliance, and user experience standards. Oracle E-Business Suite (EBS), while functionally robust, requires a modernized identity ecosystem to align with evolving federal mandates and rising cybersecurity expectations in the U.S. public sector. This paper proposed a security-by-design approach to transforming Oracle EBS access management through federated authentication and role-based access controls (RBAC).

By integrating with enterprise Identity Providers and implementing fine-grained RBAC, agencies can enhance access governance, enforce Zero Trust principles, and significantly reduce the risk of data breaches and audit failures. Real-world outcomes from public sector transformations—including reduced access violations, faster provisioning, and improved compliance readiness—demonstrate both the feasibility and the impact of this approach. The application of AI and automation in identity governance further amplifies these benefits, enabling sustainable security at scale.

Ultimately, these enhancements contribute to greater public trust, operational resilience, and better digital services for U.S. local communities. As agencies pursue modernization and digital transformation, building a compliance-ready identity foundation for Oracle EBS is not just a best practice—it is a critical enabler of secure and equitable public service delivery.

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