ELEVATING TENNCARE:

A DYNAMIC LEAP INTO ENHANCED EFFICIENCY THROUGH CLOUD MODERNIZATION

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Submitting State: State of Tennessee

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Executive Summary

Serving nearly 1.9 million Tennesseans, TennCare is responsible for the state's Medicaid program, involving the management of essential applications such as the Eligibility Determination system, Long Term Social Services, Medical Appeals, and Medicaid Enterprise System (MES) modules.

With a clear objective of providing robust technology infrastructure, pertinent resources, and reliable care, TennCare embarked on a significant technology modernization journey. This transition from legacy systems aimed to enhance user experience, foster innovation, and facilitate new service offerings through a flexible, scalable technological base. To realize this vision, TennCare established an AWS cloud foundation reference architecture framework, modernizing all applications and tools to support enterprise, managed, and application services more effectively. This transformative move marked a new era in service delivery for Tennessee residents.
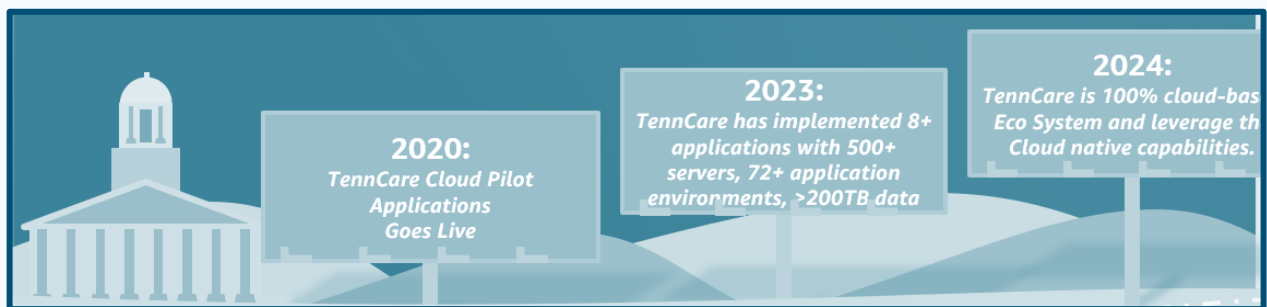
The Tennessee Eligibility Determination System, is a complex application managed by TennCare, conducts over two million transactions daily. It serves as the primary system facilitating the Medicare eligibility system utilized by caseworkers across the state. In 2024, the core Worker Portal was the final legacy component to be migrated and modernized to the AWS Cloud environment. The scope of this endeavor encompassed:

- **Migration and Modernization of Application Environments:** This involved migrating and modernizing more than 24 application environments for Eligibility Determination system, which included the build and deployment of over 300 VMs, more than 40 COTS tools, and 19 databases.
- **Simplification and Standardization of Enterprise Services:** This initiative aimed to simplify and standardize enterprise services for Cloud-hosted components, including document management, notices generation, and rule engine among others.
- **Development of a Robust Cloud Platform:** A robust cloud platform was developed to drive containerization and a closed-loop system that leverages explainable AI and ML. This platform is expected to be extended to accommodate Gen AI Use Cases in the future.
- **Re-platforming of Large Systems:** Numerous large systems were re-platformed through Cloud-native services and open-source stacks including the migration of Eligibility System from Web Sphere to JBoss application servers and transition from Oracle to Postgres database.
- **Building of a Strong Cloud Services Foundation:** A robust cloud services foundation was established to enhance efficiencies through infrastructure-as-code and cloud operation automation.
- **Migration of Enterprise Integration Services:** All enterprise integration services were migrated to the information superhighway, enabling enterprise-wide analytics.
- **Migration of Reports:** All reports were transitioned to Cloud-based reports and dashboards.
- **Migration of Application Lifecycle Management Components:** All Application Lifecycle Management components were migrated to the Cloud platform.
- **Migration of Document Management Systems:** The document management systems, inclusive of over 40+ million documents, were migrated to the Cloud.

The culmination of this modernization process necessitated a seamless migration and integration of all business and technology components into cloud services, ensuring no disruption to case workers or Tennessee citizens.

Idea: The Business Challenge

What problem did the project address and why is it important?

The Tennessee Eligibility Determination System is a comprehensive tool that facilitates integrated eligibility processes, including application registration, data collection, case management, and document management. In 2022, as the hardware underpinning of this application neared end-of-life, TennCare strategically decided to modernize entirely, transitioning it to the cloud while ensuring a seamless experience for users and citizens.

The key considerations included:

- **Infrastructure Services:** On-Premises infrastructure lacked services (hosting, technology, data, network) essential for future innovation, a gap filled by Cloud platforms that allow quick pilot testing of emerging technologies.
- **Change Management:** On-Premises infrastructure change management was inconsistent and not repeatable, leading to manual errors and longer setup times due to insufficient automation.
- **Procurement Process:** On-Premises technology procurement required extended timelines. For example, sourcing new hardware for the On-Premises data center could take 6-8 months, leading to longer project planning times, increased effort, and inflated long-term capital expenses.
- **Interagency Dependencies:** Technology changes necessitated interagency coordination as TennCare needed to sync with data center staff availability due to the manual effort required for building and implementing changes. Moreover, the cost and time to develop new infrastructure On-Premises exceeded the expense of migrating Medicaid Eligibility Platform workloads to the Cloud.

Why does it matter?

The legacy hosting environment posed technical challenges, leading to extended delivery times and increased costs for the state. Implementing programs can often be time-sensitive, with any delays potentially hindering citizens from receiving updates to their benefits in a timely manner. Hosting on the cloud not only reduces the time and effort necessary for implementing technological changes, but also allows for a greater focus on the functional changes. These alterations are more apparent to the application end-users and directly improve their experience.

What makes this project different?

TennCare's distinctive cloud migration involved a complex, large-scale transition of services and applications. A critical component was the Worker Portal application, essential for Medicaid applications and deeply integrated with internal and external systems like CMS and SSA, requiring minimal downtime during migration. This project was more than a simple Lift & Shift migration; it integrated modernization within the migration process. Application servers were refactored from WebSphere to JBoss, and the database from Oracle to Postgres, leading to significant cost savings without compromising performance.

Further, all 250+ web services were modernized into cloud-based API Gateways and over 40 Application Support COTS products and ALM tools migrated, enhancing automation and DevOps efficiencies. The amalgamation of such significant changes into a single migration effort underscores the project's unique nature.
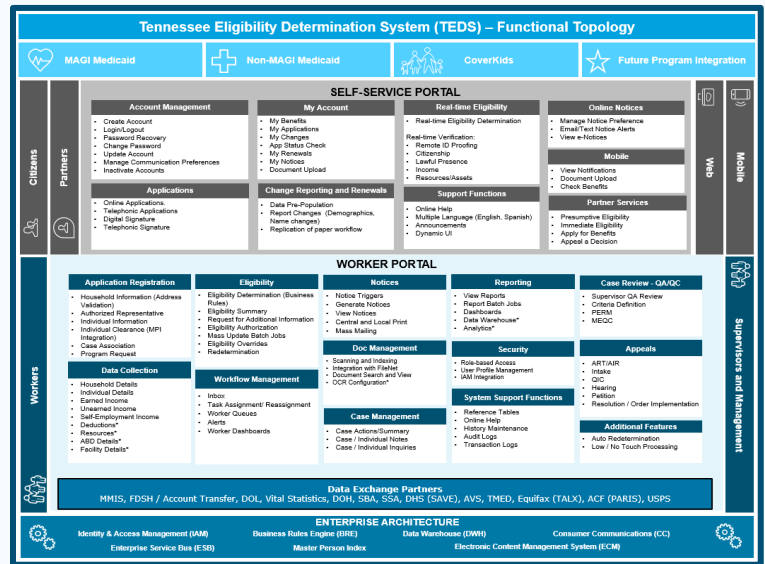
What makes it universal?

In an era of rapidly evolving technology, the transition of enterprise applications from on-premises data centers to the cloud is increasingly prevalent. The Medicaid Eligibility platform Cloud Modernization stands as a north star of innovation, providing instrumental insights for agencies looking to modernize crucial application technology components. This initiative not only brings about substantial cost savings but also fosters a smooth transition away from existing data centers. Moreover, it champions the modernization of enterprise services and integration engines through Cloud Native services. All this is achievable without impacting users or core functionality, by adeptly using Cloud Native services for key application components. This project serves as a guiding light for other states seeking to navigate the journey of technological modernization.

Implementation: The Cloud Modernization Journey

What was the roadmap? Who was involved? How did we do it?
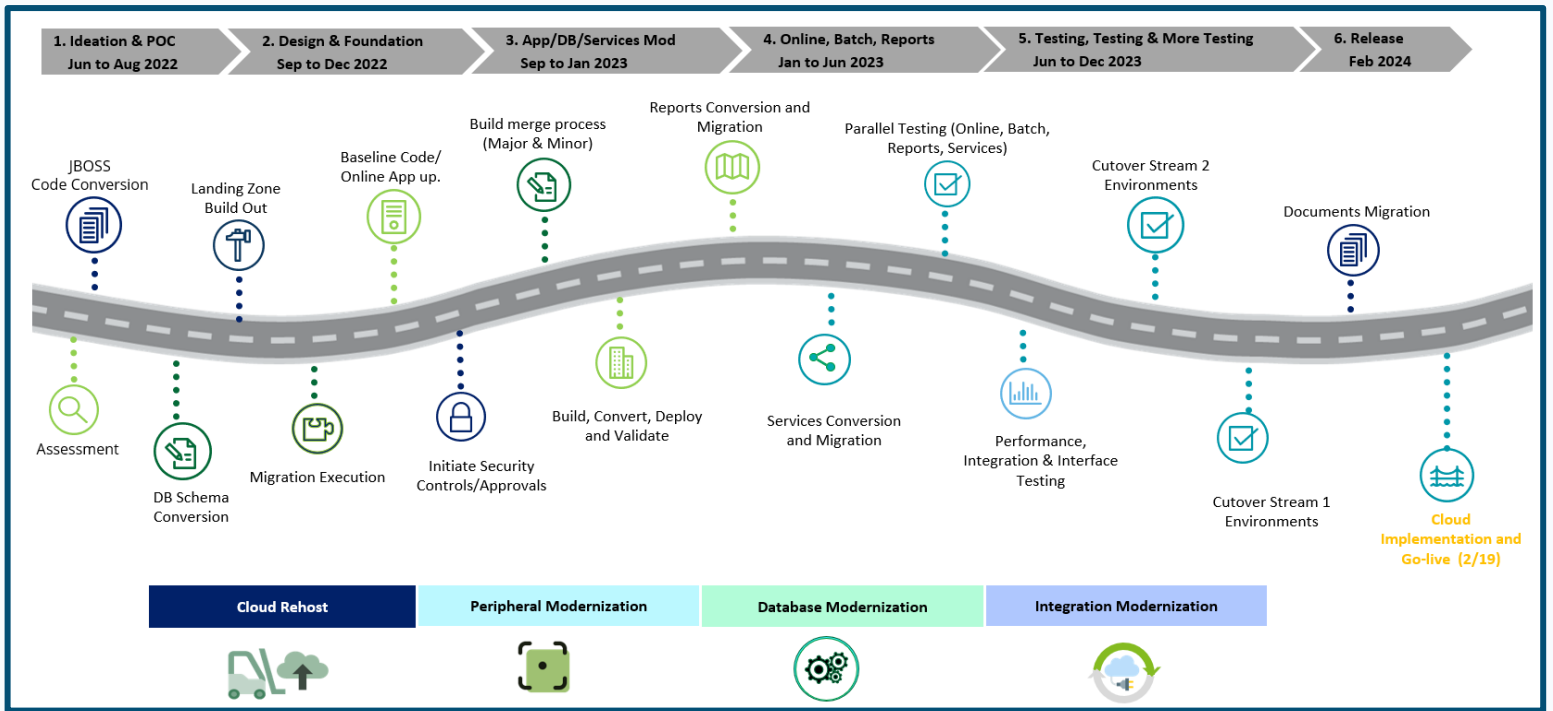
As the fundamental Medicaid application, Cloud Modernization necessitated a highly integrated and synchronized effort to build, configure, test, and transition to the new Cloud environments. The Worker Portal application previously hosted On-Premises, consisted of 22 environments designed to support various needs, including development, testing, performance testing, and training. TennCare tackled the Cloud modernization by incrementally building these 22 environments, advancing through the Software Development Life Cycle. The modernization approach is captured in the following five phases:
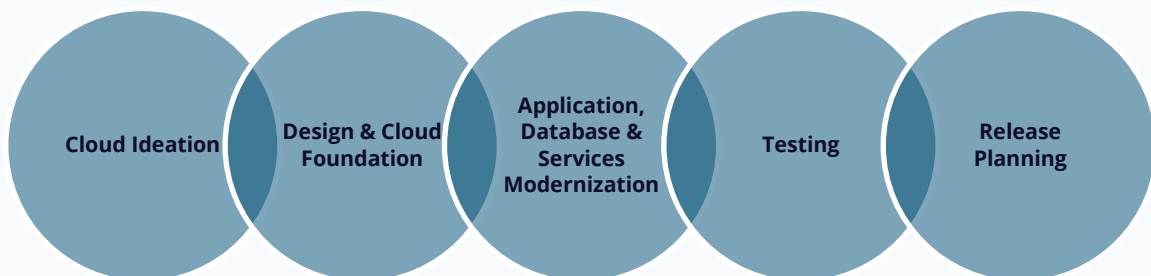
1. **Cloud Ideation:** A three-month ideation phase served as the foundation to finetune/pilot the tools/ accelerators (Database conversion, Application framework upgrade and JBoss migration). This served as a key step to understand the intricacies of the code base, identify bottlenecks, and roadblocks.

NexGen DB Conversion Accelerators

2. **Design and Cloud Foundation:** Having a clear Cloud modernization approach and execution plan is vital. All stakeholder teams (TennCare IS business units, security, data governance teams, among other key stakeholders) were aware of the complexity and support needed and were all-in to get to the finish line. Cloud architecture and design included the target cloud landing zone including VPCs, network, security, database and application infrastructure. This design was documented in design packages and reviewed and approved with the key stakeholders. TennCare established enterprise reference architecture (consistent Application Centric Infrastructure (ACI) based virtual private clouds and subnets for various application environments), allowing for consistent monitoring and standard operational processes. In addition, the project team automated the infrastructure buildout process using Ansible scripts as infrastructure-as-code.

3. **Application, Database and Services Modernization:** From the project onset, modernization through the adoption of Cloud native services was considered a priority. The following list of activities include the core scope of modernization performed:

   - *Converting application server from WebSphere to JBoss, and database from Oracle to Postgres* introduced many complexities because it required a new code base due to syntax differences between hosting platforms.
   - *Migrating, transforming, and continuously synching data from the source Oracle Database to the target Postgres Database* was required to prevent data loss or corruption. To accomplish this, TennCare utilized the AWS Database Migration Service that can perform heterogenous database migrations with Change Data Capture to keep source/target databases in-synch.
   - *Development of Custom Data Refresh Automation:* To perform data refresh, which is routinely over 7TB in size, while minimizing environment downtime, a new process using RDS Snapshot and AWS Step Function was developed to refresh under 4 hours.
   - *Service Migration to API Gateway and Lambda* was performed to utilize serverless components in-place of traditional service buses like IBM Integration Bus.
   - *Online, Batch and Reports Development:* Development and roll-out was done iteratively between the online application, batches, and reports. This included over 450 screens, 250 batch jobs, and approximately 100+ custom and ad hoc reports.

4. **Testing**
   - *Systems Integration & Regression Testing:* End-to-end system validations were performed on each of the 24 environments created to confirm stability and usability of the application.
   - *Parallel Batch Testing:* Validating batches against production sized volume is challenging due to the scale of data involved. To accomplish this, TennCare synched data between On-Premises and Cloud environments and executed corresponding batches to verify the outputs were identical.
   - *User Acceptance Testing:* TennCare acceptance users actively participated in the Cloud environment validations in the UAT environment before providing signoff to proceed with the Production cutover.
   - *Performance Testing:* Using production sized infrastructure, comprehensive performance testing was performed evaluating both online and batch performance.
   - *Operational Testing:* All on-premise operational activities, such as routine data fixes, were tested in Cloud for over 3 months to support a seamless post go-live from the operations perspective.
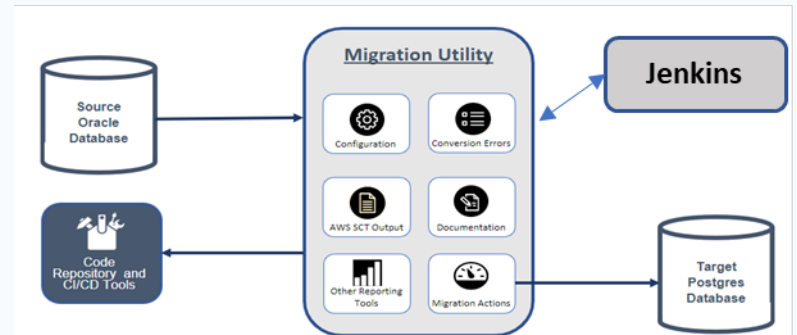
5. **Release Planning:** To perform the Cloud cutover, all integrating applications required to be modified to route their integrations to the new Cloud environment. The cutover was done incrementally over a three-month period to reduce risk and align to the release timelines and project schedules.

Impact: From Government to Citizens

What did the project make better?

While the modernization of the backend hosting environment may not have an obvious impact to the citizens of Tennessee, it has supported significant growth in the security, availability, and reliability of the system. The benefits identified from the project include:

- Significant annual cost savings (~$8 M/year) and gained operational efficiency improvements needed for TennCare.
- Improved worker efficiency by reducing batch processing (30%) and online transaction (25%) time for all simple and complex transactions within portal(s).
- The ability to scale up or down quickly without the hassle of investing in physical servers or hardware, freeing up the IT team to focus on critical tasks.
- A successful project go-live that supported 1,500 workers processing ~ 1.6 million transaction per day. All simple and complex online transactions through the system met or exceeded all performance indicators.
- 100% accuracy in data migration & reconciliation from on-premise Oracle to Cloud based Postgres DB (7TB of production data and ~40 million documents migrated).
- Accelerated feature/functionality releases through an agile cloud solution that is modular, extensible, and scalable requiring zero upfront hardware setup time.
- Improved data resiliency for disaster recovery utilizing a multi-AZ approach for the production environment and dedicated DR infrastructure hosted in a separate region.
- Constructed centralized management, automation services, and cloud native services (e.g., API Gateway, Lambda, Data Modernization) for accelerated capability development.

What is Next?

Over the last few years, TennCare has taken vital steps to revolutionize their IT experience and operationalize the infrastructure to support the business needs through enterprise standards and processes. After successfully executing the cloud migration, enhancing system features, and revamping the current TennCare Cloud platforms for improved user interface and experience, the state remains proactive in seeking strategies to elevate benefit services and the user experience for the residents of Tennessee. Additional efforts continue to emphasize the importance of increasing and improving the channel of communication between the Tennessee government and its citizens. Some of these initiatives include:

- Implementing social nudging through texts/ emails and social media to optimize outreach.
- Leverage the cloud infrastructure build the GenAI foundations platform with capabilities for enterprise to support various AI use cases such as PolicyGPT engine to assist the long-term social services nurse population.
- Leverage the cloud foundation reference architecture and enable the modularization of the Medicaid enterprise.