Case Study:

Babson Diagnostics

1. Overview

Babson Diagnostics is a leading science-first healthcare technology company, reimagining blood testing and making it more accessible, affordable, and patient-friendly. They aim to revolutionize the experience of diagnostic blood testing by offering fingertip collection services at local pharmacies across Austin, Texas.

Babson faced a critical challenge in managing fluctuating user demand while ensuring high performance and security. Their infrastructure needed to scale efficiently, deliver fast and reliable test results, and comply with strict regulations like HIPAA, all while providing a smooth user experience.

This is where R Systems, with its deep expertise in cloud-native solutions and healthcare technology, stepped in to address these bottlenecks. R Systems designed and implemented a robust architecture powered by AWS services, ensuring the infrastructure met Babson's scalability, security, and high availability needs.

2. Architecture Overview

The customer application infrastructure, utilizing AWS services, is designed to deliver robust scalability, high availability, and top-tier security. Spanning across multiple AWS Availability Zones (AZs), this architecture is engineered to meet critical business needs. It offers solutions like SQL Clustering and secure data management. The key is high availability, ensuring that operations at scale are seamless and reliable.

Key Components of the Architecture

Frontend Hosting and Delivery:

The **BetterWay** application frontend is powered by **AWS Amplify**, ensuring rapid, low-latency content delivery across regions. Static assets are securely stored in **Amazon S3**, offering scalable and durable storage solutions.

- **Services Used:** AWS Amplify, Amazon S3
- **Key Benefits:** Lightning-fast content delivery, scalable static asset caching
- **Region:** USA

Backend Infrastructure and Content Delivery:

The backend is driven by **AWS Lambda**, with APIs managed through **AWS API Gateway**, ensuring high availability and optimal performance. Using the **Serverless Framework** and **AWS CloudFormation**, the system scales seamlessly to handle fluctuating workloads while maintaining high availability.

- **Services Used:** AWS Lambda, AWS API Gateway, Amazon EC2, Amazon Route 53
- **Key Features:**
    - **High Availability:** Multi-AZ deployment ensures resilience during service interruptions.
    - **Scaling:** Lambda automatically scales to meet increased demand.
    - **Performance:** EC2 hosts CI/CD, while Route 53 directs traffic for optimal user experiences.

Data Management:

The application relies on **Amazon Aurora RDS (PostgreSQL)** for a high-availability, multi-AZ database solution with automated backups and point-in-time recovery. **Amazon DynamoDB** handles NoSQL data for real-time, scalable data management during high-traffic workloads.

- **Services Used:** Amazon Aurora RDS, Amazon DynamoDB
- **Key Features:**
    - **High Availability:** Multi-AZ deployment ensures database reliability.
    - **Backup:** Automated daily backups safeguard against data loss.

Security and Compliance:

The system adheres to industry-leading security standards, including encryption at rest and in transit through **AWS KMS**. Compliance with regulations such as **HIPAA** is ensured through region-specific data residency controls.

- **Services Used:** AWS KMS, IAM Identity Center, KMS Encryption
- **Key Features:**
    - **Multi-Factor Authentication (MFA):** Ensures secure access.
    - **Compliance:** Auditable security measures ensure HIPAA compliance.

Data Pipeline and Storage:

Data ingestion and processing are managed through **Amazon Kinesis Data Streams**, ensuring real-time data handling. Long-term storage is supported by **Amazon S3**, providing secure and scalable storage for processed data.

- **Services Used:** Amazon Kinesis, Amazon S3
- **Key Features:**
    - **Scalability:** On-demand scaling to meet data volume increases.
    - **Data Security:** End-to-end encryption for data at rest and in transit.

Compliance and Auditability:

The architecture maintains full compliance through continuous security audits, utilizing **AWS CloudWatch Logs** to capture and log API calls and monitor changes. **Kinesis Firehose** manages application-level logging for comprehensive audit trails.

- **Services Used:** AWS CloudWatch Logs, Kinesis Data Streams
- **Key Features:**
    - **Comprehensive Logging:** Tracks API calls and resource changes.
    - **Audit Trails:** Provides complete visibility for compliance checks.

Networking and Security:

The infrastructure is hosted within an **Amazon VPC** to ensure isolated network control. **Internet Gateway** and **NAT Gateway** manage traffic flow, while **Security Groups** regulate inbound and outbound access. **VPC Endpoints** offer private connectivity to AWS services, and a **Client VPN Endpoint** ensures secure remote access.

- **Services Used:** Amazon VPC, Internet Gateway, NAT Gateway, VPC Endpoints
- **Key Features:**
    - **Security:** Granular traffic control with Security Groups.
    - **Remote Access:** Secure access via Client VPN.

Monitoring and Logging:

Amazon CloudWatch provides real-time monitoring of infrastructure health and application performance. Configured alerts through **AWS Alarms** and **SNS** to notify the team of any issues.

- **Services Used:** Amazon CloudWatch, AWS Dashboards, AWS Lambda Metrics
- **Key Metrics Monitored:** CPU utilization, memory, IOPS, RDS performance
- **Alerting:** Immediate notifications for performance and availability issues.

CI/CD Pipeline:

The CI/CD pipeline is powered by **Jenkins** and **Travis CI**, with **Bitbucket** hosting the source code. Automated tests run through Travis CI, and failed builds trigger instant notifications. **Jira** integration links issues to code commits for efficient tracking.

- **Services Used:** Jenkins, Travis CI, Bitbucket, Jira
- **Key Features:**
    - **Automated Testing:** Travis CI ensures builds are verified and tested before deployment.
    - **Infrastructure Management:** Jenkins provisions and updates AWS resources via CloudFormation.

Together, these components form a resilient, scalable, and secure architecture designed to meet the growing demands of the BetterWay application while ensuring a seamless, high-performance experience for users.

3. How R Systems Made a Difference

The customer application infrastructure, utilizing AWS services, is designed to deliver robust scalability, high availability, and top-tier security. Spanning across multiple AWS Availability Zones (AZs), this architecture is engineered to meet critical business needs. It offers solutions like SQL Clustering and secure data management. The key is high availability, ensuring that operations at scale are seamless and reliable.

- **Scalable and Secure Infrastructure:** R Systems built a cloud-native architecture on AWS, designed to scale automatically with user demands while maintaining security through features like encryption and multi-factor authentication.
- **Fast and Reliable Frontend Delivery:** Using AWS Amplify and Amazon S3, R Systems ensured the user interface was responsive and could handle rapid content delivery across regions with low latency.
- **Serverless Backend:** The backend infrastructure was powered by AWS Lambda functions and an API Gateway, enabling automatic scaling based on traffic and providing seamless user experiences even during peak demand times.
- **High Availability:** With a multi-AZ setup for Amazon RDS Aurora and DynamoDB, R Systems ensured that Babson remained online and could handle large volumes of data without disruptions.
- **Automated CI/CD Pipeline:** By integrating Jenkins for orchestration and Travis CI for testing, R Systems automated the deployment process, improving code quality and reducing time to market.
- **Real-Time Data Processing and Storage:** Amazon Kinesis Data Streams were employed to handle real-time data, while Amazon S3 provided long-term storage, ensuring data integrity and fast retrieval.
- **Enhanced Security and Compliance:** The architecture was designed in compliance with HIPAA regulations, using AWS Key Management Service (KMS) for encryption and multi-factor authentication for secure access.
- **Comprehensive Monitoring:** Amazon CloudWatch and AWS CloudFormation provided real-time monitoring and automated alerts to detect performance issues, ensuring system stability and continuous operation.

4. Conclusion

By partnering with Babson Diagnostics, R Systems helped revolutionize the blood testing experience in Austin, Texas, enabling affordable, quick, and painless fingertip sample collection at local pharmacies. Through a meticulously designed AWS cloud architecture, R Systems delivered a scalable, secure, and high-performing infrastructure that ensures reliable and lightning-fast results for customers. Babson Diagnostics now has the technological foundation to expand its innovative healthcare services, empowering individuals to take control of their health and setting a new standard in diagnostic blood testing.

Geography

Texas

Vertical

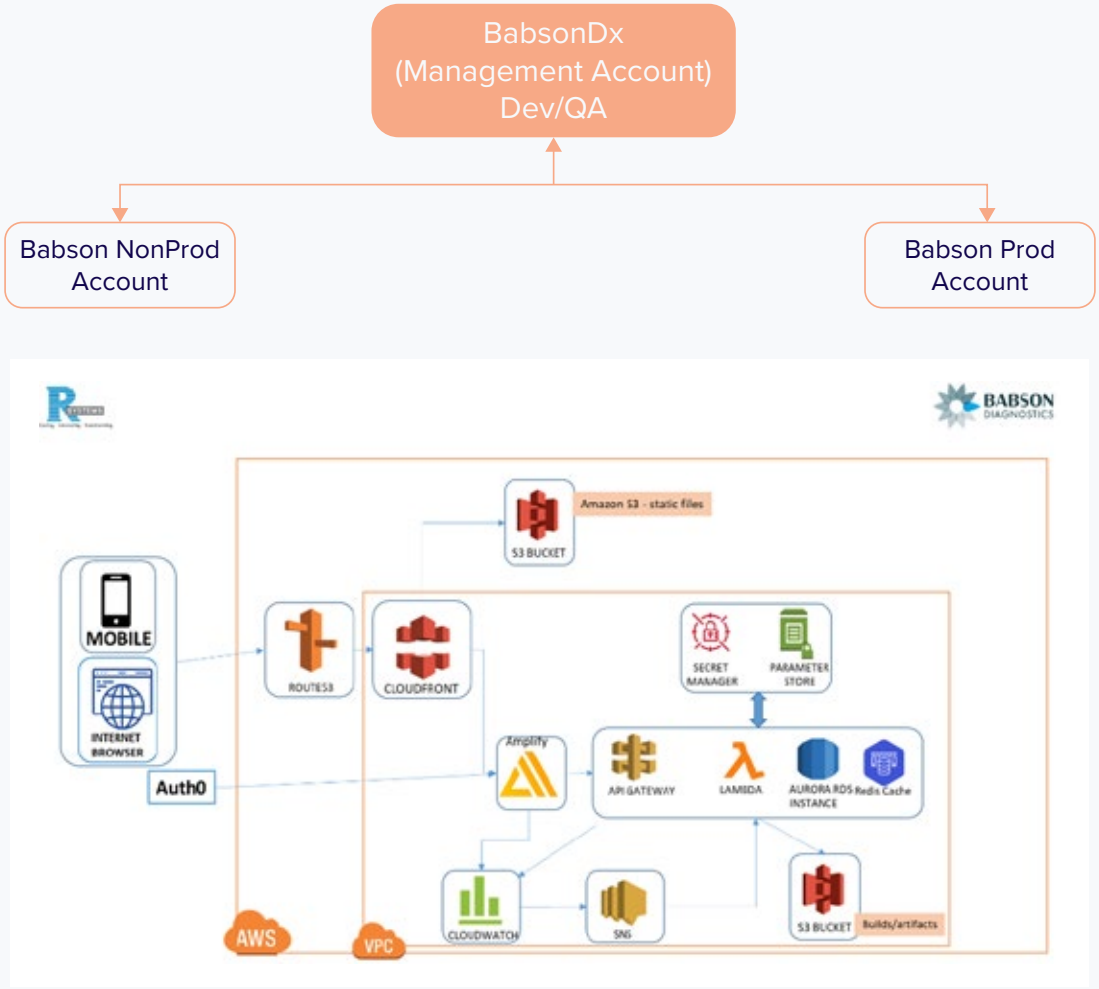
Healthcare

Tools & Technologies

AWS Services:

- EC2
- S3
- Aurora RDS
- DynamoDB
- VPC
- SQS
- API Gateway
- Lambda
- CloudWatch
- AWS SSO & IAM
- Redis
- KMS
- Route 53
- EBS (Encrypted Volumes)
- Kinesis

Workflow Overview



Partnering for Success

R Systems is a leading digital product engineering company that designs and builds next-gen products, platforms, and digital experiences empowering clients across various industries to overcome digital barriers, put their customers first, and achieve higher revenues as well as operational efficiency.
We constantly innovate and bring fresh perspectives to harness the power of the latest technologies like cloud, automation, AI, ML, analytics, Mixed Reality etc.

Contact Us

For more information about our solutions or to discuss how we can help your business, please contact us at:

aws-sales@rsystems.com
www.rsystems.com