

Broadridge is Ready for Next

How Broadridge developed an innovative AI platform to automate Corporate Action Document Classification using AWS serverless technologies

Broadridge, a global Fintech leader with over \$4.5 billion in revenues, provides the critical infrastructure that powers investing, corporate governance and communications to enable better financial lives. We deliver technology-driven solutions that drive business transformation for clients and help them get ahead of today's challenges to capitalize on what's next.

SHAREHOLDER COMMUNICATIONS FROM THE CORPORATE ACTION OPERATIONS TEAM

Our Corporate Action Operations team disseminates materials for corporate action events to over 150 bank and broker-dealer firms. We reach almost 90% of the beneficial street holder accounts by creating operational efficiencies and constantly working to improve our shareholder communications. Each day our team reviews hundreds of bankruptcy and default related documents to identify which ones to mail to shareholders-- through hardcopy mailing or e-mail. These documents adhere to the guidelines set from NASD Rule 2260 and MSRB Rule G-15.

Business Challenge

Our Corporate Action Operations team at Broadridge reviews hundreds of bankruptcy related documents daily on behalf of our bank and broker-dealer clients. Previously a manual process, our team would perform an initial review and a quality check. This time consuming process involved reading each document to determine if the information was relevant for shareholders to be notified according to regulatory guidelines (e.g. NASD and MSRB rules). Our team took a deep look to see what exactly each document contained. For example, was it covering a bankruptcy event or a default on a company payment?

As an industry leader, we continually look for ways to automate and enhance our support of brokers in all of our services. Corporate Action Operations was in search of a process that would reduce the manual effort required, decrease the amount of time involved and uphold the stringent standard of accurate review that our clients require.

When the opportunity to develop an AI classifier emerged, our team was eager to begin. Broadridge evaluated multiple Cloud providers. After looking through several trials and experimental platforms, Broadridge decided to move forward with AWS. AWS is a pioneer in the Cloud computing space and is a proven leader with a large client base and a strong track record.

This led to the launch of the Broadridge Artificial Intelligence Cloud Environment (BRAICE).



Through our partnership with AWS, this new classifier:

- Eliminated hours of manual review
- Sped up service to our clients
- Maintained the high degree of accuracy in classifying corporate actions required by our customers

BRAICE has had a tremendous positive impact on our clients by increasing the agility and speed with which our Corporate Action Operations team services them. We now have technology that provides extremely high and consistent classification accuracy on a day-to-day basis – and it has improved with use. This significantly reduces our team's time and manual effort that was previously put into this process. What was once an estimated 140 hours a month of labor, is now reduced to approximately 20 hours (85% labor savings) – a remarkable achievement that enables Broadridge to serve its clients more effectively.

"I am pleased with the way our Technology and Operations areas joined forces to execute on our strategy of delivering next-generation solutions for our clients and internal business users. We harnessed the power of AWS Cloud Technologies to ideate, innovate and productionize a brand new streamlined and automated AI solution that has improved operational efficiency. Success stories like BRAICE that accelerate the rate of our Business and Technology transformation help keep Broadridge 'Ready for Next.'"

JOHN OLIVERI, CHIEF TECHNOLOGY OFFICER AND HEAD OF
BUSINESS EFFICIENCY, INVESTOR COMMUNICATION SOLUTIONS

WHY AWS?

BRAICE was initially deployed in 2019 as a containerized application (Docker + Kubernetes) running on on-prem data centers. During late 2019, the BRAICE Development team ran an experiment with the Enterprise Cloud Architecture team to assess the architectural, technical and business viability of migrating the application onto AWS. The results of the three-week experiment were eye-opening. The benefits of migrating BRAICE to AWS were immediately clear and:

- Achieved significant ROI improvement on Cloud by switching IT spending to a pay-as-you-use model (OpEx), thus eliminating CapEx costs.
- Eliminated the need for Broadridge Technology Infrastructure teams to maintain underlying server infrastructure, thereby enabling personnel re-deployment to more strategic value-added tasks.
- Provided horizontal auto-scalability through native AWS services such as Lambda, SQS, S3, CloudFront and others.
- Leveraged AWS as the perfect platform to design and implement a highly secure application with a micro-services architecture, modular codebase, and a fully automated CI/CD pipeline
- Made use of tools like AWS Cost Calculator, allowing both Business and Technology organizations to predict total cost of ownership (TCO) projections with a high degree of confidence.



"The BRAICE product is a great example of Broadridge executing on The ABCDs of Innovation® technology strategy. We were able to improve a critical business process and deliver value for clients by leveraging the Cloud and AI technology in tandem. AWS has been a fantastic partner and helped accelerate our timelines through their expertise and collaboration"

STEVE KRZEMIENSKI, ARCHITECTURE AND TECHNOLOGY INNOVATION

MINDSET SHIFT

Faster innovation via collaborative experimentation

- The technology and business teams have a very open relationship and a true partnership. This allowed us to continually seek opportunities to enhance the product and add value. One strategy that both teams embraced was to question the status quo and continually look for ways to innovate. After determining that an idea was worth exploring and brainstorming, the technology teams ran short, time-bound experiments. Based on business feedback on the demonstrated results, they either continued or pivoted to the next set of ideas in the pipeline.



Deliver incremental value faster & more cost-effectively

- Compared to projects that use waterfall methodologies, the Agile approach enabled us to ideate, develop, test and deploy new feature enhancements incrementally and at regular intervals. As an example: one business user step was to convert each day's PDF documents into text files, which was a manual step performed using a vendor product. BRAICE identified this area as an opportunity for process improvement. After initial research, the technology team proposed running a Proof of Concept using AWS's Textract service. The working prototype combined several AWS services together -- Textract, Lambda, SNS, SQS, and S3--to fully automate the task of extracting the contents of PDF files to text files. In addition to saving the business time and cost associated with a manual, repetitive and undifferentiated daily activity, the team was also able to eliminate our dependency on the vendor product and its associated licensing costs. As a result, our solution crystallized from ideation to production deployment within a matter of weeks.

BUSINESS EFFICIENCIES AND BENEFITS

As a global Fintech leader that handles shareholder financial communications, Broadridge understands that time equals money. BRAICE has provided the Corporate Action Operations team with more time and cost efficiencies than initially anticipated.

The development of the AI classifier has greatly increased the team's operational efficiency. Previously, the team would have two employees dedicate time and effort into this process: the first being the reviewer (the Maker) and the second being the quality Checker. This Maker-Checker process was highly repetitive. The Maker would perform the first review for 4-6 hours on average per day. Once completed, the Checker would review the same documents, along with notations from the first review, for up to an additional 2 hours. Through BRAICE, we created a system that can think like we do, and a whole entity of work has been removed. We allow the system to be the Maker and a Broadridge team member remains as the Checker. If we assume an average of 60 documents per day, the original method would have taken approximately 4.5 hours. BRAICE has accelerated our processes and dropped our average time spent to 45 minutes per day.

Being able to teach a Machine Learning (ML) system how documents are interpreted by a human has allowed us to maintain and improve our accuracy, while continuously decreasing our margin for error. It also performs much faster than any human could, while processing the information in larger volumes. All of the manual effort that went into the initial review of these documents has been reduced to the click of a button. The amount of time it has given back has allowed our team to allocate resources elsewhere and continue to raise the bar on our firm's client-centric approach. By being more present for our clients, we can dedicate more time to their needs and desires, while helping them to grow their business.

"The use of ML for the automatic extraction of data points has been immensely beneficial to Broadridge. We're able to pull more data points faster with AWS services and Textract. We were delighted to get a 90% saving in manual effort with our newfound efficiencies through our partnership. In addition to our direct benefits, our bank and broker-dealer clients are also positively impacted. Our clients have the reassurance that our employees are using highly accurate technology to deliver their shareholders' communication, quickly and effectively"

MARTIN KOOPMAN, PRESIDENT - BBD

ENTERPRISE ARCHITECTURE

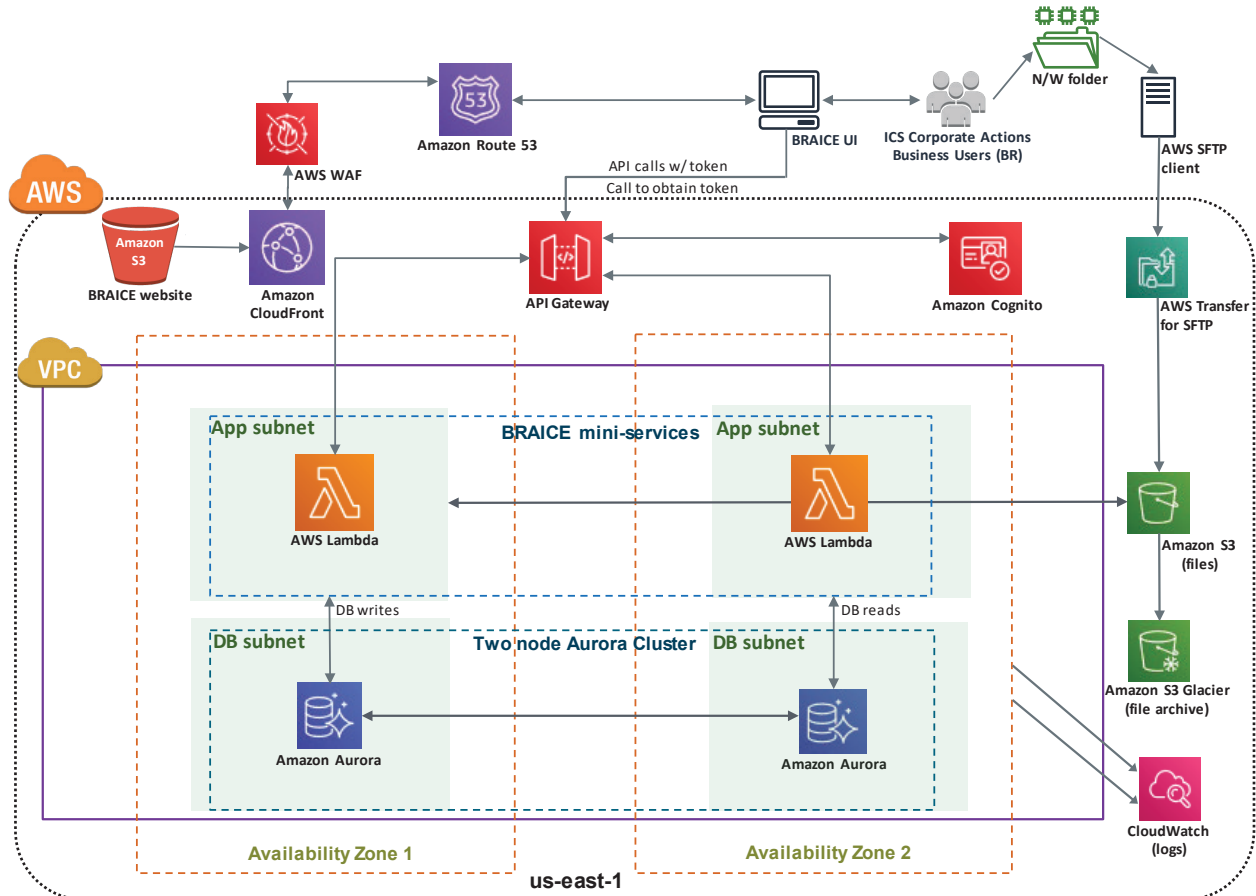
Broadridge is focused on creating value for our customers by leveraging AWS. In order to be successful, Broadridge had to create the repeatable solutions for modernized applications that reduced the risk to the enterprise, while increasing the agility of the business. BRAICE was instrumental in driving this process.

By working with the Enterprise Cloud Architecture (ECA) team to apply best practices around S3, Lambda, AI/ML, performance and resiliency for BRAICE, the solution offered the ability to reuse a governance approved serverless starting point for future applications. The ECA team worked with the BRAICE team to codify the solution into a pattern that could be used by any application looking to deploy a serverless application. These new applications were able to leverage the best practices built into the pattern. This then increased the speed to market since the pattern was already governance approved. The estimated reduction in Infrastructure as Code development was between 50% – 60% for new applications using the pattern.

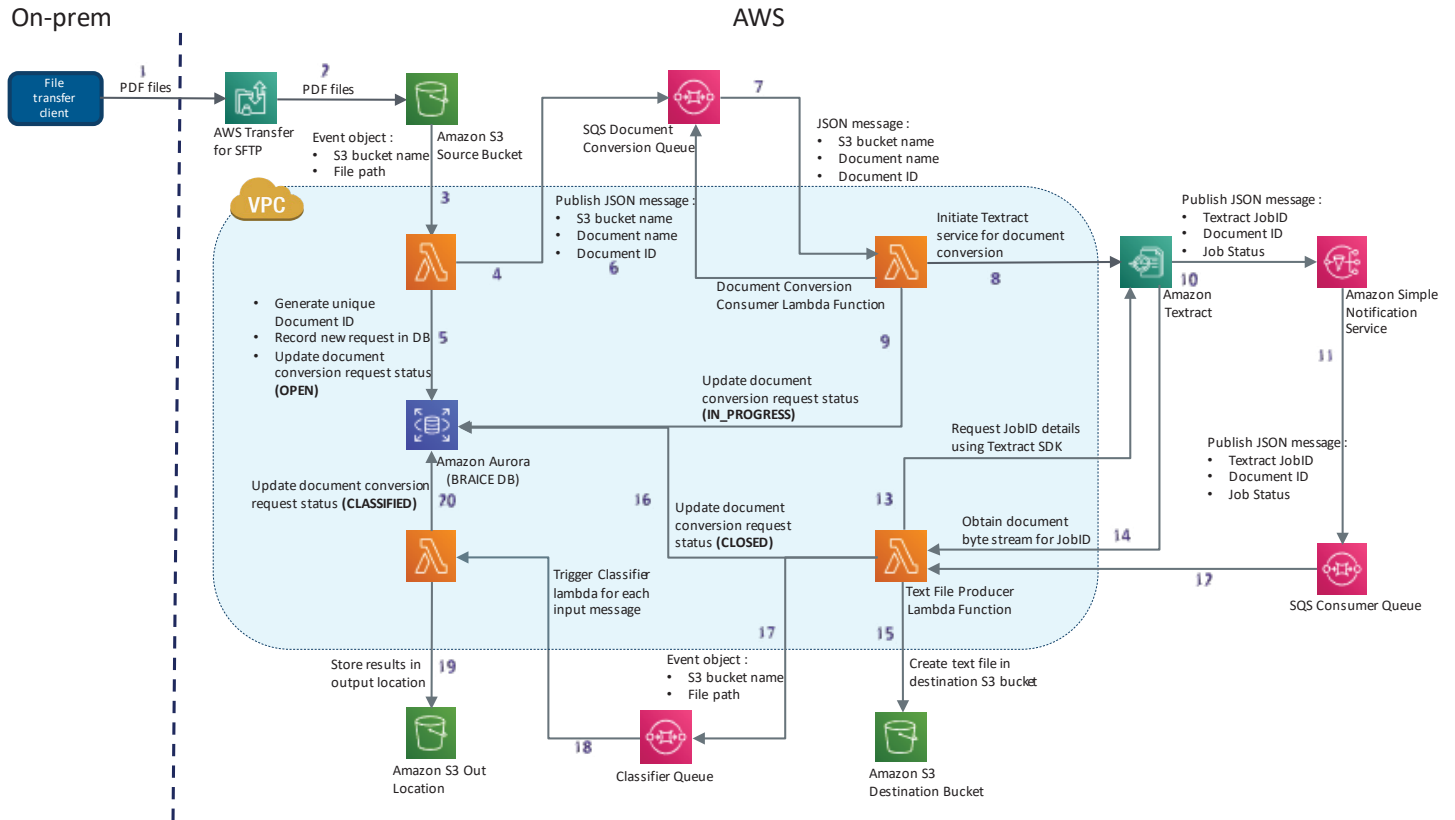
To the enterprise, this small step proved that (1) serverless plus AI/ML would work for Broadridge and thus launched the adoption of serverless at Broadridge, and (2) repeatable patterns accelerated the development teams' speed to market, while reducing the risk to our customers. This paved the way for a solution catalog of codified patterns which includes over 40 patterns today.



ARCHITECTURE - BRAICE APPLICATION ON AWS



ARCHITECTURE - EVENT-DRIVEN TEXT EXTRACTION & DOCUMENT CONVERSION



Authors

Vijay Vemuri - Sr Dir, Software Engineering

Courtney Fleming – Client Project Administrator, Corporate Action Operations

Deepak Elias – VP, Enterprise Architecture

Broadridge Financial Solutions (NYSE: BR), a global Fintech leader with over \$4.5 billion in revenues, provides the critical infrastructure that powers investing, corporate governance and communications to enable better financial lives. We deliver technology-driven solutions to banks, broker-dealers, asset and wealth managers and public companies. Broadridge's infrastructure serves as a global communications hub enabling corporate governance by linking thousands of public companies and mutual funds to tens of millions of individual and institutional investors around the world. In addition, Broadridge's technology and operations platforms underpin the daily trading of on average more than U.S. \$10 trillion of equities, fixed income and other securities globally.

broadridge.com

