

Using containers, microservices, and DevOps best practices, the USTA Player Performance team was able to collaboratively iterate with coaches to rapidly create a flexible, personalized analytics solution.

USTA Powers Player Performance with DevOps, Containers, and Cloud

November 2020

Written by: Mary Johnston Turner, Research Vice President, Cloud Management

Introduction: USTA Player Development Goals and Challenges

The United States Tennis Association (USTA) Player Development leadership team believed there were opportunities to improve player agility, stamina, and endurance — particularly in the later rounds of tournament play — if coaches could gain greater levels of insight about the physical and mechanical loads and energy utilization of players.

The USTA is chartered to promote the development of top U.S. tennis players and to continuously increase the number of U.S. seeds and their success in prestigious Grand Slam tournaments: Wimbledon, the US Open, the Australian Open, and the French Open. The association supports coaches working with top U.S. tennis prospects starting at around age 11. The USTA maintains a rich database of statistics, videos, development benchmarks, and tournament outcomes for the top 100 players. Analysis of this data is used to inform coaches to help them better advise players about training programs and tactical development.

The USTA provides coaches of the top 100 U.S. players with up-to-date profiles and performance analytics via the online USTA Coaches Portal. Coaches can set personal preferences as to the types of data and insights they wish to see for each player. They can track player outcomes on a wide range of key performance indicators (KPIs) such as returns, second serve win ratios, and depth of serve.

SOLUTION SNAPSHOT

ORGANIZATION:

United States Tennis Association

ORGANIZATIONAL CHALLENGE:

Maximize U.S. tennis player performance and participation in global Grand Slam tournaments by providing coaches with more personalized, in-depth analysis and training insights based on correlation of complex statistics and tournament videos, including courtside ball tracking videos captured at a rate of 50 frames a minute and player position videos captured at a rate of 20 frames a minute, for the top 100 players.

SOLUTION:

The USTA Energy Evaluation System and Coaches Portal built to rapidly ingest, correlate, and report on large volumes of data using:

- » Red Hat OpenShift on IBM Cloud
- » IBM Cloud Object Storage
- » Advanced IoT analytics powered by IBM Maximo

The resulting platform can process an individual match in seven minutes versus the four or five hours previously required.

PROJECT DURATION:

12 weeks from the beginning of development to initial application stand-up, with ongoing innovation

BENEFITS:

- » The time needed to ingest and index the courtside Hawk-Eye line-calling system and player videos from championship matches was reduced by 95%.
- » The previous system required four to five hours of manual tagging versus seven minutes using the Energy Evaluation System.
- » The USTA can support many more players and provide coaches with more sophisticated and customized insights more quickly.

Among the most important sources of information available to the USTA and its national coaches are recordings made by courtside Hawk-Eye computer vision systems that track ball positions at a rate of 50 frames a second. Separate video recordings of player positions are also captured at a rate of 20 frames per second.

Historically, most Hawk-Eye and player video analysis focused on player movement and shot placement. Pairing this information with synchronized timing and scoring data for the same match, the USTA could help coaches critique individual player actions in detail. Transcription of just one match typically required staff to spend four to five hours manually tagging recordings and correlating videos.

To provide coaches with deeper and more actionable player-specific insights, the USTA needed more automated ways to ingest and analyze large volumes of recordings as well as methods to better correlate player video and Hawk-Eye data with existing statistical information. The USTA team worked with IBM to brainstorm a number of possible approaches before settling on development of the USTA Energy Evaluation System and expanded Coaches Portal driven by Red Hat OpenShift on IBM Cloud, IBM Cloud Object Storage, and IoT analytics powered by IBM Maximo.

Implementation

As a longtime sponsor of the US Open tennis tournament, IBM annually makes staff and technology available to support the USTA's player development mission. During 2019, the joint IBM and USTA team, including several national coaches, scoped, tested, and launched a solution optimized for coaches, many of whom have limited technology skills. Specifically, the system required:

- » Delivery as a service with enabling infrastructure that could scale up and down as required depending on the need to ingest, analyze, and replay very large volumes of video and audio recordings from anywhere in the world on demand
- » Ability for each coach to customize data display and metrics calculated in the context of the existing Coaches Portal, which already provided historical stats and access to video replays indexed by points (Ease of use was a critical requirement.)
- » Breakthrough scale and speed of AI/ML analytics processing, as well as pattern recognition fine-tuned to tennis match sounds and visual patterns

The IBM team recognized that the flexible infrastructure provided by the Red Hat OpenShift on IBM Cloud service would provide a highly scalable back-end container infrastructure orchestrated using Kubernetes to cost effectively host the application. The OpenShift container platform service allowed the team to build a microservices-based application using containers that can be updated and deployed on a modular basis as demand changes over time. Container-enabled CI/CD development pipelines supported an agile, iterative DevOps effort that resulted in the initial application being stood up in less than 12 weeks from the beginning of development, with innovation taking place continuously.

Similarly, IBM Cloud Object Storage provided on-demand, API-enabled access to public cloud services optimized for archiving, backing up, and analyzing large volumes of data. It also supported high-speed video uploads globally. Use of public cloud infrastructure freed the USTA technical staff from having to worry about supporting complex back-end systems and storage hardware and software. The deployment of the application as a service allows IBM to provide ongoing application updates and service management, while the USTA team focuses on training and supporting coaches, providing statistical support, and identifying additional ways to gain important insights from the data.

Creating a system to visualize dynamic tennis player energy consumption required a new level of AI-based video and audio analysis to quickly ingest, tag, and correlate hours of video and Hawk-Eye recordings. The joint IBM and USTA team worked with the IBM Research data science team to adapt AI technology used to monitor assembly lines via audio-based IoT analytics powered by IBM Maximo. The Maximo IoT tool was repurposed to monitor recordings for the sound of tennis ball hits, sneakers squeaking, and referee calls.

The resulting platform can process an individual match in seven minutes versus the four or five hours previously required. The USTA sees the Energy Evaluation System and this customized IoT AI/ML engine as a platform for deriving even greater insights in the future, identifying more sophisticated patterns and building self-learning models.

Challenges

The greatest challenges in creating an effective Energy Evaluation System were related to the user interface and the ability to deliver a highly sophisticated application that could be easily consumed and customized by individual tennis coaches in the field. Because the application was developed using containers, microservices, and DevOps best practices, the team was able to collaboratively iterate with coaches throughout the ideation and development process. The team's ability to quickly stand up specific functionality and then test it and react in real time to coaches' feedback using DevOps processes and container platform services helped drive successful engagement with coaches from day one of the launch. It also allowed the DevOps team to test and deploy quickly across several end-user devices, including tablets, mobile phones, and desktops.

Benefits

The head of USTA Player Development, Martin Blackman, credits the success of the application to deep, ongoing communication and interactions with the coaching community. Although the rollout of the application was somewhat hampered by the COVID-19 pandemic after the application's initial introduction at the 2019 US Open, early feedback from coaches indicates that the system is providing a new level of value and helping spur innovative thinking across the U.S. tennis development community.

Over time, the USTA expects to make the service available beyond the national-level coaches of the top 100 players to encompass a wide swath of junior development coaches. The goal is to use the Energy Evaluation System insights and enhanced Coaches Portal to help fine-tune training and recovery schedules and to assess differences between the peak performances and poor performances of individual players. The USTA also hopes to use the system to do a better job of benchmarking developing players and to help move "bubble" players to the next level more consistently.

The ability to continuously iterate and scale using DevOps and IBM public cloud infrastructure has accelerated the time to value and positioned the USTA to see higher levels of performance across the ranks of its top players in the coming years.

Methodology

Information about the USTA Energy Evaluation System and Coaches Portal was provided to IDC by IBM and via direct interviews with senior USTA staff.

The team's ability to quickly stand up specific functionality and then test it and react in real time to coaches' feedback using DevOps processes and container platform services was critical to success.

About the Analyst



Mary Johnston Turner, Research Vice President, Cloud Management

Mary Johnston Turner is Research Vice President for Cloud Management, part of IDC's Infrastructure and Operations Management software research team. Her research focuses on emerging software and solutions for cloud, container and DevOps IT operations, cost optimization, automation, performance, and analytics. She contributes to vendor analysis as well as enterprise IT buyer advisory and custom consulting activities.

MESSAGE FROM THE SPONSOR

About IBM

At its best, cloud-native application development delivers innovative user experiences at scale and speed. In an efficient cloud-native pipeline, developers should be able to develop application code once, and deploy it anywhere, without bothering with infrastructure; and using artificial intelligence and other public cloud services, while automating processes that take away from innovating user experiences, teams keep focus on delivering customer value. US Tennis Association leverages Red Hat OpenShift on IBM Cloud to measure the coaching community's progress towards a goal within competitive tennis. Likewise, using a streamlined platform as a service, enterprise organizations can similarly align teams on efficiently achieving business objectives. The key is always to subordinate technology choices to serving customer need. To do that better, many organizations that already using multiple cloud platforms are seeking the consistency across environments that **distributed cloud services** offer.

IDC Custom Solutions

IDC Research, Inc.

5 Speen Street
Framingham, MA 01701, USA

T 508.872.8200

F 508.935.4015

Twitter @IDC

idc-insights-community.com

www.idc.com

This publication was produced by IDC Custom Solutions. The opinion, analysis, and research results presented herein are drawn from more detailed research and analysis independently conducted and published by IDC, unless specific vendor sponsorship is noted. IDC Custom Solutions makes IDC content available in a wide range of formats for distribution by various companies. A license to distribute IDC content does not imply endorsement of or opinion about the licensee.

External Publication of IDC Information and Data — Any IDC information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate IDC Vice President or Country Manager. A draft of the proposed document should accompany any such request. IDC reserves the right to deny approval of external usage for any reason.

Copyright 2020 IDC. Reproduction without written permission is completely forbidden.