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# How Amazon Location Service enabled tracking of London Marathon runners


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# Refining runner experience

Tata Consulting Services (TCS) creates race apps for 12 of the world’s leading running events

Race organizers can provide optimal levels of services and experiences to participants and spectators

By providing services like live and virtual runner tracking and positioning, friends and family around the world can follow the progress of their runners and see how they are performing

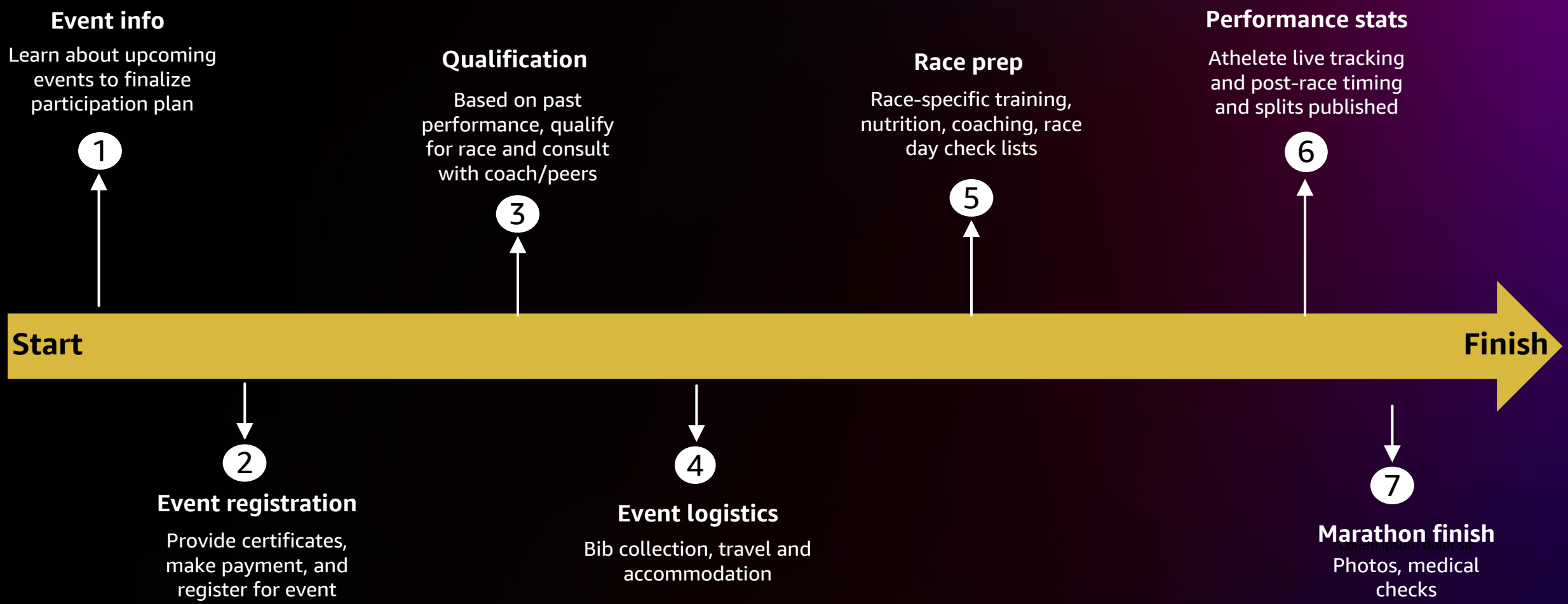


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# How did TCS get here?

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# Marathon runner’s journey




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# During the race: Runner

Share virtual and in-person views of elapsed time and pace every 5 kilometers or 3.1 miles

3D map feature using augmented reality (AR) for virtual runners

Share the runner's GPS location

Share live pro athlete leaderboards and bios

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# During the race: Supporters

Track runners and their positions on map based on the distance they have covered

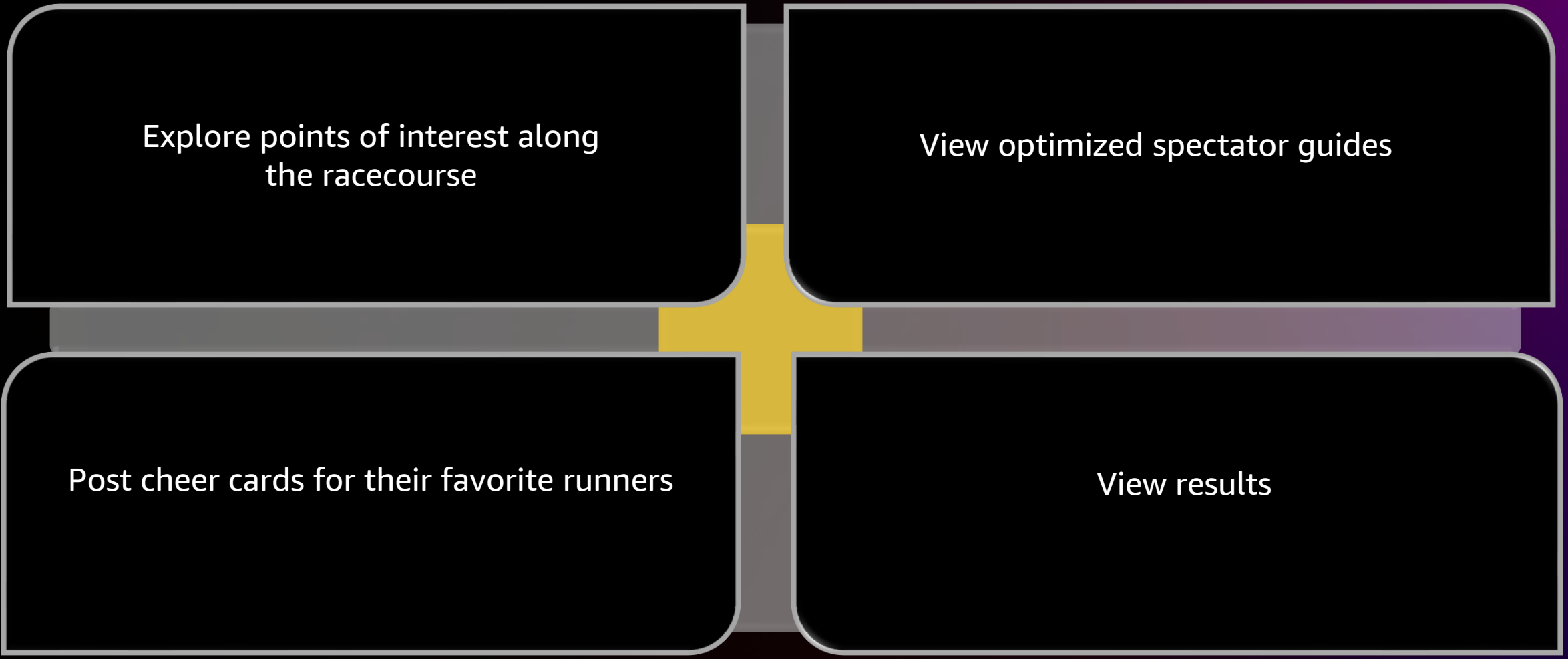
View current position and predicted finishing time of each runner in order to catch sight of them live on the track

View race day starting times for various groups

Share tracking results

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# During the race: Casual spectator




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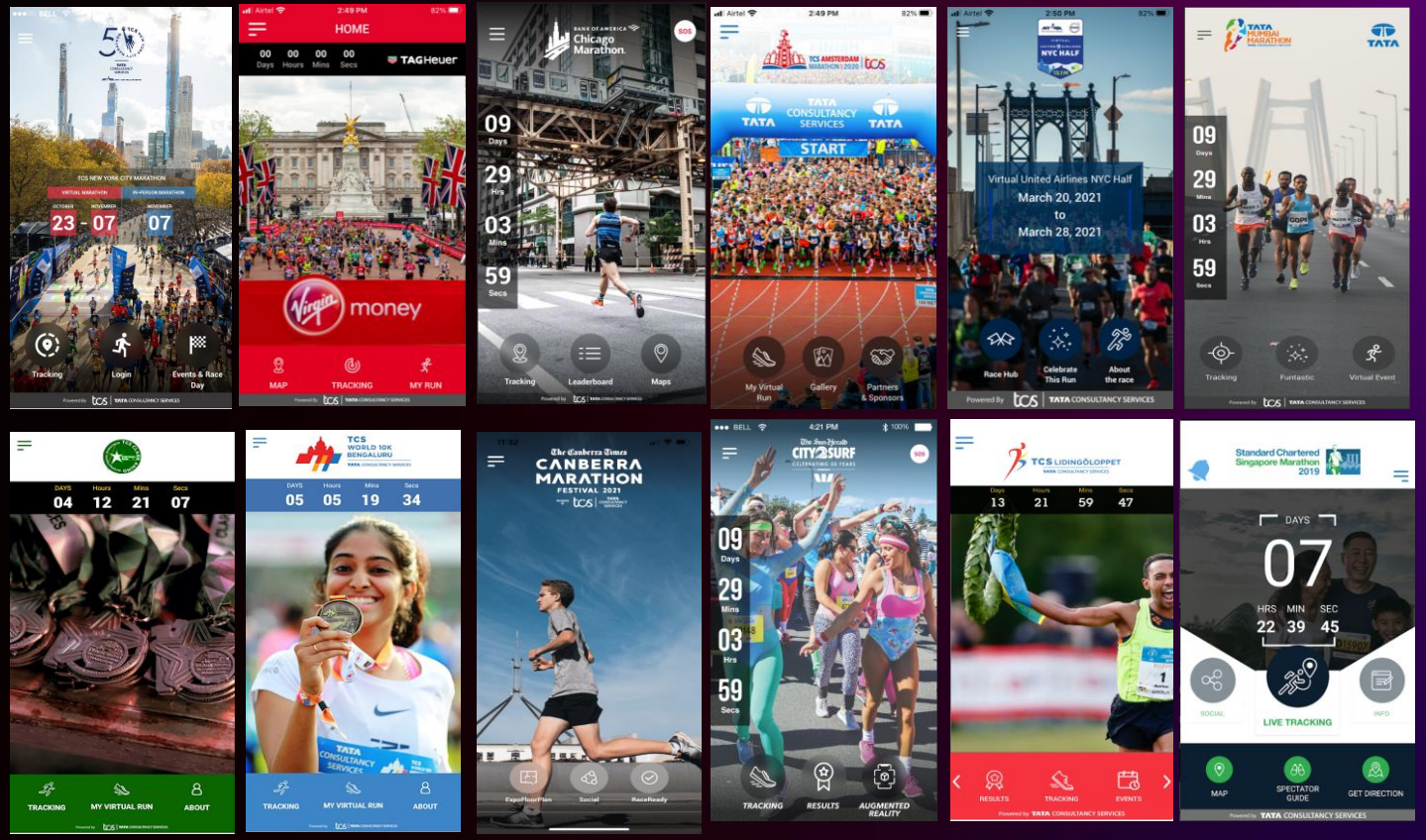
# Choosing the right architecture and technologies

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# To make it happen

You need various geospatial features like:

- Importing geospatial map tiles
- Adding points of interest
- Geocoding
- Routes on map
- Tracking
- Geofencing

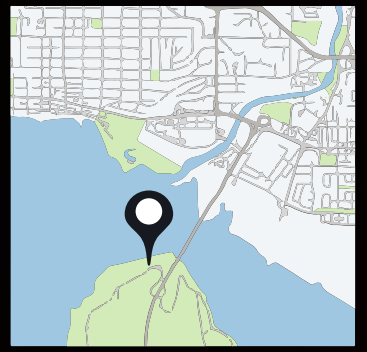



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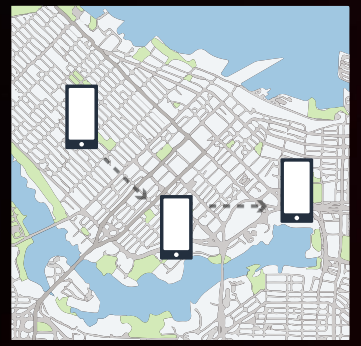
# Amazon Location Service features



Maps



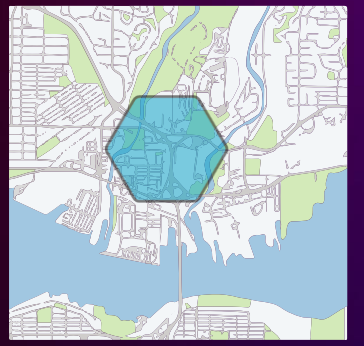
Places



Trackers



Routes

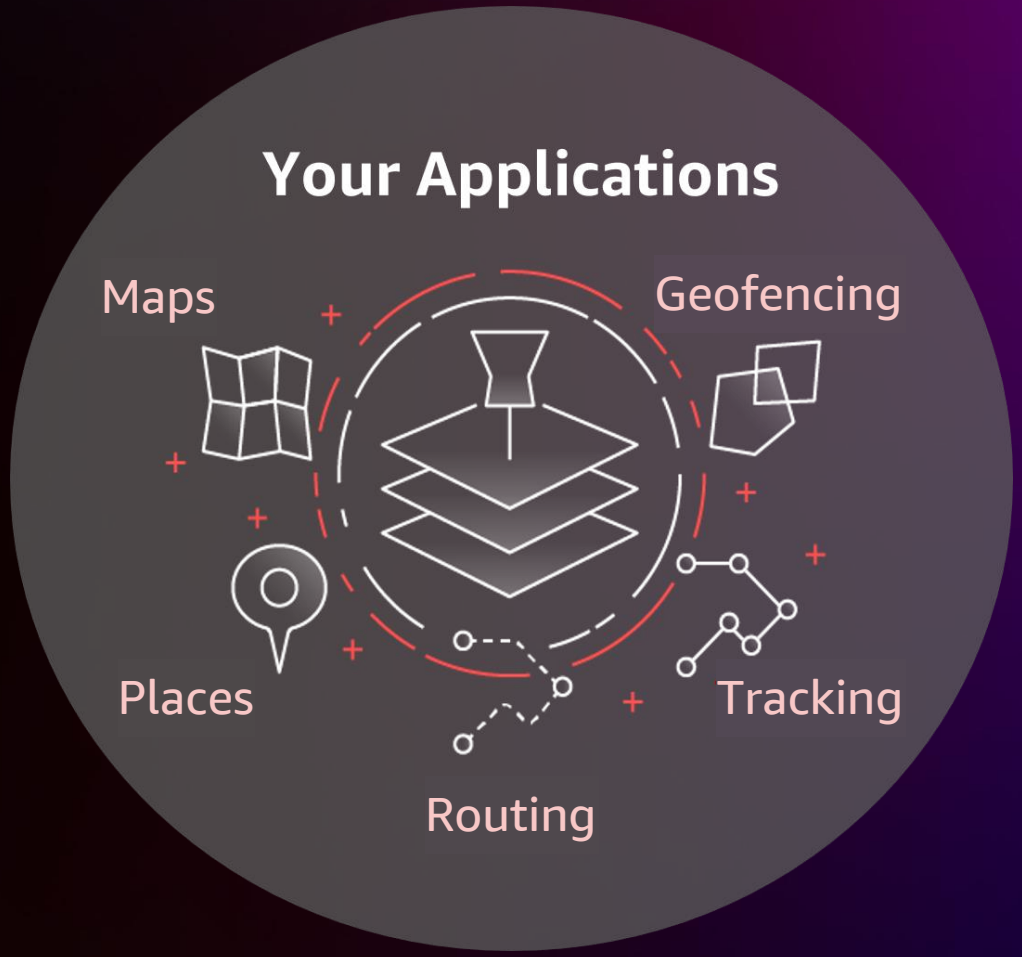


Geofences

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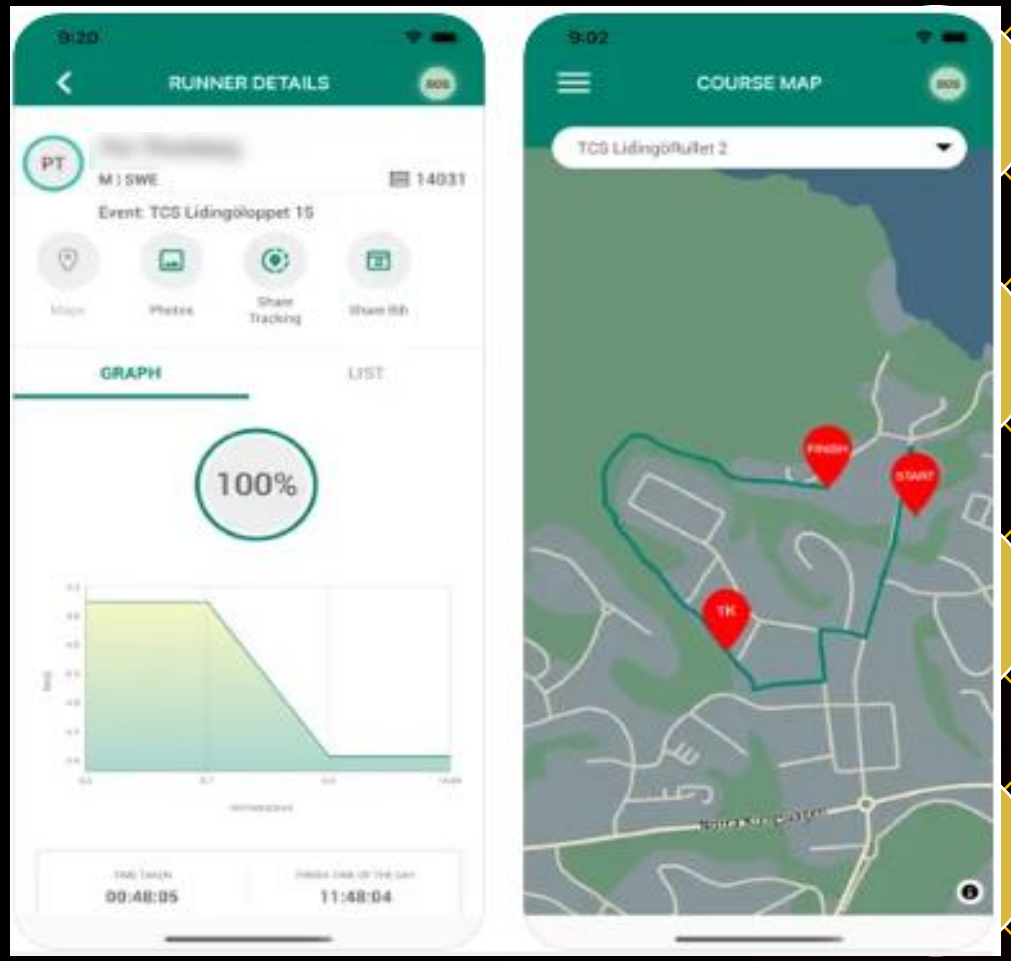
# Amazon Location benefits

- Easily integrate geospatial data into your applications
- Accelerate application development with integrations with AWS
- Protect user privacy, shield sensitive information, and reduce security risks
- Access cost-effective, high-quality geospatial data from trusted data providers




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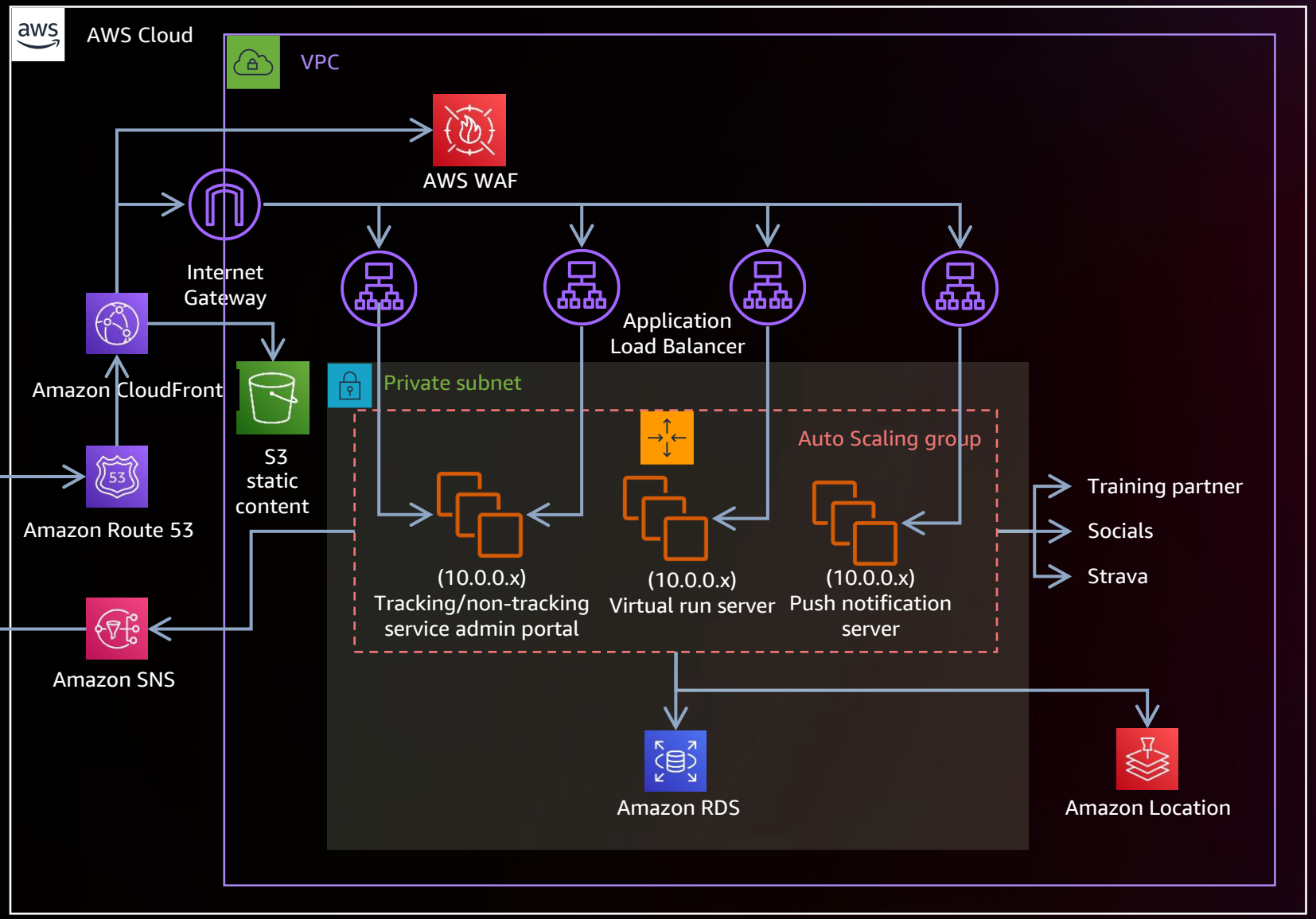
# TCS marathon app




- Importing map tiles
- Adding points of interest on the running course
- Geocoding the runners based on time and speed
- Displaying the marathon route on the map

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# Architecture




## Solution tenets

**Amazon Location**
Securely and easily add location functionality to application

**Amazon Route 53**
Returns IP addresses for DNS records queried by the DNS server

**Amazon CloudFront**
Distribute the content by routing user request through the AWS network to the edge location

**Amazon RDS**
This web service makes it easier to set up, operate, and scale a relational database in the cloud

**Internet Gateway**
Scale horizontally, redundant and highly available VPC component that allows communication between VPC and the internet

**Application Load Balancer**
The load balancer distributes incoming application traffic across Availability Zones

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# Alignment to AWS Well-Architected Framework

## Operational Excellence

Leverage AWS CloudFormation templates

Modular deployment enabling incremental changes

Amazon CloudWatch and AWS CloudTrail to monitor and enable traceability

## Security

Code distributed on CloudFront

AWS WAF–enabled firewall

Complete data encryption

## Reliability

Serverless deployment to ensure scalability

Segregation of user groups to reduce single point of failure

Separate deployment for static and dynamic content

## Performance Efficiency

CloudFront deployment to enable seamless user experience globally

Serverless deployment to optimize resources

## Cost Optimization

Leveraging serverless and just-in-time scalability

Usage-based analytics

## Sustainability

Track range of environmental and social indicators

Adoption of serverless components

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tcs TATA CONSULTANCY SERVICES

# TCS marathon app: Best practices



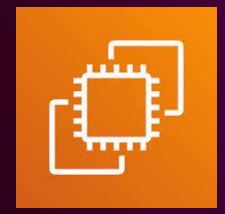
Backup and version control powered by AWS CodeCommit



Resources encrypted with restricted access and within a VPC



Strong passwords maintained and changed frequently



Security groups configured for AWS resources



Multi-factor authentication layer for all



CloudTrail in all Regions for event logging and monitoring



Amazon S3 and S3 backups encrypted and version controlled



Contextual access control and permission powered by AWS Identity and Access Management (IAM)

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# Customer value delivered




**Seamless integration**
Productivity improvement in delivery




**User-friendliness**
Customer satisfaction increased



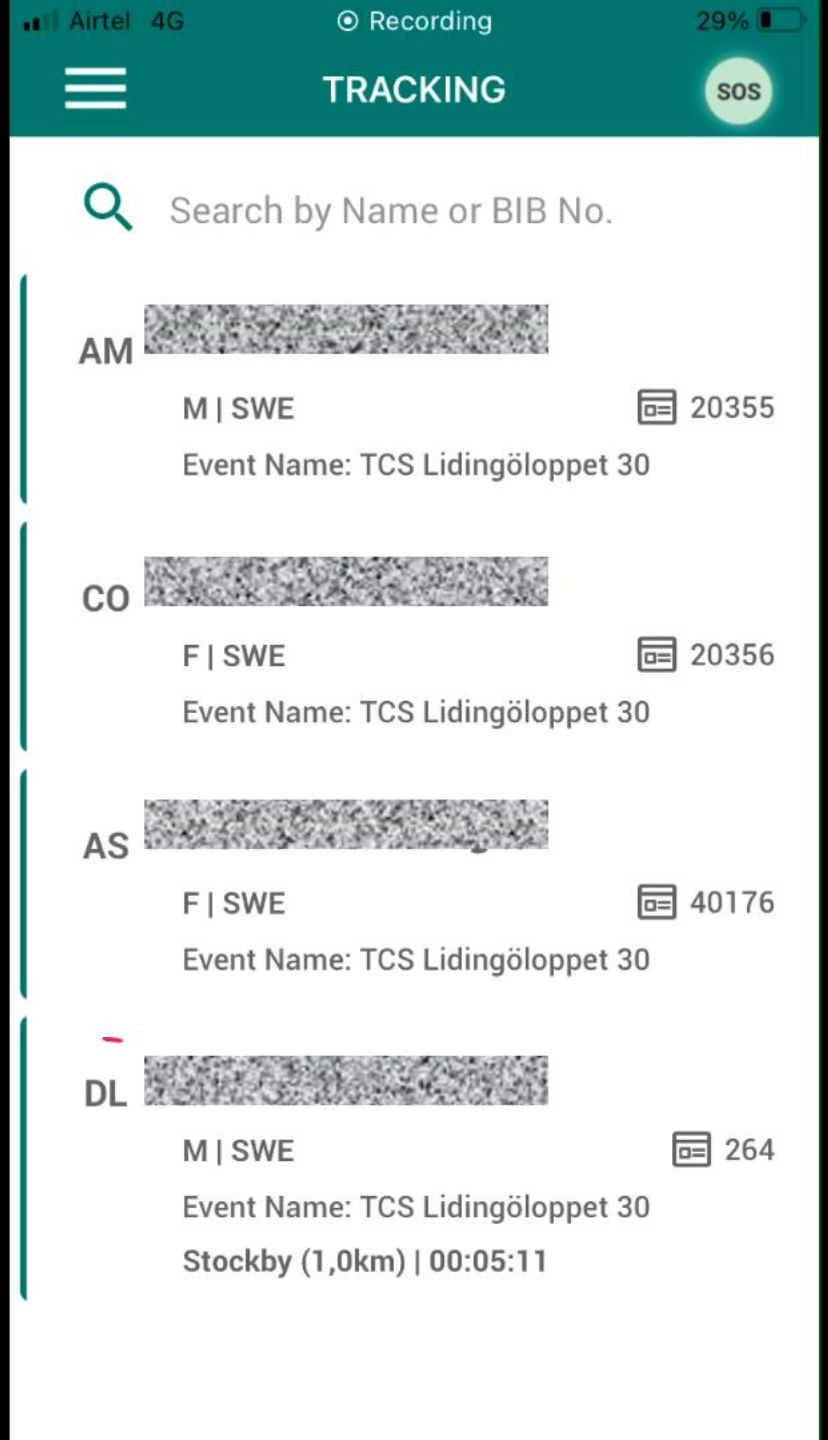

**Ease of use**
Reduced touchpoints for handling map tiles




**Cost-efficiency**
Saved cost using Amazon Location

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# Glimpses from TCS Lidingöloppet



# Looking ahead

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# Looking ahead

Live streaming of cheer videos

Augmented reality and gamification (focus on training experience)

Collaboration platform

Customized training and monitoring plan

IoT-based proximity sensors for user experience

Real-time tracking and automatic health analysis

Content on the go

Baggage tracking

Supporting hybrid experience for live and virtual runners

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# Summary

Trust on Amazon Location geospatial features

100% alignment to AWS Well-Architected Framework

Focus on experience

Address privacy, protect information, and reduce risks

Automated application development

Spike testing and scalability




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# Thank you!

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