E2E Customer Testing
To
Synthetic Monitoring

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SREcon23 APAC
AGENDA

SRE @ PayPal

Why Synthetic testing?

Synthetics - Introduction

Synthetics - Design

E2E Testing Platform

Architecture

Insights

Feature Take Aways

Q&A
### What is at stake?

**Business – Q1 2023**

- 5.8 billion transactions
- $354.5 billion in total payment volume
- 433 million active accounts
- Connects people and businesses in > 200 markets

**Platforms**

- On both cloud & on-premises
- Distributed across several availability zones
- Hardware and software components
- 1000s of VMs

**Applications**

- Over 3200 applications and services
- Database & data warehouse
- Multiple programming languages
- Web, mobile & API offerings
VISION: Create the most reliable payment platform on the planet.

MISSION: Build & democratize an AI driven reliability engine that builds trust by powering highly reliable customer experiences.
Why Synthetic Monitoring?

- Proactively identify performance problems
- Reduce mean time to resolution (MTTR)
- Launch in a new market
- Meet performance goals (SLOs or other benchmarks)
- Partner and Merchant Communications
What Is Synthetic Monitoring?

Synthetic monitoring is a monitoring technique that is done by using a simulation or scripted recordings of transactions.

Behavioral scripts (or paths) are created to simulate an action or path that a customer or end-user would take on a site, application, or other software (or even hardware).

Those paths are then continuously monitored at specified intervals for performance, such as functionality, availability, and response time measures.

This type of monitoring does not require actual traffic, thus the name synthetic.
# Synthetics - Requirements

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scope</strong></td>
<td>Support all Business Units, GEO locations, API, Web and Mobile Applications &amp; Support all Environments</td>
</tr>
<tr>
<td><strong>End to End Flow coverage</strong></td>
<td>Partners &amp; High-Volume Merchant Flows, Major TPV coverage, New Market or Product Launches, Third Party APIs/Endpoints</td>
</tr>
<tr>
<td><strong>Web Vitals –</strong></td>
<td>Largest Content Paint (LCP), First Input Delay (FID), Cumulative Layout Shift (CLS), First Contentful Paint (FCP), Apdex (Application Performance Index)</td>
</tr>
<tr>
<td>(loading, interactivity,</td>
<td></td>
</tr>
<tr>
<td>and visual stability)</td>
<td></td>
</tr>
<tr>
<td><strong>User Experience</strong></td>
<td>DNS Time, Connection Time, SSL Handshake time, Total Download Bytes, Trending Over Time, Web Performance long Tails versus the Average</td>
</tr>
<tr>
<td><strong>Measurements</strong></td>
<td></td>
</tr>
</tbody>
</table>
PRIMARY USE CASE

• The Product shall offer support for using multiple Synthetic Monitor Types in a test, like combining API Monitoring with Website/Mobile Application Monitoring.

• A typical PayPal use case would involve both and the idea is to port the existing E2E tests suites into the Product.
Synthetics - Design

Availability Zones

Test Run

[Vantage Points]
Browser & Device Farms

On Alert

Test Initiation

[Somewhere outside of PayPal & BUs]
Synthetic Monitoring Platform

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### Synthetics – Vendor Evaluation

<table>
<thead>
<tr>
<th>API Monitoring</th>
<th>Multiple Step Transactions and Monitoring the Performance at each step</th>
<th>Test Automation Frameworks supported (Java TestNG, WebdriverIO, Cypress etc.)</th>
<th>Multiple Devices, OS and Browsers</th>
<th>Native Mobile Application Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Built Performance Measurements</td>
<td>Testing From Global Locations</td>
<td>Benchmarking Website Availability and Performance</td>
<td>Testing in Pre-Production</td>
<td>Manual Test execution</td>
</tr>
</tbody>
</table>

Dashboard /Visualization to view various metrics /results
Synthetics – Security Constraints with Cloud Set up

- Safe Transfer of Code Artifacts from PayPal Repository
- Security of Data (Credentials and Auth Tokens, etc.) involved for testing Customer flows.
- Application Ownership to Scale
- Alerting and Monitoring of the Application & Infrastructure Maintenance
E2E Testing Platform

An in-house product, including a Test Runner, Framework, and Production AZ that allows product teams to author, publish, run, and debug end-to-end (e2e) tests with the confidence that their code will work in production and their customers will have the quality experiences they expect from the product.
E2E Testing Platform – Key Features

- Test from Customer Point of View
- Vet Releases in an N+1 environment
- Gate to Delivery - Render Go/No Go decision
- Re-Certify a previously live AZ / New AZ
- Continuous Functional Monitoring in live AZ
E2E Testing Platform – Release Vetting Routing Architecture
Test Authoring and Framework support

Product Development Team

Git Repo
- Cypress Tests
- wdio JS Tests
- Java Tests
  - TestNG
  - Selenium
  - Retrofit

CI

Package Management
Package the Test Repos
- Version
- Dependencies
- APIs to activate/Deactivate the test packages

Executor Service
- Docker Containers
  - Selenium
    - Firefox
    - Chrome
  - Cypress
    - cypress/included
    - API to execute Cypress tests
Synthetics - Platform Capabilities

- Dynamically distributed Tests across servers.
- Tests and Accounts are isolated for parallel execution.
- Scheduled Job runs for Continuous Monitoring.
- Real-Time view of Execution in Dashboard.
- Results are stored in Database with Logs, Screenshots, etc.
- API Request/Response details persisted.
## Synthetics - Sample Execution

**Completed: Pass**

### Execution Request Summary

<table>
<thead>
<tr>
<th>Date &amp; Time</th>
<th>User</th>
<th>Release</th>
<th>Parameter Group</th>
<th>Duration</th>
<th>Geo Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/11/2023 11:30 pm PDT</td>
<td>Synthetic Execution</td>
<td>-</td>
<td>Set2</td>
<td>2m 5s</td>
<td>US</td>
</tr>
</tbody>
</table>

Filters returned 1 out of 1 test executions.

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Time of Execution</th>
<th>Duration</th>
<th>Browser</th>
<th>Executor Node</th>
<th>Status</th>
<th>Status Validity</th>
<th>Remediation Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ebay Synthetic Test</td>
<td>06/11/2023 11:30 pm PDT</td>
<td>2m 4s</td>
<td>Firefox</td>
<td>10.141.144.103</td>
<td>Pass</td>
<td>History</td>
<td></td>
</tr>
</tbody>
</table>
## Synthetics - Sample Execution

**Test Name:** Ebay Synthetic Test

PayPal Checkout Synthetic Testing of BUYER EXPERIENCE. Used for eBay continuous monitoring.

**Time of Execution:** 06/11/2023 11:30 pm PDT

<table>
<thead>
<tr>
<th>Step #</th>
<th>Step Name</th>
<th>Step Result</th>
<th>Reason</th>
<th>Attachments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GetAccessToken</td>
<td>Success</td>
<td></td>
<td>View Details</td>
</tr>
<tr>
<td>2</td>
<td>CreateOrder</td>
<td>Success</td>
<td></td>
<td>View Details</td>
</tr>
<tr>
<td>3</td>
<td>Login</td>
<td>Success</td>
<td></td>
<td>View Details</td>
</tr>
<tr>
<td>4</td>
<td>PayPal Login Password Entry</td>
<td>Success</td>
<td></td>
<td>View Details</td>
</tr>
<tr>
<td>5</td>
<td>Review payment</td>
<td>Success</td>
<td></td>
<td>View Details</td>
</tr>
<tr>
<td>6</td>
<td>Payment successful. Redirect to Home</td>
<td>Success</td>
<td></td>
<td>View Details</td>
</tr>
<tr>
<td>7</td>
<td>GetOrder</td>
<td>Success</td>
<td></td>
<td>View Details</td>
</tr>
<tr>
<td>8</td>
<td>CaptureOrder</td>
<td>Success</td>
<td></td>
<td>View Details</td>
</tr>
<tr>
<td>9</td>
<td>RefundOrder</td>
<td>Success</td>
<td></td>
<td>View Details</td>
</tr>
</tbody>
</table>
Insights

• Proactive signals for major **Incident detection and Customer experience degradation**.

• Critical E2E Flows for each Product are Identified with the help of Automated **TPV (Total Payment Volume) Report** that provides Key Data and Analytics.

• We are focusing to leverage **AI** to generate automation test scripts so that any E2E flow can be on-boarded into Platform with ease.

• Latency measurements across various **GEO’s** are constantly benchmarked.
Features & Take Aways

- Change Reliability through End-to-End Customer Flow validation
- Synthetics, a customer experience feedback
- Elucidating Requirements for E2E testing
- Building Synthetics as a Platform capability
- Synthetics, one of the signals for proactive incident detection
Q & A
Thank you!!

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