MOZARK

State of Video Streaming Experience in India

Pan-India study of the app experience of leading video OTT providers

Video OTTs have seen a dramatic increase in their viewership during the lockdown. However, is this trend likely to be permanent? Are we witnessing the start of digital TV replacing satellite TV completely?

For such a shift to be permanent, the user experience delivered through OTT video platforms has to match that of satellite TV. For this, OTT apps have to become “Responsive” (imagine switching videos with the same ease as switching channels!), and their “Streaming” experience has to be seamless (buffering is an unknown concept in the satellite broadcasting world!).

To understand this better, we at MOZARK, have been continuously monitoring the user experience on leading video OTT platforms in India. Our measurements on smartphones connected to real networks distributed across 20+ cities in India. More than 21,000 samples were collected and analyzed for this study.

Methodology

Application Quality Index (AQI) is our proprietary measure of user experience. AQI is a function of “Responsiveness” and “Streaming” indices. Many factors determine the Responsiveness and Streaming index of an app (see figure 1). However, for this study, we have taken Responsiveness as a function of Home page load time and Streaming index as a function of Play Start Time, Re-buffering rate, and # of buffering instances.

Application Quality Index (AQI)

Responsiveness Index	Streaming Index	Video Quality	Audio Quality	Functional stability	Resource Load
• App Start load time	• Play start time	• % playtime in high resolution	• Audio perceptual index	• App crash rate (at launch)	• Battery Usage rate
• Home page load time	• Rebuffering Rate	• Blur score	• Mutes ratio	• Monkey Test score	• CPU Usage
• Search response time	• # of buffer instances /min	• Blockiness score	• Mutes instances/min	• Load Test score	• Memory Usage
• Time to load page from carousal		• Sharpness score	• Signal to Noise Ratio	• Error rate (video start)	
		• Contrast score			
		• Freeze time %			
		• Freeze time Count			

Pink indicates index covered in study

Figure 1 – Illustration only, additional factors may exist

All these metrics were measured through our industry-first Connected Experience platform that uses completely non-intrusive methods to measure the user experience. Tests were performed on low-end and high-end smartphones connected to real telco networks (Airtel, Jio, and Vodafone/Idea). Our ML platform analyzes automation, OS, and network logs, along with video stream analysis to derive these KPIs and maintain an accuracy of <50ms!

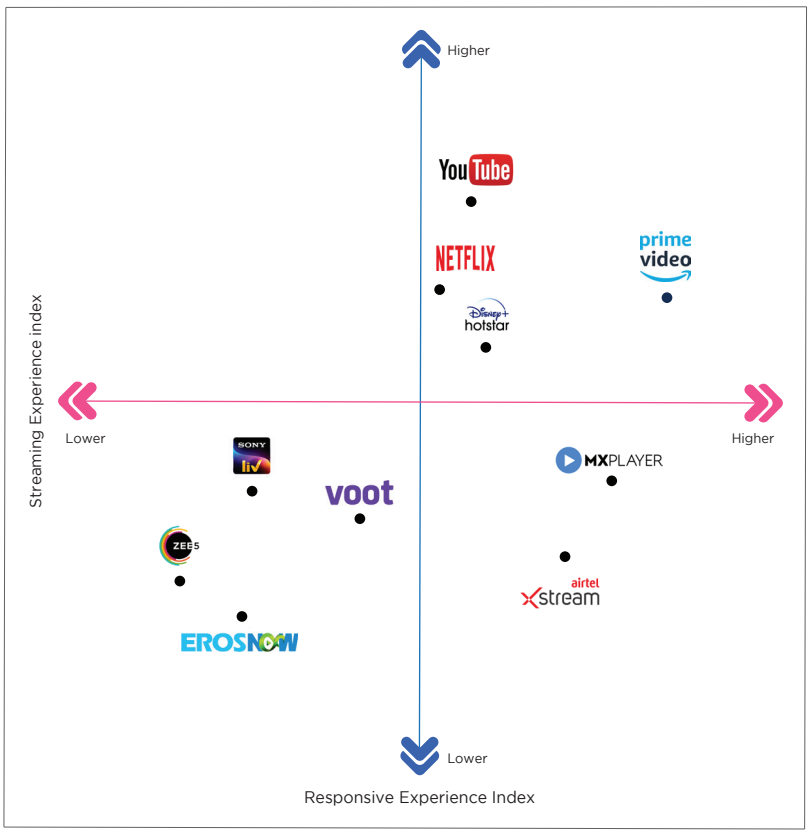
For this study, we measured the user experience of following OTTs:

Insights

While several app-specific experience optimizations are possible, we focus on a few industry-wide trends that we observed as part of this study.

#1: OTTs are making a trade-off rather than optimizing both Responsiveness and Streaming

Getting a consistent experience across the Responsiveness of the app and the Streaming performance is hard. In our analysis, the only OTTs that came close to achieving this were Netflix, Youtube, Prime Video and Hotstar.



Responsiveness is a function of several factors such as performance of the app backend, optimization of images, and efficiency of personalization APIs/algorithms. On the other hand, Streaming requires burst performance where a large amount of data needs to be downloaded in a short period. Here is where CDNs come into play. Using the most effective CDN, depending on the geographical distribution of the customer base is vital. A CDN that performs well in one geography may not necessarily give the same performance in another. Even within the country, we have seen vast differences in the performance of a CDN between various regions, as explained later in this whitepaper.

#2: OTTs with greater control over 3rd party infrastructure perform better

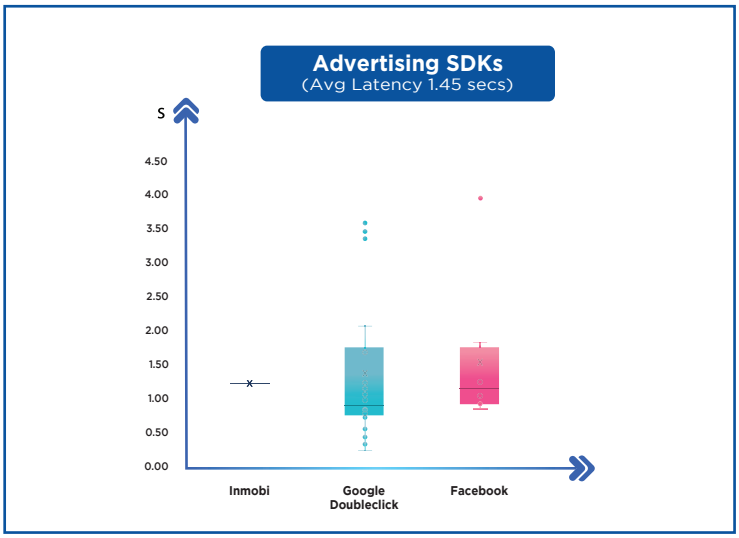
For every 100MB of data that is sent by a typical video app, only 10MB is exchanged with its own backend. Rest is transferred with various 3rd party infrastructures such as CDNs, online video platform SDKs, marketing and customer analytics cloud, APM cloud, etc. Understanding the impact that such 3rd party integrations have on end-user customer journey performance is very critical.

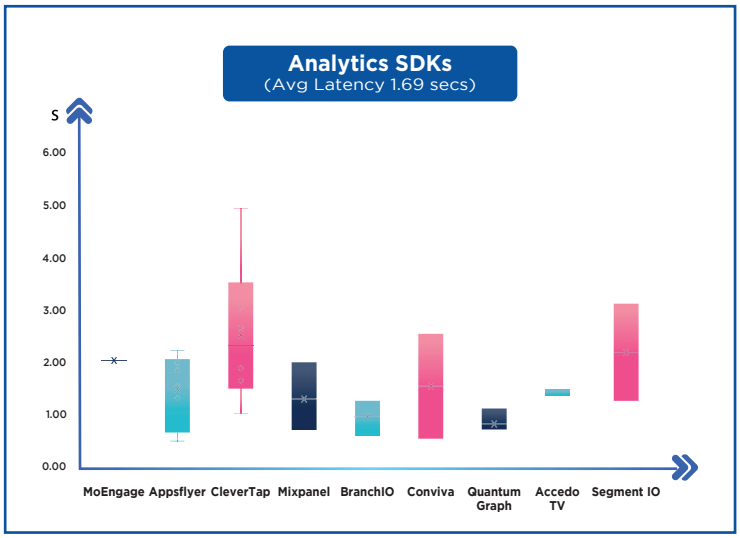
Based on our assessment of the various apps, we find four typical 3rd party integrations as follows:

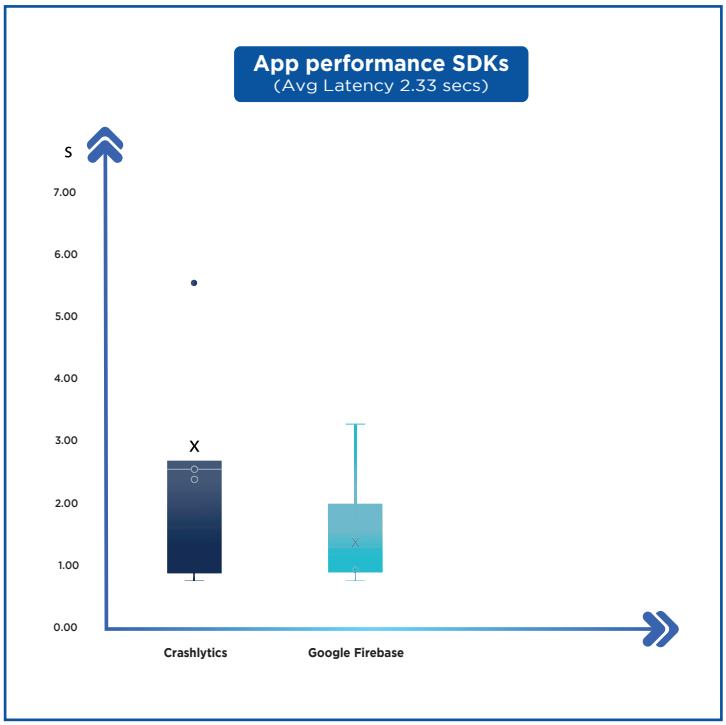
- Ad Networks
- Marketing & Customer Analytics cloud
- Online video platform cloud
- Application performance management cloud

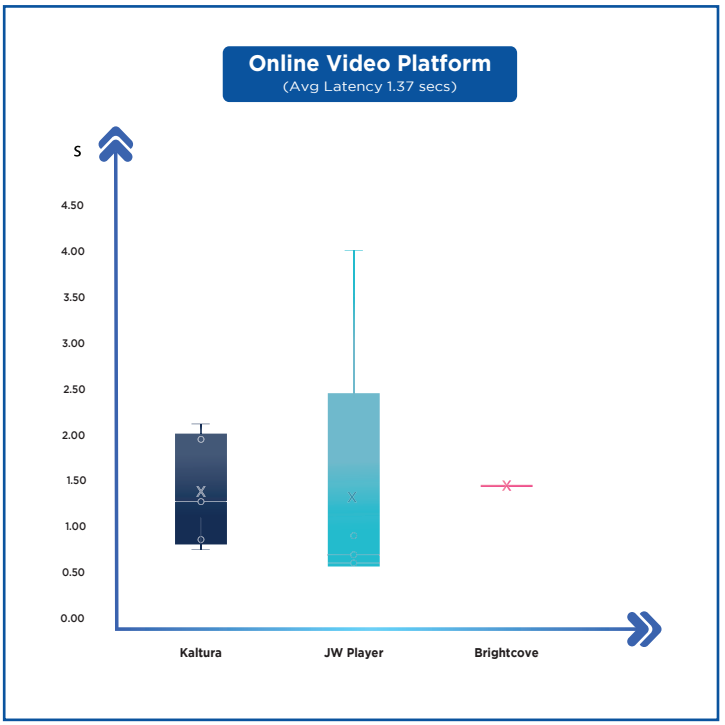
We analyzed the overall latency of each of these integrations. Here, the overall latency is defined as the sum of TCP Handshake time and TLS Handshake time.

Across all the above categories, we found vast latency variations across the board. Such high latency variations would have a material impact on the performance of the app. Latencies can be vastly improved by apps transitioning to server-side integrations rather than client-side integrations. By using server-side integrations, apps can setup dedicated WAN connections to the respective 3rd party clouds. By doing so, the communication between the client and server are limited to the app backend and the CDN.









#3: Choosing CDN wisely is the most crucial decision that any video OTT must make

More than 60% of any video OTT's traffic is delivered via Content Delivery Networks (CDNs). Thus, more than the last mile telecom network performance, the distribution, and performance of the CDN have a more significant impact on the app performance.

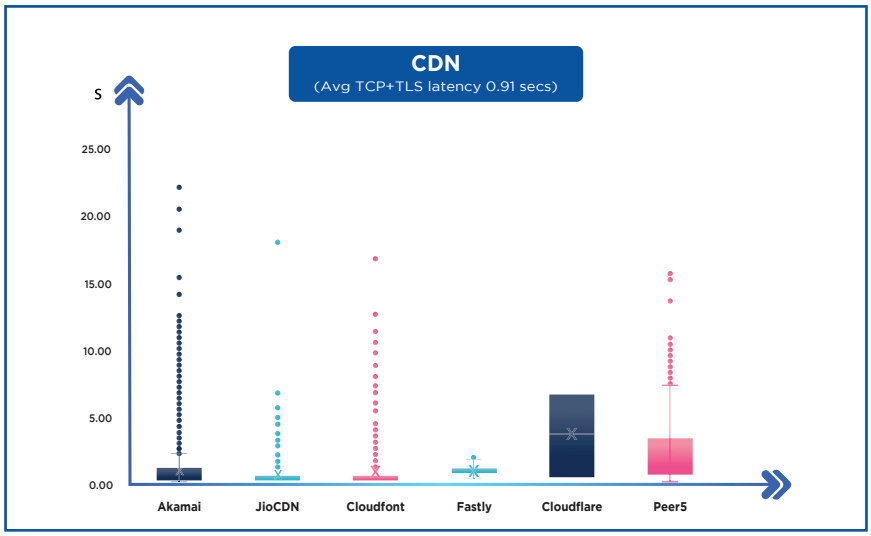
More than cost, several technical considerations must go into choosing the CDN provider, few of which are the following:

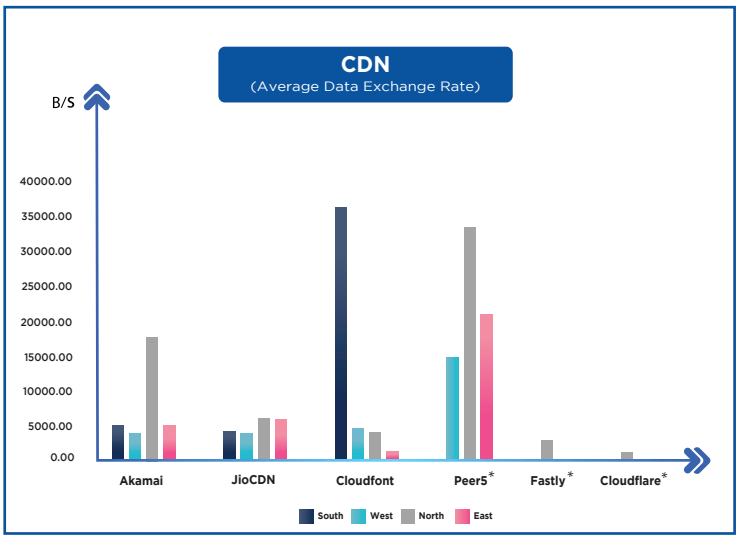
- Geographical distribution of the pops across the country
- Network connectivity deployed at these pops
- Peak throughput that can be delivered from the pops
- Caching capacity of the pops

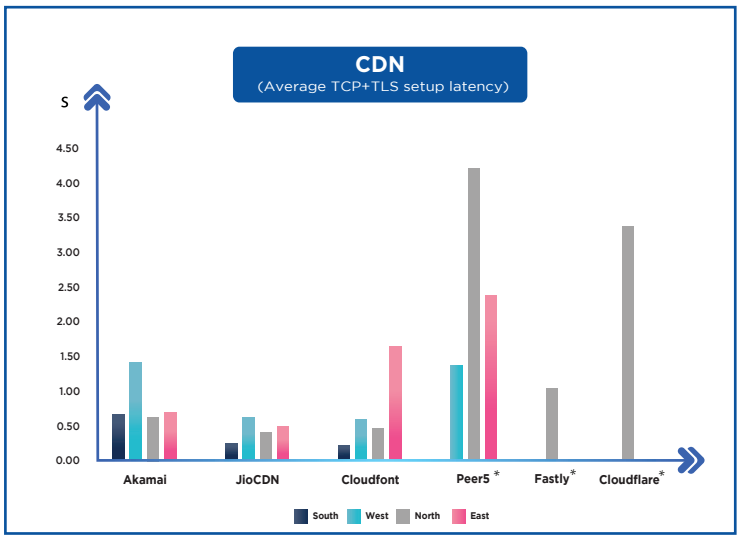
In the OTTs that we observed, Akamai, Cloudfront, Jio, and Peer5 were the CDNs that were used. We analyzed the latency variations of these CDNs based on our tests. Cloudfront showed the maximum variance in performance across all the tests we performed, while Akamai was the most stable.

In terms of regional performance, too, we found all 3 CDNs to be quite weak in the East, indicating that substantial investments need to be made in expanding the CDN infrastructure across our East.

Many OTTs now are also looking at multi-CDN architecture, in order to avoid lock-in with one partner and also leverage the performance variations across CDNs to choose dynamically from where to deliver content from. OTTs are integrating real-time CDN performance intelligence with their load balancers to make such decisions on the fly.







Not enough samples in some zones

#4: App architectures need to take into account the variations in network latencies

Countries that have not invested in vast fiber networks typically have higher latencies. Countries with poor infrastructure also see massive fiber cuts leading to congestion on the more stable routes. Lack of fiber infrastructure means latencies, even with 4G, will never match that of the more advanced counterparts. Even within the developed markets, there could be large variations across regions.

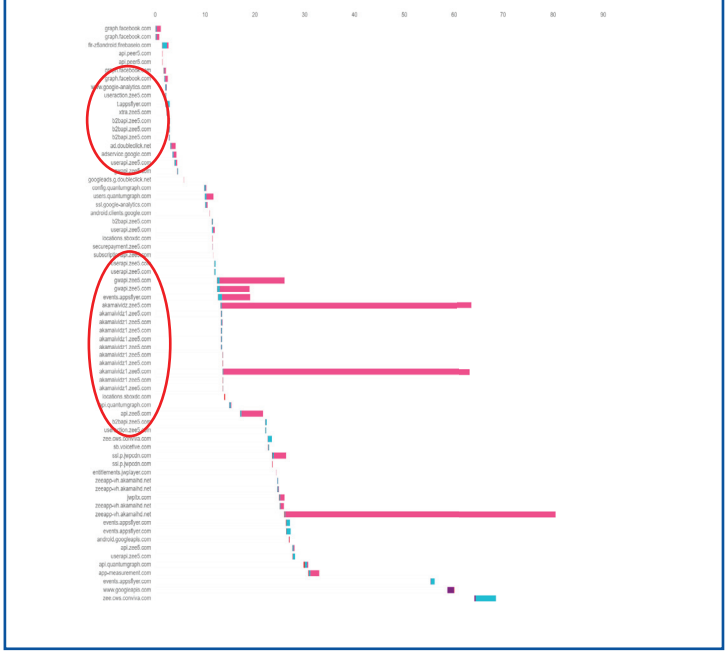
Thus, when developing content apps, the architecture need to be designed to take into account higher latencies. Limiting network calls back and forth between the client and the server is critical. Chatty networking calls can result in very high overheads, thus slowing down the app overall. Minimizing protocol overheads and maximizing time spent on payload transfer is vital, as shown in the comparison of a network waterfall chart between two leading OTT apps in India. To achieve an optimal network overhead by apps, they need to define their API architecture carefully to ensure that multiple requests are server with one connection establishment.

Zee5 Network call flow during active test (with VoD video played)

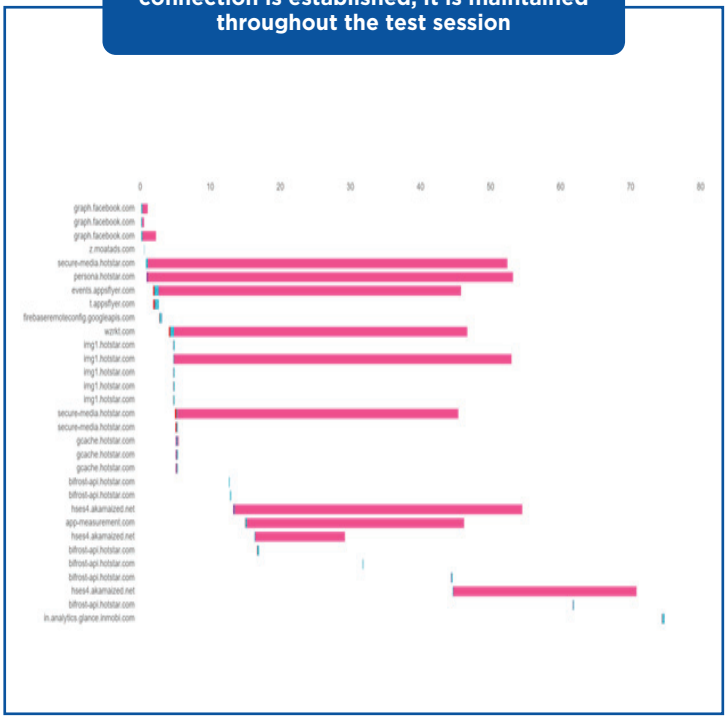
Hotstar Network call flow during active test (with VoD video played)

dns query time | dns tcp delta time | tcp handshake time | tls handshake time | data exchange time

High degree of chattiness (repeated connections to same server) observed for both 1st party and 3rd party backend servers



Chattiness lesser. Generally, once server connection is established, it is maintained throughout the test session



**Data is of May 2020*

Key Takeaways

- OTT platforms like Netflix and Youtube have invested heavily in not only creating content but also laying out their own infrastructure like international fiber networks and CDNs.
- Smaller OTTs, however may not be able to make the same levels of investment in technology as majority of their investments must go into content creation and may integrate with 3rd parties.
- Although not a challenge, ensuring that OTTs deploy monitoring mechanisms to keep a tab on the performance of 3rd parties and be able to enforce strict SLAs as part of their contracts is crucial.
- Thus, the first step in becoming a world class app is to start measuring user experience. After all what is not measured cannot be improved!

About MOZARK

The world is getting increasingly connected. Use cases that are going digital are exploding as more devices get connected and network technology evolves to provide greater bandwidth. As the business and technology complexity of providing the necessary connectivity infrastructure rises, it becomes even harder to “guarantee” a certain Quality of Experience of being connected to customers.

At MOZARK, we are passionate about ensuring that right Connected Experience is delivered to end customers.

Our platform uses cutting edge technologies such as video and audio analysis without reference files, robotic process automation, ML driven radio frequency simulations and deep packet inspection to measure performance.

We work with telecommunication service providers, building owners & tenants (e.g., enterprises, real estate), regulators and application publishers to enhance the QoE delivered to customers.

We are the only global truly independent Connected Experience platform

Disclaimer

Purpose of the study is to highlight the differences in end user experience through a statistically relevant survey. It is not a substitute for actual data capture and analysis but more of a pointer towards potential problem areas. It is not meant to endorse any one brand over another but purely a result of a deeply data driven external survey. None of the parties evaluated, paid for any component of the survey nor participated in any form during the tabulation of the results. Using or citing these findings for marketing or other purposes without the knowledge of MOZARK is strictly prohibited.