Android instrumentation library

This page describes the particular implementation and usage details of the Android Instrumentation Library. This library follows the common concepts of all instrumentation libraries.

Including in Android project

The library is distributed as an AAR library file. To include the library in your own Android Studio project, follow the instructions in the Android Developers site:

1. Download the AAR file
2. Open the app project in Android Studio
3. Import the file as a new module:
    1. Click File > New Module
    2. Click Import .JAR/.AAR Package then click Next
    3. Enter the location of the AAR file, then click Finish
4. Make sure the library is listed at the top of your settings.gradle file: include ':app', ':triangle-appinstr-android
5. Open the app module's build.gradle file and add a new line to the dependencies block:

```
dependencies {
    compile project(":triangle-appinstr-android")
}
```

Finally, click Sync Project with Gradle Files.

Other ways of integrating the library in an Android app may work, but are not supported.

Organization

The library classes are organized into packages according to the use cases. Each package contains one class per feature of that use case. Each class contains one method per measurement point used to compute the feature KPIs.

The base package for his hierarchy is eu.triangle_project.appinstr.

The package/class/method organization is then as follows:

- Base package: eu.triangle_project.appinstr
    - Use case package: <use_case>
        - Feature class: <feature>MeasurementPoints
            - Measurement point method: <measurement_point>

The names for <feature> and <measurement_point> will follow the usual CamelCase Java conventions.

The feature class will be final and abstract. The measurement point methods will be static and return void.

Measurement point methods

Each measurement point method has one argument per argument required by the measurement point. Absent from these arguments are the timestamp (which is extracted automatically), and additional measurement point ids.

The measurement point argument types are mapped into the following Java types:

- boolean → boolean
- int → int
- double → double
- string → String

The following measurement points are currently supported by the instrumentation library:

- Common Services
    - Login
        - App Initialization Start - Login Required

```
eu.triangle_project.appinstr.commonservices.LoginMeasurementPoints.appInitializationStartLoginRequired()
```

- App Initialization Start - Login Not Required

```
eu.triangle_project.appinstr.commonservices.LoginMeasurementPoints.appInitializationStartLoginNotRequired()
```

- App Started

```
eu.triangle_project.appinstr.commonservices.LoginMeasurementPoints.appStarted()
```

- Menu Navigation
  - Menu Navigation - App Ready

```
eu.triangle_project.appinstr.commonservices.MenuNavigationMeasurementPoints.menuNavigationAppReady()
```

- Content Distribution Streaming Services
  - Media file playback
    - Media File Playback - Start

```
eu.triangle_project.appinstr.contentdistributionstreamingservices.MediafileplaybackMeasurementPoints.mediaFilePlaybackStart()
```

- Media File Playback - End

```
eu.triangle_project.appinstr.contentdistributionstreamingservices.MediafileplaybackMeasurementPoints.mediaFilePlaybackEnd()
```

- Media File Playback - First Picture

```
eu.triangle_project.appinstr.contentdistributionstreamingservices.MediafileplaybackMeasurementPoints.mediaFilePlaybackFirstPicture()
```

- Media File Playback - Video Resolution

```
eu.triangle_project.appinstr.contentdistributionstreamingservices.MediafileplaybackMeasurementPoints.mediaFilePlaybackVideoResolution(int resolution_x, int resolution_y)
```

- Media File Playback - Content Stall Start

```
eu.triangle_project.appinstr.contentdistributionstreamingservices.MediafileplaybackMeasurementPoints.mediaFilePlaybackContentStallStart()
```

- Media File Playback - Content Stall End

```
eu.triangle_project.appinstr.contentdistributionstreamingservices.MediafileplaybackMeasurementPoints.mediaFilePlaybackContentStallEnd()
```

  - Download media content for offline playing
    - Media Content Download - Start

```
eu.triangle_project.appinstr.contentdistributionstreamingservices.DownloadmediacontentforofflineplayingMeasurementPoints.mediaContentDownloadStart()
```

        - Media Content Download - End

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.Downloadmediacontentf
          orofflineplayingMeasurementPoints.mediaContentDownloadEnd()
          ```

    - Play And Pause
        - Media File Playback - Pause

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.PlayAndPauseMeasureme
          ntPoints.mediaFilePlaybackPause(boolean success)
          ```

        - Media File Playback - Resume

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.PlayAndPauseMeasureme
          ntPoints.mediaFilePlaybackResume(boolean success)
          ```

    - Stop And Replay
        - Media File Playback - Stop

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.StopAndReplayMeasurem
          entPoints.mediaFilePlaybackStop(boolean success)
          ```

    - Search And Seek
        - Media File Playback - Search

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.SearchAndSeekMeasurem
          entPoints.mediaFilePlaybackSearch(boolean success)
          ```

        - Media File Playback - First Search Result

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.SearchAndSeekMeasurem
          entPoints.mediaFilePlaybackFirstSearchResult()
          ```

    - Rewind And Fast Forward
        - Media File Playback - Rewind

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.RewindAndFastForwardM
          easurementPoints.mediaFilePlaybackRewind(boolean success)
          ```

        - Media File Playback - Fast Forward

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.RewindAndFastForwardM
          easurementPoints.mediaFilePlaybackFastForward(boolean success)
          ```

    - Playlist Skip Forward and Backward
        - Playlist - Skip Forward

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.PlaylistSkipForwardan
          dBackwardMeasurementPoints.playlistSkipForward(boolean success)
          ```

        - Playlist - Skip Backwards

          ```
          eu.triangle_project.appinstr.contentdistributionstreamingservices.PlaylistSkipForwardan
          dBackwardMeasurementPoints.playlistSkipBackwards(boolean success)
          ```

- Live Streaming Services
    - Live video playback

- Live Video Playback - Start

```
eu.triangle_project.appinstr.livestreamingservices.LivevideoplaybackMeasurementPoints.liveVideoPlaybackStart()
```

- Live Video Playback - End

```
eu.triangle_project.appinstr.livestreamingservices.LivevideoplaybackMeasurementPoints.liveVideoPlaybackEnd(boolean success)
```

- Live Video Playback - First Picture

```
eu.triangle_project.appinstr.livestreamingservices.LivevideoplaybackMeasurementPoints.liveVideoPlaybackFirstPicture()
```

- Video Resolution

```
eu.triangle_project.appinstr.livestreamingservices.LivevideoplaybackMeasurementPoints.videoResolution(int resolution_x, int resolution_y)
```

- Live Video Playback - Stall Start

```
eu.triangle_project.appinstr.livestreamingservices.LivevideoplaybackMeasurementPoints.liveVideoPlaybackStallStart()
```

- Live Video Playback - Stall End

```
eu.triangle_project.appinstr.livestreamingservices.LivevideoplaybackMeasurementPoints.liveVideoPlaybackStallEnd()
```

- Broadcast live video
  - Broadcast Liveo Video - Start

```
eu.triangle_project.appinstr.livestreamingservices.BroadcastlivevideoMeasurementPoints.broadcastLiveoVideoStart()
```

  - Broadcast Live Video - End

```
eu.triangle_project.appinstr.livestreamingservices.BroadcastlivevideoMeasurementPoints.broadcastLiveVideoEnd(boolean success)
```

  - Broadcast Live Video - First Picture

```
eu.triangle_project.appinstr.livestreamingservices.BroadcastlivevideoMeasurementPoints.broadcastLiveVideoFirstPicture()
```

  - Broadcast - Stall Start

```
eu.triangle_project.appinstr.livestreamingservices.BroadcastlivevideoMeasurementPoints.broadcastStallStart()
```

  - Broadcast Stall End

```
eu.triangle_project.appinstr.livestreamingservices.BroadcastlivevideoMeasurementPoints.broadcastStallEnd()
```

- Social Networking
  - Post text
    - Post Text - Start

      ```
      eu.triangle_project.appinstr.socialnetworking.PosttextMeasurementPoints.postTextStart()
      ```

    - Post Text - End

      ```
      eu.triangle_project.appinstr.socialnetworking.PosttextMeasurementPoints.postTextEnd(boo
      lean success)
      ```

  - Post image
    - Post Image - Start

      ```
      eu.triangle_project.appinstr.socialnetworking.PostimageMeasurementPoints.postImageStart
      ()
      ```

    - Post Image - End

      ```
      eu.triangle_project.appinstr.socialnetworking.PostimageMeasurementPoints.postImageEnd(b
      oolean success)
      ```

  - Post video
    - Post Video - Start

      ```
      eu.triangle_project.appinstr.socialnetworking.PostvideoMeasurementPoints.postVideoStart
      ()
      ```

    - Post Video - End

      ```
      eu.triangle_project.appinstr.socialnetworking.PostvideoMeasurementPoints.postVideoEnd(b
      oolean success)
      ```

  - Post File
    - Post File - Start

      ```
      eu.triangle_project.appinstr.socialnetworking.PostFileMeasurementPoints.postFileStart()
      ```

    - Post File - End

      ```
      eu.triangle_project.appinstr.socialnetworking.PostFileMeasurementPoints.postFileEnd(boo
      lean success)
      ```

  - Show Image
    - Social Networking - Image Download Start

      ```
      eu.triangle_project.appinstr.socialnetworking.ShowImageMeasurementPoints.socialNetworki
      ngImageDownloadStart()
      ```

    - Social Networking - Image Download End

      ```
      eu.triangle_project.appinstr.socialnetworking.ShowImageMeasurementPoints.socialNetworki
      ngImageDownloadEnd(boolean success)
      ```

  - Play Video
    - Social Networking - Play Video Start

```
eu.triangle_project.appinstr.socialnetworking.PlayVideoMeasurementPoints.socialNetworkingPlayVideoStart()
```

- Social Networking - Play Video End

```
eu.triangle_project.appinstr.socialnetworking.PlayVideoMeasurementPoints.socialNetworkingPlayVideoEnd(boolean success)
```

- Social Networking - Video First Picture

```
eu.triangle_project.appinstr.socialnetworking.PlayVideoMeasurementPoints.socialNetworkingVideoFirstPicture()
```

- Social Networking - Video Resolution

```
eu.triangle_project.appinstr.socialnetworking.PlayVideoMeasurementPoints.socialNetworkingVideoResolution()
```

- Social Networking - Video Stall Start

```
eu.triangle_project.appinstr.socialnetworking.PlayVideoMeasurementPoints.socialNetworkingVideoStallStart()
```

- Social Networking - Video Stall End

```
eu.triangle_project.appinstr.socialnetworking.PlayVideoMeasurementPoints.socialNetworkingVideoStallEnd()
```

- File Downloading
  - Social Networking - File Download Start

```
eu.triangle_project.appinstr.socialnetworking.FileDownloadingMeasurementPoints.socialNetworkingFileDownloadStart()
```

  - Social Networking - File Download End

```
eu.triangle_project.appinstr.socialnetworking.FileDownloadingMeasurementPoints.socialNetworkingFileDownloadEnd(boolean success)
```

- Play Live Video From User
  - Social Networking - Live Streaming Start

```
eu.triangle_project.appinstr.socialnetworking.PlayLiveVideoFromUserMeasurementPoints.socialNetworkingLiveStreamingStart()
```

  - Social Networking - Live Streaming End

```
eu.triangle_project.appinstr.socialnetworking.PlayLiveVideoFromUserMeasurementPoints.socialNetworkingLiveStreamingEnd(boolean success)
```

  - Social Networking - Live Streaming First Frame

```
eu.triangle_project.appinstr.socialnetworking.PlayLiveVideoFromUserMeasurementPoints.socialNetworkingLiveStreamingFirstFrame()
```

  - Social Networking - Live Streaming Resolution

```
eu.triangle_project.appinstr.socialnetworking.PlayLiveVideoFromUserMeasurementPoints.socialNetworkingLiveStreamingResolution()
```

- Social Networking - Live Streaming Stall Start

```
eu.triangle_project.appinstr.socialnetworking.PlayLiveVideoFromUserMeasurementPoints.socialNetworkingLiveStreamingStallStart()
```

- Social Networking - Live Streaming Stall End

```
eu.triangle_project.appinstr.socialnetworking.PlayLiveVideoFromUserMeasurementPoints.socialNetworkingLiveStreamingStallEnd()
```

- Search Object
  - Social Networking - Search Start

```
eu.triangle_project.appinstr.socialnetworking.SearchObjectMeasurementPoints.socialNetworkingSearchStart(boolean success)
```

- Social Networking - Search First Result

```
eu.triangle_project.appinstr.socialnetworking.SearchObjectMeasurementPoints.socialNetworkingSearchFirstResult()
```

- High Speed Internet
  - File download
    - File Download - Start

```
eu.triangle_project.appinstr.highspeedinternet.FiledownloadMeasurementPoints.fileDownloadStart()
```

- File Download - End

```
eu.triangle_project.appinstr.highspeedinternet.FiledownloadMeasurementPoints.fileDownloadEnd(boolean success)
```

  - File upload
    - File Upload - Start

```
eu.triangle_project.appinstr.highspeedinternet.FileuploadMeasurementPoints.fileUploadStart()
```

- File Upload - End

```
eu.triangle_project.appinstr.highspeedinternet.FileuploadMeasurementPoints.fileUploadEnd(boolean success)
```

  - Pause And Resume Download
    - File Download - Pause

```
eu.triangle_project.appinstr.highspeedinternet.PauseAndResumeDownloadMeasurementPoints.fileDownloadPause(boolean success)
```

- File Download - Resume

```
eu.triangle_project.appinstr.highspeedinternet.PauseAndResumeDownloadMeasurementPoints.fileDownloadResume(boolean success)
```

- Pause And Resume Upload
  - File Upload - Pause

```
eu.triangle_project.appinstr.highspeedinternet.PauseAndResumeUploadMeasurementPoints.fileUploadPause(boolean success)
```

  - File Upload - Resume

```
eu.triangle_project.appinstr.highspeedinternet.PauseAndResumeUploadMeasurementPoints.fileUploadResume(boolean success)
```

- Virtual Reality
  - Virtual Reality Session
    - Scenario Selected

```
eu.triangle_project.appinstr.virtualreality.VirtualRealitySessionMeasurementPoints.scenarioSelected()
```

    - 3D Visual Context Loaded

```
eu.triangle_project.appinstr.virtualreality.VirtualRealitySessionMeasurementPoints._3DVisualContextLoaded()
```

    - Immersion Session Started

```
eu.triangle_project.appinstr.virtualreality.VirtualRealitySessionMeasurementPoints.immersionSessionStarted()
```

    - Immersion Session Ended

```
eu.triangle_project.appinstr.virtualreality.VirtualRealitySessionMeasurementPoints.immersionSessionEnded(boolean success)
```

    - Immersion Session Resolution

```
eu.triangle_project.appinstr.virtualreality.VirtualRealitySessionMeasurementPoints.immersionSessionResolution()
```

- Augmented Reality
  - Augmented Reality Session
    - Aim To Physical Marker

```
eu.triangle_project.appinstr.augmentedreality.AugmentedRealitySessionMeasurementPoints.aimToPhysicalMarker()
```

    - Virtual Layer Displayed

```
eu.triangle_project.appinstr.augmentedreality.AugmentedRealitySessionMeasurementPoints.virtualLayerDisplayed()
```

    - Augmentation Session Started

```
eu.triangle_project.appinstr.augmentedreality.AugmentedRealitySessionMeasurementPoints.augmentationSessionStarted()
```

    - Augmentation Session Ended

```
eu.triangle_project.appinstr.augmentedreality.AugmentedRealitySessionMeasurementPoints.augmentationSessionEnded(boolean success)
```

- Clear Augmentation Layer - Start

```
eu.triangle_project.appinstr.augmentedreality.AugmentedRealitySessionMeasurementPoints.clearAugmentationLayerStart()
```

- Clear Augmentation Layer - End

```
eu.triangle_project.appinstr.augmentedreality.AugmentedRealitySessionMeasurementPoints.clearAugmentationLayerEnd(boolean success)
```

- Gaming
  - Game Session
    - Game Session Start

```
eu.triangle_project.appinstr.gaming.GameSessionMeasurementPoints.gameSessionStart()
```

    - Game Started

```
eu.triangle_project.appinstr.gaming.GameSessionMeasurementPoints.gameStarted()
```

    - Game Session End

```
eu.triangle_project.appinstr.gaming.GameSessionMeasurementPoints.gameSessionEnd(boolean success)
```

    - Game Content Stall Start

```
eu.triangle_project.appinstr.gaming.GameSessionMeasurementPoints.gameContentStallStart()
```

    - Game Content Stall End

```
eu.triangle_project.appinstr.gaming.GameSessionMeasurementPoints.gameContentStallEnd()
```

    - Game Video Resolution

```
eu.triangle_project.appinstr.gaming.GameSessionMeasurementPoints.gameVideoResolution()
```

  - Pause and Resume
    - Game Pause

```
eu.triangle_project.appinstr.gaming.PauseandResumeMeasurementPoints.gamePause(boolean success)
```

    - Game Resume

```
eu.triangle_project.appinstr.gaming.PauseandResumeMeasurementPoints.gameResume(boolean success)
```

  - Start Saved Game Session
    - Saved Game Load Start

```
eu.triangle_project.appinstr.gaming.StartSavedGameSessionMeasurementPoints.savedGameLoa
```

```
dStart()
```

Custom measurement points

To provide custom measurement points, the Android instrumentation library provides a CustomMeasurementPoints class in the eu.triangle_project.appinstr.custom package, with a set of overloaded methods, called custom. These methods have two or three arguments: the feature and measurement point ids, and optionally the actual value.

Example

The “Social Networking” use case contains (amongst others) the following features: “Post image” and “Post video”. For these features there are two measurement points: “Post Image Start/End” and “Post Video Start/End”. The instrumentation library contains two classes with two methods each to give support for these features, as follows:

- eu.triangle_project.appinstr.socialnetworking
  - public final class PostimageMeasurementPoints
    - public static void postImageStart()
    - public static void postImageEnd(boolean success)
  - public final class PostvideoMeasurementPoints
    - public static void postVideoStart()
    - public static void postVideoEnd(boolean success)

Let’s assume that a particular app performs the upload inside a uploadPicture method. The measurement point methods could be called inside that method, where the required values are known. In particular, those related to events (i.e. “Post Image Start/End”) should be placed as close to the actual place where that event happens, to provide precise measurement points. In addition, the app developer may want to provide a custom measurement point with some metadata from the picture.

For instance:

```
import eu.triangle_project.appinstr.socialmedia.PostPictureMeasurementPoints;
import eu.triangle_project.appinstr.custom.CustomMeasurementPoints;

public class MediaUploader {
    public void uploadPicture(Picture picture) {
        CustomMeasurementPoints.custom("picture_metadata", "exif", picture.getExif());

        PostPictureMeasurementPoints.pictureUploadStart();
        boolean uploadResult = doUploadPicture(picture); // Perform actual upload
        PostPictureMeasurementPoints.pictureUploadEnd(uploadResult);
    }
}
```