

**Customer Experience Index (CEI)
Functional Requirement Specification**

Verified tmforum Conformant

Abstract:

STC CEM requires that a Customer Experience Index (CEI) based upon objective and measurable Customer Journey Touch-points should be developed for the CJ's that an STC customer is likely to undergo in his day-to-day interaction with STC services.

The CEM project focuses on Telecom Customer Experience assurance and aims to provide an end-to-end Telecommunications Management Forum (TM Forum) based CJ quality monitoring and management solution for STC.

Audience:

This document is aimed primarily at:

- STC and Huawei CEM Engineers & Management
- Huawei product developing engineers

Modification record

Title	Description	Contact Information
Document Owner	The person who wrote or owns this document	Mostafa Fathy M84067241
Change Log 1	07/06/2018: Add more Metrics and dimensions	Mostafa Fathy M84067241
Review TM Forum V1R2	Initial Conformance Review by TM Forum	Alfred Anaya-Dubernard aanaya@tmforum.org

Contents

1. Overview.....	4
1.1. STC's Requirements.....	4
1.2. Solution Overview	5
1.3. Advantages of CEI solutions are as follows:.....	6
2. CEI Solution Description	7
2.1. CEI Calculation Methodology.....	7
2.2. CEI Calculation Approach	8
2.3. Indicators (CJ Metrics) Selection Principle	9
2.4. Top App's Selection Criteria.....	12
2.5. Subjective and Objective Analysis and Modeling	19
2.6. Weighting Criteria	20
3. CEI Enhancement.....	24

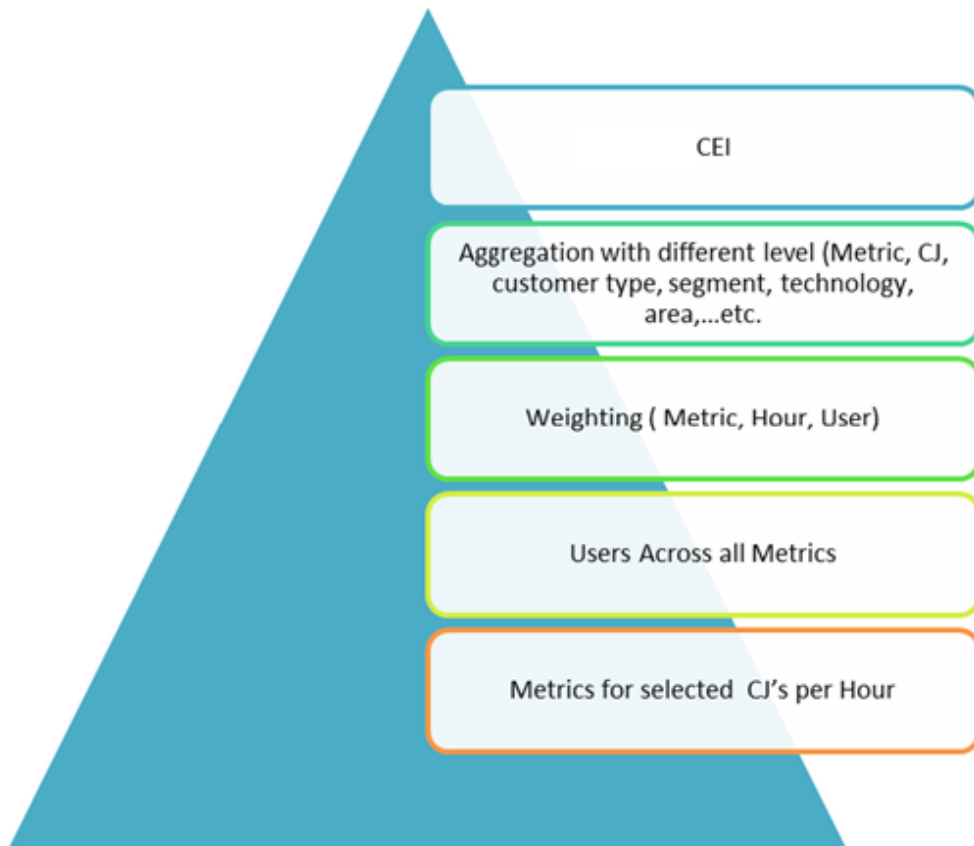
Verified tmforum Conformant

1. Overview

1.1. STC's Requirements

STC expect to develop a model to evaluate user experience, analyze and monitor user experience changes and trends, identify users with poor service experience during the whole lifecycle, and effectively handle ICT problems to improve user experience. STC adopt CEI (CEI) to indicate user experience.

- CEI will provide visibility of E2E Customer Experience across the ICT domain where all “Touchpoints” with STC’s services occur.
- It will provide a technology-based index of the Customer’s Experience, primarily across all part of the TMF Lifecycle Model, based upon Objective metrics provided by IT & CT data.
- There should be several levels of CEI starting from User level, Metric Level, CJ level, Customer and Business type views up to an overall CEI score of each lifecycle stage.
- Indexing is required to calibrate the CEI to actual Customer Experience to ensure correct weighting of aggregated data.



1.2. Solution Overview

Based on deep understanding of STC’s requirements, user experience measurement solution focuses on user experience modeling during the ICT journeys. User experience modeling is based on the full customer lifecycle and is used to analyze subjective and objective factors affecting KPIs and KQIs of different journeys.

We start developing a set of user experience measuring models that can accurately reflect user experience by establishing the mappings between subjective and objective factors and analyzing the relevance between these factors. The figure below illustrates the proposed CEI Solution for STC, which cover ICT customer journeys and across all lifecycle stages (Engaging, Using, Evaluating)

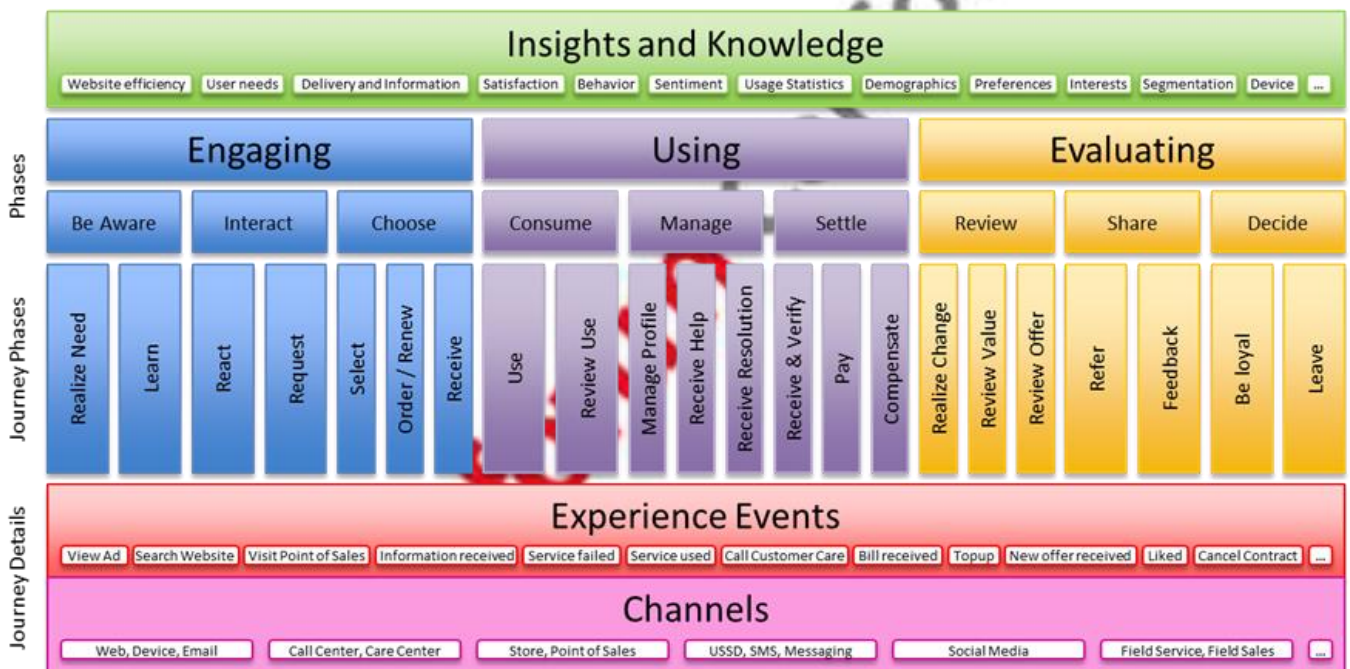
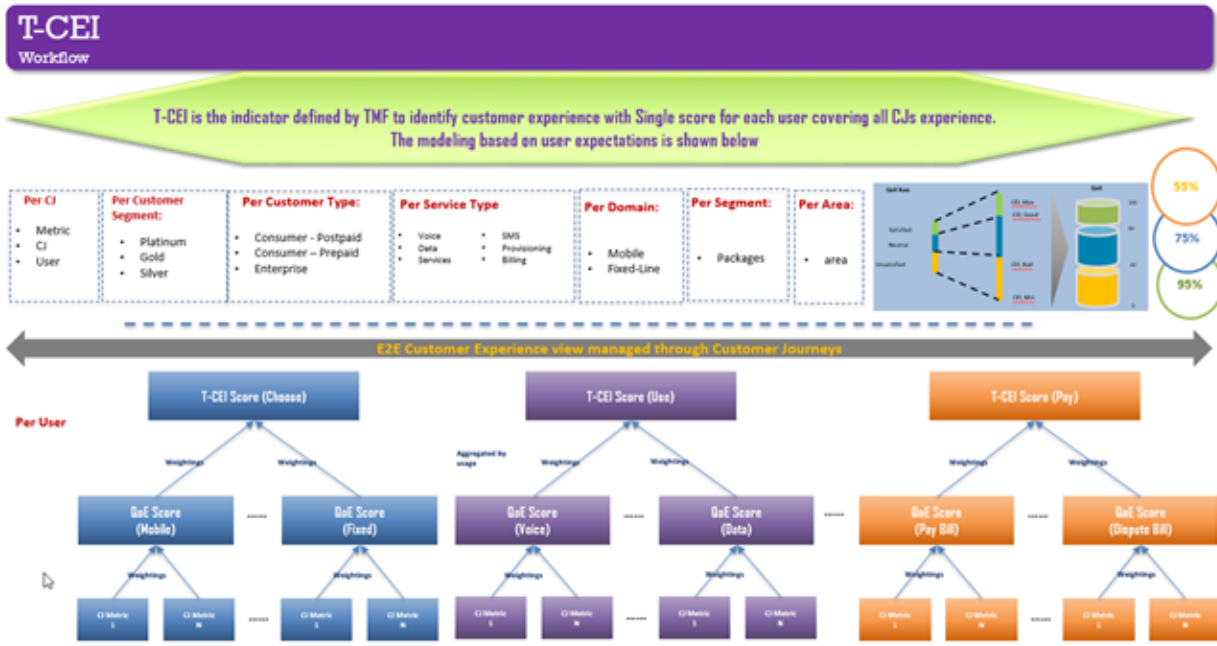


Figure 1: CEI solution overview



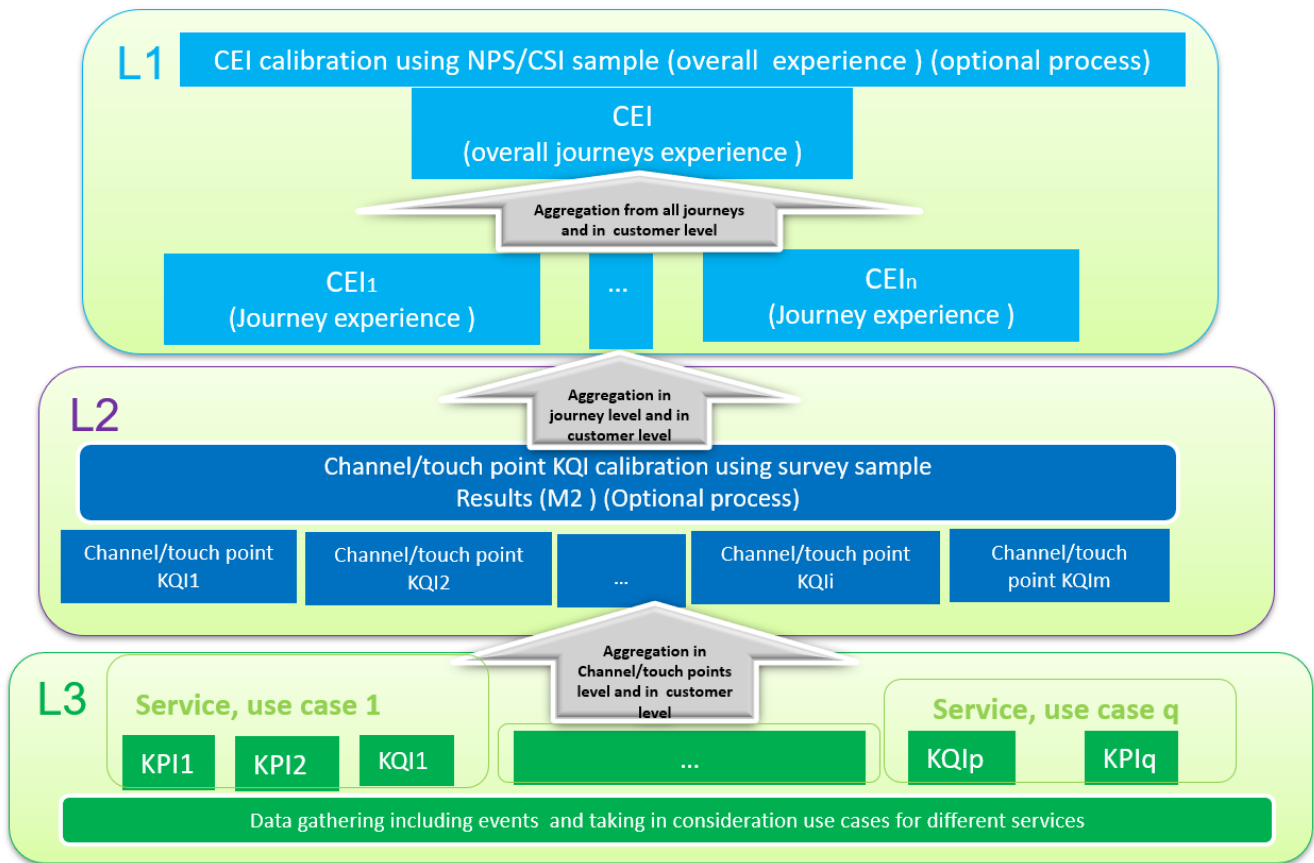
1.3. Advantages of CEI solutions are as follows:

- Objective ICT indicators (CJ Metrics) can reflect user experience. Based on these indicators, the solution identifies users with poor experience and improves user experience.
- The CEI score is the comprehensive result of user experience measurement in key ICT customer journeys and can show the true user experience.
- The CEI dashboard shows user experience in graphical and geographical forms.
- Insights gained from user experience measurement can be used to guide operations and marketing departments in taking rectification measures to eliminate issues from the user experience perspective, to improve user experience.

2. CEI Solution Description

2.1. CEI Calculation Methodology

The abbreviation of Customer Experience Index, this measures customer satisfaction across each journey where a customer interacts with their service provider. CEI relates to customer journey, every journey has a CEI.



2.2. CEI Calculation Approach

- Put weight for each Metric per separated CJ, then start calculation per Metrics per user per hour
- Take in consideration some services need different threshold in the same metric (Ex. Activation delay for roaming)
- Take in consideration the service time (Ex. Peak hour & Non-Peak hour), Also consider time duration
- Combining all Matrixes per CJ per customer
- Put the weighting for each customer type (Gold & Silver & Platinum), and consider the percentage of each type from the total customers
- Combining all CJ's based on their weighting
- Separate the CJ's based on service type (Voice, Data, etc.)
- Separate based on Top X Application (Facebook, WhatsApp, Snapchat, Twitter, etc.)
- Separate based on Network Element (Cell, site, area, etc.)
- Separate based on Technology (2G, 3G, LTE, etc.)

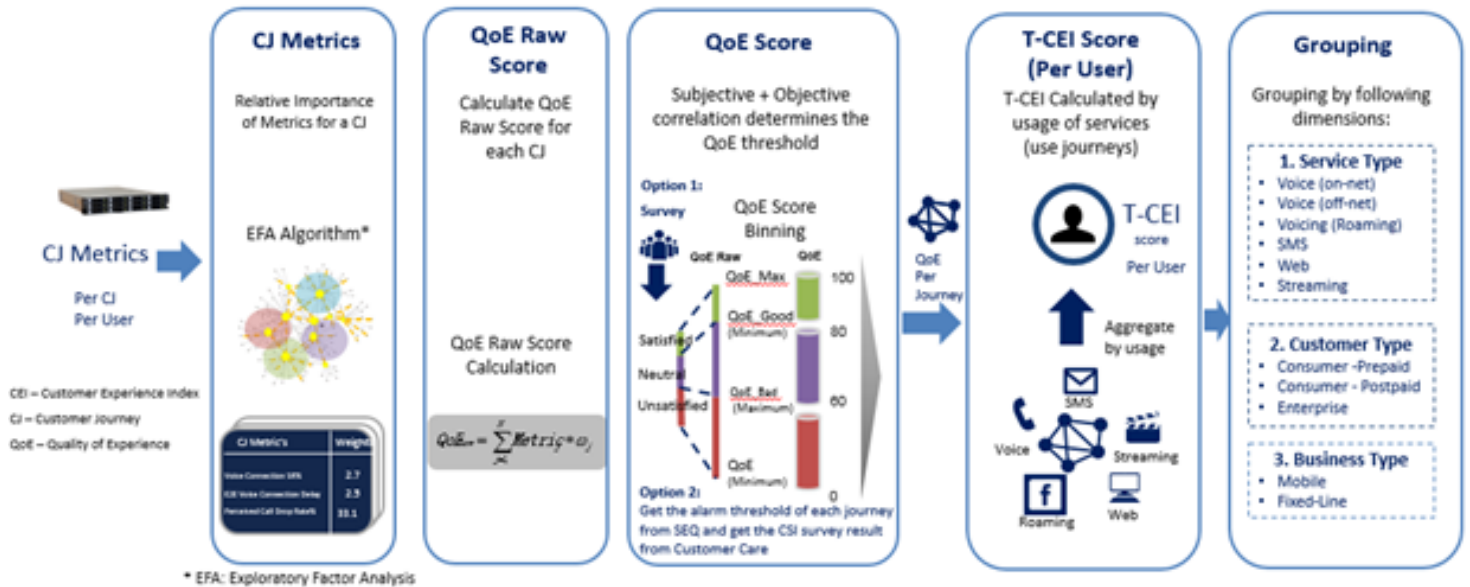
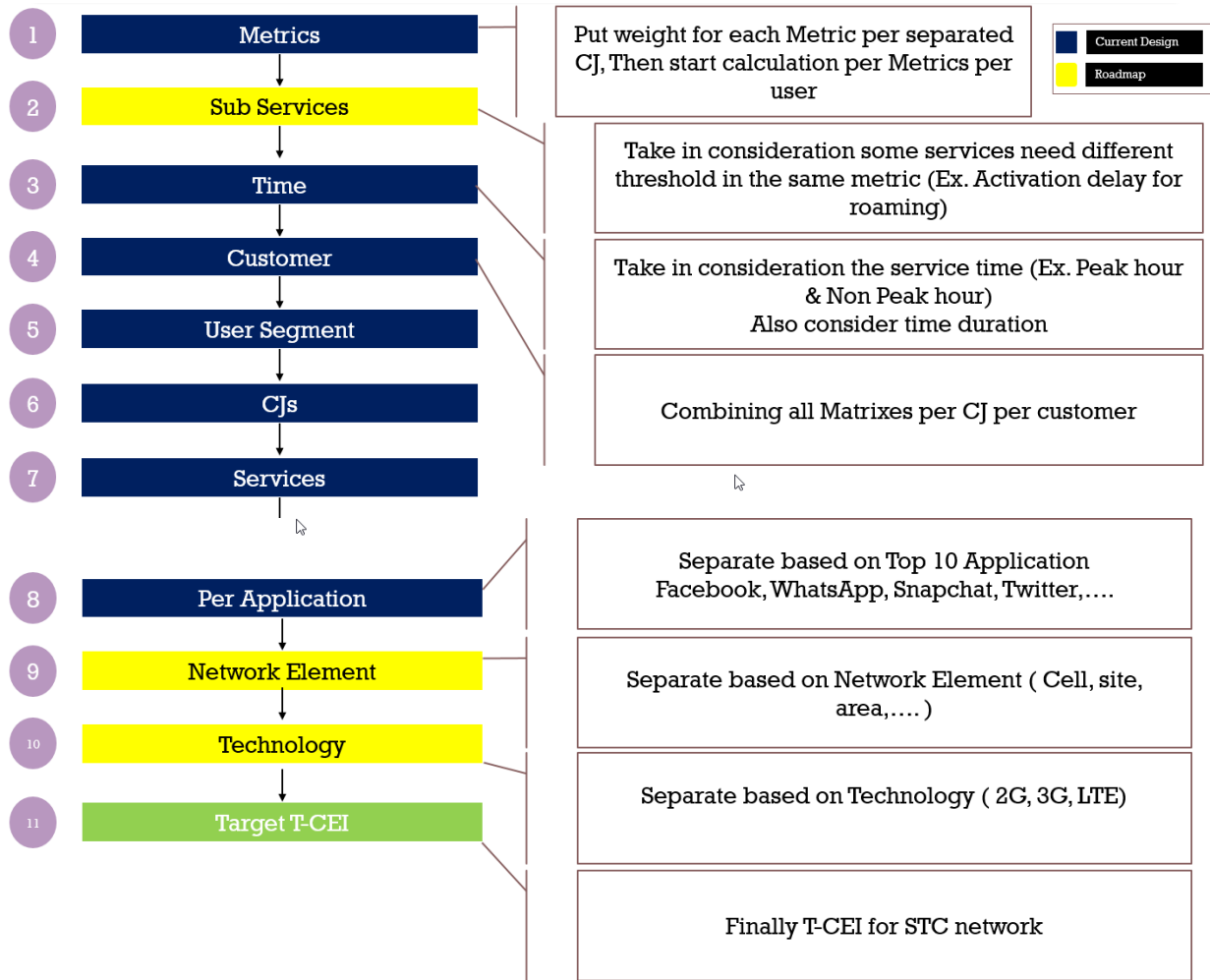


Figure 2-CEI Calculation Approach



2.3. Indicators (CJ Metrics) Selection Principle

- The selected indicators come from existent CJ metrics of STC, it's the fundamental of T-CEI modeling.
- Choose impacted customer experience related metrics, such as successful rate, failed rate, duration, etc.
- CJ Metrics (KQI/KPI) selection is based on CEI solution benchmarking which comes from global successful projects delivery, and the most common used metrics. The attachment below is the benchmarking for reference:

The following tables have the selected matrices per CJ.

Metrics Name (Browsing)	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
Average of page_response_succ_rate	7.00 %	100	82.3	0	100	0	100	ABS(Difference-(Value-Good))/(Worst-Good))
Average of avg_page_response_delay	7.00 %	0	960	34659	34659	34659	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of page_browsing_succ_rate	7.00 %	100	76	0	100	0	100	ABS(Difference-(Value-Good))/(Worst-Good))
Average of avg_page_browsing_delay	7.00 %	0	6264	102446	102446	102446	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of page_download_throughput	8.00 %	16600	420	0	16600	16600	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of ms_ack_fst_get_delay	6.00 %	0	190	4030	4030	4030	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of srv_ack_fst_data_delay	6.00 %	0	129	16129	16129	16129	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of tcp_syn_2_syn_ack_delay	12.00 %	0	158	19934	19934	19934	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of tcp_syn_ack_2_ack_delay	12.00 %	0	166	7857	7857	7857	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of server_tcp_rtt	6.00 %	0	215	8310	8310	8310	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of client_tcp_rtt	6.00 %	0	165	5094	5094	5094	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of client_dl_tcp_pkt_lost_rate	8.00 %	0	0.5	100	100	1	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of server_dl_tcp_pkt_loss_rate	8.00 %	0	0.3	100	100	1	0	ABS(Difference-(Value-Good))/(Worst-Good))
Metrics Name (Streaming)	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
Average of Video Streaming Start Success Rate	7.00 %	100	88	0	100	0	100	ABS(Difference-(Value-Good))/(Worst-Good))
Average of Video Streaming Start Delay	7.00 %	0	4680	411038	411038	411038	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of Video Streaming Plays Disconnection Rate	7.00 %	0	10	100	100	0	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of Video Streaming Stall Frequency	7.00 %	0	1	7	7	7	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of Video Streaming Normalized Stall Time(%)	7.00 %	0	17	100	100	1	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of Streaming Throughput	8.00 %	34155	795	0	34155	34155	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of ms_ack_fst_get_delay	6.00 %	0	131	16849	16849	16849	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of srv_ack_fst_data_delay	6.00 %	0	229	3011	3011	3011	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of tcp_syn_2_syn_ack_delay	12.00 %	0	108	1645	1645	1645	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of tcp_syn_ack_2_ack_delay	12.00 %	0	230	9452	9452	9452	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of server_tcp_rtt	6.00 %	0	413	7469	7469	7469	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of client_tcp_rtt	6.00 %	0	117	1940	1940	1940	0	ABS(Difference-(Value-Good))/(Worst-Good))
Average of client_dl_tcp_pkt_lost_rate	9.00 %	0	1.5	100	100	1	0	ABS(Difference-(Value-Good))/(Worst-Good))
Metrics Name (Voice)	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
% Call Setup Success Perceived	30.00 %	100	90	0	100	0	100	ABS(Difference-(Value-Good))/(Worst-Good))
# Seconds per Call Origination	10.00 %	500	800	1500	1500	1500	0	ABS(Difference-(Value-Good))/(Worst-Good))
% Calls Dropped Perceived	30.00 %	0	0.2	100	100	1	0	ABS(Difference-(Value-Good))/(Worst-Good))

% Paging Success Rate	20.00%	100	50	0	100	0	100	ABS(Difference-(Value-Good)/(Worst-Good))
% Location Area Update	5.00%	100	50	0	100	0	100	ABS(Difference-(Value-Good)/(Worst-Good))
% Handover Success Rate	5.00%	100	50	0	100	0	100	ABS(Difference-(Value-Good)/(Worst-Good))
Metrics Name (SMS)	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
% SMS Origination Success	35.00%							ABS(Difference-(Value-Good)/(Worst-Good))
# Seconds SMS Origination	15.00%							ABS(Difference-(Value-Good)/(Worst-Good))
% SMS Termination Success	35.00%							ABS(Difference-(Value-Good)/(Worst-Good))
# Seconds SMS Termination	15.00%							ABS(Difference-(Value-Good)/(Worst-Good))
Metrics Name (Overseas)	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
# Roaming Registrations rejected								ABS(Difference-(Value-Good)/(Worst-Good))
# Roaming charge notifications								ABS(Difference-(Value-Good)/(Worst-Good))
# of Notifications of commencement								ABS(Difference-(Value-Good)/(Worst-Good))
Number of Notifications 80% reached								ABS(Difference-(Value-Good)/(Worst-Good))
Number of Notifications 100% reached								ABS(Difference-(Value-Good)/(Worst-Good))
# notifications to Normal roaming rates								ABS(Difference-(Value-Good)/(Worst-Good))
Metrics Name (Roaming Bundle)	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
% Recharge Success	80.00%							ABS(Difference-(Value-Good)/(Worst-Good))
# Seconds Recharge	20.00%							ABS(Difference-(Value-Good)/(Worst-Good))
Metrics Name (Prepaid Recharge)	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
% Recharge Success	80.00%							ABS(Difference-(Value-Good)/(Worst-Good))
# Seconds Recharge	20.00%							ABS(Difference-(Value-Good)/(Worst-Good))
Metrics Name (Mobile Setup)	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
% Account Subscription Activation Success Rate	70.00%							ABS(Difference-(Value-Good)/(Worst-Good))
# Time to Activate Account Subscription - Overview	5.00%							ABS(Difference-(Value-Good)/(Worst-Good))
# Time to Activate Service - Overview	5.00%							ABS(Difference-(Value-Good)/(Worst-Good))
# Seconds Activation for Order to Notification	5.00%							ABS(Difference-(Value-Good)/(Worst-Good))
% Order Activation Success Rate	15.00%							ABS(Difference-(Value-Good)/(Worst-Good))
% Mobile Number Used Network Within 24 Hours	0.00%							ABS(Difference-(Value-Good)/(Worst-Good))
Metrics Name (Make Change)	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
make_change_sr	70.00%	100	50	0	100	0	100	ABS(Difference-(Value-Good)/(Worst-Good))
% Service Cessation Compliant								ABS(Difference-(Value-Good)/(Worst-Good))
# Seconds to Activate Service, from Request to Activation								ABS(Difference-(Value-Good)/(Worst-Good))
make_change_delay	20.00%	1	129728	259456	259456	259456	1	ABS(Difference-(Value-Good)/(Worst-Good))

seconds_from_activation_to_notification	10.0 0%	1	33556. 698	6711 3	67113	6711 3	1	ABS(Difference-(Value-Good)/(Worst-Good))
Metrics Name (Billing (Pay Bill))	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria
% Bill Payment Success	70.0 0%	100	50	0	100	0	100	ABS(Difference-(Value-Good)/(Worst-Good))
# Seconds Bill Payment	30.0 0%						1	ABS(Difference-(Value-Good)/(Worst-Good))

2.4. Top App's Selection Criteria

Top Application Criteria

Top 20 for all Application

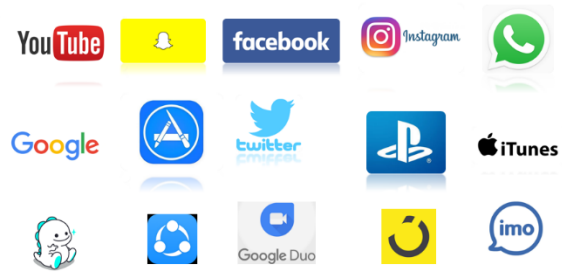
App	Publisher	Category
1 WhatsApp Messenger	WhatsApp Inc.	COMMUNICATION
2 imo free video calls and chat	imo.im	COMMUNICATION
3 Messenger - Text and Video Chat for Free	Facebook	COMMUNICATION
4 noon	Noon E-commerce	SHOPPING
5 Google Duo	Google LLC	COMMUNICATION
6 Snapchat	Snap Inc	SOCIAL
7 SHARER - Transfer & Share	SHARER Technologies Co.Ltd	TOOLS
8 JollyChic-Online Shopping Mall for A New Lifestyle	im.jollychic	SHOPPING
9 Instagram	Instagram	SOCIAL
10 Twitter	Twitter, Inc.	NEWS_AND_MAGAZINES
11 imo beta free calls and text	imo.im	COMMUNICATION
12 Facebook	Facebook	SOCIAL
13 Yalla-Free Voice Chat Rooms	FYXTech Limited	ENTERTAINMENT
14 BIGO LIVE - Live Stream	BIGO TECHNOLOGY PTE. LTD.	SOCIAL
15 Shein - Shop Women's Fashion	Shein Group Ltd	SHOPPING
16 SuperVPN Free VPN Client	SuperSoftTech	TOOLS
17 Games Box	Special Applications	ENTERTAINMENT
18 Subway Surfers	Kiloo	ARCADE
19 YoShop - Your Fashion Shop	Yoshop.com	SHOPPING
20 Google Translate	Google LLC	TOOLS

Top 10 Social Application

App	Publisher
1 Snapchat	Snap Inc
2 Instagram	Instagram
3 Facebook	Facebook
4 BIGO LIVE - Live Stream	BIGO TECHNOLOGY PTE. LTD.
5 FindNow	Ratech
6 Facebook Lite	Facebook
7 musical.ly	musical.ly
8 Saudi phone book & Caller id	Tech-World
9 NumberBook Caller ID & Block	Numberbook Social
10 Live.me - video chat and trivia game	Live.me Broadcast

Top 10 App traffic based

App Name	Rank
YouTube	1
Snap Chat	2
Facebook	3
Instagram	4
WhatsApp	5
Google Common	6
AppStore	7
Twitter	8
PlayStation	9
iTunes	10





Top 15 Application

We select the top 15 application based on the most contributed Apps used by the customer to reflect the user experience per Aps, also we consider the traffic of each one



Application Name	Weight	Good	Average	Worst	Denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00%							Max - Value / Max - Min	Value
ms_ack_fst_get_delay	9.00%							Worst - Value / Worst - Min	Value
srv_ack_fst_data_delay	9.00%							Worst - Value / Worst - Min	Value
tcp_syn_2_syn_ack_delay	15.00%							Worst - Value / Worst - Min	Value
tcp_syn_ack_2_ack_delay	15.00%							Worst - Value / Worst - Min	Value
server_tcp_rtt	9.00%							Worst - Value / Worst - Min	Value
client_tcp_rtt	9.00%							Worst - Value / Worst - Min	Value
client_dl_tcp_pkt_lost_rate	11.00%							100 - value	Percentage
server_dl_tcp_pkt_loss_rate	11.00%							100 - value	Percentage
	100.00%								

Youtube	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
	100.00%								

Snapchat	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value

client_tcp_rtt	9.00%								ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00%								ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00%								ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
	100.00%									

Facebook	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
	100.00%								

Instagram	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
	100.00%								

WhatsApp	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value



tcp_syn_2_syn_ack_delay	15.00 %								ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00 %								ABS(Difference-(Value-Good)/(Worst-Good))	Value
server_tcp_rtt	9.00%								ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_tcp_rtt	9.00%								ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00 %								ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00 %								ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
	100.00 %									

Google_Common	Weight	Good	Average	Worst	denominator	Difference	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
	100.00 %								

AppStore	Weight	Good	Average	Worst	denominator	Difference	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
	100.00 %								

Twitter	Weight	Good	Average	Worst	denominator	Difference	Blank Value	Criteria	Raw Data Type
---------	--------	------	---------	-------	-------------	------------	-------------	----------	---------------



DL_Throughputdownload_throughput	12.00 %								ABS(Difference-(Value-Good)/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%								ABS(Difference-(Value-Good)/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%								ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00 %								ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00 %								ABS(Difference-(Value-Good)/(Worst-Good))	Value
server_tcp_rtt	9.00%								ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_tcp_rtt	9.00%								ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00 %								ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00 %								ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
	100.0 %									

PlayStation	Weight	Good	Average	Worst	Denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
	100.0 %								

Itunes	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good)/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00 %							ABS(Difference-(Value-Good)/(Worst-Good))	Percentage

100.0
0%

Bigo	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage

100.0
0%

Share IT	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage

100.0
0%

Google Duo	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00 %							ABS(Difference-(Value-Good))/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value



client_tcp_rtt	9.00%								ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00%								ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00%								ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
	100.00%									

Noon	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
	100.00%								

IMO	Weight	Good	Average	Worst	denominator	Diff	Blank Value	Criteria	Raw Data Type
DL_Throughputdownload_throughput	12.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
ms_ack_fst_get_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
srv_ack_fst_data_delay	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_2_syn_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
tcp_syn_ack_2_ack_delay	15.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
server_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_tcp_rtt	9.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Value
client_dl_tcp_pkt_lost_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage
server_dl_tcp_pkt_loss_rate	11.00%							ABS(Difference-(Value-Good))/(Worst-Good))	Percentage

2.5. Subjective and Objective Analysis and Modeling

2.5.1. Modeling Results

Objective CJ Metrics of Huawei SEQ and are used as the input of the model, and the output CEI score ranges from 1 to 100, after a CEI score (per Metric per user per Hour) is generated, lifecycle stage level of CEI can be measured for each user.

CE Score of Each Metric per hour	Experience Level
T-CEI score > 90	Good
80 < T-CEI score ≤ 90	Fair
T-CEI score ≤ 80	Poor

- Converting the value of all metrics to percentage using some pre-defined / configurable threshold as shown.
- Our calculation based on User per hour per metric.
- After that we can make aggregation on different dimension.
- All threshold used in our calculation are configurable, and it will reflect directly in our T-CEI result.
- Different use journeys have different traffic densities. Compared with the IM service, the traffic of the video service in the same period of time is much higher. After standardization, impacts of traffic characteristics can be avoided.
- Service volume units vary with services (duration/traffic).
- Service volume of a user among a group must satisfy the customer group definition, and the general score should be relatively stable.

Dealy (ms)						
Value	Worst	Average	Good	Difference		
33	100	50	0	1	67.00%	ABS(Difference-(Value-Good)/(Worst-Good)))
SR (%)						
Value	Worst	Average	Good	Difference		
50	0	50	100	1	50.00%	ABS(Difference-(Value-Good)/(Worst-Good)))
Through put (Mbps)						
Value	Worst	Average	Good	Difference		
9	0	5	10	1	90.00%	ABS(Difference-(Value-Good)/(Worst-Good)))
RTT (ms)						
Value	Worst	Average	Good	Difference		
10	100	50	0	1	90.00%	ABS(Difference-(Value-Good)/(Worst-Good)))
TCP PKT Loss Rate (%)						
Value	Worst	Average	Good	Difference		
1	100	50	0	1	99.00%	ABS(Difference-(Value-Good)/(Worst-Good)))



2.6. Weighting Criteria

2.6.1. Hour Weighting

Weighting for each hour per day are configurable and should consider below points

- User behavior like (Working hour / Non-working hour)
- Based on service types (Voice, Data,)
- Based on application type (Facebook, WhatsApp, Snapchat.....Etc.

CAT	Hours	Count of Category	Weight per Hour	Wight
Cat4	0:00	10	0.4	4.00%
Cat3	1:00	5	0.3	6.00%
Cat2	2:00	8	0.2	2.50%
Cat2	3:00	8	0.2	2.50%
Cat1	4:00	1	0.1	10.00%
Cat2	5:00	8	0.2	2.50%
Cat2	6:00	8	0.2	2.50%
Cat2	7:00	8	0.2	2.50%
Cat2	8:00	8	0.2	2.50%
Cat2	9:00	8	0.2	2.50%
Cat2	10:00	8	0.2	2.50%
Cat3	11:00	5	0.3	6.00%
Cat3	12:00	5	0.3	6.00%
Cat4	13:00	10	0.4	4.00%
Cat4	14:00	10	0.4	4.00%
Cat4	15:00	10	0.4	4.00%
Cat3	16:00	5	0.3	6.00%
Cat3	17:00	5	0.3	6.00%
Cat4	18:00	10	0.4	4.00%
Cat4	19:00	10	0.4	4.00%
Cat4	20:00	10	0.4	4.00%
Cat4	21:00	10	0.4	4.00%
Cat4	22:00	10	0.4	4.00%
Cat4	23:00	10	0.4	4.00%
				100.00%

2.6.2. Configurable & changeable Weighting

The Configurable weighting will redistribute the weighting based on the used metrics only as below criteria.

- Select the blank metrics.
- Count blank cells for all metrics.
- Sum the weighting (X) for all blank metrics.
- Count the remaining metrics which have value.
- Distribute the weighting of the blank metrics over the remaining metrics based on the same percentage.
- Take percentage from the remaining weighting (X) based on a new weighting after distributing the weighting of the blank metrics.
- Sum the output from the above step with the original weight for remaining metrics.

	Metric 1	Metric 2	Metric 3	Metric 4	Sum of Weighting	Remaining Weights	Metric 1	Metric 2	Metric 3	Metric 4
Case1	30%	30%	30%	10%	100%	0.0%	30.0%	30.0%	30.0%	10.0%
Case2		30%	30%	30%	90%	10.0%	0.0%	33.3%	33.3%	33.3%
Case3			10%	20%	30%	70.0%	0.0%	0.0%	33.3%	66.7%
Case4	50%			10%	60%	40.0%	83.3%	0.0%	0.0%	16.7%

2.6.3. Aggregate by expertise of Each ICT Journeys to the CEI

The aggregation done over metric per user per hour level, then we can aggregate on different dimension as following

- Per user per metric
- Per user per CJ
- Per service
- Per sub-service
- Per customer segment
- Per customer type
- Per domain
- Per technology
- Per package
- Per area

2.7. Deploying the CEI Model

- Configure the CJ Metrics, weightings, and binning mapping rules determined during CEI modeling in the system.
- The system automatically calculates the CEI and QoE in the specified dimension periodically.
- Use the T-CEI Dashboard to periodically monitor service experience of users and identify users and cells with poor service experience.

2.8. CEI Dashboard

The CEI Dashboard is an independent visualization module developed Using Table to present the result, The CEI Dashboard reflects service experience of each ICT journey during the whole customer lifecycle.

- Show the percentages of users with good, fair, and poor service experience in each lifecycle stage.
- Show T-CEI per user per metric per day
- Show T-CEI per user per CJ/service/sub service per day
- Show T-CEI per Customer Segment per metric per day
- Show T-CEI per Customer Segment per CJ/service/sub service per day
- Show T-CEI per Customer type per metric per day
- Show T-CEI per Customer type per CJ/service/sub service per day
- Show T-CEI per EBU/CBU per metric per day
- Show T-CEI per EBU/CBU per CJ/service/sub service per day
- Show T-CEI per Package per metric per day
- Show T-CEI per Package per CJ/service/sub service per day

Local Onnet (Metrics/User)	Local Onnet_Perceived Call Success Rate(%)	Local Onnet_Perceived Call Drop Rate(%)	Local Onnet_E2E Call Connection Delay(ms)	Local Onnet_Paging Success Rate(%)
User 1	100.0%	100.0%	100.0%	100.0%
User 2	80.0%	85.0%	88.8%	85.2%
User 3	0.0%	0.0%	0.0%	0.0%
User 4	100.0%	100.0%	100.0%	100.0%
User 5	80.0%	85.0%	88.8%	85.2%
User 6	0.0%	0.0%	0.0%	0.0%
User 7	100.0%	100.0%	100.0%	100.0%
User 8	80.0%	85.0%	88.8%	85.2%
User 9	0.0%	0.0%	0.0%	0.0%
User 10	100.0%	100.0%	100.0%	100.0%

Local Onnet (Customer Treatment)	Local Onnet_Perceived Call Success Rate(%)	Local Onnet_Perceived Call Drop Rate(%)	Local Onnet_E2E Call Connection Delay(ms)	Local Onnet_Paging Success Rate(%)
Platinum	100.0%	100.0%	100.0%	100.0%
Gold	80.0%	85.0%	88.8%	85.2%
Bronze	0.0%	0.0%	0.0%	0.0%
Silver	0.0%	0.0%	0.0%	0.0%

Local Onnet (Customer Type)	Local Onnet_Perceived Call Success Rate(%)	Local Onnet_Perceived Call Drop Rate(%)	Local Onnet_E2E Call Connection Delay(ms)	Local Onnet_Paging Success Rate(%)
Postpaid	88.0%	91.0%	93.3%	91.1%
Prepaid	40.0%	40.0%	40.0%	40.0%

Local Onnet (Segment (EBU,CBU))	Local Onnet_Perceived Call Success Rate(%)	Local Onnet_Perceived Call Drop Rate(%)	Local Onnet_E2E Call Connection Delay(ms)	Local Onnet_Paging Success Rate(%)
CBU	72.0%	74.0%	75.5%	74.1%
EBU	56.0%	57.0%	57.8%	57.0%

Local Onnet (Package (Rateplan))	Local Onnet_Perceived Call Success Rate(%)	Local Onnet_Perceived Call Drop Rate(%)	Local Onnet_E2E Call Connection Delay(ms)	Local Onnet_Paging Success Rate(%)
----------------------------------	--	---	---	------------------------------------

SAWA DAILY	0.0%	0.0%	0.0%	0.0%
SAWA LIKE	0.0%	0.0%	0.0%	0.0%
SAWA SHARE	0.0%	0.0%	0.0%	0.0%
SAWA POST	100.0%	100.0%	100.0%	100.0%
SAWA STAR	100.0%	100.0%	100.0%	100.0%

Local Onnet (User)	Number Of SIM	T-CEI
User 1	1	100.0%
User 2	1	84.8%
User 3	1	0.0%
User 4	1	100.0%
User 5	1	84.8%
User 6	1	0.0%
User 7	1	100.0%
User 8	1	84.8%
User 9	1	0.0%
User 10	1	100.0%

Local Onnet (Customer Treatment)	Number Of User	T-CEI
Platinum	4	100.0%
Gold	3	84.8%
Bronze	1	0.0%
Silver	2	0.0%

Local Onnet (Customer Type)	Number Of User	T-CEI
Postpaid	5	90.9%
Prepaid	5	40.0%

Local Onnet (Segment (EBU,CBU))	Number Of User	T-CEI
CBU	5	73.9%
EBU	5	57.0%

Local Onnet (Segment (EBU,CBU))	Number Of User	T-CEI
SAWA DAILY	1	0.0%
SAWA LIKE	1	0.0%
SAWA SHARE	1	0.0%
SAWA POST	1	100.0%
SAWA STAR	1	100.0%

 CEI_Templet_V2.5.xl
 Configurable Weighting_V2.xlsx

3. CEI Enhancement

Below the Major changes done to Enhance the CEI

- Adding new metrics related to the signaling phase.
- Segregate the data services into protocols to get different threshold & weights per each protocol
- Add more dimension view like EBU, CBU, ARPU, Device, APN)
- Identify initial weight and threshold for each metrics

3.1. Adding More Metrics

Adding more metrics to consider the signaling phase before accessing (PRACH,), as below the matrices list

Name of Metrics	Formula
Registration SR	
Perceived Call Success Rate(%)	Mobile Originated Call Alertings / Mobile Originated Call Attempts
Perceived Call Drop Rate(%)	[Perceived Call Drops]/[Perceived Call Drops + Call Drops After Answer (Non-RAN)]
E2E Call Connection Delay(ms)	E2E Call Connection Total Delay / CALL PROCEEDING Times
Paging Success Rate(%)	Total Paging Responses / First Pagings
Perceived Call Success Rate(%)	Mobile Originated Call Alertings / Mobile Originated Call Attempts
Perceived Call Drop Rate(%)	[Perceived Call Drops]/[Perceived Call Drops + Call Drops After Answer (Non-RAN)]
E2E Call Connection Delay(ms)	E2E Call Connection Total Delay / CALL PROCEEDING Times
Paging Success Rate(%)	Total Paging Responses / First Pagings
Perceived Call Success Rate(%)	Mobile Originated Call Alertings / Mobile Originated Call Attempts
Perceived Call Drop Rate(%)	[Perceived Call Drops]/[Perceived Call Drops + Call Drops After Answer (Non-RAN)]
E2E Call Connection Delay(ms)	E2E Call Connection Total Delay / CALL PROCEEDING Times
SMS Origination Success Rate	[SMS Origination Successful Times]/[SMS Origination Requests]
SMS Termination Success Rate	[SMS Termination Successful Times]/[SMS Termination Requests]
SMS Origination Delay	[SMS Origination Total Delay]/[SMS Origination Successful Times]
SMS Termination Delay	[SMS Termination Total Delay]/[SMS Termination Successful Times]
SMS Origination Success Rate	[SMS Origination Successful Times]/[SMS Origination Requests]
SMS Termination Success Rate	[SMS Termination Successful Times]/[SMS Termination Requests]
SMS Origination Delay	[SMS Origination Total Delay]/[SMS Origination Successful Times]
SMS Termination Delay	[SMS Termination Total Delay]/[SMS Termination Successful Times]
SMS Origination Success Rate	[SMS Origination Successful Times]/[SMS Origination Requests]
Service Fullfillment- New Sim/Customer	Success_rate/total Requests
Service Fullfillment- New Sim/Customer	(order completed time - order submitted time)

Service Fullfillment- VAS Activations/Modifications	Success_rate/total Requests
Service Fullfillment- VAS Activations/Modifications	(order completed time - order submitted time)
Service Fullfillment- Bundles Activations/Modifications	Success_rate/total Requests
Service Fullfillment- Bundles Activations/Modifications	(order completed time - order submitted time)
Service Fullfillment- Pre to Post Migration	Success_rate/total Requests
Service Fullfillment- Pre to Post Migration	(order completed time - order submitted time)
Service Fullfillment- Rateplan change	Success_rate/total Requests
Service Fullfillment- Rateplan change	(order completed time - order submitted time)
Barring - Service Resume/Blocking	Pre = (order completed time - order submitted time) Post = Diffofetime(Bill Payment , Service Resume)
Notifications-Usage	Success_rate (total Notifications generated,Notifications received by Customer)
Notifications-Billing	Success_rate (total Notifications generated,Notifications received by Customer)
Notifications-Service Activations	Success_rate (total Notifications generated,Notifications received by Customer)
Bill Payment: Bill payment to Service Resume	Post = Diffofetime(Bill Payment , Service Resume)
Notification: Bill Payment Notification	Success_rate (total Notifications generated,Notifications received by Customer)
Attach Success Rate(%)	Attach Success Times(times)/Attach Requests(times)*100%
TAU Success Rate(%)	TAU Success Times(times)/TAU Requests(times)*100%
RAU Success Rate(%)	RAU Success Times(times)/RAU Requests(times)*100%
Credit Control Success Rate(%)	Credit Control Success times/Credit Control request times*100%
PS Paging Success Rate(%)	Paging Success Times(times)/Paging Requests(times)*100%
PDP Activation Success Rate(%)	PDP Activation Success Times(times)/PDP Activation Requests(times)*100%
Time on cell(second)	Time on cell(second)
TCP Connection Success Rate(%)	TCP Connect Successes/TCP Connect request*100%
Server Side Downlink TCP Packet Loss Rate(%)	Server side Downlink loss Packets/Downlink Packets*100%
Server Side uplink TCP Packet Loss Rate(%)	Server side uplink loss Packets/uplink Packets*100%
Client Side Downlink TCP Packet Loss Rate(%)	Client side Downlink loss Packets/Downlink Packets*100%
Client Side uplink TCP Packet Loss Rate(%)	Client side uplink loss Packets/uplink Packets*100%
E2E Delay(ms)	TCP Connect Delay/TCP Connect Successes
Server Side Round Trip Time(ms)	Uplink Total RTT/Uplink RTT Times
Client Side Round Trip Time(ms)	Downlink Total RTT/Downlink RTT Times
UL Throughput	valid uplink traffic/valid uplink duration
DL Throughput	valid downlink traffic/valid downlink duration
UL Traffic	Uplink Network Volume
DL Traffic	Downlink Network Volume
Time on APP	???

3.2. Defined Weights Threshold

All weighting and threshold in our calculation sheet are configurable and changeable, following the initial weight & threshold for each metric

Technology		Metric	Baseline								
			CBU				EBU				
			Value	Good	Average	Worst	Value	Good	Average	Worst	
PS Signaling	3G	Attach SR	78.74 %	85.00%	78.74%	50.00 %	81.42 %	85.00%	81.42%	50.00 %	
		PDP SR	78.85 %	85.00%	78.85%	50.00 %	54.46 %	85.00%	54.46%	50.00 %	
		RAU SR	98.16 %	100.00 %	98.16%	50.00 %	99.04 %	100.00 %	99.04%	50.00 %	
		Paging SR	84.16 %	95.00%	84.16%	50.00 %	82.51 %	95.00%	82.51%	50.00 %	
	4G	Attach SR	68.73 %	75.00%	68.73%	50.00 %	56.77 %	75.00%	56.77%	50.00 %	
		TAU SR	97.64 %	100.00 %	97.64%	50.00 %	97.90 %	100.00 %	97.90%	50.00 %	
		Paging SR	97.20 %	100.00 %	97.20%	50.00 %	97.19 %	100.00 %	97.19%	50.00 %	
			Credit Control Initial SR	99.82 %	100.00 %	99.82%	50.00 %	98.89 %	100.00 %	98.89%	50.00 %
			Credit Control Update SR	98.52 %	100.00 %	98.52%	50.00 %	98.88 %	100.00 %	98.88%	50.00 %
	PS User Plane	3G	Downlink Throughput	1661	2000	1661	512	2208	2000	2208	512
Uplink throughput			339	1000	339	256	380	1000	380	256	
FDD		Downlink Throughput	6766	3000	6766	512	7140	3000	7140	512	
		Uplink throughput	2414	1500	2414	256	2797	1500	2797	256	
TD D		Downlink Throughput	2689	2400	2689	512	3503	2400	3503	512	
		Uplink throughput	326	1000	326	256	418	1000	418	256	
3G		Client Side Delay	343	200	343	500	339	200	339	500	
		E2E Delay	571	300	571	700	525	300	525	700	
		Server Side Delay	154	100	154	250	149	100	149	250	
		Client Side DW pkt loss	0.03	0.00	0.03	1.50	0.03	0.75	0	1.50	
		Client Side UL pkt loss	0.03	0.00	0.03	1.50	0.02	1.50	0	1.50	
		Server DW pkt loss	0.13	0.00	0.13	1.50	0.05	0.50	0	1.50	
		Server UL PKT loss	0.01	0.00	0.01	1.50	0.00	1.25	0	1.50	
FDD		Client Side Delay	111	50	111	200	114	50	114	200	
		E2E Delay	229	150	229	350	232	150	232	350	
		Server Side Delay	139	100	139	300	143	100	143	300	
		Client Side DW pkt loss	0.02	0.00	0.02	1.50	0.03	0.00	0	1.50	
		Client Side UL pkt loss	0.08	0.00	0.08	1.50	0.07	0.00	0	1.50	
		Server DW pkt loss	0.27	0.00	0.27	1.50	0.27	0.00	0	1.50	
		Server UL PKT loss	0.01	0.00	0.01	1.50	0.00	0.00	0	1.50	
TD D	Client Side Delay	198	120	198	300	174	120	174	300		
	E2E Delay	361	120	361	300	374	120	374	300		
	Server Side Delay	161	120	161	300	156	120	156	300		
	Client Side DW pkt loss	0.04	0.00	0.04	1.50	0.04	0.00	0	1.50		

		Client Side UL pkt loss	0.13	0.00	0.13	1.50	0.10	0.00	0	1.50
		Server DW pkt loss	0.41	0.00	0.41	1.50	0.20	0.00	0	1.50
		Server UL PKT loss	0.01	0.00	0.01	1.50	0.00	0.00	0	1.50
CS	2G	Call Success Rate	96.55%	100.00%	96.55%	50.00%	97.50%	100.00%	97.50%	50.00%
	3G	Call Success Rate	97.46%	100.00%	97.46%	50.00%	97.99%	100.00%	97.99%	50.00%
	2G	E2E Voice Delay	6379	2400	6379	6600	6578	2400	6578	6600
	3G	E2E Voice Delay	5491	2000	5491	6000	5741	2000	5741	6000
	2G	CS Paging SR	98.59%	100.00%	98.59%	50.00%	98.63%	100.00%	98.63%	50.00%
	3G	CS Paging SR	97.21%	100.00%	97.21%	50.00%	97.26%	100.00%	97.26%	50.00%

3.3. Adding New Aggregation Levels

Aggregation levels
Customer Treatment (Platinum, Gold, Bronze, Silver)
Customer Type (Postpaid, Prepaid)
Segment (EBU, CBU)
ARPU
Package (Rateplan)
Location (Cell/Cluster/City/Kingdom)
Granularity (Day, Week, Month etc.)
Technology (3G, FDD, TDD)
APN
Device (Smartphone,Router,Feature Phone)
APP
Roaming (Outbound)