

CMOS' QUALITY OF SERVICE SURVEY RESULTS – (2ND QUARTER, 2019)

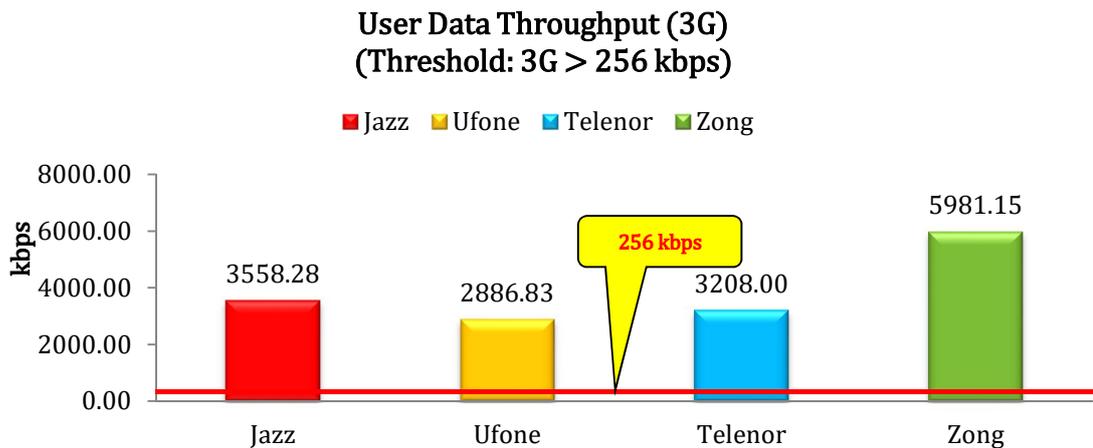
In the 2nd Quarter 2019, Pakistan Telecommunication Authority (PTA) has conducted quarterly Quality of Service (QoS) survey jointly with Cellular Mobile Operators (CMOs) using NEMO Automated QoS Tool. During the period, a total of six (6) cities of Punjab, Balochistan and KPK have been surveyed. The names of these cities are as under:-

S. No.	Name	S. No.	Name	S. No.	Name
1	Jhelum	3	Noshki	5	Bannu
2	Bahawalnagar	4	Dera Murad Jamali	6	Faisalabad

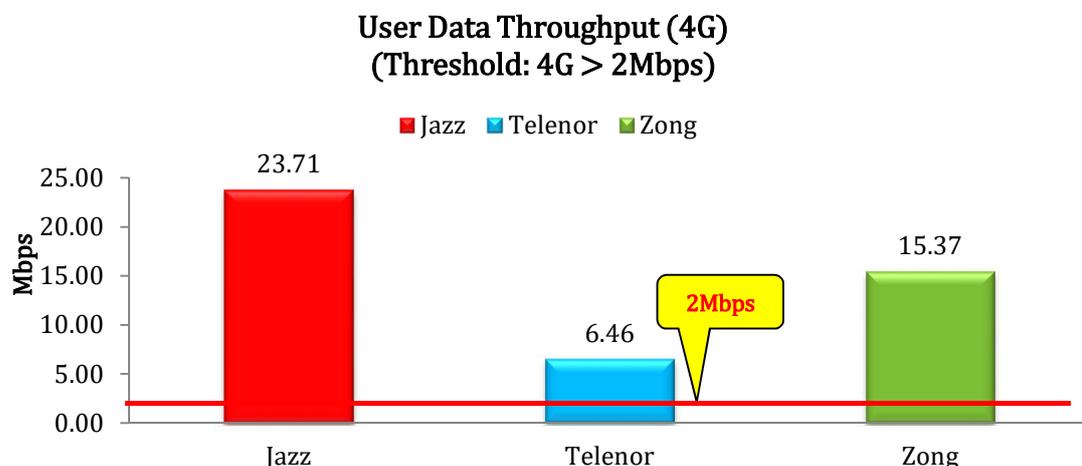
DATA – KEY PERFORMANCE INDICATORS

Data KPIs. The performance of data services of CMOs has been checked by measuring User Data Throughput and Signal Strength (i.e. Received Signal Code Power (RSCP) for 3G and Reference Signal Received Power (RSRP) for 4G) KPIs.

User Data Throughput This KPI defines user data rate (Internet speed) to be provided by NGMS operators to mobile users across the coverage areas. The data throughput results of all NGMS licensees are as under:

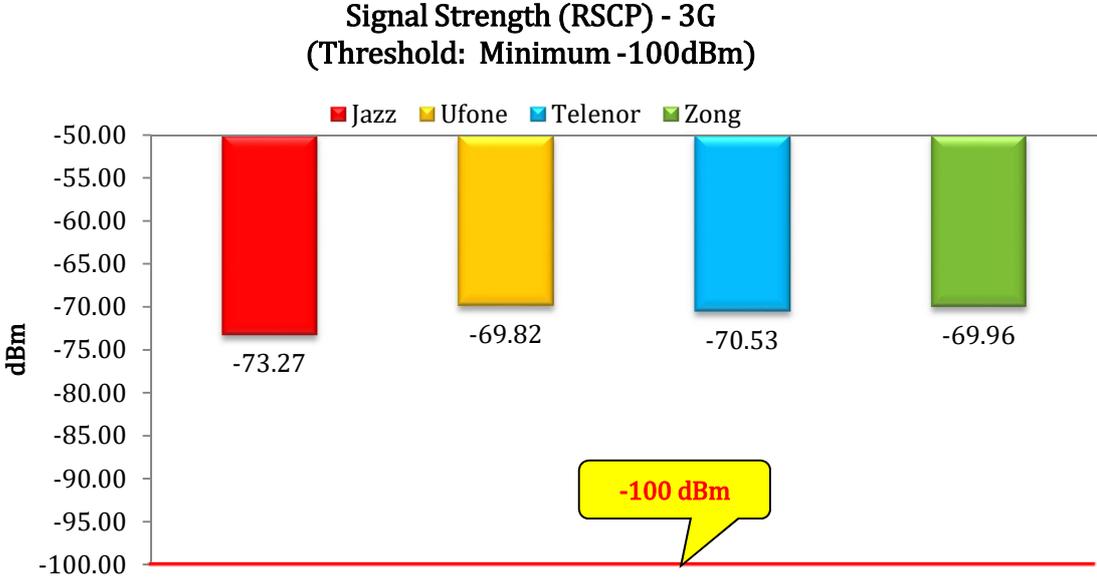


User data "throughput" of 3G services found higher than the benchmark value of 256Kbps

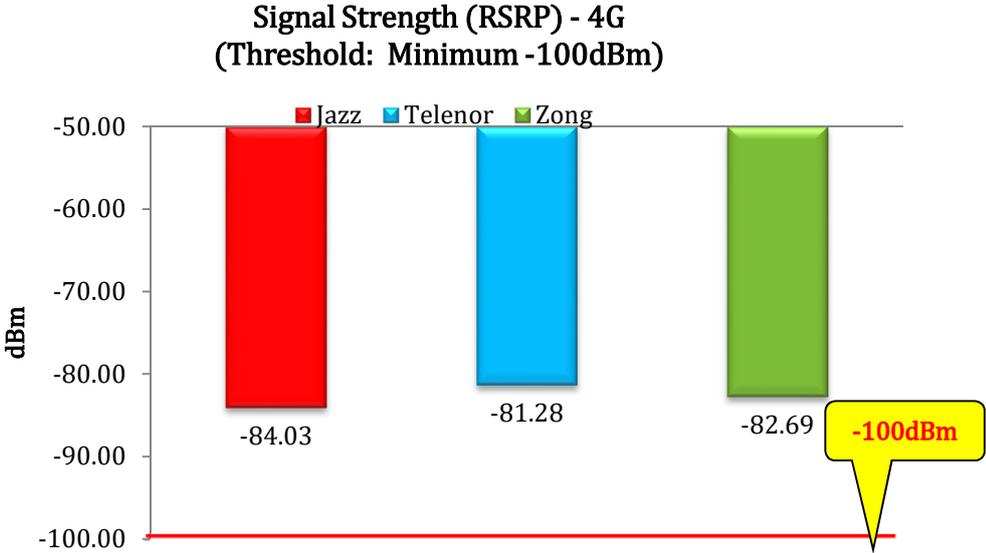


User data "throughput" of 4G services found higher than the benchmark value of 2Mbps

SIGNAL STRENGTH. This KPI defines Received Signal Code Power (RSCP) for 3G and Reference Signal Received Power (RSRP) for 4G and denotes the power measured by a receiver on a particular physical communication channel. It is used as an indication of signal strength, as a handover criterion, in downlink power control, and to calculate path loss". The Signal Strength for NGMS licensees are as under:



Signal Strength (RSCP) of 3G network has been observed greater than -100dBm threshold value

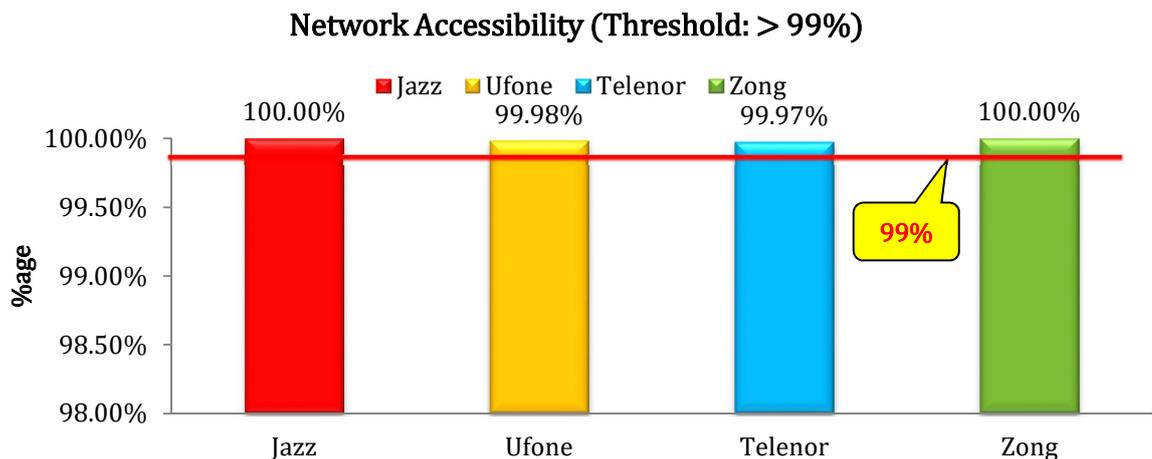


Signal Strength (RSRP) of 4G network has been observed greater than -100dBm threshold value

VOICE – KEY PERFORMANCE INDICATORS

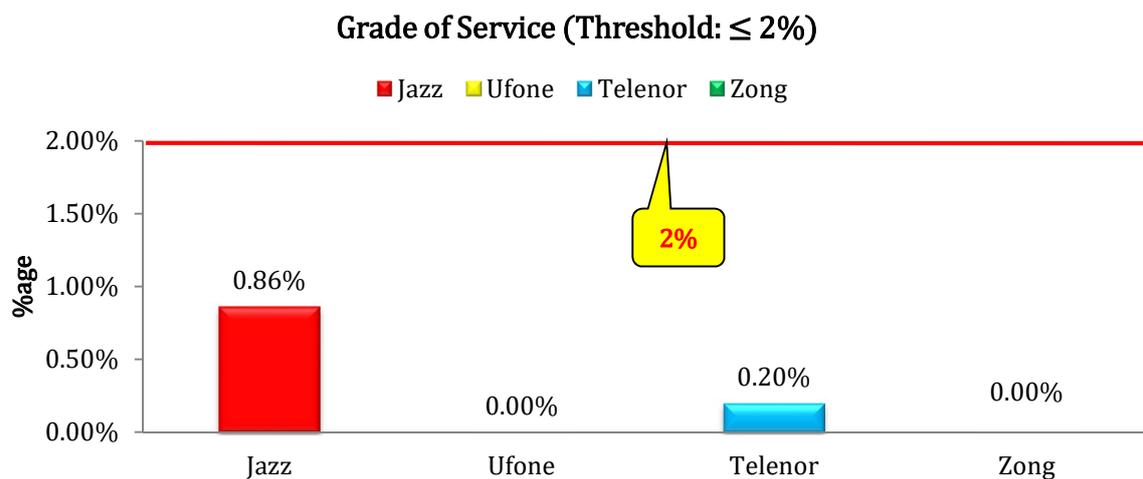
Voice KPIs. The performance of voice services of CMOs has been checked by measuring Network Down Time/Network Accessibility, Grade of Service, Service Accessibility, Call Connection Time, Call Completion Ratio, End-to-End Speech Quality and Session Abnormal Release Rate Key Performance Indicators (KPIs).

Network Accessibility. *“The probability that mobile services are available to an end customer display of the network indicator on the mobile equipment”.*



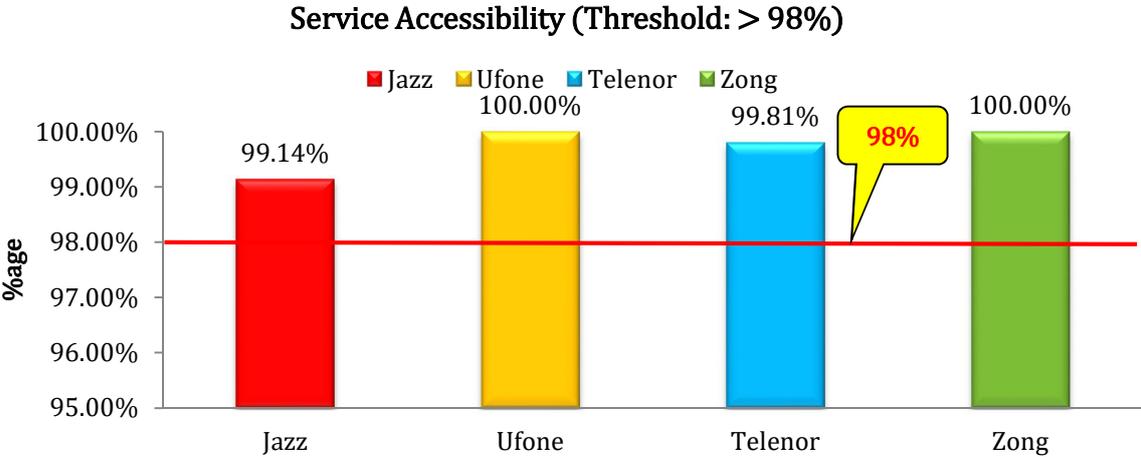
Network Accessibility is converse of Network Down Time and its value found greater than threshold value of 99% of all the mobile operators

Grade of Service (GOS). *“Grade of Service is probability that the end customer cannot access the mobile services when requested if it is offered by display of the network indicator on the mobile phone. In simple words, Grade of Service is Network Blocking”.*



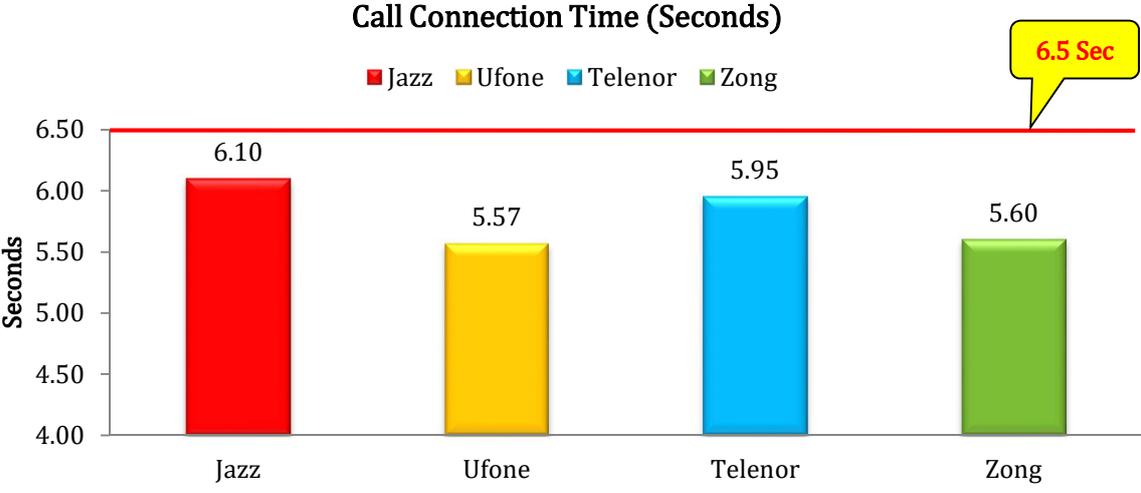
All mobile operators are meeting the threshold value of Grade of Service

Service Accessibility. "Service Accessibility is the probability that the user can access the desired service. A given network accessibility is a precondition for this phase".



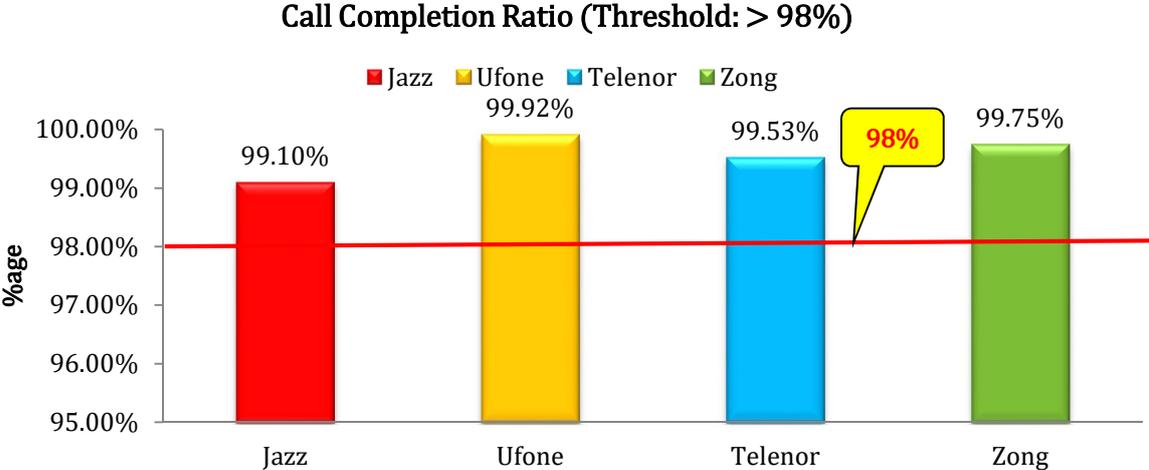
All mobile operators are meeting the criteria of Service Accessibility

Call Connection Time. "Call Connection Time is the time between sending of complete call initiation information by the caller and in return receipt of call setup notification. In simple words, it is time between dialing a number and hearing ring-back tone".



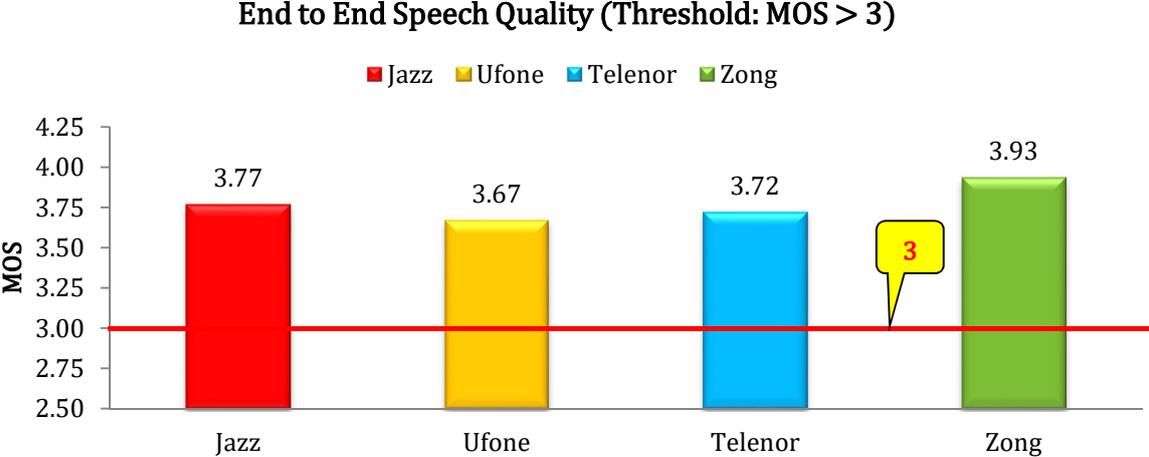
All CMOs are following the benchmark of Call Connection Time of 6.5 seconds

Call Completion Ratio. “Call Completion Ratio is the probability that a service, once obtained, will continue to be provided under given conditions for a given time duration or until deliberately terminated by either caller (A-party) or receiver (B-party). In simple words, this KPI provides information about Call Drops”.



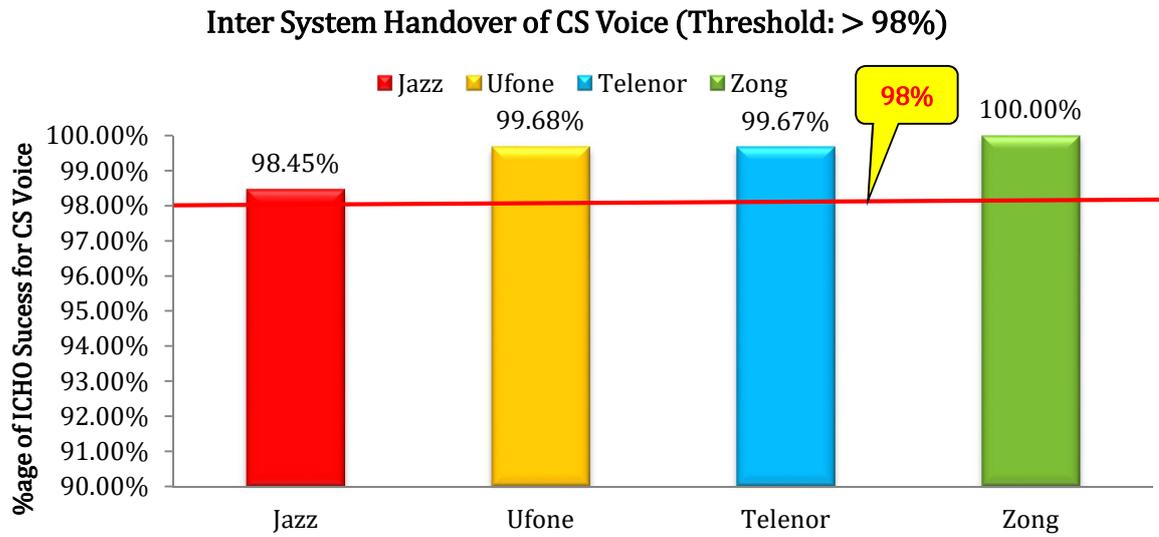
All mobile operators are meeting Call Completion Ratio threshold value of 98%

End-to-End Speech Quality. End-to-End Speech Quality is the degree of speech quality that a listener perceives at the terminal/mobile with a talker at the other end. In simple words, it provides information about clarity of voice.



End-to-End Speech Quality /Mean Opinion Score (MOS) of all mobile operators found above the threshold value of 3

Inter System Handover (ISHO) For Circuit Switched Voice. *“Inter System Handover is the measurement of successfulness of Handover in 3G/2G for Circuit Switched Voice.”*

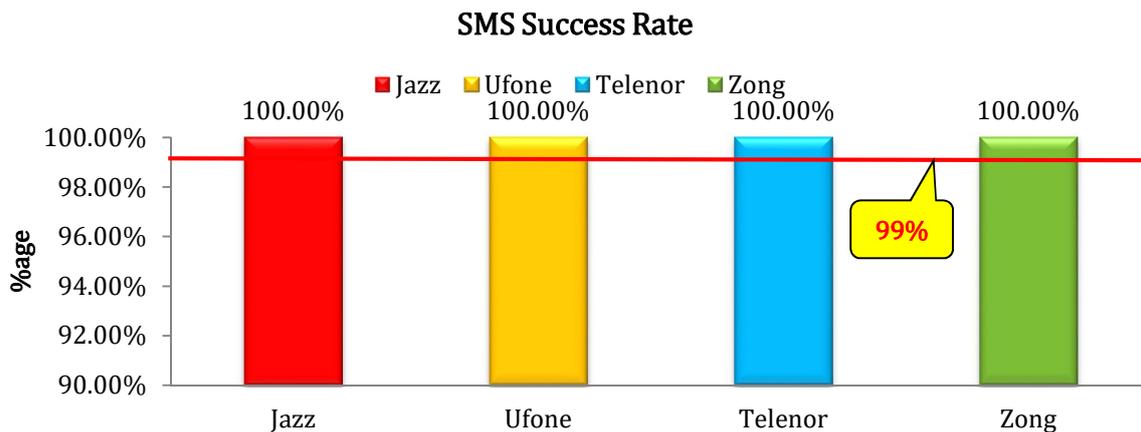


Inter System Handover of Circuit Switched Voice of all the mobile operators is above the threshold value of 98%

SMS – KEY PERFORMANCE INDICATORS

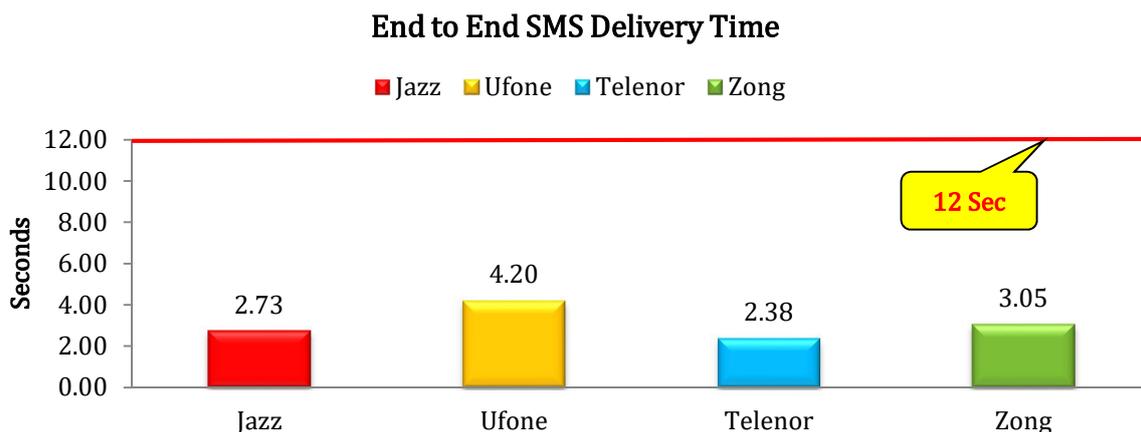
SMS KPIs. The performance of SMS services of CMOs has been checked by measuring SMS Success Rate and End-to-End SMS Delivery Time Key Performance Indicators (KPIs).

SMS Success Rate. *SMS Success Rate is the probability that the short message is delivered successfully, end-to-end when requested and display of the relevant information on the mobile phone. It provides information about successful delivery of SMS.*



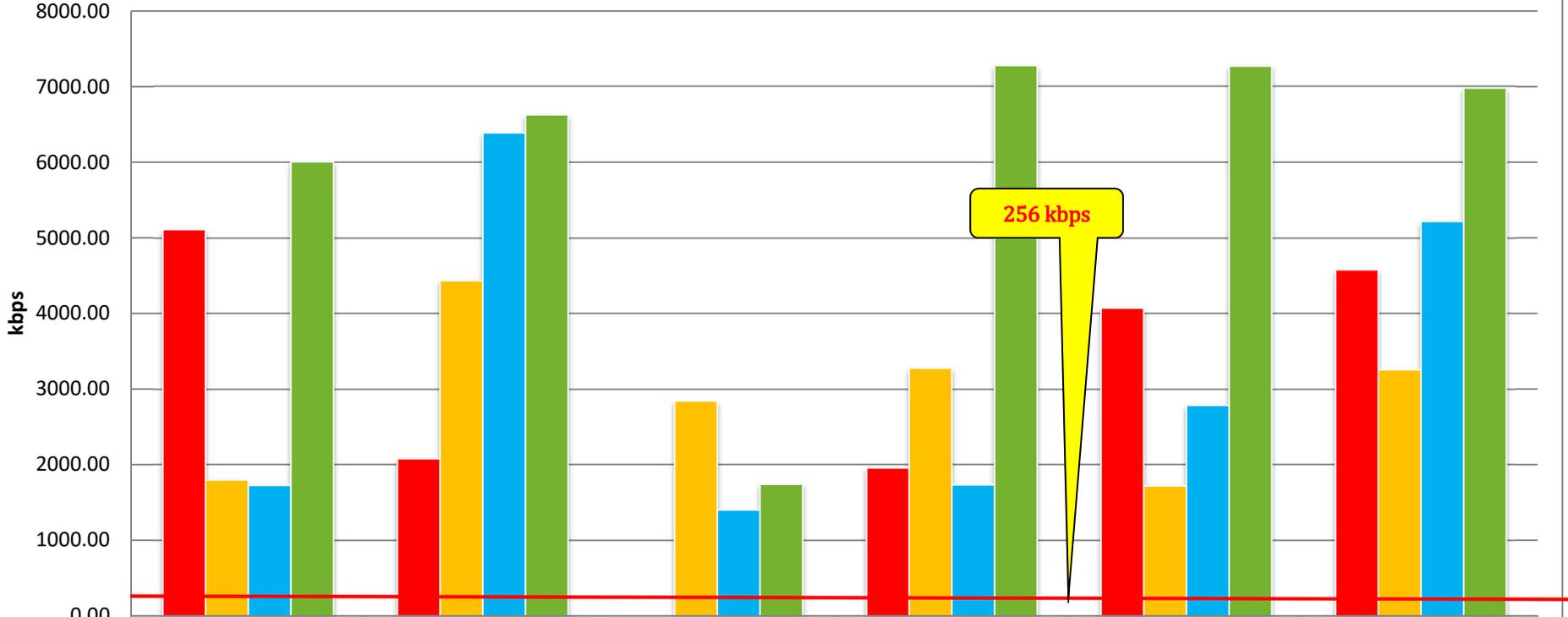
SMS Success Rate for all CMOs is above the threshold value of 99%

End-to-End SMS Delivery Time. *End-to-End SMS Delivery Time is the time between sending a short message to a short message center and receiving the very same short message at intended mobile phone (receiver). It provides average time taken for delivery of short message from sender to recipient.*



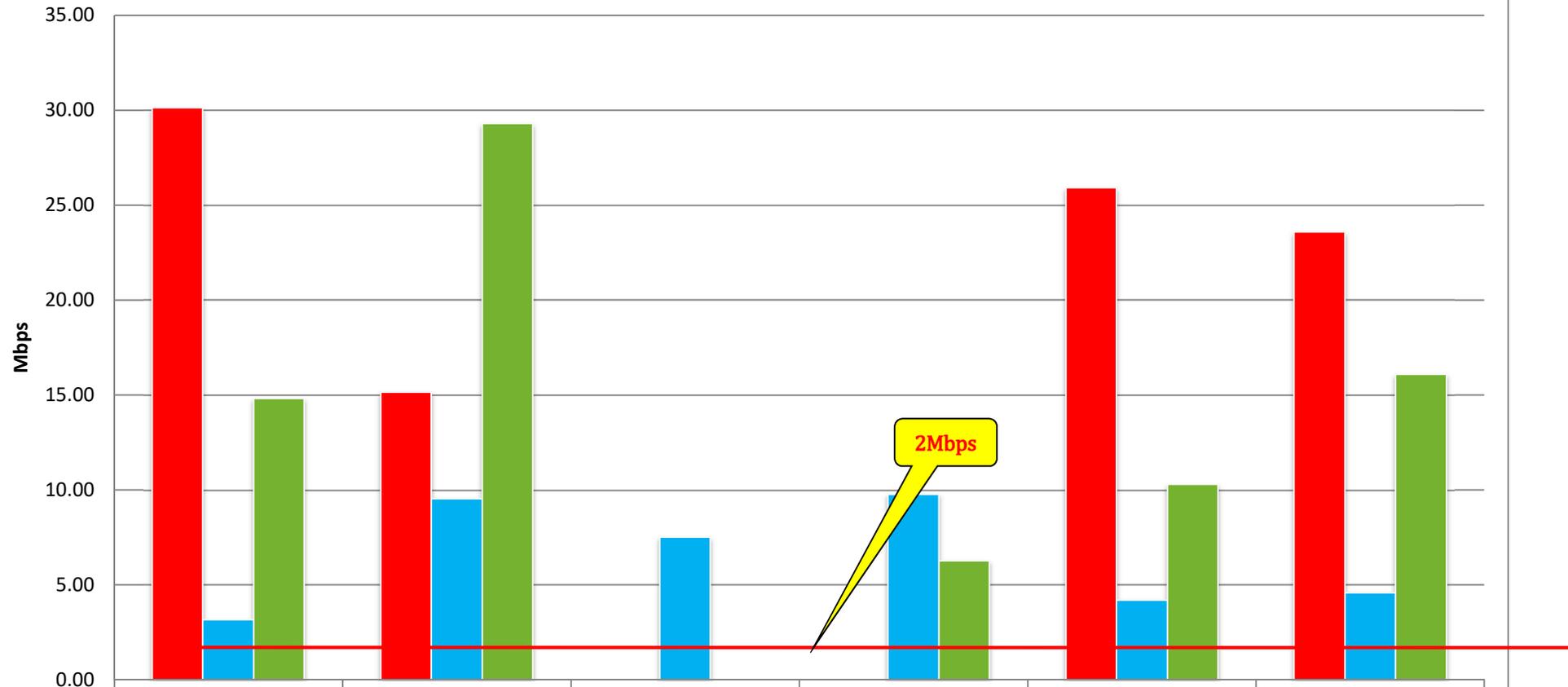
All CMOs are meeting the threshold for End-to-End SMS Delivery Time of 12 Seconds

User Data Throughput (Threshold: 3G > 256 kbps)



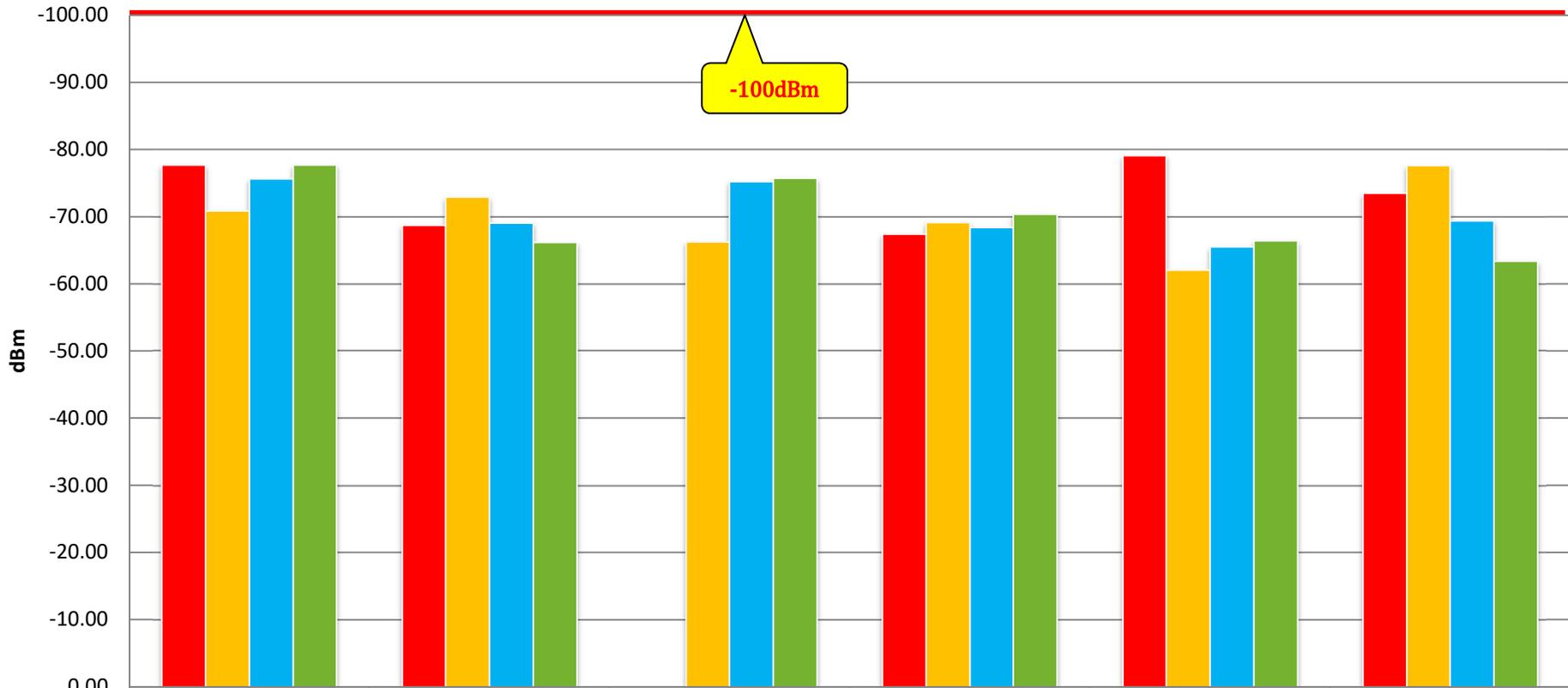
	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
■ Jazz	5115.20	2078.40	0.00	1954.90	4066.50	4576.40
■ Ufone	1795.20	4428.90	2846.50	3276.40	1716.40	3257.60
■ Telenor	1721.10	6383.80	1399.40	1734.20	2791.00	5218.50
■ ZonG	6008.90	6625.80	1737.00	7269.70	7267.40	6978.10

User Data Throughput (Threshold: 4G > 2Mbps)



	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
■ Jazz	30.14	15.16	0.00	0.00	25.92	23.62
■ Telenor	3.18	9.53	7.50	9.80	4.20	4.57
■ Zong	14.83	29.31	0.00	6.27	10.34	16.11

Signal Strength Received Signal Code Power – 3G (Threshold: Minimum - 100dBm)

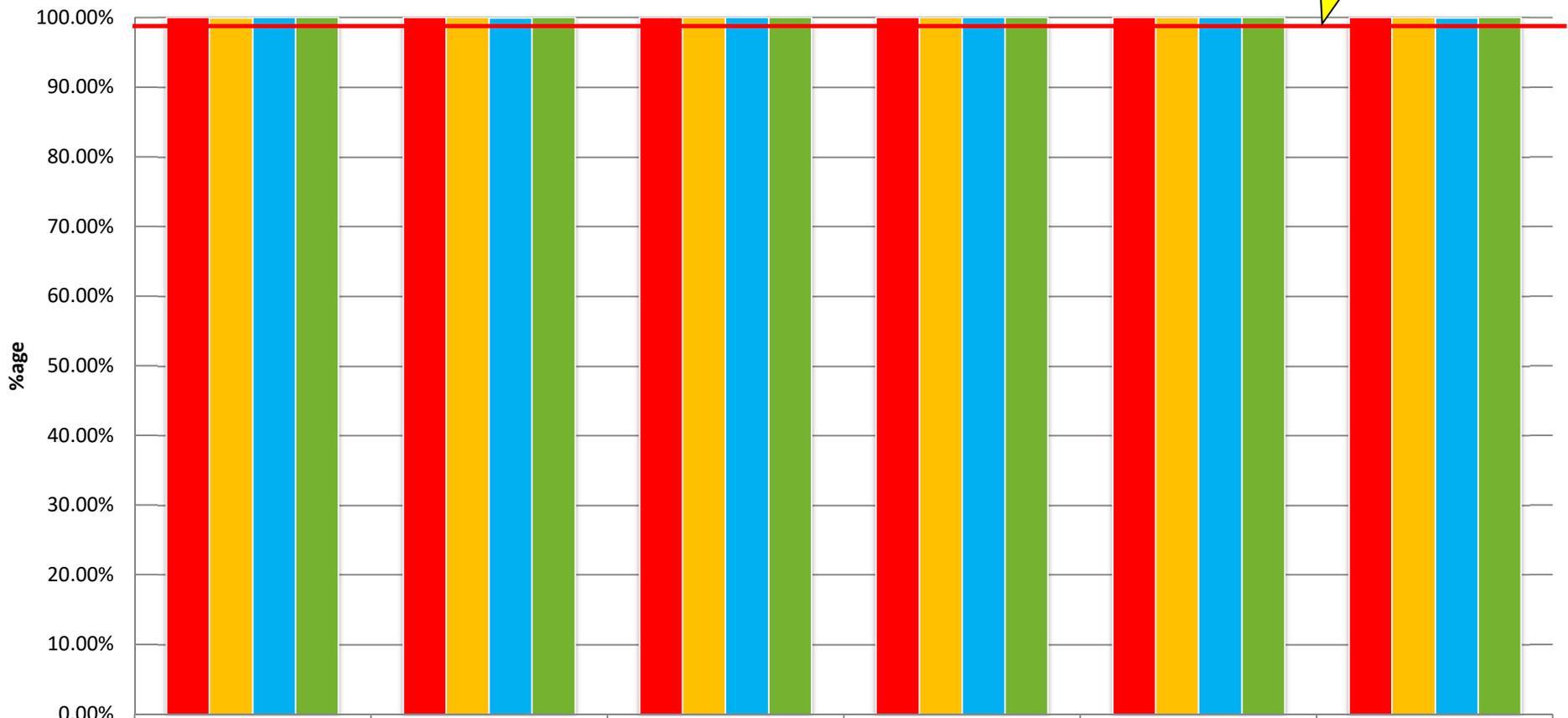


	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
Jazz	-77.70	-68.69	0.00	-67.40	-79.10	-73.46
Ufone	-70.90	-72.90	-66.30	-69.10	-62.10	-77.60
Telenor	-75.60	-69.04	-75.23	-68.40	-65.50	-69.40
ZonG	-77.70	-66.20	-75.68	-70.40	-66.40	-63.40

Signal Strength Reference Signal Received Power – 4G (Threshold: Minimum-100dBm)

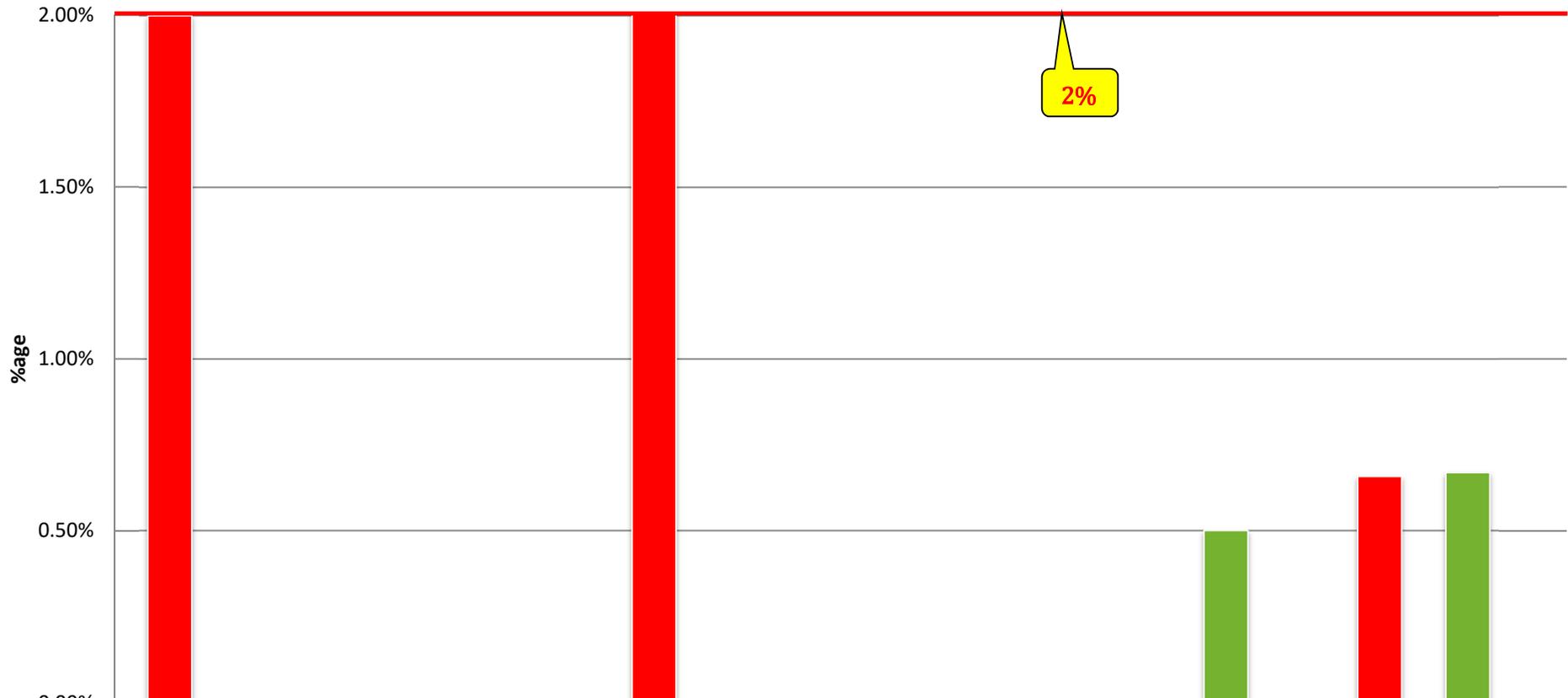


Network Accessibility (Threshold: >99%)



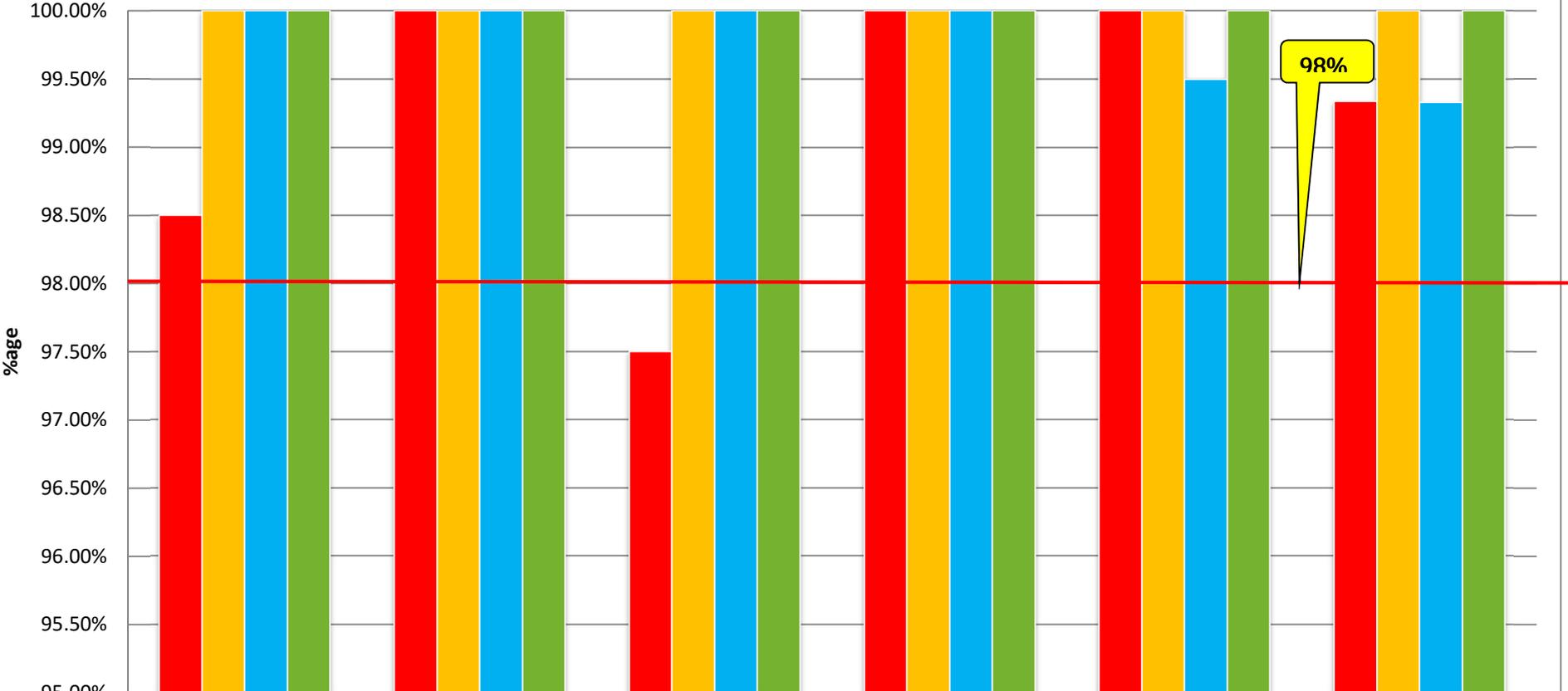
	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
■ Jazz	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
■ Ufone	99.90%	100.00%	100.00%	100.00%	100.00%	100.00%
■ Telenor	100.00%	99.90%	100.00%	100.00%	100.00%	99.90%
■ Zong	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Grade of Service (Threshold: ≤ 2%)



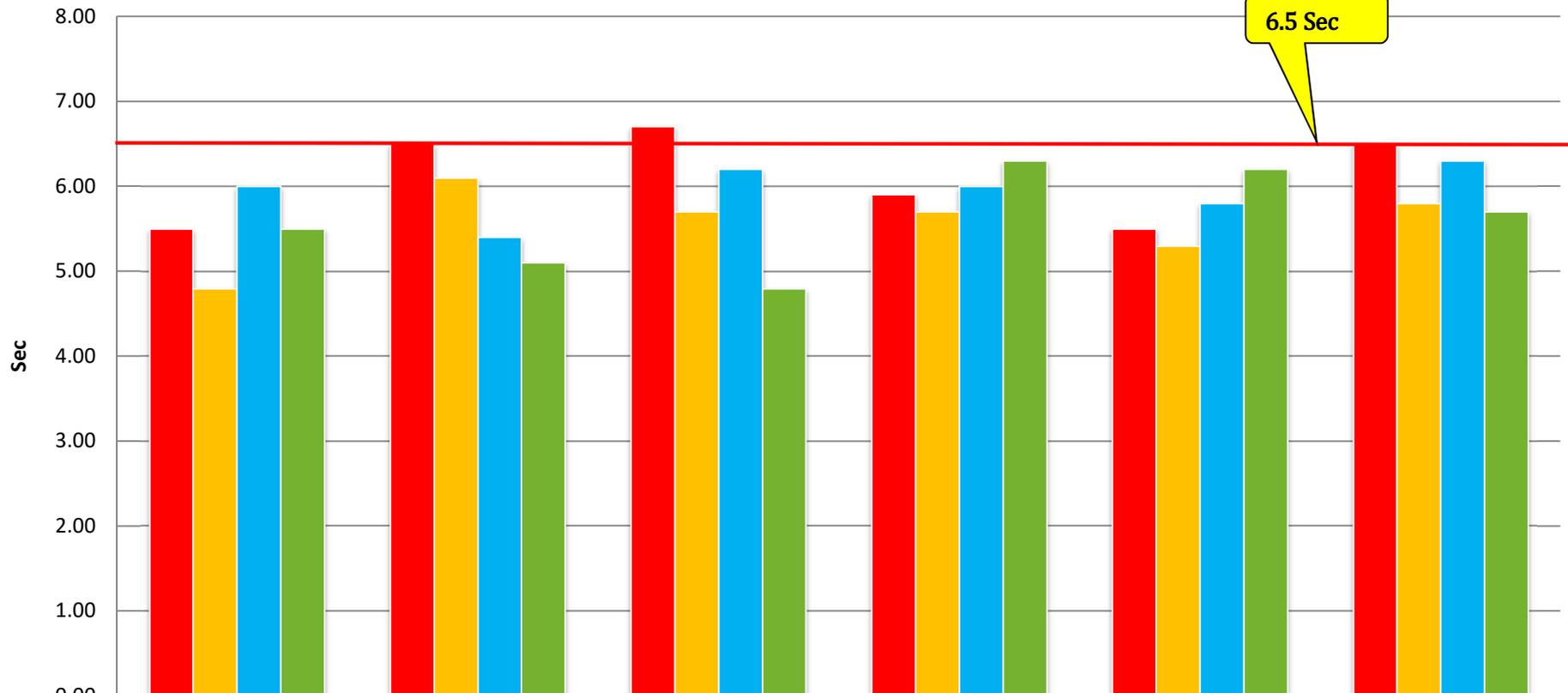
	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
■ Jazz	2.00%	0.00%	2.50%	0.00%	0.00%	0.66%
■ Ufone	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
■ Telenor	0.00%	0.00%	0.00%	0.00%	0.50%	0.67%
■ Zong	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Service Accessibility (Threshold: > 98%)



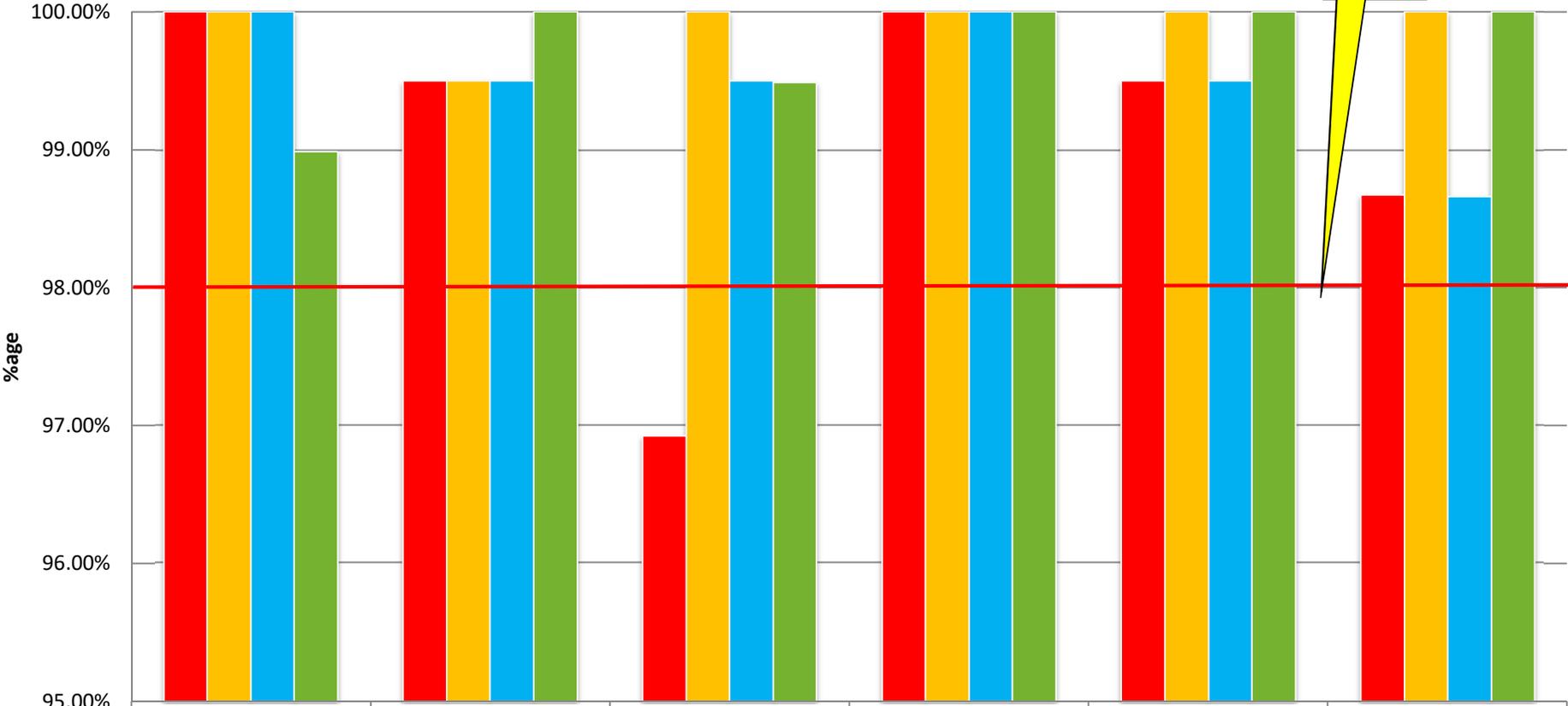
	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
Jazz	98.50%	100.00%	97.50%	100.00%	100.00%	99.34%
Ufone	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Telenor	100.00%	100.00%	100.00%	100.00%	99.50%	99.33%
Zong	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Call Connection Time (Threshold: ≤ 6.5 Sec)



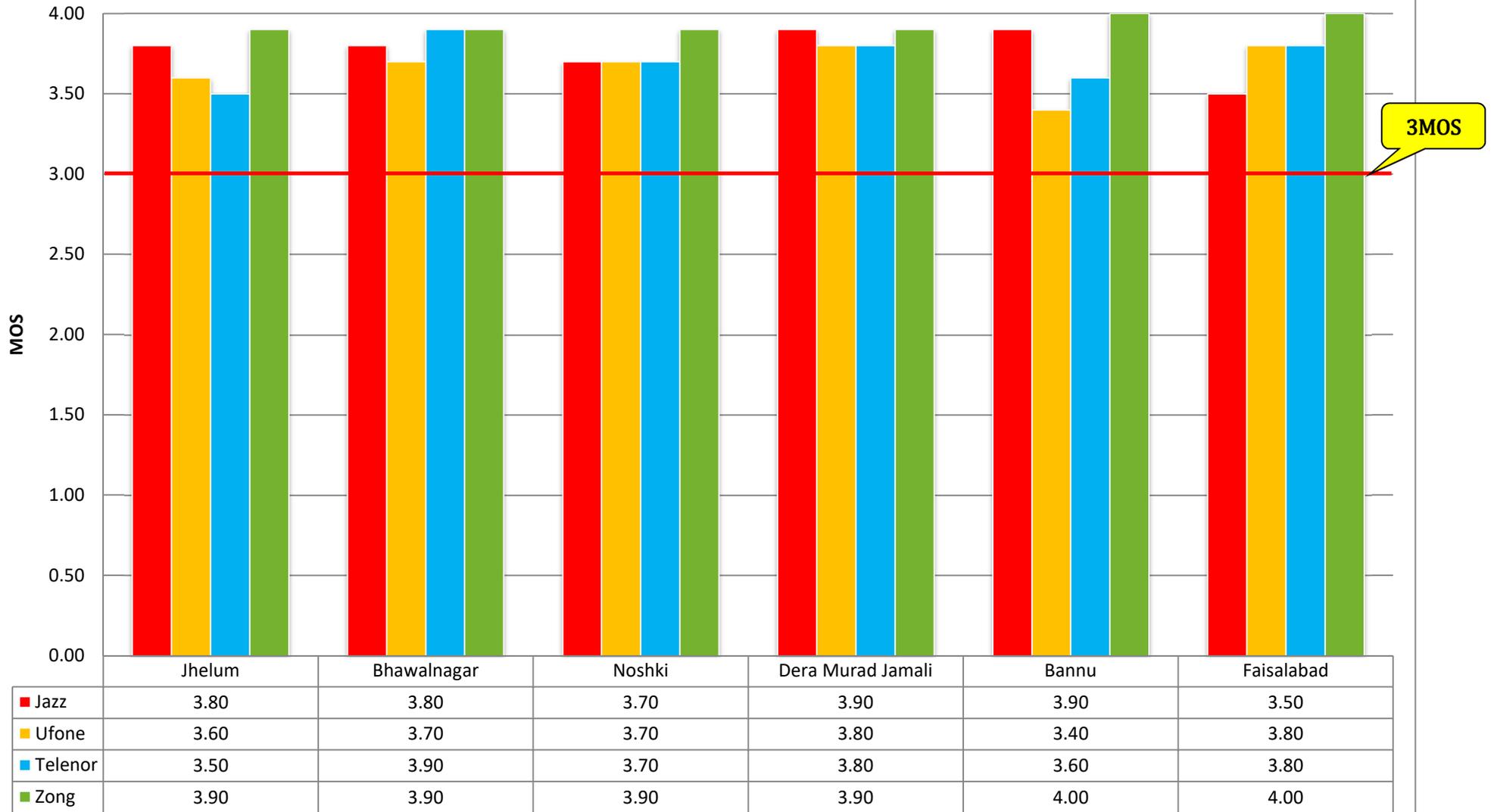
	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
■ Jazz	5.50	6.50	6.70	5.90	5.50	6.50
■ Ufone	4.80	6.10	5.70	5.70	5.30	5.80
■ Telenor	6.00	5.40	6.20	6.00	5.80	6.30
■ Zong	5.50	5.10	4.80	6.30	6.20	5.70

Call Completion Ratio (Threshold: > 98%)

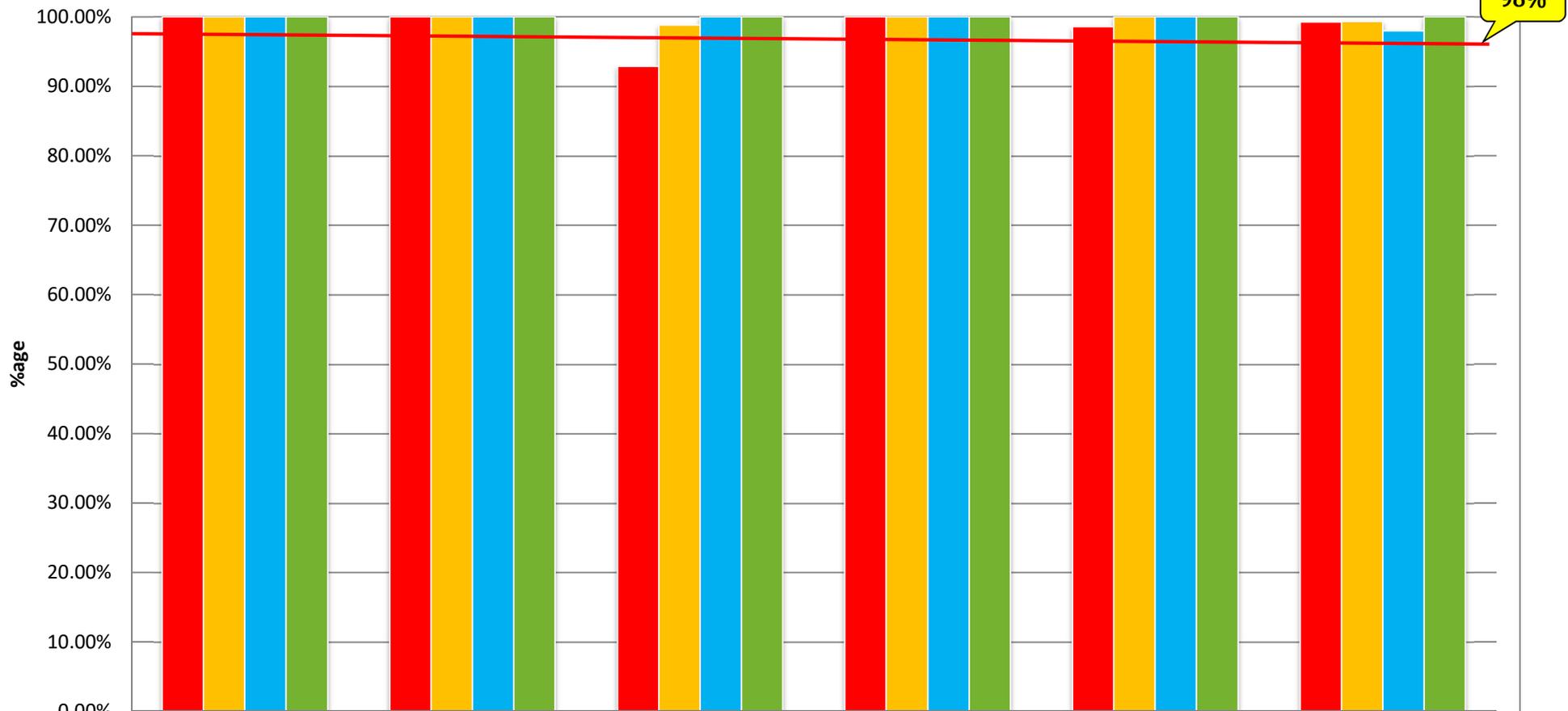


	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
Jazz	100.00%	99.50%	96.92%	100.00%	99.50%	98.67%
Ufone	100.00%	99.50%	100.00%	100.00%	100.00%	100.00%
Telenor	100.00%	99.50%	99.50%	100.00%	99.50%	98.66%
Zong	98.99%	100.00%	99.49%	100.00%	100.00%	100.00%

End to End Speech Quality (Threshold: MOS > 3)

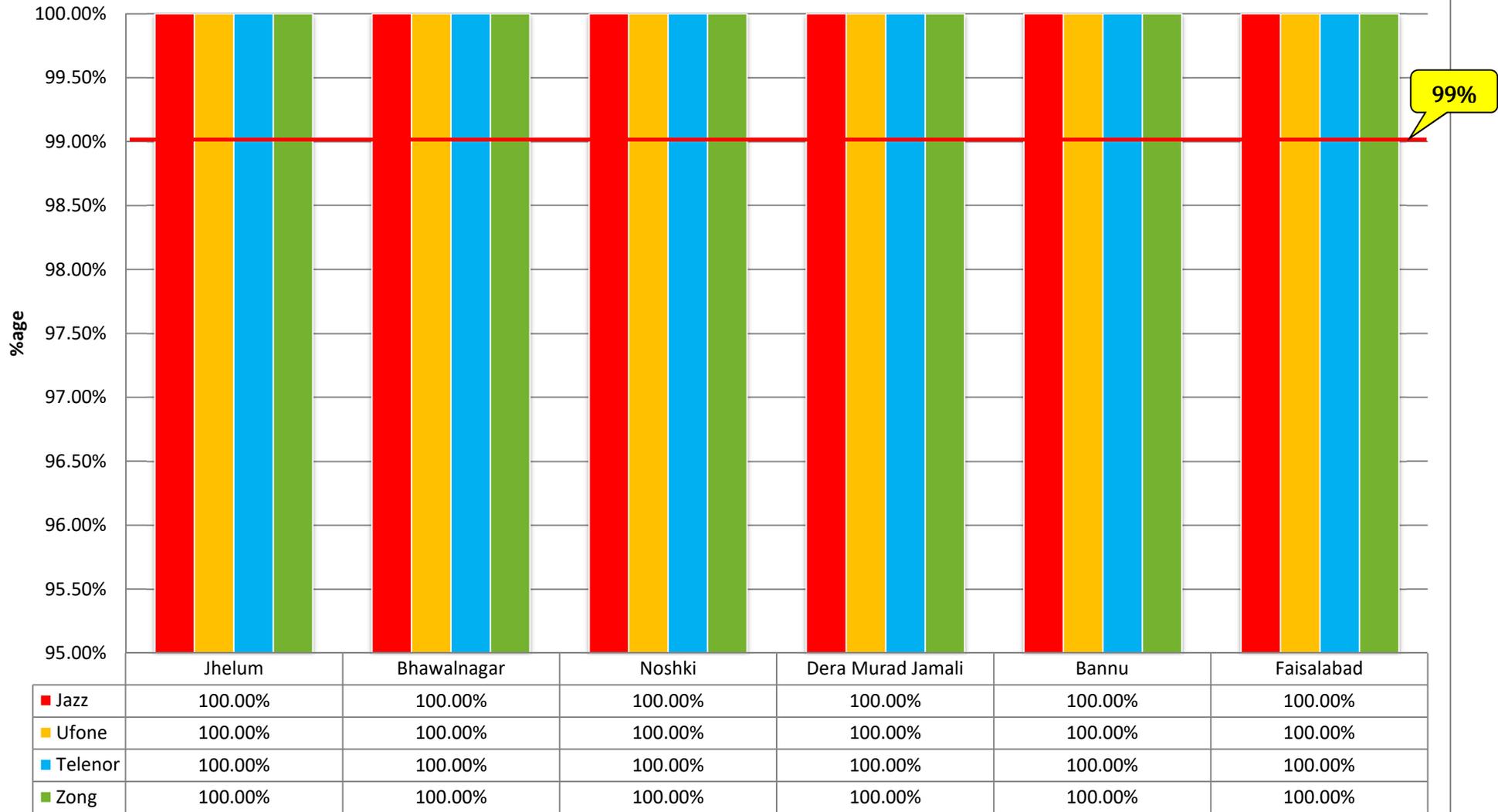


Inter System Handover of CS Voice (Threshold: > 98%)

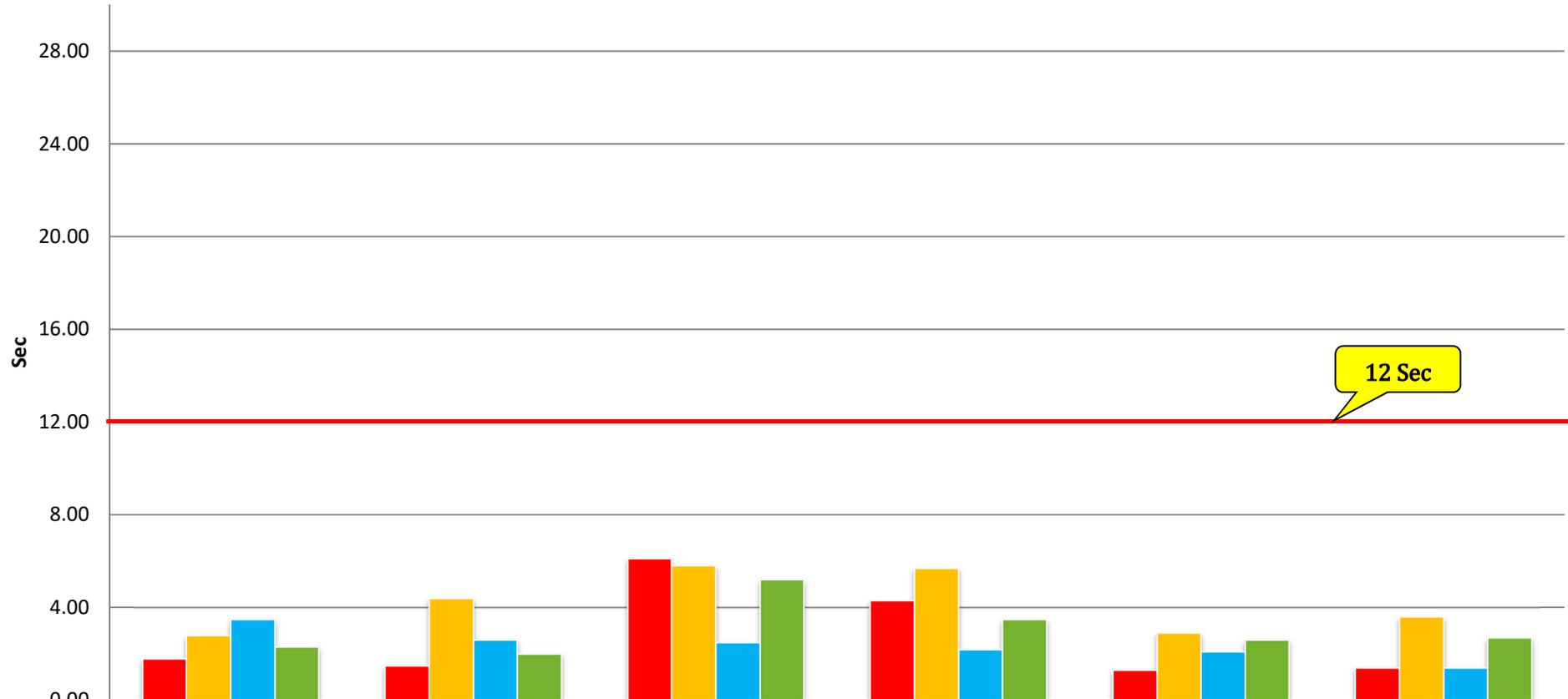


	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
■ Jazz	100.00%	100.00%	92.90%	100.00%	98.60%	99.22%
■ Ufone	100.00%	100.00%	98.80%	100.00%	100.00%	99.30%
■ Telenor	100.00%	100.00%	100.00%	100.00%	100.00%	98.00%
■ Zong	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Success Rate (Threshold: > 99%)



End to End Delivery Time (Threshold: ≤ 12 Sec)



	Jhelum	Bhawalnagar	Noshki	Dera Murad Jamali	Bannu	Faisalabad
Jazz	1.80	1.50	6.10	4.30	1.30	1.40
Ufone	2.80	4.40	5.80	5.70	2.90	3.60
Telenor	3.50	2.60	2.50	2.20	2.10	1.40
Zong	2.30	2.00	5.20	3.50	2.60	2.70