



Telecom Regulatory Authority of India



Consultation Paper
on
Duration of alert for the called party

September 16, 2019

**Mahanagar Door Sanchar Bhawan,
J.L. Nehru Marg, (Old Minto Road)
New Delhi - 110002, India**

Stakeholders are requested to send their comments, preferably in electronic form to the following address:

Shri. Asit Kadayan,
Advisor (QoS),
Telecom Regulatory Authority of India (TRAI),
Mahanagar Door Sanchar Bhawan,
J.L. Nehru Marg, (Old Minto Road)
New Delhi - 110002, India
Email: advqos@traigov.in

Last Date for submission of comments: September 30, 2019

Last Date for submission of counter comments: October 07,2019

Comments will be posted on TRAI website www.traigov.in.

For any clarification/information, Advisor (QoS) may be contacted at

Tel. No.+91-11-2323-0404, Fax: +91-11-2321-3036.

Contents

1	Introduction	1
1.1	Background	1
1.2	Relevant National or International Standards	2
1.3	Scope of Consultation	4
1.4	Structure of the consultation paper	5
2	Aspects governing duration of ring	6
2.1	Call Processing and role of timers	6
2.2	Impact of values of ringing duration on Customers	11
2.3	Impact of values of ringing duration on Access Providers	12
3	Approaches to discover appropriate duration to ring	13
3.1	Discovering appropriate value	13
3.2	Changes in ringing time duration and its impact on network resources	15
3.3	International Practices	18
3.4	Information needed for further analysis	20
4	Issues for Consultation	21

Chapter 1

Introduction

1.1 Background

1.1.1 In telecommunication networks, ring tone is used to alert the called party about the incoming call. To clearly recognize and distinguish from other kinds of sounds, specifications at International and national level, have defined ringing tones with combination of specific frequencies and given ratios of time these frequencies are to be on and off. Maximum ringing time is configured in the telecommunication networks which determines the maximum time allowed to the called party to answer the incoming call before network releases the connection forcefully. Earlier, this time duration was longer, mainly due to longer time taken by the persons in attending the calls as instruments of fixed line used to be installed somewhere in the premises, not always close to the called person. When mobile phones came in, people started keeping phones in their proximity and can respond to the incoming calls much quicker than in case of fixed line. In mobile networks, the maximum time allowed to the called party to answer the call takes on more importance as the alerting phase also engages scarce radio spectrum resources. Ringing or alerting for a long time, when called party is unlikely to answer the call, would led to non-optimal utilization of resources. Resources other than radio spectrum that remain engaged during the alerting phase of call may also be applicable even for fixed line networks such as Point of Interconnection (PoI). Telecommunication network operators could be keen to reduce duration of ringing time to optimally utilize their resources. However increasing or decreasing the duration to alert before releasing the call by network may have its own advantages and disadvantages.

1.1.2 On one hand, configuring duration of ringing time on lower side might save resources but on the other hand it may cause concerns related to network performance, if duration is much lower than the typical time one takes to answer the call. In such scenarios, it is quite likely that either the calling party would attempt again to reach out to that party or probably

be called back when called party see the calls missed in its call logs. Configuring ringing time with low duration might lead to an increase in the number of calls missed by the called party as there might be good chances that these calls could have been answered if network would have waited. It may also cause poor network performance in terms of Answer to Seizure Ratio (ASR). For establishing a call in telecommunication networks, chain of networks might be involved and these networks may belong to different service providers. If values of timers related to ringing are set differently by different network operators, chances of answering the call by user of one network would be different from the user of another networks as one party would get more time to answer the call while other party may get lesser time to answer. This may cause shift in traffic patterns on Point of Interconnection (PoI) in terms of outgoing and incoming Minutes of Usage (MoU). Such a situation does not affect service providers from network's capacity utilization perspective as most of the network elements which gets engaged in case of incoming or outgoing calls would be same. But early release of the calls when called parties intended to answer the calls would adversely impact the consumers quality of service experience.

1.1.3 Networks not releasing the calls forcefully, and continuing to ring called party for a long duration even when it is unlikely to be answered would certainly keep resources seized unnecessarily. Recently, it has been brought to the notice of the Authority that one telecommunication service provider has reduced the duration of ring to 20 seconds in its network for releasing the unanswered calls forcefully. Further, some of the service providers argued that if one network configures 20 seconds duration while other networks have longer duration values such as 30 sec or 45 sec in mobile networks and 60 sec or 120 sec in fixed line networks then performance of networks having configuration with longer duration values gets impacted. This is not only degrading their Answer-to-Seizure Ratio (ASR) but it is also affecting the pattern of traffic on PoI from incoming MoU to outgoing MoU. Telecommunication service Provider having configured duration of ring on lower side argued that reduction in the duration is helping them to utilize resources optimally. Keeping in view the impact of configured values of ring duration on quality of service experience and network performances, it is important to discover the appropriate values.

1.2 Relevant National or International Standards

Relevant timers which govern ringing or alerting duration for the circuit switched traffic are defined and described in Common Channel Signalling System no. 7 (CCS7) specifications released by International Telecommunication Union (ITU-T) in its Recommendations Q.761-764. At national level, Telecommunication Engineering Centre (TEC) has released National

CCS7 standards no. S/CCS-02/03 based on ITU Recommendations and might have modified some of the values or decided to use or not to use certain timers for the country specific purposes. In addition to this, there may be some other interrelated timers in core and radio networks which may have combined effect on maximum duration of alert or ringing to answer the call, such timers may be part of various other specifications released by International Telecommunication Union (ITU) or 3GPP for packet based networks and mobile networks. To interconnect the networks for carrying circuit switched traffic, as per the clause 27.3 of the unified license (UL), Telecommunication Service Providers are required to follow national standards of CCS No.7 released Telecommunication Engineering Centre (TEC) and as amended from time to time. To inter-work between circuit switched and IP based networks, TSPs are required to install Media Gateway Switch. On interconnection related issues, the Licensor may also direct the LICENSEE to adopt any other technical standards issued by TEC.

1.2.1 In case of circuit switched traffic, from the perspective of ringing duration, one of the key timer is Timer T9 of ISDN User Part (ISUP) which starts at receiving of CCS7 level 3 Address Complete Message (ACM) and normally terminates at the receipt of Answer Message (ANM). In case, this timer T9 expires before called party has answered the call then network forcefully releases the connection and send back release message. National CCS7 standards has neither specified range of ISUP T9 timer values which are to be followed by the TSPs for configuration in the networks nor recommended any specific value. National CCS7 standards has described ISUP Signalling Procedures which mentions that all relevant timers of ISDN User Part (ISUP) shall be as per Annex-A to ITU-T Recommendations Q.764. The Annexure to these ITU Recommendations cross refers to another ITU-T Recommendations ITU-T Q.118 for the purpose of range of values for ISUP T9 timer. ITU-T Recommendations Q.118 have recommended configuring value of 1.5 to 3 minutes in national or International exchanges for International circuits as a special release arrangements for abnormal conditions scenarios. These recommendations have further mentioned that if an Administration adopts a shorter delay period for this forced release condition, there will be a risk that the international connection will be released prematurely on calls not returning an answer signal. If the maximum delay of 3 minutes is exceeded, it will of course involve an unnecessary occupation of international circuits. The ITU Recommendations for ISUP Timer T9 values may not be applicable as such for the interconnections between networks within the national boundaries as time required by the relevant messages to propagate between relevant network entities would significantly differ in case of national scenarios. However, due to same or similar issues as highlighted in these ITU Recommendations, suggests that there would be a requirement to recommend range of ISUP T9 timer values or specific values to be followed in case of

interconnection arrangements of networks within national boundaries.

1.2.2 From end user's perspectives, it is a combined effect of values set for different timers in different parts of the networks including ISUP Timer T9 for circuit switched networks, relevant timers in case of packet switch based networks which will result into maximum alerting or ringing duration allowed to called party to answer the call. Appropriate range of time duration to alert, may be required to be discovered after considering subscriber's typical behaviour while responding incoming calls and may also require to consider the aspects of network performance and optimal utilization of the resources. Indicative figure to start deliberation about the appropriate range or specific value in case of fixed line networks might be taken from TEC Generic Requirements GR No. GR/LLT-01/06 APRIL 2007 for Large Size Digital Local Cum Tandem Exchanges which requires Local Exchange to force call release if No answer condition persists for 60 seconds. For the case of mobile networks, reference may be taken from the TEC Generic Requirements on Network Switching Sub-system GR/NSS-01/01.MAR 2004 which mentions various parameters to dimension the network including 30 seconds as a value for unanswered calls. Though these generic requirements might be not applicable as standards to be followed by the access providers as a part of license but provides indicative values. Appropriate values will be required to be discovered in the current prevailing environments.

1.2.3 Absence of any guiding principle or specific values may lead to a situation where reduction of the duration of ringing by one telecommunication service provider for its certain advantages may cause reactions by the other service providers in response to it by further reducing the values to even more lower levels and thereby causing chain reaction. It is apprehended that if such chain reaction or race among service providers happens to set lower and lower values of timers will severely impact the interests of the customers. In case of emergence of such situations, it would be difficult to arrest the fall of value below a critical point as there will not be any reference value or range of values. In view of this, it is important to consult on the issue and take appropriate measures.

1.3 Scope of Consultation

This consultation is focused upon discovering values for duration of ringing which should be configured by all the telecommunication service providers in their mobile and fixed line networks to force call release in case No answer condition persists beyond the given duration. It further seeks inputs on appropriate measures to be taken in this regard and invites all stakeholders to provide relevant data to help in forming opinion or taking decisions by the

Authority.

1.4 Structure of the consultation paper

Chapter 2 deliberates on technical aspects of configurations of relevant timer values in the network and also analyzes impacts of the value from various aspects including customer's and access provider's perspective. Chapter 3 deliberates on the approach to discover the appropriate value. Chapter 4 summarizes the issues of consultation.

Chapter 2

Aspects governing duration of ring

Deliberations in previous chapter about too low or high values of duration of ringing before network forcefully releases unanswered calls, raises key issue to discover the appropriate value of timers for this purpose. Before deliberating on specific values, it is important to understand various aspects in details which might impact the customers and access providers. This chapter, first describes relevant technical aspects and identifies some of the issues from customers and access providers perspective.

2.1 Call Processing and role of timers

Control of call processing involves role of originating network, transit network and terminating network. The originating network determines that the calling party is attempting a call. When the destination has been identified and call is routed then role of transit and terminating network comes into play. Depending upon types of subscription and types of calls such as prepaid or postpaid subscription, and whether called number belongs to a person, or to a service such as toll-free, premium rate call etc. additional elements of network like Intelligent Network (IN) may also get involved in the processing of call.

2.1.1 At various stages, during the processing of call, network goes in the waiting state either for receiving the acknowledgements or for knowing the action taken on the other end. Further course of action may depend upon the actual action. It might happen that distant end has not taken any action within a given time or acknowledgements/ signalling messages lost in the path. Indefinite waiting by network may lead to unnecessary seizure of resources and thereby wastage of the resources. On the other hand, waiting for shorter duration and releasing the resources early may also lead to situations where connection has been released but there were good chances of getting response from the other end if network would have waited a little longer. Premature release also nullify the efforts done.

2.1.2 Signalling System (SS7) defines the ISDN User Part (ISUP), at the application level which is responsible for setting up and releasing of circuits at interconnection circuits to establish calls. ISUP consists of call processing, supplementary services, and maintenance functions. The ITU-T defines the international ISUP standards in the Q.767 and the national standards in the Q.761-Q.764 series of specifications. The ITU-T standards provide a basis from which countries or geographical regions can further define specific requirements of the country. The ISUP protocol defines a large set of procedures and messages, many of which are used for supplementary services and maintenance procedures. While the ITU Q.763 ISUP standard defines nearly fifty messages, a core set of five messages represent the majority of the ISUP traffic on most SS7 networks. Following five messages comprise the core message set for basic call setup and release, and are therefore used frequently:

1. **Initial Address Message (IAM):** The IAM contains the information needed to set up a call and for a basic call, it is the first message sent.
2. **Address Complete Message (ACM):** A destination node sends the ACM to indicate that a complete Called Party Number (CdPN) has been received. When enbloc signaling is used to set up the call, the ACM is sent after receiving the IAM; when overlap signaling is used, it is sent after the last SAM is received. In addition to indicating the successful reception of the CdPN, the ACM sends Backward Call Indicators (BCI) to signal information about the call setup. It is not mandatory for an ACM to be sent when setting up a call.
3. **Answer Message (ANM):** The ANM is sent to the transit and originating network when the called party answers (off-hook or answers).
4. **Release Message (REL):** the REL message indicates that the circuit is being released. When an RLC (Release Complete Message) has been received in response, the circuit can be returned to the idle state for reuse. The REL message can be sent in either direction. It contains a single mandatory Cause Indicators field to indicate why the circuit is being released. Cause Indicators specify the cause information associated with the circuit being released.
5. **Release Complete Message (RLC):** The RLC message is sent to acknowledge a REL message. Upon receipt of an RLC, a circuit can return to the idle state.

2.1.3 Call Setup: A simple basic voice call can be established and released using above ISUP messages, as shown in figure 2.1 and figure 2.2. The Initial Address Message (IAM) is the first message sent, which indicates an attempt to set up a call for a particular circuit.

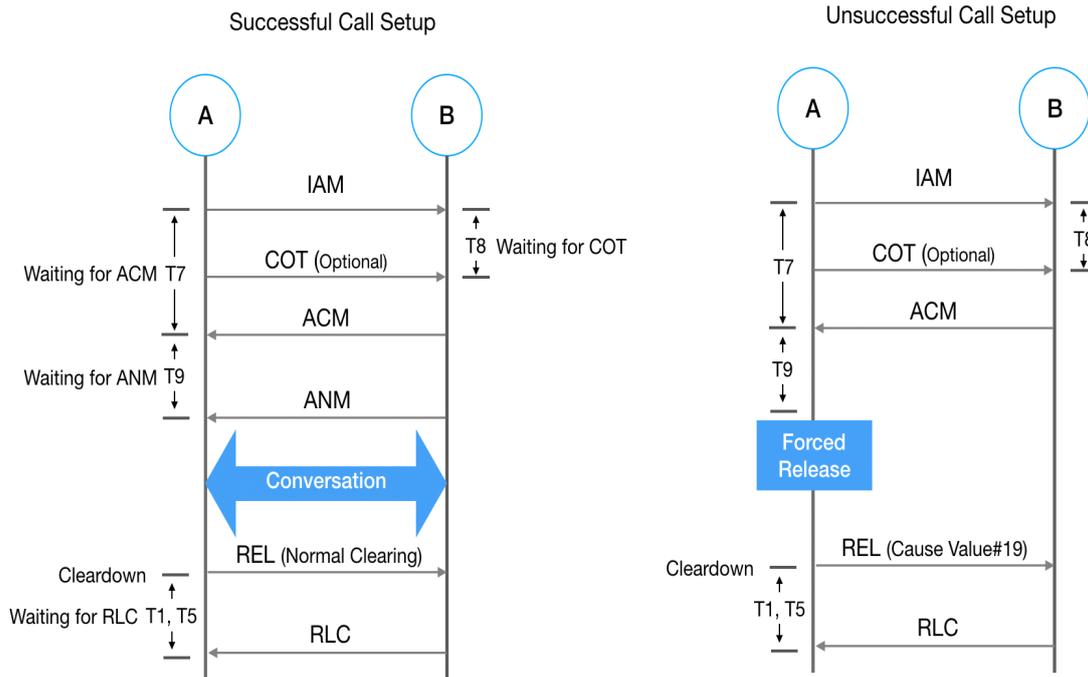


Figure 2.1: Message Flow Diagram

The IAM contains information that is necessary to establish the call connection such as the call type, called party number, and information about the bearer circuit. When terminating network receives the IAM, it responds with an Address Complete Message (ACM). The ACM indicates that the call to the selected destination can be completed. Once the ACM has been sent, ringing is applied to the terminator and ring back is sent to the originator. When the terminating set goes off-hook or answers the call, an Answer Message (ANM) is sent to the originator. The call is now in conversation phase and ISUP messages are exchanged again when one of the parties signals the end of the call by going on-hook or ending the call.

2.1.4 Call Release: When the call originator (calling Party or A-party) goes on-hook/ ends the call. Originating network sends a Release message (REL) to terminating network. The REL message signals the far end to release the bearer channel. Terminating network responds with a Release Complete message (RLC) to acknowledge the REL message. The RLC indicates that the circuit has been released. In case of PSTN, if the terminating party goes on-hook first, the call might be suspended instead of being released. Suspending a call maintains the bearer connection for a period of time, even though the terminator has disconnected. The terminator can go off-hook to resume the call, provided that he does so before the expiration of the disconnect timer or a disconnect by the originating party. In case of mobile networks, bearer is released by either calling party or the called party i.e. it permits either party release, unlike the case of PSTN.

2.1.5 Unsuccessful Call Attempt: After receiving the IAM, terminating network checks the status of the called party and it might discover that Called Party is busy. In such case, instead of an ACM, a REL message with a cause value of Network determined User Busy is sent to originating network, indicating that the call cannot be set up; or Called party (mobile user) has rejected incoming call with busy status i.e. user determined user busy; or Called party has not responded to the incoming call in given duration and network has released the bearer which is governed by timer values set in the network; or Called party is out of coverage or switched off.

2.1.6 Message Timers: ISUP uses timers as a safeguard to ensure that anticipated events occur when they should. All of the timers are associated with ISUP messages and are generally set when a message is sent or received to ensure that the next intended action occurs. For example, when a REL message is sent, Timer T1 is set to ensure that a RLC is received within the T1 time period. ITU Q.764 defines the ISUP timers and their value ranges. Figure also shows various timers involved during a basic call. Following are the definitions of each of the timers in the figure:

- (i) **T7 awaiting address complete timer-** Also known as the network protection timer. T7 is started when an IAM is sent, and is canceled when an ACM is received. If T7 expires, the circuit is released.
- (ii) **T8 awaiting continuity timer-** Started when an IAM is received with the Continuity Indicator bit set. The timer is stopped when the Continuity Message is received. If T8 expires, a REL is sent to the originating node.
- (iii) **T9 awaiting answer timer-** T9 is started when an ACM is received, and is canceled when an ANM is received. If T9 expires, the circuit is released. Answer timing is usually performed at the originating exchange to prevent circuits from being tied up for an excessive period of time when the destination does not answer.
- (iv) **T1 release complete timer-** T1 is started when a REL is sent and canceled when a RLC is received. If T1 expires, REL is re-transmitted.
- (v) **T5 initial release complete timer-** T5 is also started when a REL is sent, and is cancelled when a RLC is received. T5 is a longer duration timer than T1 and is intended to provide a mechanism to recover a non-responding circuit for which a release has been initiated. If T5 expires, a RSC (Reset Circuit) is sent and REL is no longer sent for the non responding circuit. An indication of the problem is also given to the maintenance system.

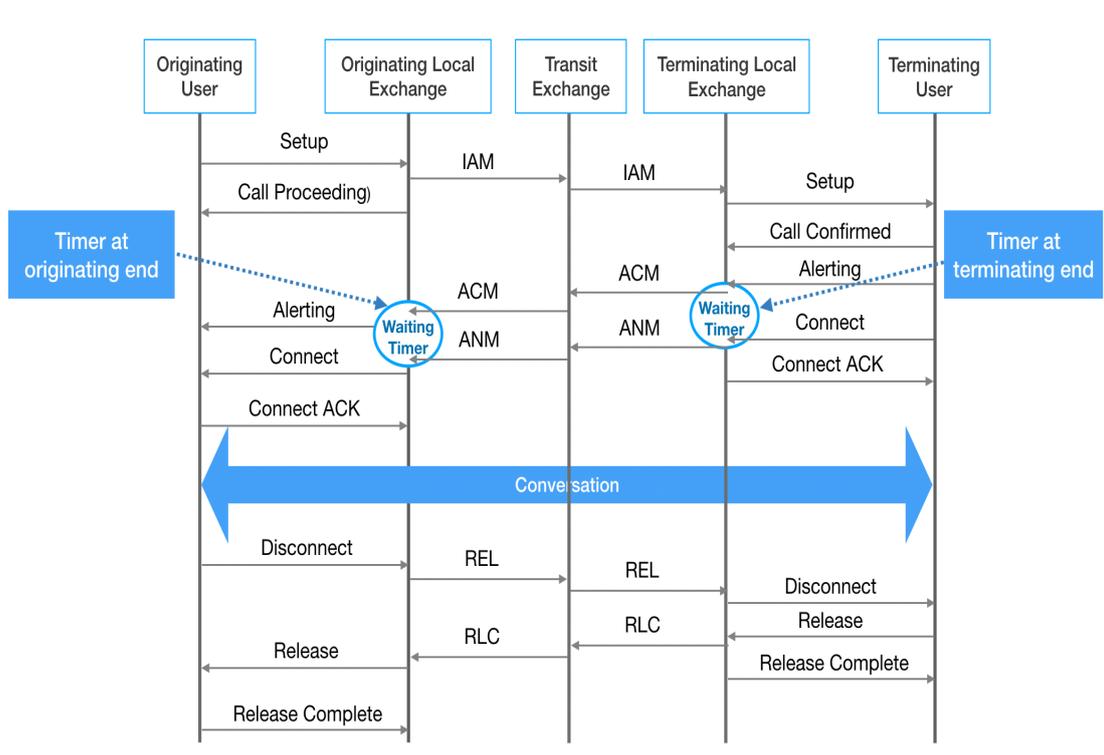


Figure 2.2: Chain of Network Entities Message Flow Diagram

2.1.7 Waiting timer might be required to be configured at both the ends i.e. at originating network's end as well as at the terminating network's end. Called party is alerted by the terminating network and normally terminating network's end initiates the process of force call release if the called party does not answer within the given duration. And resources are released on the path starting from the terminating network's side to transit network, if any, and then to originating network's end. In abnormal situations, where release message initiated by the terminating network does not reach to the originating side for a long time, due to link failure or message lost on the way, then originating network might release the resources at its end after timer expires set at its end. In normal functioning of the network, such a situation is quite unlikely to happen and therefore timer value at the originating side is set relatively much higher than value set at the terminating side. Sometimes, originating network might not set any value at the originating side as there are rare chances of occurring such a scenario. Even if such scenario occurs and no value is set at the ISUP level, then lower layers can take care of. However, setting value at the originating side lower than the terminating side would lead to situation where terminating side is in the process of establishing connection with the called party while originating network has initiated the process to release the path. In case, exactly same value is set at both the ends then simultaneously both ends would initiate release process and both will wait for the acknowledgements of release complete. To avoid such conflicting scenarios, timer value at originating end is set after adding certain margins

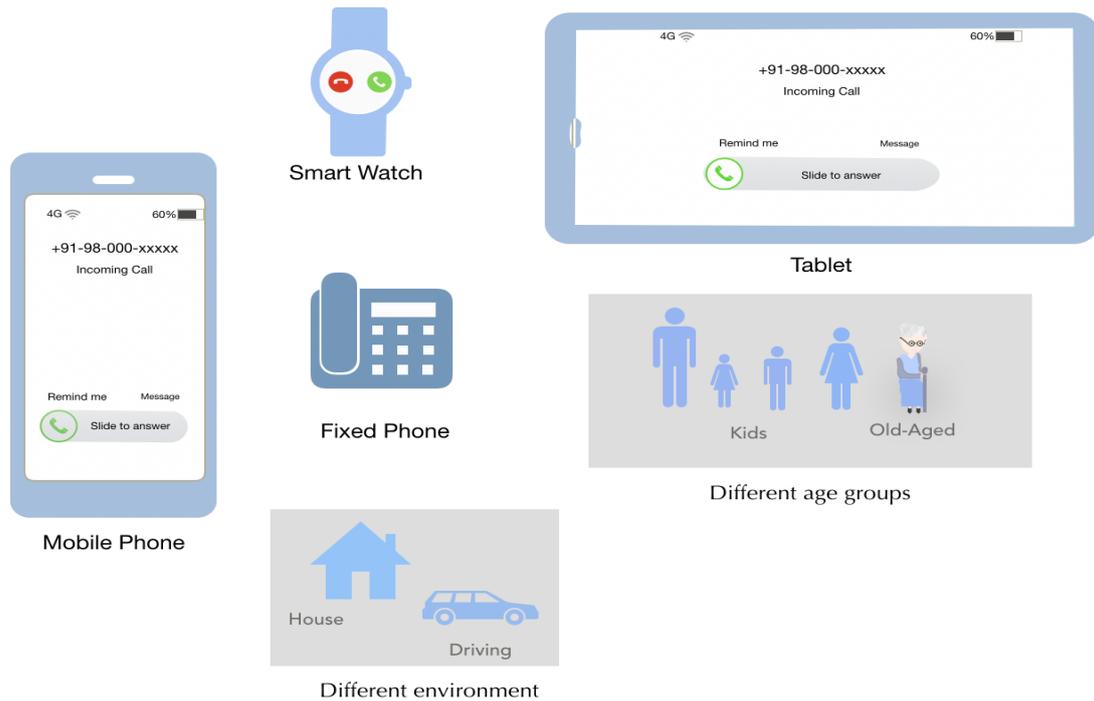


Figure 2.3: Different Environment

to the typical maximum value of timer configured at terminating network's end.

2.2 Impact of values of ringing duration on Customers

2.2.1 Issue of distinct ringing duration on networks: Telecommunication subscribers (figure 2.3) have different response times for attending the incoming calls, mobile phones have certainly improved response time of the called party as most of the time the end user device is in proximity of the user. Many people quickly take decision either to respond the call or reject it. Such subscribers do not engage resources for long time whether higher values are configured in the network. Quick response by the called party resource is either released immediately as disconnected, or utilized for the communication as answered.

Response of the called party may also depend upon various situations in which call has arrived such as on call waiting, busy with some other important work at home or office, driving on that moment. In India, mobile phones have also been used as a substitute of fixed line network and sometimes, people do not always carry the mobile phone with them while they are at home and sometimes response time of the called party even in case of mobile phones resembles with the typical response time of fixed line subscriber. Response time may also depend upon the age of the called party and their habits such as old aged person

taking longer time to notice the ring and respond to it, persons keeping mobile phones in the handbags takes longer time to notice the ring and respond to it. Now a days, people are using wearable devices to get alerts from mobile phones about the incoming call and even answer it. Some devices offer parallel or cascaded ringing on mobile device latched to same Wi-Fi networks. In such scenarios, device might alert first on primary device and after waiting for certain duration, it may alert on other devices. It may affect effective response time of called party. If Telecom Service Provider has introduced Wi-Fi calling in its network and call on secondary devices is also supported when devices are on different locations then call setup on secondary devices and response may take little longer than normal scenarios.

Persons also have different response time depending upon who is calling. Persons living in urban area and rural area might have different response time due to different environment in which they live in. If a user has configured call forwarding to voice mail after certain duration of ring and network time has been configured with lower value which causes forced release of the connection before the criteria set by the called party to forward the call is fulfilled, these call will not mature. There might be interaction and interplay with other supplementary services in terminating network used by the called party. Different settings of the duration for which called party should be rung before forced release of the connection might lead to impact on the services of the users.

2.3 Impact of values of ringing duration on Access Providers

Access providers might experience impact on performance of their networks due to values of ringing duration not set in within the typical range of response times of called party. Impact of too low and too high values have already been deliberated and its impact on ASR, shift in the outgoing and incoming traffic patterns between access providers, optimal utilization of the resource. It is important for identifying typical values which might be suitable for all access providers.

Chapter 3

Approaches to discover appropriate duration to ring

3.1 Discovering appropriate value

3.1.1 One of the approaches to discover appropriate values for duration of ring after which network may forcefully release an unanswered call would be to collect data from the networks and analyze it. If distribution of percentage of calls answered by the called party or released by the calling party are plotted (Figure 3.1) against the time taken by calling or called party to take action then it might help to get idea about appropriate value. For discussion purpose, a probable distribution graph has been created considering inputs received and applying other scenarios affecting the pattern. This graph is only for deliberation purpose and actual graph may be different if some aspects have been missed at this stage of consultation. However, deliberation around it would help irrespective of the shape of actual graph.

3.1.2 Section-A of graph which depicts early stage of the ringing phase and hardly any call gets answered. There may be auto rejection of the calls if calling number has been blocked by the end user device of the called party. Section-B of the graph depicts, local peak due to calls released by calling party who have intentionally given a missed call. Section-C of the graph depicts natural and global peak of percentage calls answered by the called parties. Section-D of the graph depicts that percentage may start declining in this section but there may be another local peak due to release of calls by calling party especially by machine generated calls such as outbound call centres, cloud telephony etc. where time of release of calls are configured in their systems. Section-E of the graph depicts a dotted line at the start of the section which denotes a time of ringing from a customer's perspective and depends upon combine effect of timer values set by various networks in the chain to force call release if calls remain unanswered. Section-E also depicts a shaded region with diagonal lines which

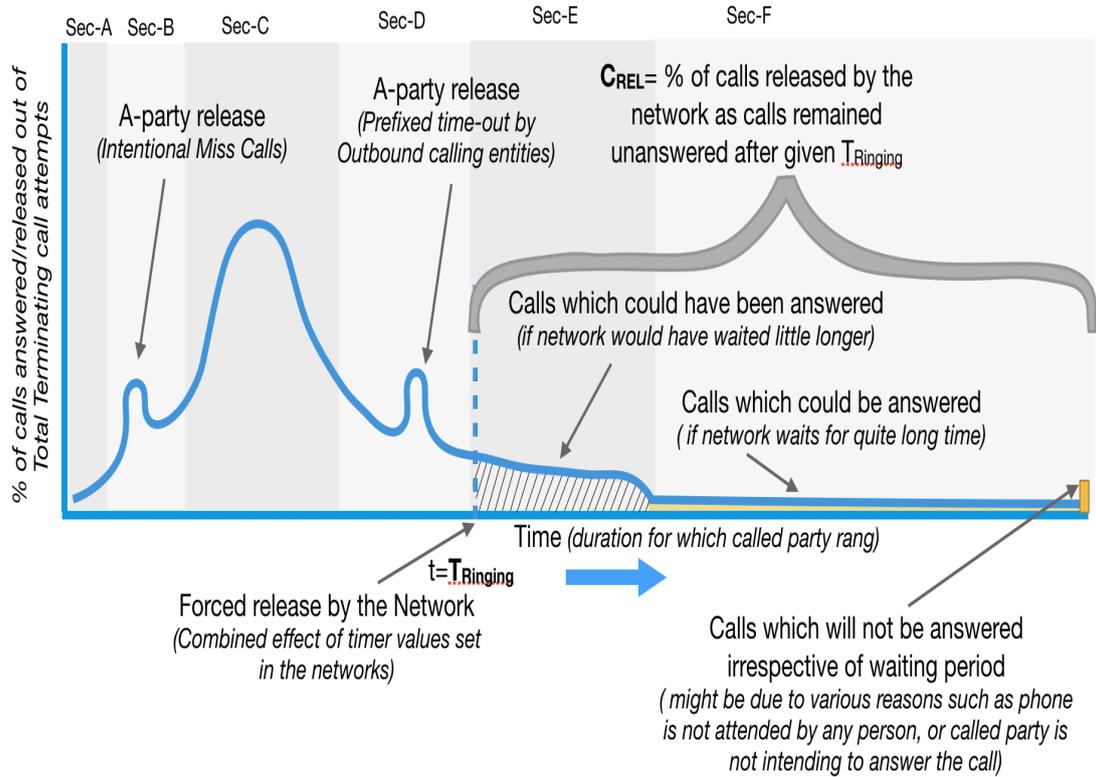


Figure 3.1: Distribution Graph Diagram

represents calls that could have been answered if network would have waited a little longer i.e. dotted line shifted rightwards. Last section in the graph is Section-F which depicts a long tail with little gain in percentage of calls answered and it may be due to phones that are not attended.

3.1.3 Point on time axis where dotted vertical line cuts, may be denoted by the notation T_{Ringing} . From customer's perspective, network alerts him for this duration if he does not answer the call within this duration, network may force release the call. T_{Ringing} may be a combined effect of different timers in various parts of the chain of the networks, some set from customer's perspective and others set by CCS7 signalling procedures or other protocols (such as SIP or Radio network procedures or inter-working gateway related procedures or other kinds of procedures depending upon the type of networks involved in setting up the call). However, customer will only be concerned with the combined effect i.e. T_{Ringing} . Overall instances when customers are likely to be affected by T_{Ringing} will be indicated by the percentage of calls force released by the network and may be denoted by the notation C_{REL} . For different values of T_{Ringing} , different target values of C_{REL} would be achieved. The appropriate value of T_{Ringing} is related to acceptable target value of C_{REL} . This graph may also provide insight where increasing T_{Ringing} would not add any value because there is

marginal gain in terms of C_{REL} while resources might be engaged for a longer duration.

3.2 Changes in ringing time duration and its impact on network resources

3.2.1 If maximum ringing time duration is reduced from $T_{Ringing}$ to say $T_{Ringing(1)}$ as shown in the figure 3.2, the change may be bring some benefit by saving the network resources engaged in alerting the called party. Such savings would be equivalent to the area shown as shaded region in red colour and represents time interval with quantum of network resources which were earlier engaged are now released to serve another user. This saving might give opportunity to TSPs to serve other users in waiting for establishing communication. However, from perspective of customers, there might be additional calls released by the network forcefully and thereby increasing C_{REL} to a value say $C_{REL(1)}$. These calls would have been answered if the network would not have reduced the time and not have released the calls. This will impact the quality of service experienced by the customers. If configurations of time to force call release by the networks are not properly aligned with the most of the customers' expectations then it would lead to situations where many callers would make repeat attempts to call the same party or the called party would attempt to contact by calling back. For some users, long waiting by calling party to expect answering of the call is an indication that calling party has some urgency and expected duration of ringing may also be dependent upon the current situations in which parties to communicate are. Similarly, repeat call attempts from the calling party are also considered as indication of urgency by some of the users. Such scenarios leads to immediate call back and repeat attempts to contact even if mobile number of called person is busy at that moment. Another scenario, which is considered by some of the users to contact urgently by making repeat call back attempts is when one miss to notice alert of incoming calls in case of call from a person important to the called party. In summary, saving achieved by reducing time duration to alert and releasing calls forcefully, in turn, may lead to higher call attempts by the users and adversely impact the network.

3.2.2 If maximum ringing time duration is enhanced from $T_{Ringing}$ to say $T_{Ringing(2)}$ as shown in the figure 3.3, the higher value of time duration allowed to called party to answer may require engagement of network resources to alert the called parties for additional time. It might be seen as an additional impact on network resources, but in fact, it may bring benefits to the TSPs by completing calls as answered calls. This would avoid unnecessary repeat attempts from both sides calling or called party. From perspective of customers, more calls being answered in a first instance and network not releasing calls forcefully when called party is about to answer is an improvement in quality of service. Benefits may be seen in terms of

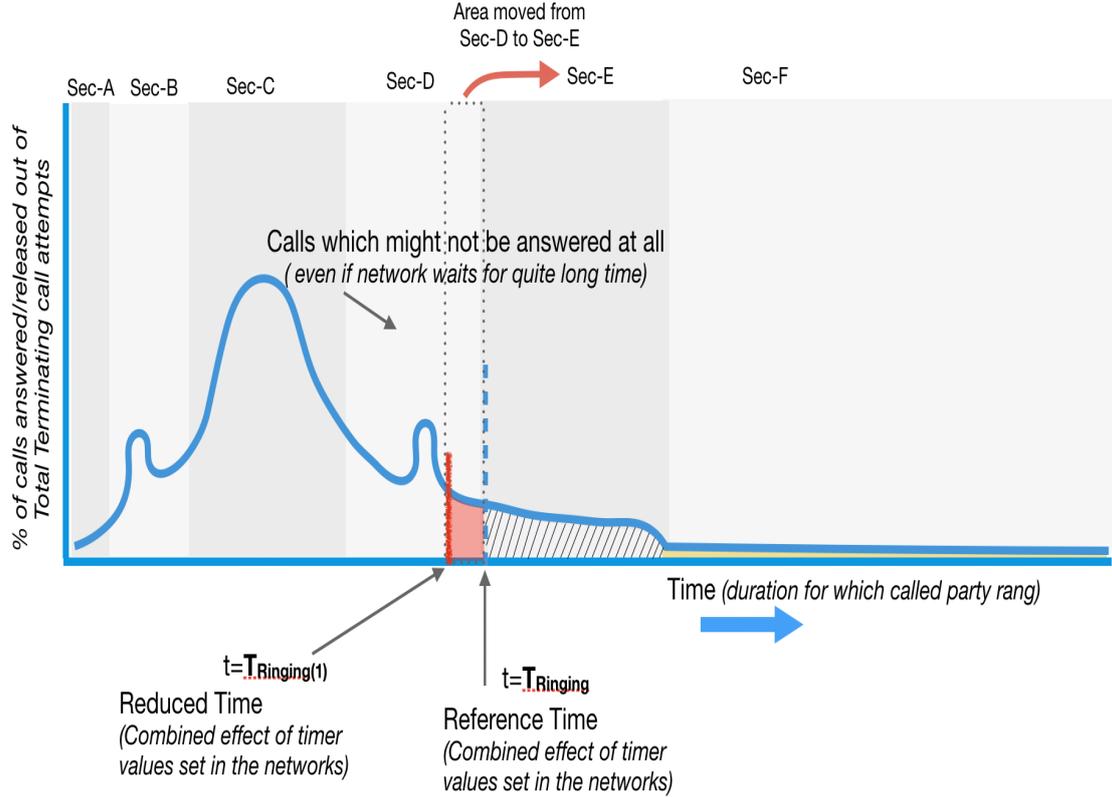


Figure 3.2: Impact due to reduction in T_{Ringing} value

decrease in the value of C_{REL} to a value say $C_{\text{REL}(2)}$. In view of this, it becomes important to properly align the alert time duration keeping all aspects into the consideration. Area shaded in green colour indicates additional impact on the network resources while change in the values of C_{REL} indicates benefit brought to the customers.

3.2.3 The figure 3.4 depicts cumulative percentage of calls getting answered or released by the calling party over a time period. As calls gets answered or released by the calling party, network resources are released which were engaged in alerting those calls. Benefit of changing maximum time duration is only for those calls which remains unanswered or not released by the calling party. Area under region shaded in red colour indicates time period and quantum of network resources engaged in alerting the called party. Area of this shaded region after point T_{Ringing} is depicted in bit darker shade to indicate that network resources will no more engaged as network will force calls to release if calls remains unanswered and the timer set gets expired. T_{Ringing} is set to save the resources unnecessarily engaged in alerting the called parties which are unlikely to answer the call. By changing T_{Ringing} to $T_{\text{Ringing}(1)}$ or $T_{\text{Ringing}(2)}$, there will be additional area which will either be excluded or included depending on whether time is increased or decreased. Actual benefits would be dependent upon the size and shape of the cumulative curve. If networks have the capability to offer customized time duration

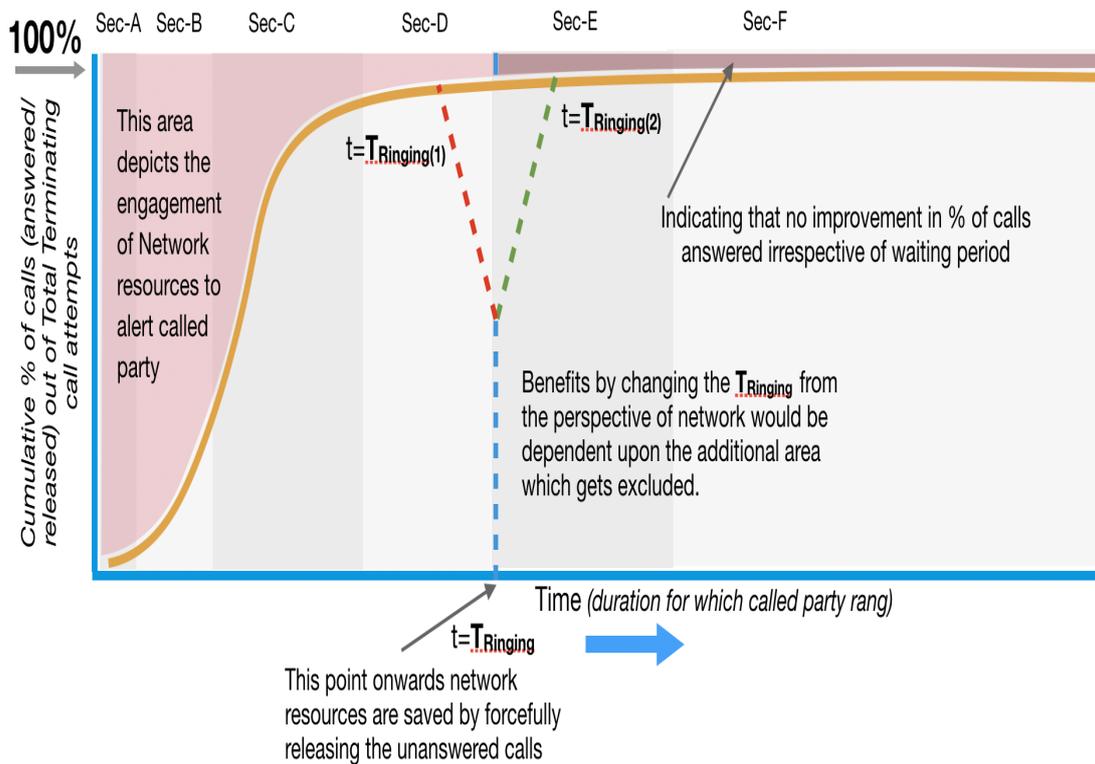


Figure 3.4: Impact on network resources by changes in T_{Ringing} values

incoming Minutes of Usage (MoU) for different access providers. This phenomenon is not related as such with the maximum time duration of alerting called party.

3.3 International Practices

Information about practices followed by other operators in different countries were also searched in the public domain and inputs provided by the telecommunication operators in India were also analyzed. It was found that UK telecommunication regulator Ofcom has considered that calls that are allowed to ring for less than 15 seconds before being terminating (unless answered before then) by the calling party, or are left ringing for extended periods, are likely to cause more harm and are likely to be subject to enforcement action¹. In Australia, Telestra and Optus, Vodafone in UK have configured their networks with ringing duration as 15 seconds while and AT&T in USA has set default value as 20 seconds and Verizon in USA has configured with fixed value as 30 seconds². Appropriate time for ringing duration also depends upon user's behaviour which may be country specific and value discovered as

¹https://www.ofcom.org.uk/data/assets/pdf_file/0024/96135/Persistent-Misuse-Policy-Statement.pdf

²<https://community.verizonwireless.com/t5/Verizon-Wireless-Services/Can-I-change-how-long-the-phone-rings-before-going-to-voice-mail/td-p/1028419>

appropriate in case of one country might not be appropriate for another one.

3.3.1 Customer specific options: Some of the International operators such as Telestra³ and Optus⁴ in Australia, Vodafone⁵ in UK, AT&T⁶ in USA have mentioned on their websites that customers can change duration of ringing by dialling some specific codes. It is mentioned that Telestra users may change ringing time from 15 seconds to 30 seconds, users of Vodafone in UK can change values from 5 seconds to 30 seconds, users of AT&T can change value from 6 seconds to 36 seconds. In most of the cases granularity of change is of 5 seconds. Such options may be useful to set customized values depending upon user specific scenarios such as old age users. It might be important to find out current capabilities of networks deployed in the Indian Telecommunication network. If such facilities can not be offered immediately, then how and when such capabilities may be acquired and offered to the users. It may help to set better values of timers for optimal utilization of the resources. In such cases, in addition to discovering appropriate default value of T_{Ringing} , there would be need to discover appropriate range of values, say T_{max} , T_{min} and a granular value, which is available as an option to the customer to modify settings of ringing duration for his own purpose. If call remains unanswered even after the duration of time set by the customer to ring then it would be a terminating network which is supposed to take first action to force release the call, and to happen this, timer values at terminating network need to be lower than values at originating network.

3.3.2 To modify values of ringing duration, network may be required to offer standard procedures such as dialling a specific set of codes on the end user devices to modify the settings. One of the telecom operators of United Kingdom, Vodafone is offering its customers to modify the duration of alert by dialling a specific code `**61*121*11*` (Number of Seconds)⁷. Telestra, operator of Australia, has specified code `**61*101**`(number of seconds)⁸ to modify duration of alert. Another operator of Australia, Optus, has specified code as `**61*321**`(number of seconds)⁹.

It is also required to explore that with the use of Artificial Intelligence (AI) and Machine Learning (ML), whether network can adapt behaviour best suitable to a particular subscriber.

³<https://crowdsupport.telstra.com.au/t5/Samsung/How-to-extend-the-ring-time-of-my-mobile/td-p/122064>

⁴<https://www.optus.com.au/for-you/support/answer?id=1424>

⁵<https://support.vodafone.co.uk/Using-our-network/Voicemail/40854185/How-do-I-increase-the-time-before-a-call-goes-to-voicemail.htm>

⁶<https://www.att.com/esupport/article.html/u-verse-voice/KM1010611?gsi=1fn9oy>

⁷<https://support.vodafone.co.uk/>

⁸<https://crowdsupport.telstra.com.au/>

⁹<https://www.optus.com.au/for-you/support/>

It may also be useful to discover the technical options and capabilities of the networks to have different ringing duration in case of commercial communication calls. In case of commercial communications, called party may not like to forward it to their voice mails.

3.4 Information needed for further analysis

In view of the discussions in previous paras, following data or information might be helpful to form the opinion or take decisions with regard to the issues under consultation:

- (i) 'Ringing time from customer's perspective before network force call release if call remains unanswered in the fixed line and mobile network, License Service Area wise and Technology wise.
- (ii) Distribution graph as described in previous paragraph with actual data
- (iii) Impact on ASR (Answer to Seizure Ratio) with different timer value configuration.
- (iv) Impact of different timer value on different use case scenarios, such as call forwarding, call waiting, wearable smart devices, parallel calling, cascaded calling etc.

Chapter 4

Issues for Consultation

Q. 1. Can the the arbitrary value of T_{Ringing} impacts consumer experience? Please give your views with detailed justifications.

Q. 2. How to discover the appropriate values of T_{Ringing} from customer's perspective? What may be the guidelines to be followed when configuring specific values of relevant timers in the originating and terminating networks to achieve T_{Ringing} ? Please give your views with detailed justifications

Q. 3. Is there a requirement to configure values of timers related to ringing in a uniform manner across the networks or is there also a requirement to maintain additional time margins for the timer in the originating network with respect to the typical values of timer configured in the terminating networks? Please suggest typical values for T_{Ringing} along with supporting data and explain with detailed justifications.

Q. 4. Whether customers need to be offered options to change or modify the duration of ringing time particularly for them? If yes what should be the typical range of values within which one can set the values and what should be the granularity to make such a change? To modify values, What procedure is suggested to be followed by the customer to make such changes? Please give your views with detailed justifications.

Q. 5. How to discover the appropriate values of percentage of calls that can be force released by the network i.e. value of C_{REL} , which may be acceptable in general from customer's perspective? How this value affects with the changes in value of the T_{Ringing} ? Please suggest typical values for C_{REL} along with supporting data and explain with detailed justifications.

Q. 6. How the impact on the utilization of different types of telecommunication

resources such as radio spectrum, point of interconnect etc. may be assessed due to the change in the values of timers, related to duration of ringing, configured at originating network or at terminating network? Please provide details of computation methodology to make such assessment along with supporting data to justify the suggested value of T_{Ringing} .

Q. 7. Whether networks can be adaptive by utilizing Artificial Intelligence (AI) and Machine Learning (ML) techniques to discover appropriate value of ringing duration specific to a subscriber or class of subscriber? Whether networks can also differentiate commercial calls from normal calls from the perspective of ringing duration? Please provide inputs and give your views with detailed justifications.

Q. 8. Any other issue which is relevant to this subject?