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Call Drop Rate on Cellular Network (Case Study of PT Indosat, Tbk Palembang)

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Abstract-Call Drop Rate (CDR) is an occurrence where when a person is making a call but without one of them (both the caller and the person who is called) disconnect the call suddenly the phone was disconnected by itself, because of the poor signal quality usually caused by something. For example the failure of a network to handover, Congestion, weak signal transmit power and others, with various parameters that can interfere with voice services, it is necessary to have an appropriate analysis to overcome the problem of Drop Call so that there will be an effective solution. The area network ,that is used for this study, is only in the area of Palembang which is in some sectors BTS PUSRI2, RAMBUTAN_PL3, DMATA_MERAH3, MAKARTI_JAYA3, and only discuss about GSM network technology based on Call Drop Rate (CDR) parameter. Based on the CDR value range, the result of the test drive and the result of the measurement data indicates that the CDR in the 4 cell is on average in the range of 3.00% or in other words the call failure rate of <5% ie under 2 failed calls in 100 times the call with time at the same time.

Keywords-call drop, handover, congetion, signal

I. Introduction

The rapid development of telecommunication technology, which began with the use of Voice over Internet Protocol (VoIP) technology, is a satellite technology that allows communication where, when and with anyone. Another one is the mobile telecommunication technology. This technology continues to evolve from the first generation in the 80s using Advanced Mobile Phone System (AMPS). AMPS which use analog technology works at 800 Mhz frequency and Frequency Division Multiple Access (FDMA) methods. In the 90s, the second generation (2G) emerged. Global System for Mobile (GSM) method with the combined access technology between FDMA (frequency division multiple access) is used and TDMA (Time Division Multiple Access) which has started to shift the existence of AMPS . This technology works at a frequency of 900 Mhz. The third generation (3G) comes from the result of the communication technology path which is the continuation of GSM / GPRS / EDGE and CDMA (IS-95 or CDMA one). 3G technology uses Universal Mobile Telecommunication Service (UMTS) method that can be obtained at 5KHz frequency. And the latest is the fourth generation that we have been familiar with recently, 4G. This 4G uses Orthogonal Frequency Division multiplexing (OFDM) and Multi Carrier technologies.

As a matter of fact, every network often encounters a problem in the network itself such as at the time of communication. One example is when a user does a voice call, Drop Call often occurs. Call Drop Rate (CDR) is an occurrence when a person is making a call without one of them neither the caller nor the one who answers disconnects the call, but suddenly it is disconnected by itself. This happens because of poor signal quality caused by several things, namely the failure of a network handover, congestion, weak signal transmit power and others [2]. Handover is an incident of EU channel movement without the occurrence of disconnection and interference from the user. Handover occurs because the movement of MS or EU is out of the original cell coverage and enters the new one [5].

Starting from a variety of parameters that can influence the voice services, it is necessary to apply an appropriate analysis to overcome the problem of Drop Call so that an effective solution can be achieved.

Call Drop Data is the result of the division of Call Attempt data (number of calls entered during the observation period) divided by Call Drop during the observation and multiplied by 100 so that the data collected in the form of percentage refers to the KPI (Key Performance Indicator) standards owned by PT. Indosat, tbk. It was determined that Call Drop can be said to be fair if ≤3,0%. [3]

Call Drop Rate Calculation Formula (CDR)

$$CDR = \frac{Call\ Drop\ Rate}{Call\ Attempt}\ x\ 100 \qquad (1)$$

II. Methodology

The network areas used as discussion were only in Palembang such as, BTS PUSRI2, RAMBUTAN_PL3, DMATA_MERAH3, and MAKARTI_JAYA3. This research only discussed GSM network technology based on Call Drop Rate (CDR) parameter.

In this study the researchers used action research methods. This research utilizes the real action in the form of innovative development process that "tried on the go" in detecting and solving the problems. [1] It consists of several stages, such as:

Diagnosing

At this stage the researchers made a diagnosis or initial analysis of Call Drop data so that it could generate problems that might occur in the Sector that experienced Call Drop.

Action Planning

The devices needed to make improvements of the Call Drop cause were hardware and software.

Action Taking

Conducting an action plan must be based on what has been planned. At this stage, the researchers began to check and collect some important data and improvements to BTS that experienced a low level of customer success in making calls.

The action plans conducted based on Standard Operating Procedure (SOP) at PT. Indosat, Tbk, were:

1. Taking a list of sectors that experienced Call Drop.
2. Analyzing the problems occurred in the sectors that experienced the Call Drop degradation.
3. Checking performance data for 7 days.
4. Rechecking the data for the comparison analysis in the field whether or not Call Drop Rate had decreased.

Observation

In this stage, the researcher evaluated the results of the Action performed and checked the measurement data in order to make the overall comparison.

Learning

Learning was the final stage of this research. The researchers did the final procedure which was the documentation and reported the results of the stages being passed.

III. Results & Discussion

The data taken were the one-week Performance KPI from April 25th to the 30th owned by PT.Indosat, Tbk Palembang based on Call Drop Rate (CDR) parameter at 4cell in Palembang region which experienced Call Drop Rate (CDR) level above the standard.

TABLE I. SAMPLE OF THE TRAFFIC VALUE AND CDR EFFECT

BTS_NAME	DATE	CALL_ATTEMPT /USER	CDR /USER	CALL_DROP (%)
PUSRI2	4/24/2016	872 /User	55 /User	6.3 %
PUSRI2	4/25/2016	349 /User	31 /User	8.88 %
PUSRI2	4/26/2016	229 /User	53 /User	23.14 %
PUSRI2	4/27/2016	367 /User	46 /User	12.53 %
PUSRI2	4/28/2016	421 /User	32 /User	7.6 %
PUSRI2	4/29/2016	128 /User	31 /User	24.21 %
PUSRI2	4/30/2016	572 /User	52 /User	9.09 %
RAMBUTAN_PL3	4/24/2016	443 /User	27 /User	6.09 %
RAMBUTAN_PL3	4/25/2016	134 /User	13 /User	9.7 %
RAMBUTAN_PL3	4/26/2016	190 /User	44 /User	23.15 %
RAMBUTAN_PL3	4/27/2016	428 /User	32 /User	7.47 %
RAMBUTAN_PL3	4/28/2016	274 /User	45 /User	16.42 %
RAMBUTAN_PL3	4/29/2016	317 /User	28 /User	8.83 %
RAMBUTAN_PL3	4/30/2016	386 /User	42 /User	10.88 %
D_MATA_MERAH3	4/24/2016	1212 /User	74 /User	6.1 %
D_MATA_MERAH3	4/25/2016	318 /User	29 /User	9.11 %
D_MATA_MERAH3	4/26/2016	478 /User	98 /User	20.5 %
D_MATA_MERAH3	4/27/2016	945 /User	68 /User	7.19 %
D_MATA_MERAH3	4/28/2016	218 /User	36 /User	16.51 %
D_MATA_MERAH3	4/29/2016	658 /User	82 /User	12.46 %
D_MATA_MERAH3	4/30/2016	438 /User	42 /User	9.58 %
MAKARTI_JAYA 3	4/24/2016	2178 /User	286 /User	13.13 %
MAKARTI_JAYA 3	4/25/2016	1484 /User	111 /User	7.47 %
MAKARTI_JAYA 3	4/26/2016	2178 /User	287 /User	13.17 %
MAKARTI_JAYA 3	4/27/2016	1836 /User	183 /User	9.96 %
MAKARTI_JAYA 3	4/28/2016	2841 /User	241 /User	8.48 %
MAKARTI_JAYA 3	4/29/2016	973 /User	210 /User	21.58 %
MAKARTI_JAYA 3	4/30/2016	1972 /User	236 /User	11.96 %

There were several factors that caused CDR in Pusri2, Rambutan13, Dmatamerah13, Makartijaya3 areas such as: the failures in transmission, line antenna, VSWR (volt standing wave ratio), and system module. Here are the following details of the problems occured in each BTS:

1. BTS Pusri 2

   Problem happened was ET / E1 transmition failure from the BTS side that experienced Block degradation with Chanel Failure alarm indication refered to the weak quality of ET / E1 due to hang system. Thus, the action was done by resetting ET / E1 and manually increased the canal.

2. BTS Rambutan 13

   In this BTS, Antenna Line Failure occurred. The sector analysis condition of Rambutanpl3 resulted that there were some blocked TRX that caused some channel could not be occupied for call. Moreover, the side of alarm referred to signal transmitting antenna. Thus, action done was switching the device.

3. BTS Dmatamerah3

   VSWR or Volt Standing Wave Ratio occurred in this BTS. RF_Module failure and leakage of the frequency channel feeder cable to the antenna transmitter. The results of the BTS situation and condition analyses and the alarm indicated that the RF_Module and feeder to the antenna transmitter were damaged and resulted weak signal transmit power on coverage. The action performed was replacing the damaged device.

4. BTS Makartijaya3

   In this BTS System_Module failure happened. By checking the condition of the BTS that experienced block and the alarm obtained, this was caused by System_Module failure that could not distribute its

frequency to RF_Module and the transmitter antenna as well. That was why it could not provide good signal quality and System_Module device must be replaced.

After conducting several actions for the treatment, the researchers took 1 week data of post-improvement in order to obtain the comparison between CDR rate before and after. This following table shows the detailed results.

TABLE 2. DESCRIPTION OF PROBLEMS, RESULTS OF ANALYSES AND ACTIONS TAKEN

BTS_NAME	DATE	CALL_ ATT	CDR /USER	CDR (%)	DATE	CALL_ ATT	CDR /USER	CDR (%)
PUSRI2	4/24/2016	872	55	6.3	7/18/2016	921	21	2.2
PUSRI2	4/25/2016	349	31	8.88	7/19/2016	521	15	2.8
PUSRI2	4/26/2016	229	53	23.14	7/20/2016	374	11	2.9
PUSRI2	4/27/2016	367	46	12.53	7/21/2016	421	7	1.6
PUSRI2	4/28/2016	421	32	7.6	7/22/2016	531	15	2.8
PUSRI2	4/29/2016	128	31	24.21	7/23/2016	182	4	2.1
PUSRI2	4/30/2016	572	52	9.09	7/24/2016	481	12	2.4
RAMBUTAN_PL3	4/24/2016	443	27	6.09	7/18/2016	589	16	2.7
RAMBUTAN_PL3	4/25/2016	134	13	9.7	7/19/2016	214	4	1.8
RAMBUTAN_PL3	4/26/2016	190	44	23.15	7/20/2016	271	3	1.1
RAMBUTAN_PL3	4/27/2016	428	32	7.47	7/21/2016	362	8	2.2
RAMBUTAN_PL3	4/28/2016	274	45	16.42	7/22/2016	341	7	2
RAMBUTAN_PL3	4/29/2016	317	28	8.83	7/23/2016	281	6	2.1
RAMBUTAN_PL3	4/30/2016	386	42	10.88	7/24/2016	388	10	2.5
D_MATA_MERAH3	4/24/2016	1212	74	6.1	7/18/2016	1137	31	2.7
D_MATA_MERAH3	4/25/2016	318	29	9.11	7/19/2016	215	4	1.8
D_MATA_MERAH3	4/26/2016	478	98	20.5	7/20/2016	321	9	2.8
D_MATA_MERAH3	4/27/2016	945	68	7.19	7/21/2016	861	22	2.5
D_MATA_MERAH3	4/28/2016	218	36	16.51	7/22/2016	312	8	2.5
D_MATA_MERAH3	4/29/2016	658	82	12.46	7/23/2016	522	12	2.2
D_MATA_MERAH3	4/30/2016	438	42	9.58	7/24/2016	328	7	2.1
MAKARTI_JAYA3	4/24/2016	2178	286	13.13	7/18/2016	1734	44	2.5
MAKARTI_JAYA3	4/25/2016	1484	11	7.4	7/19/2016	961	21	2.1
MAKARTI_JAYA3	4/26/2016	2178	287	13.17	7/20/2016	1162	31	2.6
MAKARTI_JAYA3	4/27/2016	1836	183	9.96	7/21/2016	1120	26	2.3
MAKARTI_JAYA3	4/28/2016	2841	241	8.48	7/22/2016	1942	12	0.6
MAKARTI_JAYA3	4/29/2016	973	210	21.58	7/23/2016	821	21	2.5
MAKARTI_JAYA3	4/30/2016	1972	236	11.96	7/24/2016	1842	33	1.7

The next process after giving treatments on the base stations experiencing problems was doing Drive Test for each BTS sector previously encountered Drop Call. Drive Test is the process of measuring the mobile communication system on the radio waves side of the air from the direction of Node B to the EU or vice versa, by using a phone designed specifically for measurement. Drive Test aims to measure the quality of the signal in real time so that it can analyze the quality of the signal to repair all the problems related, especially for cellular technology. The information displayed in this mode was obtained from the TEMS device directly during the Drive Test [4].

Drive Test Pusri2

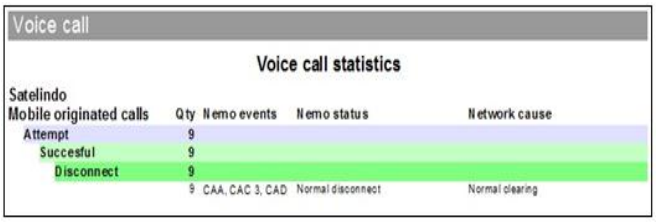


Figure 1. Drive Test Result in Pusri2 area

The result of Drive Test showed that the 9 times call were successfully done and manually terminated by the user.

Drive Test Rambutanpl3

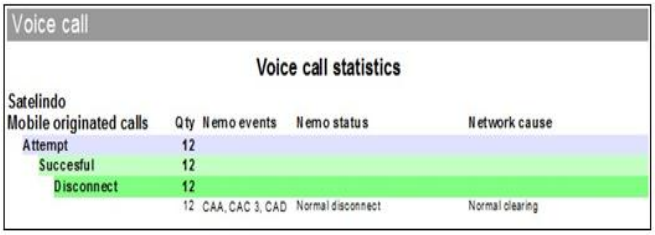
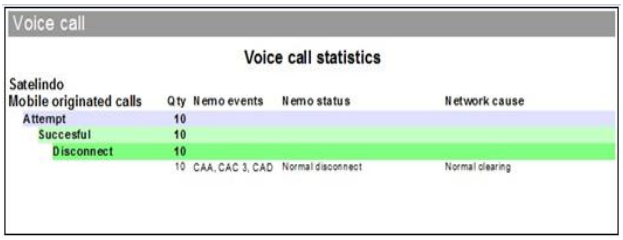


Figure 2. Drive Test Result in Pambutanpl3 area

The result of Drive Test showed that the 12 times call were successfully done and manually terminated by the user.

***Drive Test* Dmatamerah3**


Voice call

Voice call statistics

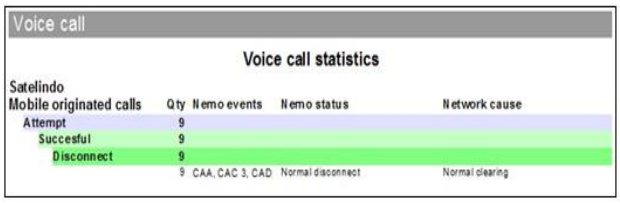
Satelindo

Mobile originated calls	Qty	Nemo events	Nemo status	Network cause
Attempt	10			
Succesful	10			
Disconnect	10			
	10	CAA, CAC 3, CAD	Normal disconnect	Normal clearing

Figure 3. Drive Test Result in Dmatamerah3 area

The result of Drive Test showed that the 10 times call were successfully done and manually terminated by the user.

***Drive Test* Makartijaya3**


Voice call

Voice call statistics

Satelindo

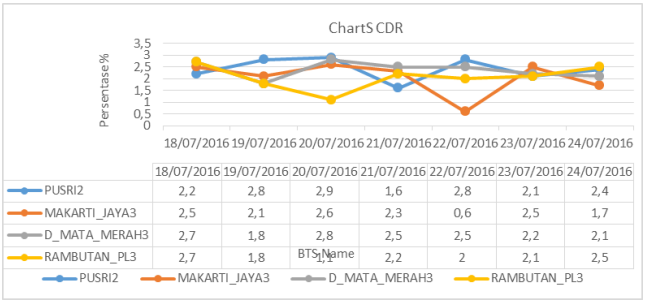
Mobile originated calls	Qty	Nemo events	Nemo status	Network cause
Attempt	9			
Succesful	9			
Disconnect	9			
	9	CAA, CAC 3, CAD	Normal disconnect	Normal clearing

Figure 4. Drive Test Result in Dmatamerah3 area

The result of Drive Test showed that the 9 times call were successfully done and manually terminated by the user.

Evaluation

Assessing the initial observation as well as action improvements and Drive Test results conducted, it could be proven that the problems had been clear. The following results show the improvement of customer success in making calls in accordance with the stages described previously.



	18/07/2016	19/07/2016	20/07/2016	21/07/2016	22/07/2016	23/07/2016	24/07/2016
PUSRI2	2,2	2,8	2,9	1,6	2,8	2,1	2,4
MAKARTI_JAYA3	2,5	2,1	2,6	2,3	0,6	2,5	1,7
D_MATA_MERAH3	2,7	1,8	2,8	2,5	2,5	2,2	2,1
RAMBUTAN_PL3	2,7	1,8	2,2	2,2	2	2,1	2,5

Figure 5. Graph of Call Drop decrease percentage

The graph of measurement above shows that the call disconnection rate was <3% and had met the KPI standards thus the success rate of the users in making calls could be suppressed and maximally support the traffic. Additionally, Call Drop could also be pressed and support the network quality significantly.

IV. Conclusion

1. In spite of many factors affecting the CDR, dominant weather factor, especially the bad one can also affect the quality of the radio transmission. It causes the number of devices cannot work optimally and the performance is reduced. In addition, the weaker and the older the device can also be a determining factor in making the device lacks functioning optimally.
2. For cells experiencing CDR on 24/04/2016 until 18/07/2016 had increased significantly. Based on the CDR value range, the results of the drive test and measurement data indicated that the CDR in the 4 cell was on average in the range of 3.00% or in other words the call failure rate of <3% ie under 2 failed calls in 100 times call at the same time

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