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ANALYSIS OF FAILURE CALLS CAUSED BY BLOCK CALL AND HANDOVER ON MOBILE COMMUNICATION SERVICE IN THE ROUND OF LHOKSEUMAWE CITY

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Abstract - Besides the availability of telecommunications services, providers of mobile communication services must also attention to the quality of the services they provide. Quality of service can be seen from the percentage of call failures. The conditions that most often cause failures when making a call are block calls and handovers. A measurement-based analysis of data is needed that can be used by communication service providers to improve the quality of their services. This research was conducted in Lhokseumawe city with two different providers, Telkomsel and XL. Measurements were taken directly through the drivetest using TEMs Investigation software. After making a call, the data recorded are a block call and handover. It also recorded the drivetest parameter capacity of the call, that is Received Signal Code Power (RSCP) and Energy Chip per Noise (Ec / No). The results showed that the Telkomsel provider had done a quite good network optimization. This is indicated by the measured RSCP value of -82.00 dBm and Ec / No value of -12.00 dBm. There was no block call in the city of Lhokseumawe. A new block call occurs in the Geudong region with a RSCP value of -82.00 dBm and an Ec / No value of -23.00 dBm. Meanwhile, for XL providers, a block call has occurred in the Lhokseumawe city with a RSCP value of -107.00 dBm and an Ec / No value of -17.50 dBm. It is estimated that the cause of the block call is the signal level weakened due to the blocking area by buildings or trees. This shows that network optimization by XL is not good enough. When the drive test enters the Geudong region, data records cannot be performed due to the unavailability of 3G services of XL provider in this region. However, both Telkomsel and XL showed a 100% successful handover which means the percentage of failure was 0% or there was no failure when diverting calls.

Key words: block call, handover, drivetest, RSCP, Ec/No

I. INTRODUCTION

Beside the availability of telecommunications services, telecommunications service providers must also pay attention to the quality of the services they provide. However, even though telecommunications service providers have tried to maintain the quality of their services, there are still interruptions that cause communication processes to fail. Especially with the increasing number of customers. Increasing the number of customers of an operator not only results increased in revenue, but also will be increase in the number of unsuccessful calls. The percentage of failure is one of the determinants of network performance [1]. The occurrence of these failures can be caused by network conditions, as well as device conditions on the user's side [2]

The conditions that most often cause failures when making a call are handovers and block calls. Handover is a way that allows users to move services from one sector to another both within one BTS and between BTS without any termination and the frequency/channel switching automatically occurs by the system [3].

Meanwhile, a block call is the inability of the system to receive and make call services because the available channels are already filled. So when making a call the user must wait or be disconnected due to circumstances not allowing to make a call [4]. Block call is an event that can occur only before the call is completed between the recipient and the user. The completion of the call is intended that the connection has been completed for one of the parties to exchange talks. For every call made on the cellular network, the service provider must find all the resources needed to connect the call between the two parties. If calls are long distance, the service provider must ensure that there is sufficient network capacity through the intermediary network to carry calls from one end to the other. If there is not enough capacity to forward calls, this will result in blocked calls.

For the Lhokseumawe city area, there are several providers that provide communication services, two of them are Telkomsel and XL. In this study, the percentage of call failures caused by block calls and handovers from the those providers will be measured and compared. The study was conducted at several points around the city of Lhokseumawe. The measurement process is done by looking at the condition of the propagation channel through the driver test. Drive test according to its terminology is the measurement of the signal carried out to test the performance of a particular cell site or BTS [5]. This drive test is used for network optimization by first considering many other factors. The purpose of the drive test is to collect network information in real time in the field.

The parameters taken for measurements in this drive test are Received Signal Code Power (RSCP) and Energy Chip per Noise (Ec/No) [6]

- *Received Signal Code Power,* that is a parameter that indicates the received measurement from one code on the main signal channel. It can be interpreted the value shown by RSCP is the power at the signal that serves the mobile station to the signal strength level in the network.
  The signal strength categories according to [5] are shown in the following Table I.

Tabel I. Category of Signal Strength

Category	Remark
≥ -70 dBm	Excellent
< -70 dBm s/d ≥ -70 dBm	Good
< -80 dBm s/d ≥ -90 dBm	Quite good
< -90 dBm s/d ≥ -100 dBm	Bad
< -100 dBm s/d ≥ -110 dBm	Can not be used

- *Energy Chip per Noise*, that is the ratio in dB of chip energy to the total noise power measured in the main channel signal. Ec/No indicates network quality, which if the value is getting smaller means that the level of interference is high with the quality of data or voice on the operator's network.
  The signal quality categories according to [5] are shown in Table II.

Tabel II. Category of Signal Quality

Category	Remark
0 s/d ≥ -6 dBm	Excellent
< -6 dBm s/d ≥ -9 dBm	Good
< 9 dBm s/d ≥ -12 dBm	Quite good
< -12 dBm s/d ≥ -15 dBm	Bad
< -15 dBm	Can not be used

The information collected is the actual condition of Radio Frequency (RF) in a Base Transceiver Station (BTS) as well as within the scope of the base station sub-system (BSS) which is carried out in motion. The trip is equipped with digital maps, GPS, handsets and drive test software, such as TEMS.

TEMS is short for Test Mobile System. TEMS Investigation is used for setting and maintaining cellular networks [6]. The main devices for setting up and maintaining cellular networks are computers/note books that have TEMS installed, TEMS phones and GPS. One of the main features of TEMS is that it uses a cellphone with standard radio parts and standard power, which is an ordinary cellphone with modified software. Therefore TEMS will behave the same as a standard cellphone. However, it has additional features as a collector of information about signal level, signal quality, and much more as emitted by the BTS. One of the cell phones that are compatible with this software is the Sony Ericsson K800i. TEMS functions for cellular network analysis and optimization (usually used in drive tests and walk tests) both for testing signals depending on the type of TEMS investigation itself. Information that can be obtained by using TEMS is cell identity, base station identity code, BCCH carrier ARFCN, mobile station country code, network code, and serving cell area code. TEMS also provides information on RxLev, BSIC and ARFCN six neighboring cells; channel number, timeslot number, channel type and TDMA offset; channel mode, sub-channel number, hopping channel indication, mobile allocation index offset and hopping sequence number on a dedicated channel; RxQual, FER, DTX downlink, TEMS Speech Quality Index (SQI), Timing Advance (TA), TX power, radiolink timeout counter and C / A parameters [7]

A measurement-based analysis of data is needed that can be used by communication service providers to improve the quality of their services. From the measurement data obtained, it can be determined whether the communication services of the two providers still meet the service standards in conducting the communication process in the Lhokseumawe city area. Furthermore, it is hoped that both providers can determine the right strategy to improve service quality by reducing the percentage of communication failures caused by block calls and handovers.

II. METHODOLOGY

The study began with the selection of routes around Lhokseumawe. Next the drive test method will be determined. In this study the drive test method chosen was mobility. This method is done by passing a certain route. Basically the purpose of cellular communication is the mobility capability of the user, so this method is suitable for knowing the condition of a cellular network when the user moves from one place to another.

Materials and equipment used in this study are:

Laptop	: 1 Unit
Hp Sony ericsson k800i	: 1 Unit
Sofware TEMs Investigation	: 1 Unit
Telkomsel Card	: 1 Pc
XL Card	: 1 Pc
GPS	: 1 Unit
USB Cable	

The first thing to do is to determine the sub-route to which the call quality will be observed. The chosen route is from around the city of Lhokseumawe to the Geudong area. After determining the sub route, then do a drive test by passing the sub route that has been selected to retrieve data by voice method. With this method mobile devices are used to make calls to other users by short call. Calls are made over a short period of time, around 120 seconds repeatedly with pauses between calls for over a period of 5 seconds and repeated. Drive tests are carried out at a maximum speed of 80 km / h, with an average speed of 60 km / h in order to record the required data. After making a call, GPS is activated to detect areas that experience call interference such as block calls and handovers in that area. The measurement set up is shown in Figure 1

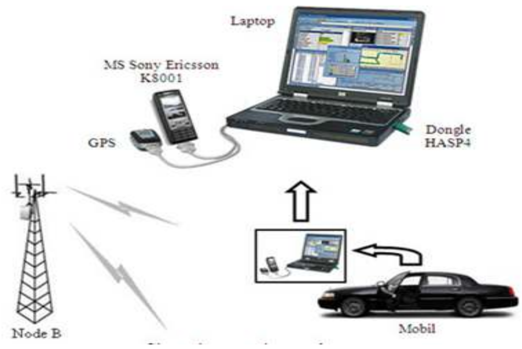

Figure 1. Set up of Measurement

The drive test results in the form of logfile data are then exported using the TEMs Investigation software which can then be used as a call quality analysis material. The parameters observed are block call and handover as well as Received Signal Code Power (RSCP) and Energy Chip per Noise (Ec / No).

The information displayed is obtained from the online TEMs device. For drive tests and recording logfiles, the condition of the equipment is connected during replay. The information displayed is read from the logfile. In this mode we can replay logfiles for inspection and analysis.

III. RESULT AND DISCUSSION

The percentage of communication service failures caused by block calls of the two providers observed in this study are displayed in the form of a line chart as shown in Figure 2 and Figure 3below.

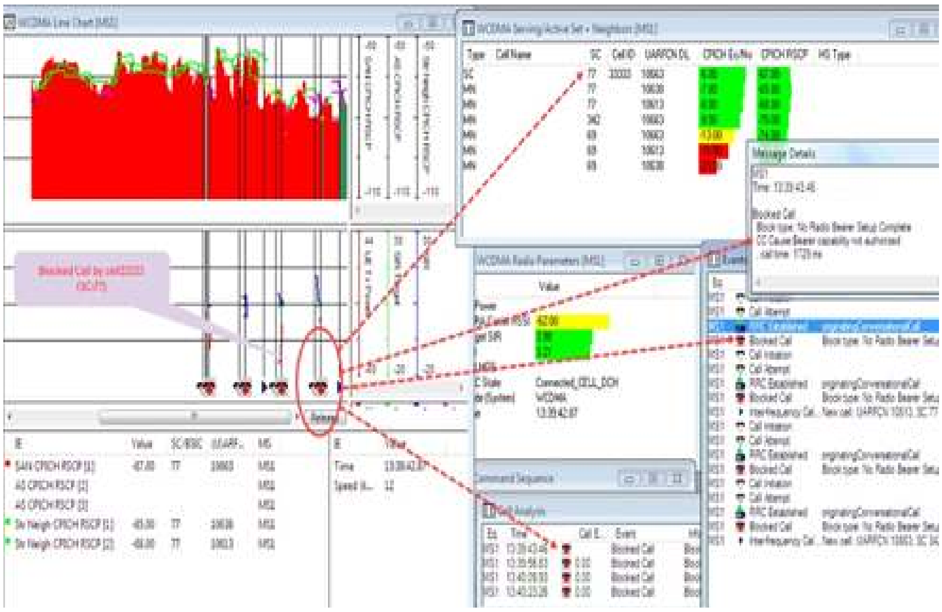

Figure 2. Line chart display of Telkomsel block call

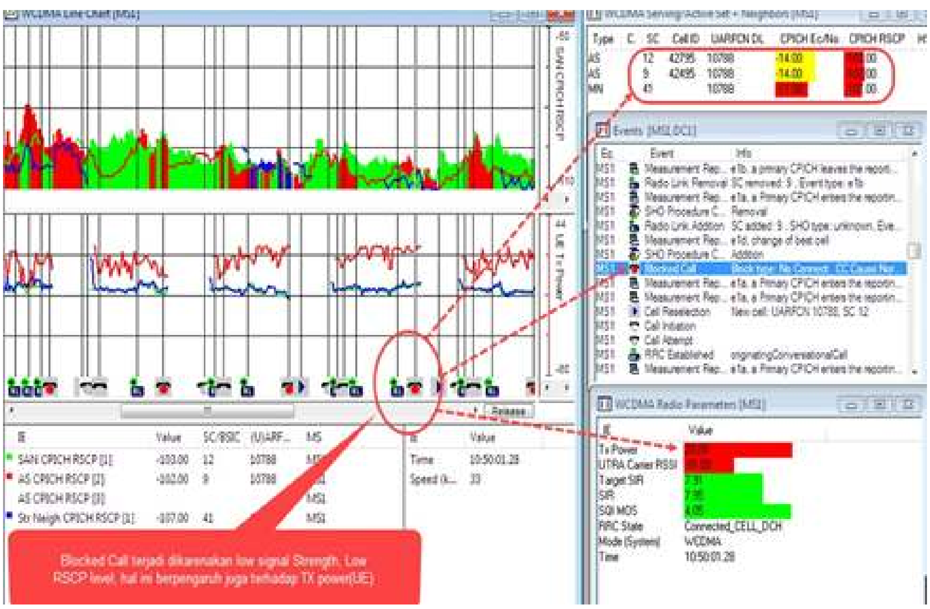

Figure 3. Line chart display of XL block call

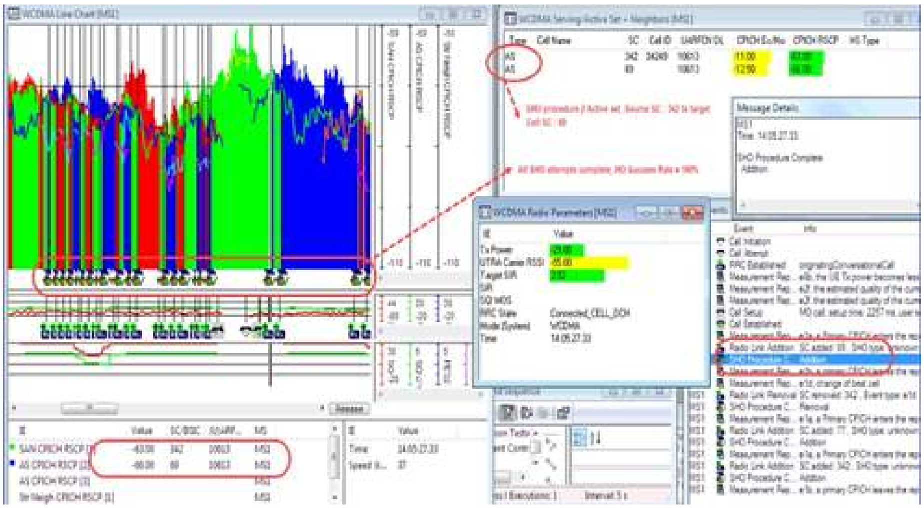

Figure 4. Line chart display of Telkomsel handover

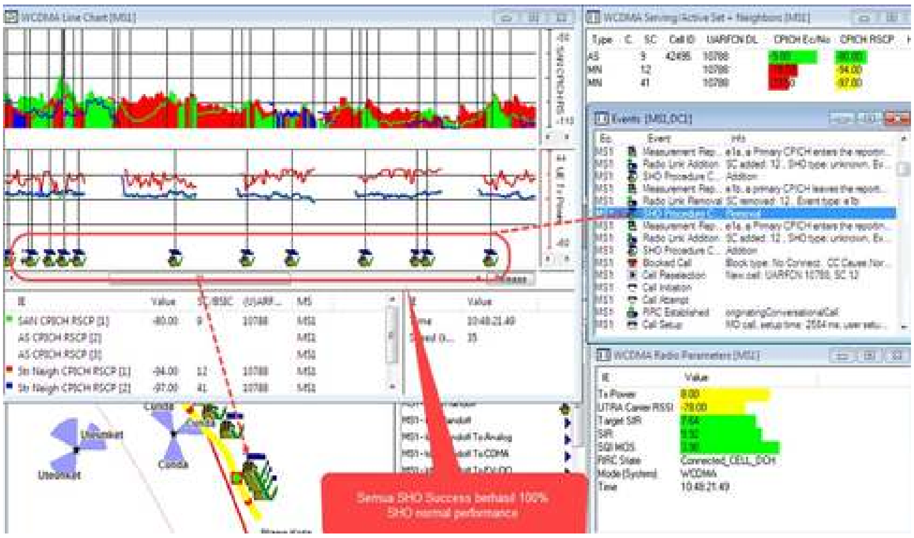

Figure 5. Line chart display of XL handover

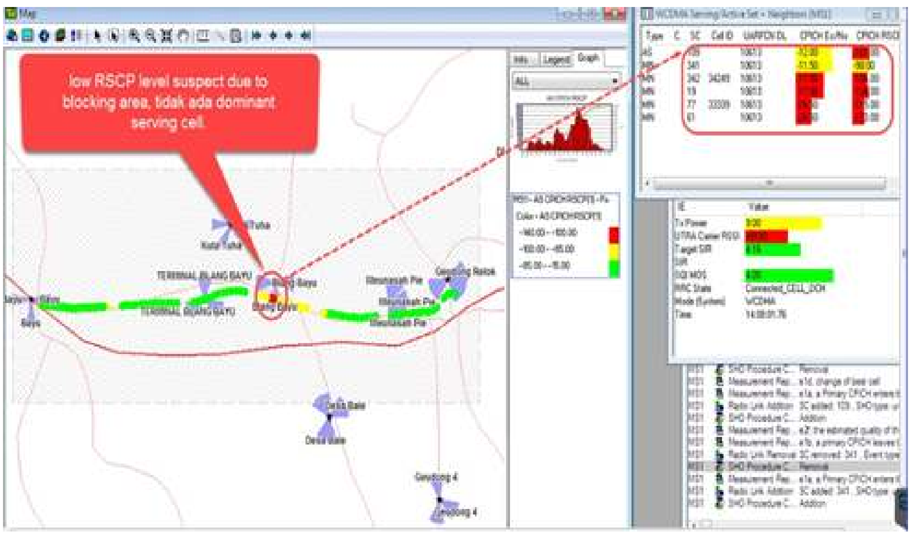

Figure 6. RSCP and Ec/No of Telkomsel

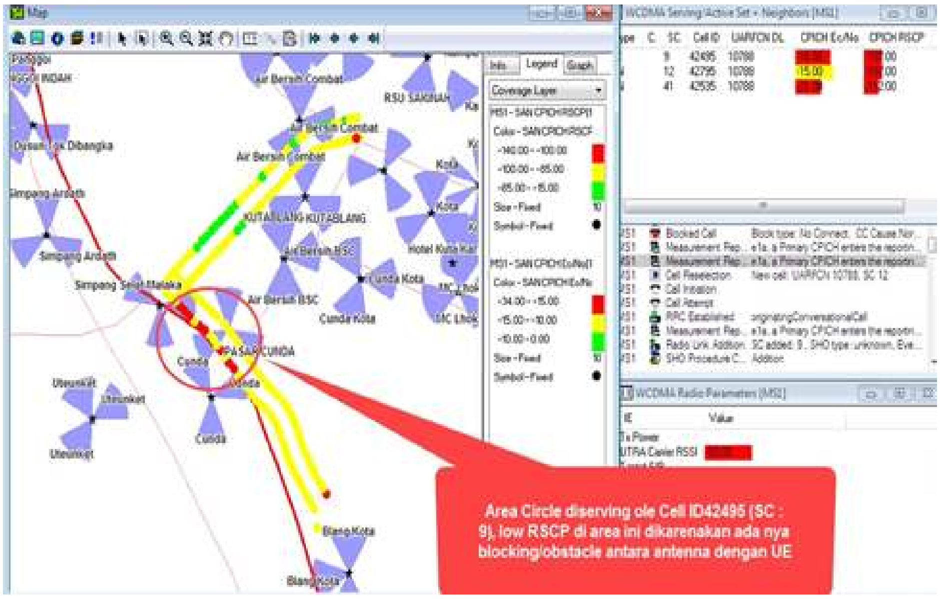

Figure 7. RSCP and Ec/No of XL

Furthermore, the percentage of communication service failures caused by handover of the two providers are shown in Figure 4 and Figure 5. Meanwhile, the results of the drive test and recording log file also produce Received Signal Code Power (RSCP) and Energy Chip per Noise (Ec/No) data as shown in Figure 6 and Figure 7.

When conducting a drivetest in the Lhokseumawe City area using the Telkomsel provider it was seen that there were no disturbances in the Lhokseumawe city area (no block calls). The reason is because the optimization of Telkomsel provider is done very well, so that it can prevent interference when making a call. The measured RSCP values are -82.00 dBm and Ec / No -6.00 dBm. However, upon entering Geudong, precisely in SC: 77 the disturbance began to appear marked by the RSCP value -82.00 dBm and the Ec / No value -23.00 dBm, resulting in a block call. Referring to Table I and Table II, the signal quality in this area is in the good category and the sound quality in the category is very bad (cannot be used), so a block call occurs. The reason for this condition is that there are too many users (full traffic) that call requests cannot be served. Block calls generated from Telkomsel providers when testing occurs 5 times in 40 calls.

Then, when conducting a drive test in the Lhokseumawe city area using the XL provider, a block call occurred on SC SC: 12, where the BTS signal condition was very bad. This is indicated by the signal strength (RSCP) weakening, thus affecting the signal sent by the EU (UMTS Equipment). In GSM systems, the EU is better known as the Mobile Station. The measured signal strength (RSCP) value is -107.00 dBm and the sound quality value (Ec / No) becomes -17.50. Based on Table I and Table II, it can be stated the condition of signal quality and sound quality in the very bad category (cannot be used). For the next BTS, signal conditions are still poor. It is estimated that the cause of the block call is the signal level weakened due to the blocking area by buildings or trees. This shows that network optimization by XL is not good enough. When the drive test enters the Geudong region, data records cannot be performed. This is due to the unavailability of 3G services in the region. When testing, block calls occur 20 times in 31 calls.

Hand over was success 100% when using the Telkomsel provider. This means that the percentage of failure for hand over is 0% or there was no failure. In this study the type of hand over that occurred was the type of soft handover. This can be seen from the testing mechanism where cells move from source to target without disconnecting existing connections. The steps taken to make the handover 100% successful are to provide more than one active set before actually releasing from source to target. With the availability of many active sets, it can handle 2 to 4 cell traffic by the same user.

Successful handover also occurs when using XL provider, meaning the percentage of failure for handover is 0% or without any failure. Drivetest continues into the Geudong area, but for the Geudong area there is no 3G network service available for XL operators. So there is no data that can be informed by TEMs Investigation when there is an interruption in making a call.

IV. CONCLUSION

For Telkomsel providers, a block call occurs in the Geudong area with a RSCP value of -82.00 dBm and an Ec / No value of -23.00 dBm. When conducting a test drive in the Lhokseumawe area, there were no interruptions during the call. This shows that network optimization by Telkomsel is good enough. In the Lhokseumawe city area, the measured RSCP value is -82.00 dBm and the Ec / No value is -12.00 dBm.

Meanwhile, for XL providers, a block call occurred in the Lhokseumawe city area with a RSCP value of -107.00 dBm and an Ec / No value of -17.50

dBm. This shows that the signal condition is very bad. It is estimated that the cause of the block call is the signal level weakened due to the blocking area by buildings or trees. This shows that network optimization by XL is not good enough. When the drive test enters the Geudong region, data records cannot be performed. This is due to the unavailability of 3G services in this region.

However, both Telkomsel and XL showed a 100% successful handover which means the percentage of failure was 0% or there was no failure when diverting calls.

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