Analysis Call Drop on CDMA Network Case Study PT.Telkom Indonesia Division Flexi Area Network

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Abstract*-This paper presence of technology cdma 2000-1x in mobile communication technologies when it began anticipated by the community as well as the operator Global System for Mobile communications (GSM) previously so in the telecommunications market.As technology new, cdma 2000-1x offer some of the more as a higher, the sound quality good, small prices and so on. In development arising there have been problems faced by cdma technology 2000-1x when make a call , one problem on technology cdma 2000-1x is a failure call or commonly known dropcall when customers are doing communication*

In this case, PT.Telkom Flexi set dropcall rate a maximum 2 % so that the quality of services stay awake .In the area network balikpapan been a bts who have not fulfilled standart namely bts124 _ kota hijau batakan value drop call rationya 2.04 % .We need to done optimize bts124 _ kota hijau batakan, by analyzing tilting antennas to the scope , safe distance

Key words: **drop call, CDMA 2000-1x, drop call rate**

I. INTRODUCTION

The development of the cell phone systems has witnessed a tremendous improvement in technology since the first cell phones were introduced at the beginning of the 1980s. The first generation (1G) of mobile phone systems were based on analogue technology and provided voice communications only. The first commercial analogue system to be launched was the Nordic Mobile Telephone (NMT) and shortly after, the Advanced Mobile Phone Service (AMPS) was commercially launched in the US. The Total Access Communication System (TACS) developed by Motorola was introduced in the UK and many other countries. These were the main mobile systems of the 1G that were developed around the globe but various variants were developed in other individual countries to suit their needs. The 1G mobile phone systems were very similar in concept; the voice information was carried on a frequency modulated carrier and a control

channel enables the voice signal to be routed to an available channel. The channel spacing used in these systems was different: NMT used a channel spacing of 12.5 kHz, AMPS a 30 kHz spacing, and TACS used a 25 kHz spacing. The penetration rate of mobile phone subscription was increasing rapidly around the world. However, since a limited spectrum was available for the mobile phone provision, the analogue technology could not meet the demand because of its inherent shortcomings. There was a great deal of research into the application of digital technology into mobile phone systems. The research has led to the development of the second generation (2G) wireless mobile phone system that has been deployed in the early 1990s.

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In a meeting in 1982 , the European Confrence of Postal and Telecommunication Administrations (CEPT), as a coordinating body for European state owned telecommunications organizations, decided to work towards a digital system to replace the multi-standards systems of 1G operation within the Europe at that time. To this end, CEPT established. the European Telecommunications Standards Institute (ETSI) in 1988 to lay down the specifications and recommendations for the new pan-European mobile system. This was known as the Global System for Mobile (cellular) communications (GSM) devised by the Special Mobile Group of ETSI. The GSM system operates in Europe within the 900 MHz band with channels spaced 200 kHz. It employs Time Division Multiple Access (TDMA) to carry data from up to eight users on each of the available time slots. Other bands in the 1800 and 1900 MHz bands are also used. The basic service offered by GSM system is essentially voice with low data rate communications.

Mobile system development in North America took a slightly different direction towards the evolution of mobile communications. Unlike the Europeans who opted for a new 2G mobile system, the North Americans adopted the Interim Standard 54 (IS-54) and later updated to Interim Standard 36 (IS-36), for Analogue AMPS and Digital AMPS (D-AMPS) systems to work side by side with the 2G mobile phone systems. The DAMPS employ TDMA technology with 30 kHz channel spacing to be compatible with existing AMPS. Again, as in GSM, D-AMPS provide voice services plus low rate data communications.

An important development took place in the mid 1990s in North America which allowed a major leap in mobile technology. A US firm called Qualcomm pioneered a totally new concept in mobile technology based on direct sequence spread-spectrum techniques, previously used for military communications. The multiple access used in this technology is called Code Division Multiple Access (CDMA). The new digital system was defined under Interim Standard 95 (IS-95A). Each channel has a bandwidth of 1.25 MHz and many users can communicate using the same bandwidth. The current mobile technologies, the wideband CDMA and the CDMA2000 standards are all natural migrants from earlier IS-95 system technologies [1].

The development of Mobile communications technology or cellular develops very rapidly over the past few years . Started from the first generation or generation analog in the 80s which then develops into digital generation in the 90s , and so when it has been used third generation of technology . For the time being , users GSM technology (global system for mobile communications) more than user a technology of cdma (code division multiple access) .This is a result of this is because of technology GSM were first

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introduced to the public .However, since the early 1990s, CDMA has been heavily investigated for commercial system. Of particular note is the success that CDM has experienced in commercial cellular systems [2]. The first commercial CDMA standard, IS-95, pioneered by Qualcomm Inc. ,was one of three mayor second generation cellular standard and led to a third generation of cellular system that was dominatated by CDMA technique (at least for voice services)

CDMA technology is constantly evolving to offer customer new, advanced services. The Mobile data speeds offered through CDMA phone are increasing, and new voice codecs provide speech quality close to wireline.Internet access is now available through CDMA terminals.There has been much talk of so-called third-generation (3G) data capabilities, where PCS providers will be able to compete with wireline service provides at high access speeds (3).

In terms of quality, Actually technology cdma not inferior to technology GSM and with the Low Price Relative .Technology is communication move have been applied in the our life for example make a call , send a short message (sms) , do internet access , etc .With the increasing number of demand subscribers will communications technology move , it takes also the quality of services satisfactory . Hence cellular operators also are competing to give the best services and Low cost.

On Technology CDMA every call communication will be certain codes unique so with the source of the same frequency conducted communication without any cross talk and interference . This is distinguish technology CDMA with GSM. On technology cdma, signals will be spread by spread spectrum deployed with the bandwidth 1.25 mhz., and repeater will be conducted decoding so that it will get information provided.

Users increasingly on the system of cdma in an area , it will be increasingly also many emerging problems , for example as the frequent drop the call .A service sound good quality influenced by signals from the network .The quality of the signals that bad usually caused by several things , for example the failure of a network perform handover , congestion , low power repeater and etc.

With various parameter that can interfere with the voice service , then required to a proper analysis to overcome problems drop call so that it will get a handling effective .Thus , Customer will have been served properly

Purpose in this study is to find intensity traffic and the level drop call users cdma 2000 1x (telkom flexi) in the area balikpapan every time.

Based on the background above , so formulation problems in this research was as follows:

1. How charts the intensity of traffic bts every time ?
2. Do service cdma 2000 1x on an area of network balikpapan have met drop call ratio maximum ?
3. Is there solutions if drop call ratio not maximum or have not fulfilled standart ?

II. RESEARCH METHODS

Data collection method is ways that can be used by researchers to collect the data.The success of the collection data is strongly influenced data collection method used.Data collected will be used as for analysis set . As for data collection method done in this research was by using the method

1.the method of observation.Here writer directly hold observation or research on one operator cdma namely PT .Telkom flexi balikpapan .In this observation the researchers had obtained data on were working from drop call that can be viewed from the perspective of: the value of call attempt and drop call .

2. Interview , In this case writer hold interviews with employees of pt .Telkom flexi balikpapan , in order to be more are free to ask you something pertaining to an object to be researched .This is processing

data for Call Ratio

$$Drop\ Call\ Ratio\ (\%) = 100\ X \left[\frac{\sum Total\ Drop\ Call}{\sum Total\ Call\ Attempt}\right] \text{.....(1)}$$

If drop call ratio having value under 2 % , so services cdma 2000 1x in bts telkom flexi area balikpapan considered to have been meet standart , if more than 2 percent and services needs to be improved .The number 2 % set itself by pt.telkom flexi .To optimize needs to be done to bts dropout call rate-nya over two % , it can be by controlling the slope antenna (tilting) and also calculation repeated safe distance interference re-use frequency

$$\alpha = \arctan\left[\frac{H}{D}\right] + \frac{\theta}{2} \text{ .....(2)}$$

α = large angular tilting antenna (o, degree)

H = High Antenna (m)

D = Distance BS dengan MS (m)

Θ = Vertical Beamwidth (°,degree)

Based on the it can be known coverage as the antenna with equation as follows :

) .....(3)

Safe Distance Interference Re-Use with equation as follows :

$(m) = \sqrt{3K}\ x\ Rtilt$ .....(4)

R tilt = Radius Cell (m)

H = High Antenna (m)

α = large angular tilting antenna (o, degree)

K = sum of frequency Re-use

III. RESULT AND DISCUSSION

In this Result of analysis drop call , From the data voice call attempt, sms call attempt and data call attempt for a week, so obtained the total number of call attempt every bts which is shown in table follows :

Tabel 1 : Data Call Attempt (Voice,Data & SMS)

NO	ID_BTS	BTS Name	Voice Call Attempt	Data Call Attempt	SMS Call Attempt	Totally Call Attempt
1	[1]	[542]-GUNUNG MALANG	74046	50378	17765	142189
2	[121]	[542]-POLDA KALTIM	20953	20542	4094	45589
3	[122]	[542]-Pertigaan DAM	50324	29383	9618	89325
4	[123]	[542]-Tangki Satu	47662	54550	12488	114700
5	[124]	[542]-Kota Hijau Batakan	12544	19187	3557	35288
6	[127]	[542]-KS Tubun STO	7614	5273	2217	15104
7	[131]	[542]-DIVRE 6	79360	113377	21293	214030
8	[132]	[542]-Sudirman_RT	74602	52168	14079	140849
9	[133]	[542]-Bluesky	46427	51549	10680	108656
10	[135]	[542]-Martadinata	65115	53447	16284	134846
11	[136]	[542]-Rapak	57841	60349	14907	133097
12	[14]	[542]-GUNUNG RAMBUTAN	64907	59055	17365	141327
13	[15]	[542]-PUPUK	22047	32068	5066	59181
14	[17]	[542]-BALIKPAPAN BARU	42354	47328	8095	97777
15	[2]	[542]-BATU AMPAR	46389	34286	10405	91080
16	[22]	[542]-Hotel Bandara_RT	28821	11165	7810	47796
17	[24]	[542]-RSS_DAMAI_TSEL	53287	77167	13392	143846
18	[6]	[542]-SEPINGGAN	17520	15471	4281	37272
19	[93]	[542]-Kampung Timur	56085	66441	14721	137247
20	[96]	[542]-A_Yani	41409	33481	18314	93204

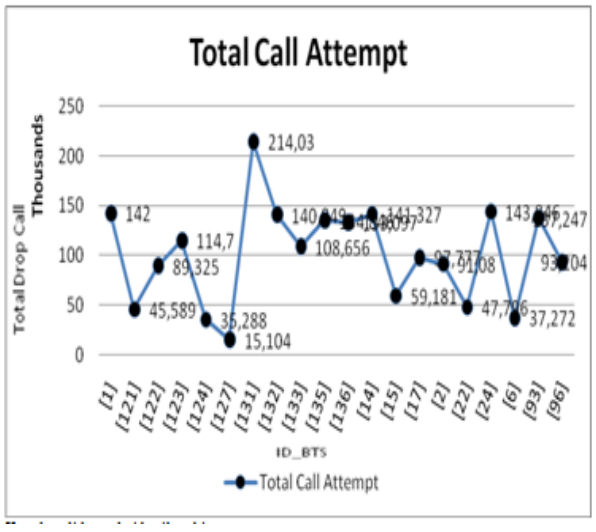

Figure 1 : Grafical Total Call Attempt

IV. ANALYSIS DROP CALL

Analysis drop call , shown in table follows table 2 . describe that comparison between total drop call and total call attempt.

Tabel 2 : Data Total Drop Call & Total Call Attempt

NO	ID_BTS	NAMA BTS	Total Drop Call	Total Call Attempt
1	[1]	[542]-GUNUNG MALANG	199	142189
2	[121]	[542]-POLDA KALTIM	77	45589
3	[122]	[542]-Pertigaan DAM	82	89325
4	[123]	[542]-Tangki Satu	117	114700
5	[124]	[542]-Kota Hijau Batakan	721	35288
6	[127]	[542]-KS Tubun STO	19	15104
7	[131]	[542]-DIVRE 6	177	214030
8	[132]	[542]-Sudirman_RT	268	140849
9	[133]	[542]-Bluesky	111	108656
10	[135]	[542]-Martadinata	185	134846
11	[136]	[542]-Rapak	189	133097
12	[14]	[542]-GUNUNG RAMBUTAN	161	141327
13	[15]	[542]-PUPUK	37	59181
14	[17]	[542]-BALIKPAPAN BARU	137	97777
15	[2]	[542]-BATU AMPAR	176	91080
16	[22]	[542]-Hotel Bandara_RT	235	47796
17	[24]	[542]-RSS_DAMAI_TSEL	222	143846
18	[6]	[542]-SEPINGGAN	532	37272
19	[93]	[542]-Kampung Timur	112	137247
20	[96]	[542]-A_Yani	116	93204

Can be concluded that the more large amount of call attempt or the dense traffic so it is likely that also the number of drop call BTS.

From of the equation (1) Drop call Calculation where drop call Ratio

The formula for a drop call ratio , the sum drop call divided by the number of call attempt .If drop call ratio smaller than 2 % , so its expressed traffic standards service or no need to optimize . And if drop call ration become more 2 % , So BTS need optimize

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Tabel 3 : Data Drop Call Ratio

NO	ID_BTS	NAMA BTS	Total Drop Call	Total Call Attempt	Drop Call Ratio Attempt
1	[1]	[542]-GUNUNG MALANG	199	142189	0.14
2	[121]	[542]-POLDA KALTIM	77	45589	0.17
3	[122]	[542]-Pertigaan DAM	82	89325	0.09
4	[123]	[542]-Tangki Satu	117	114700	0.10
5	[124]	[542]-Kota Hijau Batakan	721	35288	2.04
6	[127]	[542]-KS Tubun STO	19	15104	0.13
7	[131]	[542]-DIVRE 6	177	214030	0.08
8	[132]	[542]-Sudirman_RT	268	140849	0.19
9	[133]	[542]-Bluesky	111	108656	0.10
10	[135]	[542]-Martadinata	185	134846	0.14
11	[136]	[542]-Rapak	189	133097	0.14
12	[14]	[542]-GUNUNG RAMBUTAN	161	141327	0.11
13	[15]	[542]-PUPUK	37	59181	0.06
14	[17]	[542]-BALIKPAPAN BARU	137	97777	0.14
15	[2]	[542]-BATU AMPAR	176	91080	0.19
16	[22]	[542]-Hotel Bandara_RT	235	47796	0.49
17	[24]	[542]-RSS_DAMAI_TSEL	222	143846	0.15
18	[6]	[542]-SEPINGGAN	532	37272	1.43
19	[93]	[542]-Kampung Timur	112	137247	0.08
20	[96]	[542]-A_Yani	116	93204	0.12

The results of data processing that has been done , then got that the quality of services bts124 _ Kota Hijau batakan have not fulfilled standard because it has drop call ratio over two % , on the other hand the number of call attempt of bts this is not too large show trafiknya not solid , but drop call ratio that exceeds 2 % is caused by the scope of antenna a less well and control power from transmitter that bad .Ratio drop call the best owned by bts15 _Pupuk by value 0.06 % to drop call ratio call attempt.

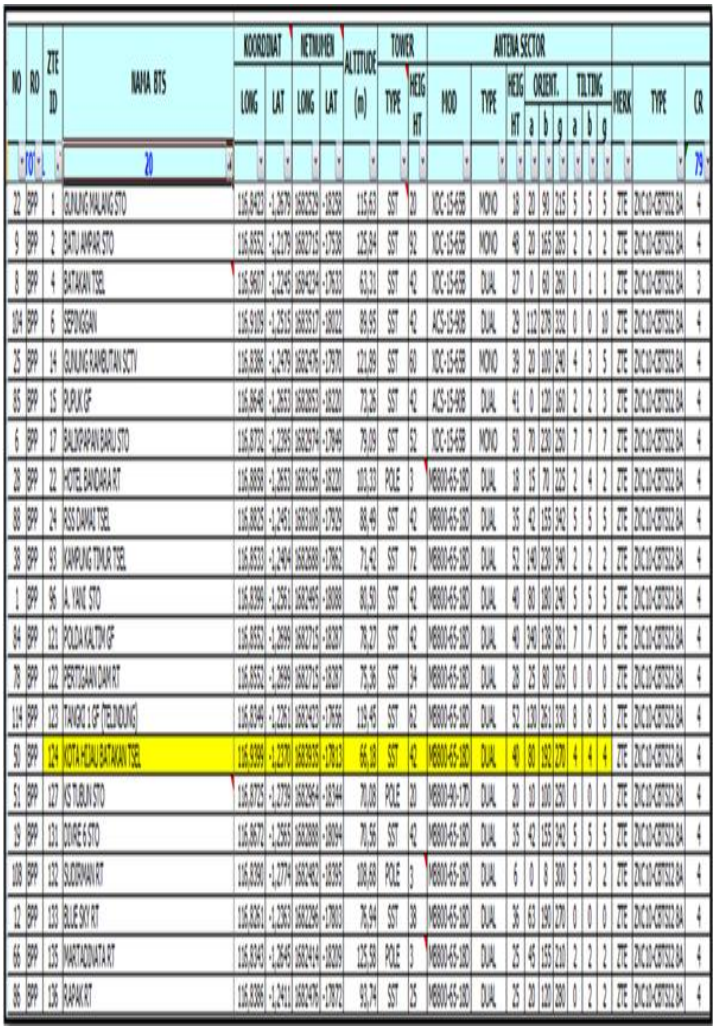
OPTIMIZE OF INTERFERENCE AND THE SCOPE OF BTS

In bts24 _ Kota Hijau batakan the dropcall rate more than 2 % , for that required to a optimize .Optimize can be done to reduce dropcall rate is to analysis the scope , the interference and trouble shoot bts .

Tilting Antenna

Before optimize bts124 _ Kota Hijau batakan , have to check tilting antenna before optimize namely by seen data pt.telkom flexi under this:

Tabel 4 : Data Antenna (tilting)



From the data above we get tilting the antenna is 4° , next we analyze or with reference to optimize the use of the formula tilting antenna as follows:

$$\alpha = \arctan\left[\frac{H}{D}\right] + \frac{e}{2}$$

$$\alpha = \arctan\left[\frac{40}{1024}\right] + \frac{13}{2}$$

$$\alpha = 8.736°$$

Above from calculations show that bts24 _ Kota Hijau batakan requiring tilting worth 8.736° antenna . After getting the angle of tilting the antenna , then need to find the scope of the new antenna:

$R = H \times \tan (90 - \alpha)$
$R = 40 \times \tan (90 - 8.736°)$
$R = 260.307$ m

Safe Distance Interference

To avoid from frequency re-use interference , so sought safe distance interference so dropcall rate can minimize:

Safe Distance : $\sqrt{3K} \times Rtilt$

Safe Distance : $\sqrt{3}.(1) \times 260.307$

Safe Distance : 450.865m

So tilting an antenna that supposed at bts124 _ Kota Hijau batakan is 8,736° and distance secure 450.865 m.

Tabel 5 before optimized

No	BTS	H	D		K	α	R	Safe Distance
1	BTS124	40 m	1024 m	13^0	1	4°	572,026 m	990,778 m

Tabel 6 after Optimized

No	BTS	H	D		K	α	R	Safe Distance
1	BTS124	40 m	1024 m	13^0	1	8.736°	260.307 m	450.865 m

Figure 2 : Safe Distance bts24_Kota Hijau Batakan

on the see of Figure 2 bts124 _ Kota Hijau batakan to coverage already meet safe distance interference good with other BTS Near from bts124 _ Kota Hijau batakan

V. CONCLUSION

From research on a conclusion can be drawn as follows:

1 . The number of call attempt received by any BTS in the area balikpapan city different .This shows that every BTS need to be allocated traffic according to average the number of call attempt received , obtained bts131 _ divre6 is bts high traffic , with the average shown in voice call attempt (11337 per day) , data services (16197 per day) and services sms (3042 per day) , while bts127 _ kstubun sto is its with a traffic the lowest worth Average voice call attempt (1088 per day) , data services (753 per day) , sms service (317 per day) .

2 . The quality of services cdma 2000 1x in the area network balikpapan already well and very satisfied , but there was a bts not comply with having drop call ratio up 2 % namely bts24 _ Kota Hijau batakan worth 2.04 % . The bts24 _ Kota Hijau batakan need optimized with requiring tilting worth 8.736° antenna and for distance secure the scope of The bts24 _ Kota Hijau batakan enough to fulfill safe distance interference.

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