



2G, 3G Network Planning and Optimization...

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Archives

▼ 2009 (56)

▼ Октябрь (15)

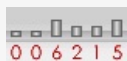
- 5.5 Network Problem Solutions 5.5.1 Coverage Pt...
- 5.4 Traffic Statistics Index Analysis At the n...
- 5.3 Network Performance Evaluation Before putt...**
- 5.2 Network Optimization Tools 5.2.1 Test MS ...
- 5 GSM Radio Network Optimization Radio network o...
- 4.10 Systematic Important Timers 4.10.1 T3101...
- 4.9 Power Control and Related Parameters 4.9.1 ...
- 4.8 Handover and Related Parameters 4.8.1 FBGT ...
- 4.7 Radio Link Failure Process and Parameters ...
- 4.6 Distance Control Parameters 4.6.1 Call Cl...
- 4.5 Frequency Hopping Parameters 4.5.1 Freque...
- 4.4 Parameters Affecting Network Functions 4.4...
- 4.3 Serial Parameters of Cell Selection and Res...
- 4.2 Paging and Access Control Parameters 4.2.1 ...
- 4 GSM Parameter Configuration and AdjustmentWhen o...

► Сентябрь (41)

Live

ВЗ. ДЕНЬ	724 195
ОТ ДНЕЙ	136 47
ВЧ МЕСЯ	94 11
СЕГОДНЯ	38 3
НА ПИНИШ	92 3

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5.3 Network Performance Evaluation

Before putting network optimization into practice, you should have an overall understanding of the network performance. The traffic statistics data, DT (drive test) data, and CQT (call quality test) data are necessary for network performance acquisition.

5.3.1 DT

DT is used to evaluate the connectivity, coverage, call drop, and voice quality for the main roads and transportation backbones in urban areas. The indexes for the roads include connected ratio, call drop rate, coverage rate, voice quality, and so on. The indexes for transportation backbones include call drop rate per kilometer, coverage rate, voice quality, connected rate, and so on.

- Connected ratio

Connected ratio = total connected times/attempted calls *100%

- Call drop rate

Call drop rate = call drop times/total connected times *100%

- Coverage rate

Coverage rate = (≥ -94dBm test road kilometers)/total test road kilometers*100%

- Voice quality

According to bit error rate, voice quality can be divided into 8 classes, from 0 to 7. Each class matches its bit error rate range.

The calculation of voice quality depends on actual conditions. Generally, the following method is in common use:

Voice quality = [Rxqual (class 0)% + Rxqual (class 1)% + Rxqual (class 2)%*1 + Rxqual (class 3)%* + Rxqual (class 4)%*0.8 + Rxqual (class 5)%* + Rxqual (class 6)%*0.5 + Rxqual (class 7)%*0.2

- Call drop ratio per kilometer

Call drop ratio per kilometer = (≥ -94dBm test road kilometers)/total call drop times

5.3.2 CQT

CQT is applied to the important spots in urban areas. It enables you to experience the network quality from the perspective of users. This section introduces the indexes used to evaluating the CQT.

- Coverage rate

Coverage rate = (≥ -94dBm test points)/total calling test points)*100%

- Connected ratio

Connected ratio = total connected times/attempted calls *100%

- Call drop rate

Call drop rate = call drop times/total connected times *100%

- Voice discontinuity/background noise rate

Voice discontinuity/background noise rate = (total voice discontinuity occurrence times + total background occurrence times)/total connected times*100%

- One-way audio/echo/cross-talking rate = (total one-way audio times + total echo occurrence times + total cross-talking occurrence times)/total connected times*100%

CQT enables you to use the MOS (mean opinion score) to evaluate the voice quality from the perspective of people's objective feeling. The MOS can be divided into five classes, from 1 to 5. For the evaluation standard, see *Table 5-2 of Chapter 5 GSM Radio Network Planning of GSM Radio Network Planning and Optimization.*

5.3.3 Network Operation Indexes

Though DT and CQT can detail network problems, they are restricted from test routes and time. Therefore, DT and CQT cannot test the overall network. To give an overall evaluation towards the network, you should collect as more network operation indexes as possible.

The indexes evaluating network operation quality are listed below:

- Service access capacity indexes

Service access capacity indexes include toll network connected ratio, short message connected ratio, (GPRS) PDP activation ratio, and IP telephone connected ratio.

- Service hold capacity indexes

Service hold capacity indexes include call drop rate, worst cell ratio, traffic call drop ratio, handover success rate, and short message gateway transit success rate.

With the expansion of network scale, the network structure becomes ever more complicated. In this case, networks with high performance but low cost are encouraged.

The indexes on network utilization can be used to evaluate whether the cost to run a network is low. These indexes include toll circuit utilization rate, traffic channel availability, busiest and idle cell ratio, and so on.

Hereunder introduces the methods to calculate the indexes used to evaluate network operation at the radio side.

- Radio connected ratio

Radio connected ratio = $(1 - \text{SDCCH congestion rate}) * (1 - \text{TCH congestion rate (all busy)}) * 100\%$

- Call drop rate

Call drop rate = $\text{TCH call drop} / \text{successful TCH seizures (all busy)}$

- Worst cell ratio

A cell with TCH congestion rate higher than 5% at busy hours or a cell with TCH call drop rate higher than 3% is defined as a worst cell. The number of the worst cells varies with network scales.

- Traffic call drop ratio

Traffic call drop ratio = $\text{total TCH traffic volume} * 60\% / \text{total TCH call drop times (all busy)}$

- Handover success rate

Handover success rate = $\text{successful handovers} / \text{attempted handovers} * 100\%$

- Traffic channel availability

Traffic channel availability = $\text{the available traffic channels at busy hour} / \text{configured traffic channels} * 100\%$

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