QUESTION	ANSWER
Can you list me the interfaces of a GSM network?	Air, Abis, Ater, A, Gb, Gi, Gn, Gd, Gr, Gs
Can you list me the network elements of a GSM network?	MS, BTS, BSC, MSC, SGSN, GGSN,BG,HLR,EIR,AUC,CG,LIG
What is the IMSI?	Unique Identifier for a SIM.1 MS can be paged with a single PAGING message
What is the TMSI?	TMSI in a Location Area. Shorter so you can page more MS
When do you use IMSI and when TMSI?	Authentication, but basically we care about it for paging. Paging message always contains IMSI
How many MS can you page with 1 paging message done w/ IMSI?	2
How many MS can you page with 1 paging message done w/ TIMSI?	4
Paging method? Can you change this method w/ BSS parameters?	Either IMSI and / or TMSI … you can change the method by NSS parameters
Name some of the CCH channels	RACH, AGCH, PCH … there is also NCH but it is not used …
Which are the feature we have in ----- in order to change the CCCH behaviour?	Default PCH has always priority over AGCH. Anyway you can reserve a certain number of blocks of AGCH. However, if AGCH =0, AGCH has priority over PCH
Which are the CCCH in UL and which are in DL?	UL = RACH DL = AGCH, PCH, (NCH)
Dedicated Channels in GSM	FACCH, SACCH, SDCCH, TCH
Broadcast Channels in GSM	BCCH, FCH, CBCH, SCH
Which is the difference between CONGESTION and BLOCKING?	Congestion = all resources in use. BLOCKING = Blocked requests
How do you measure CONGESTION in -----?	seconds
How do you measure BLOCKING in -----?	events
Which is the unit of measure for the blocking measurement?	1 event
Which is the measurement period for the congestion measurement?	10 msec
Which is the measurement period for the traffic measurement?	20 sec
Which are the ----- features to help SDCCH congestion not to become SDCCH blocking?	Dynamic SDCCH, FACCH Call Set Up
Which are the ----- features to help TCH blocking?	HR (EFR and AMR), DR, DADLB (actually this one avoids congestion to happen as well as traffic reason handover), traffic reason HO (MSC initiated), AMH (traffic reason HO, BSC initiated)
Which is the difference between DADLB and DR?	DR is triggered when there is actual congestion in the TCHs. DADLB is triggered when the load of the BTS is above a certain threshold defined as a parameter.

Which type of HO is triggered w/ DR?	SDCCH - TCH HO
Is DR helpful for SDCCH or TCH congestion?	TCH Congestion
There are 2 timers and 1 threshold you need to define when you activate DR … can you tell me which are these parameters and what are these for?	Min Time = Time in order to identify neighbours. Max Time = max time to try HO. Level Threshold = Minimum Threshold of the neighbours in order to try SDCCH-TCH HO
Which are the differences between DR (directed Retry) and IDR (Intelligent Directed Retry)?	Basically IDR is an improvement of DR and it takes into account the Source Call Type, Target Cell Type and Subscriber type … anyway it is never used …
Which are the DR parameters you need to set?	Threshold Level Min time DR Max Time DR
Can you briefly explain to me the BSC INITIATED TRAFFIC HO?	Basically when the BTS load is above the load defined by a parameter (in AMH feature's parameter group). the AmhPBGT MARGIN for that specific neighbour relation is squeezed in order to help to lower load traffic … that's the reason why you call it TRAFFIC HO
What happen in a network if there are legacy MS that don't support C2?	They just use C1 (it happens all the time in Europe)
Why do you want to use C2?	Microcell and to bias a layer (it happens in CINGULAR for 850 in order to have dual band MS which are EDGE capable only on 850)
Can you make practical examples of C2 usage?	traffic management in dualband, microcell
What's the difference between Cell Selection and Cell Re-Selection?	Cell Selection is when you switch on the MS. Cell ReSelection when it is already on
What are the 4 criteria of the suitable cells for MS to camp on	- MS is able to read BCCH - MS is allowed to register to the PLMN and LA - the cell is not barred - signal level is higher than threshold (C1 > 0)
What is the TIMING ADVANCE?	Measure distance MS -BTS w/ resolution of 550 meters
How long is it in time and in space?	1/2 bit where the bit rate is 270kbps ~ 550 meters
Who calculates it?	BSC/BTS and sends back to the MS
How is it calculated?	RACH delay
How can you collect TA statistics in the ----- OSS?	There is the table … although we have only 10 bins … not 63 …
Can you modify the setting of the TA stats in the ----- OSS?	Yes, BSC level, maximum is 10 bins
Why do we need to use timing advance	BTS needs to know when MS signal is expected to arrive to avoid inter symbol interference

Max distance you can keep a call in GSM? (what is the maximum value of timing advance in normal GSM cell? And what does it equivalent to?)	63 TA .. Equivalent to ~ 35 km
Which network element uses TA to take certain decisions? MS or BTS?	Basically MS sends its bursts in advance in order to get to the BTS in the window expected …
What is the extended cell feature?	Alows to have double maximum distance MS - BTS … theoretically 70 km … practically 65 km
Is it available in -----?	Yes …
Which is the cabinet / BSC you need to have in order to make Extended Cell work?	Ultrasite will support it in S11.5. Talk Family supports it since S7
Advantages and disadvantages of the MASTER-MASTER and MASTER-SLAVE configuration	Basically when you have a MASTER, if this goes down also the other cabinet goes down
Do you need the Synch Cable between cabinets in order to share the T1?	no
Which is the best configuration for cabinet synchronization (MASTER, SLAVE, INDEPENDENT) if you don't have CBCCH?	independent
Why independent configuration is the best?	Because doesn't have a chain effec in case 1 BCF has problems
Advantages and disadvantages of allocating 1900 radios on one cabinet and 850 on another cabinet	Basically a hybrid configuration is always an headache for implementation
Briefly explain FULL and SUB measurements in the Air I/F?	FULL is when you don't use DTX, SUB when you use DTX. FULL Is measured on 104 frames, SUB on 12 frames
Are these stats always sent? Both of them?	Yes., both all the the time
How can the BSC understand which one to use?	There is a flag that says if DTX is used or not
If you plot these stats what do you notice?	Sub stats are more spread, more standard deviation
What happens when you enable UL DTX / disable UL DTX to your RxQuality?	RxQual has more samples in 0 and 7
How much of it is due to real interference?	Some is real interference but most is just statistical distribution
Why you have a different distribution between SUB and FULL RxQual samples? (HINT - It is a statistical reason)	Less samples = Less reliable = More deviation
What are BER and BEP?	Bit Error Rate and Probability
Can you explain what is NBLO measurement and how it is used?	It is used in CBCCH and it measures the difference between BCCH and non-BCCH layer

Which is the main advantage of CBCCH Vs. Multiple BCCH?	CBCCH advantage = Trunking Gain + you can assign the call to the slave (e.g. other layer) w/ call assignment w/o using HO MBCCH advantage = Give BCCH channel to both bands … especially here in US where there are a lot of legacy phones in singleband @ 1900
Could you please explain the basic signalling of a Mobile Originated Call Setup?	RACH, AGCH, SDCCH, TCH …
Could you please explain the basic signalling of a Mobile Terminated Call Setup?	PCH, RACH, AGCH, SDCCH, TCH …
What are the important GSM specifications for radio performance?	3.22, 4 series esp. 4.08 & 4.60, 5 series esp 5.08, 5.05
What is the channel spacing in GSM?	200 kHz
What is the duplex frequency of GSm850 and GSM1900?	45 MHz for GSM850 and 80 MHz for GSM1900
in GSM, What is the multiple access and duplex used?	FDMA/TDMA with FDD
What is ARFCN? What does it mean?	Absolure Radio Frequency Channel Number. Basically it is the frequency in use.
Is ARFCN = 120 in GSM850 or GSM1900 band?	850
How many ARFCN do you have in GSM850?	ch 128 -251 (124 Ch)
How many ARFCN do you have in GSM1900?	Ch 512 - 811 (300 ch)
Which is the number of frames in a SIGNALLING CHANNEL?	51
Which is the number of frames in a TRAFFIC CHANNEL?	26
What's the difference between MECHANICAL and ELECTRICAL DOWNTILT?	Electrical reduces also side lobes and back lobes.
How does the ELECTRICAL DOWNTILT work?	Put a signal w/ different phases which deletes part of the initial one creating smaller lobes
What is the difference in propagation between 850Mhz and 1900Mhz?	7 dB. The higher the frequency, the more the loss.
What is Slow fading?	Also known as shadowing, caused by large obstructions such as hils, building trees. Behaviour is a slow change in propagation
What is Fast fading?	Also known as multipath or Rayleigh. Caused by constuctive or destructive interference as a result of reflections, multiple propagation paths. Fades as deep as 30 dB over distances of half a wavelength
In the slow moving mobile environment, what kind of fading has more impact to signal?	Fast Fading.

What is Diffraction?	When the RF signal is distorted around an object. Happens to all EM waves, it seems as though the wave "bends" around an object, therefore can provide coverage behind an obstruction. Happens when there is no LOS or the 1st Fresnel zone is obstructed. Commonly modelled as knife edge, either single or double. Epstein-Petersein is a multiple edge model.
What is the effect of transmit frequency on Diffraction?	None. Diffraction is independent of frequency
What is the difference between "Service" and "Coverage"?	Coverage is provided by the signal propagating to an area. Service is useable coverage, affected by interference or GSM distance constraints
What is the relationship between Coverage and Interference?	Interference is unwanted coverage. The same signal can be both coverage or interference depending on whether the signal is useful or not
What is the required information from site survey activities? And what are their purpose?	Site location (Lat, long), Antenna configuration (diversity, HPBW, gain, type), Antenna line information (feeder length/loss, spiltter, diplexer, MHA), Rooftop layout. This is used for link budge calc., coverage planning and prediction simulation, optimization analysis
Customer wants to give to ----- a new service, coverage planning of a new market. You need to tell him which are the inputs you need in order to start your work. Please do so … which are the inputs you need to ask him for.	Coverage Polygons (Rural, SubUrban, Urban, Freeway) # Different RxLevel for each polygon # Coverage Probability
What is the Coverage Probability? You have normally 2 Coverage Probabillity … which are their names?	Cell Edge. Cell Area.
Which is a typical Coverge Probability you can use for coverage dimensioning purposes?	Cell Area Coverage Probability ~ 90% is a typical value you can use and that you have to put in the Propagation model as an input in order to have the Cell Range and from that the Cell Area.
The customer has given you the input you have requested him (Polygons, RxLev, Coverage Probability) now you need to decide which are the tools you need in order to give him an initial understanding of how many sites he needs. Please tell me which are the tools you need	1. You need to decide the type of equipment and configuration you want to have. Normally this is a standard one (e.g. ULTRASITE, w/ LNA, 2 TRXs) 2. Calculate the LINK BALANCE for that specific configuration. 3. Propagation Model (e.g. Okomura Hata) correction factors (e.g. mean and standarddeviation)
Probably at this point you have to decide / ask which is the typical configuration you want in the sites (omni, 2 sectors, 3 sectors). Which are the advantages / disadvantages of OMNI?	PRO OMNI = Trunking Gain. Cover perfectly an Island for example, from the top of a hill. CONS OMNI = Painful when you need to make frequency plan and/or limit interference

Probably at this point you have to decide / ask which is the typical configuration you want in the sites (omni, 2 sectors, 3 sectors). Which are the advantages / disadvantages of 2 sectors?	Probably you can use a 2 sector site when you have a freeway in a rural area.
Probably at this point you have to decide / ask which is the typical configuration you want in the sites (omni, 2 sectors, 3 sectors). Which are the advantages / disadvantages of 3 sectors?	3 sectors is probably the best combination for coverage and frequency plan and it gives good ability to control interference (w/ tilts)
Related to the previous question … which is the best configuration is you have to cover a freeway? And if you need to cover an Island? And if you need to cover a city?	City = 3 sectors. Freeway = 2 sectors (but only if around there is really nothing else to cover). Island = Omni works just fine if you put it on the top of the hill
Once you have decided which is the sector configuration to use, how can you use the Cell Range calculated w/ the Propagation Model correction factors in order to calculate how many sites to you need?	You use the typical hexagon model. With that you know how many sites you need in order to cover you polygon.
What is the relationship of W, dB and dBm?	10*log (W) = dBW, 10*log(W/1000[mW]) = dBm, 10 log (Power/ Reference) = dB or 20 log (Voltage / Reference)
10 dB + 14 dB	24 dB
10 dBm + 14 dB	24 dBm
10 dBm + 14 dBm	In order to do it you need to convert the dBm to Watt, sum the Watts and go back to dBm … in this case the results is 15.455 dBm
Is the following statement correct? Okumura Hata model used in GSM850 is the same as GSM1900.	False. The A and B coefficient used in OH model is different if frequency below 1000 MHz and above1500MHz. Besides, the area correction factor is different between the 2 frequency
What is the possible way to improve link budget?	BTS type (Rx sensitivity and Tx Power), Antenna gain, feeder length and types (site planning), using MHA and diversity (improve Rx), using Booster (improve Tx)
Sensitivity and TRX output power for ----- METROSITE?	-112 to -115 dBm, 5W TRX
Sensitivity and TRX output power for ----- ULTRASITE?	-115 typical (-112 to -118 dBm), 43dBm (guaranteed ~ minimum on 100% production) 47dBm TRX (nominal ~ on 90% of production)

How does the link budget impact to number of the sites required in an area?	With the maximum allow pathloss from link budget with consideration of LP, STD, Slow fading margin and propagation model , it is used for defining the cell range. If the pathloss is bigger, the cell range could be higher and the number of sites require will be reduced.
Please list 3 methods of capacity enhancement and their pros & cons	cell/site splitting: coverage enhancement but more cost to hardware & limitation of frequency more TRX: easy but need frequency micro cell layer: more easy to control interference but more site require dualband: additional spectrum required, minimize impact to existing band coverage/capacity, soft capacity features: hopping, IUO, DFCA, AMR, DTX better cell planning &optimization for better interference control.
How does LNA improve the sensitivity?	Basically the LNA is helping to improve the effective noise figure of the receiving path which then reduces the Rx Sensitivity of receiving path. The simple way to do is the compensation of feeder loss (but not more than LNA gain). However, the calculation have to be calculated on the effective noise figure and effective gain of the receiving path.
INTELLIGENT DOWNLINK DIVERSITY?	IDD is basically a DL booster. The way it works is basically putting together the signals of 2 TRXs with the same signal but w/ a different phase. The gain is ~ 3 dB.
What is the problems with highrise buildings?	lack of coverage as the antennas are lower down. Increased interference from LOS to many sites.
What is trunking gain?	TRUNKING GAIN IS THE GAIN THAT YOU HAVE WHEN YOU HAVE LESS ENTRY POINT TO THE RESOURCES (e.g. 1 line in front of the 10 airport check-in counters works much better than 10 lines in front of the same 10 airport check-in counters) …
what does 1 Erlang mean?	One channel used for 3600 seconds in 1 h ~ 100% utilization of a resource (TCH or PDCH in GSM)
Customer is complaining that w/ 1TRX he can serve only 3 Erlang and has 10% blocking while we have told him that according to the Erlang B table we should be able to serve 3 Erl w/ 2% blocking. What is happening?	Basically the traffic is not approaching the BTS w/ a Poisson distribution (which is the assumption that is the base of the Erlang B model)
What is the Erlang C table?	It is a model which takes into account queuing
If we have QUEUING active do we need to use the Erlang C table? Why?	No … because queue is not infinite …
Is the Erlang B table the right model to use in case of AMR FR / HR?	NO
1 TRX w/ 2% blocking … according to the Erlang B table how many Erlang can I serve?	~ 3 Erl

What is the output from link budget?	Maximum allowed pathloss (UL and DL)
Which is a typical PathLoss you can have in a GSM connection?	~ 150 dB
Do we use different LINK BUDGET for different type of environments?	No, maximum allowed path loss is not environment dependent. It is service dependent though
What is the purpose of a radio planning tool?	To model the network. Allows the planner to see the effect of making changes to the network so the best solution can be chosen and implemented. Can also be used to store all the site data.
How can you ensure the planning tool is as accurate as possible?	First start with accurate clutter, DTM and building data. Next calibrate the model correctly. All site data must be correct. This will give the propagation model of the network.
What general power law do propagation models follow?	3.5 power law (4th power law good enough)
Name two methods of propagation modelling	Statistical and Deterministic (Ray tracing, virtual source)
Name two statistical models commonly used	Okumra-Hata (General propagation) and Walfisch-Ikegami (canyon like environment)
How do you calibrate a statistical propagation model?	Collect CW (not TEMS, noise floor isn't low enough) measurements from mulitple locations. Drive through as many clutter classes as possible. Input all data to a planning tool. Calculate SD. Use different values of first co-efficient to get different SD values. This is normally a square function, so get minimum. Continue with other coefficients. Repeat. Coefficient order: distance, diffraction, BTS height, BTS height*distance
What are the main MML families in manipulating radio objects?	EA: Adjacency, EE: BSC, EQ: BTS, ER: TRX, EH: HOC, EU: POC
How do you list current alarms for a BTS?	ZEOL
What does the initial "Z" stand for in an MML command?	It makes MML interpret the command from the main level, even if you are inside another family
What is the available tool for OSS data collection in -----?	TANO, NDW, EOSFLEX
Name two drive test tools	TEMS, NEMO(TOM)
What drive test equipment is needed for performance data collection?	Logging tool, 2 phones (one short call, one long), GPS, scanner, map, power supply for all
What type of measurements should be used for model calibration?	Continuous Wave (CW), Greater dynamic range and lower noise floor
Name some protocol analysers for monitoring the Abis, A or Gn interfaces	Nethawk, K1215, Agilent
What is co-channel interference	When a cell is being interfered with by another cell with the same carrier frequency

What is the GSM rejection ratio for co-channel interference?	9 dB
What is adjacent channel interference?	When a cell is being interfered with by another cell with a carrier frequency which is seperated by 200kHz for the 1st adjacent interferer, 400kHz for the 2nd adjacent interferer, etc.
What is the GSM rejection ratio for the first adjacent channel interference?	-9 dB (-18 dB for the second adjacent interferer)
What is frequency reuse 4/12 ?	There are 12 frequency ch reuse on the 4x3-sector sites.
When planning a frequency what is the channel separation required for the TRX in the same cell?	3 ch. (600 kHz) for GSM850 and 4 ch (800 kHz) for GSM1900
When planning a frequency what is the channel separation required for the TRX in the same site?	400 kHz
what is the different between hopping scheme 1/1, 3/3, 1/3?	1/1: there is 1 MA list and reuse on every cells 3/3: there are 3 MA list and each site (3 sectors) using same MA list and reuse every 3 sites 1/3: there are 3 MA list and each cells in same site using different MA list. And reuse same pattern for every site.
What is the factor to determine which hopping scheme above to be used?	Number of TRX (too small number of TRX cannot gain much from BB hopping) and combiner type. (RTC is only can use BB hopping)
Do we need to plan MAIO Step, MA List, MAIO Offset and HSN when use BB hopping?	There is no need to plan for MAIO and MAIO offset in BB hopping. However, HSN is required.
Do we need to plan MAIO Step, MA List, MAIO Offset and HSN when use RF hopping?	yes, all of them. MA list is required to plan to ensure that there is no frequency collision within the site. HSN should be same for all sectors in the sites.
Do you have MAL only w/ RF hopping or also w/ BB hopping?	only with RF hopping
Which is the main difference between RF and BB hopping?	RF = TRX changes ARFCN. BB = Call moves from 1 RTSL to an other (in an other TRX)
What is a MAL?	Mobile Alloction List. It is used for RF HOPPING
How many MAL can you define in a ----- BSC?	128
Which are the parameters you need t define in the BTS when you want to use a MAL?	HSN, Maio Step, MAIO Offset,hopping mode, MAlist
Why do we use Frequency Hopping? (I mean which are the advantages of frequency hopping)	You have 2 advantages w/frequency hopping … FREQUENCY DIVERSITY (FADING) and INTERFERENCE DIVERSITY
Which is the type of fading you are able to "beat" when you use HOPPING?	Fast Fading

You have a BTS w/ 3 hopping TRXs and a MAL w/ 3 ARFCN … once you try to unlock the the site the BSC gaves you a DX error saying that you don't have enough frequencies … where is the problem?	Basically the sum of MAIO OFFSET and MAIO STEPS exceeds the number of ARFCN in the MAL … it is indeed a silly problem but you need to know it. Suggestion is to keep MAIO OFFSET = 0 and MAIO STEP =1 in such a case (where probably you are using ad HOC hopping)
How many HSN do we have?	64 (0 … 63)
Is this a GSM standard or do you know if ----- has any plan to increase this number?	No. it can't … it is GSM specs
How does HSN = 0 works?	sequential hopping (others are psuedo-random)
Do you know which are the basics of the algorithm used from HSN?	Uses the parameters you set (MAIOs) and FN which is something you can't define … that is the reason why in a synch network you can better control the interference.
How many HSN do I need to define for each BTS in RF HOPPING?	1
How many HSN do I need to define for each BTS in BB HOPPING?	2
What is EFL?	Effective Frequency Load. A way of measuring spectral efficiency with a hopping system. Formula: erls/(#freq*ave#(TCH/TRX))
What is spectral efficiency?	A way of measuring how effectively the spectrum is being used. The more traffic carried with less spectrum the more efficient the use. Formula: erls/MHz/Cell
Is the following statement correct? Why? It is good enough to use RF hopping reuse 1/1 with MA list length 15 in the area with 6+6+6 BTS.	No, because it is all frequencies are used all the time which could create the high interference level esp. if the site planning (dominant area) is not good enough.
When customer want to build GSM1900 on GSM850 site or vise versa, what are the things that you would like to suggest him to check and what is the issue behind that? (not parameters)	Frequency use (intereference and intermodulation between 2 bands) antenna solution (Isolation requirement and area spacing)
When can you have paging thru the Gb I/f instead of the A I/f?	Gs interface is necessary
What's the advantage of the paging thru the Gb I/f?	Can page a MS in data session
Does the Abis I/f size change the paging capability?	Yes … if the LA is bigger you need to page more MS, so all these messages need to go thru the Abis … so you need a bigger Abis
How many MS can you paging messages can you send in 1 hour w/ 16kbps TRXSig?	100,000 paging messages … 200,000 MS if you use IMSI or 400,000 MS if you use TMSI
How many MS can you paging messages can you send in 1 hour w/ 64kbps TRXSig?	400,000 paging messages …

Which is a parameter you can change in order to reduce the probability that a MS that went out of coverage will be paged?	Periodic Location Update … you need to reduce it …
Why do we need BSIC in GSM?	Identify neighbour … couple BCCH, BSIC make you identify the neighbour
How many bits are the BSIC?	6
Which are the 2 components of the BSIC?	NCC, BCC
Which is the relation between BCC and TSC?	They should be the same in the BCCH TRX, not in all the TRXs … NOKIA by default is usig the same but it is not mandatory in GSM.
Can we have TSC <> BCC in -----? Since when? Do you know if CINGULAR has it activated? (do we have any features that could allow TSC <> BCC?)	Yes, we have a S10 feature about it. CINGULAR doesn't use it.
Which is the the reason to have TSC <>BCC?	Better HO SUCCESS RATE … but basically it doesn't change anything …
Which is the relationship between NCC and PLMN?	There is no relationship. PLMN is MCC + MNC
Why do we need TSC (Training Seuqence Code) in GSM?	This is for the MS and BTS to learn the interference. Basically the MS is expecting a certain TSC but receives an other if there is intereference. The difference between the expected and the measured one is used in order to reconstruct the rest of the bits of the burst.
Which is a recommended size for the LA in -----?	Depends from Abis LAPD size … 1-2 BSC works fine w/ 16kbps
Can you have smaller LA?	YES
Can you have bigger LA?	YES
Can you have a LA across 2 different MSC?	NO
Why do you need the LA in GSM?	Paging reasons
Can you have a LA across more than 1 BSC?	Yes
Which is the trade off in the LA size?	Paging and SDCCH traffic
Which are the KPI you need to monitor when you are modifying the LA size?	SDCCH, Paging Success Rate, congestion in Abis and Air for LAPD and CCCH
Does roaming traffic affecting the LA size?	No
Which are the parameters you can change in order to make harder or easier LA update?	Cell Reselection Hysteresis

What is the PLMN permitted parameter?	It defines to which PLMNs the MS is permitted to report measurement results.
Is "PLMN permitted" parameter the same as PLMN id?	No.
What parameters need to be set as the equal to or subset of PLMN permitted?	NCC part of the BSICs.
If it is not set, what will happen?	MS is not possible to measure the cells e.g. no HO.
Where really do you need this parameter?	National Borders
Do you know which is the PLMN setting used in CINGULAR?	All of them
Can you use TRAFFICA tool in the CINGULAR network? Blue? Orange? Why?	Only if you have our core … means Orange
If you increase the LA size do you expect an increase in the A I/f traffic?	NO
If you increase the LA size do you expect an increase in the Abis I/f traffic?	YES
If you increase the LA size do you expect an increase in the Air I/f traffic?	YES
What do you use the FACCH for in UL and DL?	HO, CALL SETUP if you have the feature
What do you use the SACCH for in UL and DL?	System Info (DL), Measurements (UL), SMS during a call
How many SDCCH can you put in 1 RTSL?	8
Which is the difference between COMBINED and SEPARATED signalling?	combined = CCCH + 4SDCCH; separated = CCCH and SDCCH are in different RTSL
Which channels have no power control?	BCCH, SDCCH, GPRS TSL(DL)
Measurement report is sent to BSC every period of which channel and how long does it equivalent to?	SACCH = 480 ms
What is the different between sync and non-sync HO? And in which case it will happen? And what parameter is used to define this?	in non-sync HO, there is physical information is require for MS to perform HO. The information contains TA information and it requires when the cell HO to different BCF cell. The parameter is in each ADJ pair "SYNC"
is following statement correct? There is no problem if the neighbor list contains the same BCCH and same BSIC from different cells as long as the 2 neighbour are far away and not interfere to each other.	False. MS report only BCCH and BSIC to BSC, therefore BSC will not be able to differentiate which ADJ is the right one and that could cause HO failure and eventually call drop

What is the Nx/Px parameters in handover parameters defined? And what is the impact on setting large number of Nx/Px?	Nx is the total number of sample in the evaluation. Px is the number of samples within Nx that below or above threshold. The large number could lead to the longer time for HO decision making
What's the difference between HO ATTEMPT and HO command in -----?	HO Attempt is before the check if target has available RTSL. HO Command is after. There are more HO attempts than HO commands
Which is the 1st thing you should check in the formula when the customer is telling yu he has a very high HO failure rate?	If counts HO attempts …
Please name 5 types of HO reasons	1) Interference (uplink or downlink) 2) Uplink quality 3) Downlink quality 4) Uplink level 5) Downlink level 6) Distance between MS and BTS 7) Turn around corner MS (special case of rapid field drop) 8) Any other rapid field drop 9) Fast / slow moving MS (special case of umbrella handover) 10) Any other umbrella or power budget handover 11) traffic reason ho
What is the 4 criteria in ranking the ADJ for HO candidate?	1) Adjacent Cell Load Threshold : Can be checked only for cells belonging to the same BSC as the serving one 2) Adjacent Cell Priority 3) Overloaded Cell -> Reduction of Priority 4) RX level (if same priority)
What is typical value use for PBGT HO margin?	6 dB
What are the 3 parameters in BSS that need to change to make sure that dualband is working?	dualBandCell Y indicates cell as dual band cell multiCellBandReporting 0..3 number of adjacent dual band cells taken into account for measurement report earlySendingIndication Y enables MS to send classmark 3 message as early as possible
What is the impact of setting higher number of mulitcellBandreporting?	it reduces the amount of same band reporting. Normally there are only 6 cells report from MS. Deducting by MBR, the rest will be used for same band.
What feature could be used to help the situation?	EMR
What is the RLT parameter?	RLT = Radio Link timeout.
How does RLT works?	It is both in UL and in DL. Speaking about UL … if the BTS doesn't receive the SACCH in UL it decreases this counter by -1 and if receives the SACCH it increments by +2. If it gets to the maximum value it stops incrementing. When it gets to zero the BSC releases the call.
How many RLT do we have in -----? UL / DL / AMR FR / AMR HR?	In NOKIA we have only one RLT …

Why should we have different RLT for AMR FR and AMR HR and EFR?	Because the C/I protection in very different … so the RLT should take into account before dropping a call …
What does EFR mean?	EFR = Enhanced Full Rate
What is FAST AVERAGING?	It is a way to speed up the Power Control + HO decisions because you don't need to wait the complete window before start counting Nx/Px in your decision
We have a WEIGHTING parameter in HOC, POC … what is this for?	It is used to overweight if you want) the FULL measurements rather than the SUB measurements
How many parameters do you have for FAST AVERAGING? (at what call phase Fast Averaging can be applied?)	3 … after Call Set Up, After PC, After HO
Why do we have the concept of PRIORITY in the HO?	Because based on the measurements we can take after the same SACCH different HO decisions and you want to give to certain HO more priority (e.g. Quality HO should have higher priority over PBGT HO because the problem is more urgent … and the way you choose the neighbours for the different HO types are different)
What is a CLEAR CODE?	DX Cause w/ failure
What is a DX CAUSE? Why this funny name?	Internal Cause in BSC. Because of DX architecture ofBSC and MSC
After activation of Double BA list the sector doesn't make anymore HO … what's the problem?	Neighbour BCCHs are not in the list
where to find information about ----- counter and KPI?	1) NED 2) Jump page. 3) Database Description for BSC Measurements (PDF document)
What is the JUMP PAGE?	Intranet page w/ info about KPI, COUNTERS
How can you use DX CAUSE and CLEAR CODE in order to optimize my network?	CLEAR CODES CAN BE MONITORED W/ OBSERVATIONS … YO CAN FOR EXAMPLE USE "DROP CALL OBSERVATION" OR "DROP CALL BREAKDOWN" …
WHICH IS THE DIFFERENCE BETWEEN MEASUREMENT AND OBSERVATION	THEY ARE BOTH WAYS TO GET PERFORMANCE STATS … KPI AND COUNTERS ARE FROM MEASUREMENTS TABLES. OBSERVATION ARE GIVING US CLEAR CODES / DX CAUSE.
Is the MS or the BTS able to measure the actual C/I of the Air I/f?	No … in GSM we can't measure the C/I … we can only measure the BER, FER … which are affected of the C/I
In the ----- OSS I have seen there are interference measurements . Can you explain what they mean and how they is measured?	These are idle mode measurements and they are only in UL … basically in the RTSL not in use if the Level is above -110 dBm we assume it is interference and it is recorded in the OSS stats …
In the ----- OSS measurements I can see HO due to interference? How do these HO work / are triggered?	INTERFERENCE HO are basically QUALITY HO in good RxLevel condition (which is set with a RxLevel parameter) … the reason is dual … 1) Have stats about bad Quality in good RxLevel conditions. 2) Trigger an intracell HO rather than a intercell HO

What is AMR?	Adaptive Multirate voice coding
How does it work?	AMR varies the proportion of voice coding and channel coding to provide more robustness in bad C/I at the expense of voice quality
How many AMR codecs are there at FR and HR?	8 at FR, 6 at HR (1 not used in HR). Only 4 can be used in a call
What is MOS?	Mean Opinion Score: A subjective view of the quality of a voice call
What is FER?	Frame Erasure Rate: Number of speech frames discarded due to errors. A better measure of quality than BER with AMR because BER is measured before decoding and FER after decoding
What is the effect of AMR on a full rate channel?	It allows the call to maintain the same FER in worse C/I conditions
What is the effect of AMR on a half rate Channel?	It allows the FER to improve in better C/I conditions while occupying half a timeslot
How does AMR link adaptation work?	When certain C/I thresholds are met, the voice codec will be changed. There is no target FER to maintain and thresholds have to be carefully chosen
What is a half rate channel?	A channel with 11.4 kbps. FR is 22.8 kbps. Each channel occupies alternate bursts of a multiframe.
How does the BSC decide whether to use a HR or FR channel?	With cell load thresholds. When the lower limit is reached, calls are packed, when the upper limit is reached, new calls are sent to FR
When is a HR unpacked to FR?	When the RxQual of the HR call reaches a pre-set limit
Does ----- supports all the GSM AMR codecs?	No doesn't support HR 7.95kbps because it should use 16kbps TRAU and NOKIA doesn't have it.
What is MAXCAP feature?	Name of a CINGULAR idea to maximize capacity. Basically while testing it they have found that our BSS had a problem and wasn't unpacking if a candidate for Quality HO wasn't available. When it was introduced we saw a sudden increase in drop call during unpacking. That is the reason why we want to have MAXCAP = OFF.
Do you have more signalling channels in AMR HR?	In band singalling, but it is transparent
Does the overall bit rate on the Air I/F changes w/ AMR?	No it doesn't …
What is DFCA?	Dynamic Frequency and Channel Allocation, is a BSS radio resource management functionality that selects the radio channel individually for each connection from a dedicated channel pool based on C/I criteria. The different degrees of interference tolerence of different connection type such as EFR,AMR FR, HR are taken into account in the ch selection process.

What are the DFCA HW requirement?	-BSC2i + CP2MX CPU cards or BSC 3i -BSC-BSC connections for BSC using DFCA and have adjacent service area. -Ultrasite or metrosite BTS - Wideband combiner - LMU in every BTS
What are the DFCA SW requirement?	-S11.5 - CX4.1 -OSS4 -LMU4.1
Three frequency bands are defined in DFCA, what are they?	BCCH band, Regular band (optional), DFCA band
What are the requirement/limitation in DFCA band?	-The range of Malist is 1-32 -The DFCA MA list must be defined the same way in al BSCs within each continous BSC area -DFCA MA list do not contain consecutive frequency -Any two DFCA MA lists containing adjacent frequency are required to be of the same length.
What are the inputs for DFCA channel allocation?	-non real time information I.e. Background inteference matrix -near real time information I.e. Mobile measurement report - realtime information I.e. Radio channel usage information
What are the 4 methods in DFCA C/I estimation?	incoming DL, Incoming UL, Outgoing DL, Outgoing UL
What is the Soft Blocking in DFCA?	Soft Blocking is a user define parameter. If in the C/I estimation phase any of the four C/I estimates produced for each radio channel candidate does not exceed the soft blocking limit of the interfered connection, then the radio channel candidate is deemed soft blocked. If there are no acceptable assignment candidates (i.e. all the candidates breach the connection type specific soft blocking C/I limit), the assignment will be directed to a regular TRX if available. If there are no free TSLs on any regular TRXs of the cell, the call will be finally rejected (DFCA soft blocking situation). Directed retry could still be used and if successfull the directed retry will move the call to another cell in which case the call is not rejected. In case of handovers soft blocking is not applied except if the handover is for DR or DADLB then the soft blocking is applied as in normal call setup.

What is DFCA forced HR mode?	If the current incoming DL C/I average is below the Force HR mode C/I threshold for the corresponding channel type (non-AMR/AMR), then the force HO mode is switched on. After HR mode switched on, HR channel/AMR HR channel will be assigned to a speech connection that is placed on a DFCA TRX until the HR mode switched off. DFCA Force HR mode C/I threshold and Force HR C/I threshold AMR are user defined parameters.
What is the restrictions to use DFCA? (features interworking limitation)	· Packet switch territory is not allow in DFCA TRX · Dynamic SDCCH is not allowed in DFCA TRX · FACCH call setup to DFCA TRX is not possible. · Antenna hopping cannot be used in DFCA TRX
Apart from DFCA parameter, what are the parameters shall be checked for DFCA activation?	BSS Synchronization -Sync MUST be on prior to switching to DFCA Mode. -FN and TS offsets should be set (not left at 0) Interference Handovers -nterference based handovers should be enabled on all DFCA BTS Dynamic Power Control -Should be enabled on all DFCA BTS for UL and DL Timeslot Type -TCH timeslots only supported on DFCA TRX's -All signaling (e.g. SDCCH) and GP timeslots must be removed. Idle & Active BA List Usage -BA list must be created and attached for Idle & Active use in each DFCA BTS
What additional network elements are needed for Data?	SGSN, GGSN, CG, DNS, (BG, LIG)
What elements need to be upgraded to activate EGPRS?	TRXs. A modulation scheme is used and modulation is performed by the TRX with hardware
How does an MS handover from one cell to another during a data session?	It doesn't. MS performs cell re-selection exactly like idle mode
What is a Flush?	When a cell re-selects, the data stored in the BVC buffer is Flushed (Deleted). If the new cell is in the same PCU than the data is moved to the new BVC. If not it is deleted and there is a bigger break in downloading.
What modulation scheme does GRPS use?	GMSK
How many GPRS coding schemes are there currently in ----- and what are they called?	CS1, CS2
What modulation scheme does EGPRS use?	GMSK(mcs1-4), 8PSK
How many EGPRS coding schemes are there?	9: MCS1 - MCS9

What is the maximum bitrate per timeslot with GPRS and EGPRS?	GPRS: 13kbps with CS2, EGPRS: 59.62 kbps with MCS9
What is timeslot capacity?	Maximum TSL capacity after C/I has reduced the MCS but before TBF multiplexing
What are the MCS families used for?	Re-transmissions are sent in MCSs of the same family as each family has a different packet length.
What functionality counters fast fading in EGPRS?	Incremental Redundency
How does it work?	Data is punctured after coding. This involves reducing the number of bits needed to send the data. 3 puncturing codes are used. If the first packet can't be fully decoded, it is sent again with different puncturing scheme. The packets are combined until it is decoded.
What functionality counters slow fading in EGPRS?	Link Adaptation
How does it work?	PCU tries to keep best throughput by using BEP to calculate the probabilty of the packet being decoded. PCU uses initial MCS, then once it has BEP values, chooses modulation, then coding scheme according to whether it is initial transmission or re-transmission. User only has to set initial MCS
What is timeslot multiplexing?	When there is more than one TBF allocated to the same timeslot
What is TBF multiplexing?	When there is a mix of GPRS and EGRPS TBFs on a timeslot. Especially bad with UL GPRS and DL EGRPS
How many different types of Network Mode of Operation are they and how are they different?	3, NMO1: Needs a Gs link, all CS and PS paging through SGSN and PCCCH (or CCCH). NMO2: No Gs link, CS paging through MSC and CCCH, PS paging through SGSN and CCCH, NMO3: No Gs link, CS paging through MSC and SGSN, PS paging through SGSN and PCCCH (not supported in Nokia)
What is the difference between the RLC and LLC protocols?	Radio Link Control is between the PCU and the MS. Logical Link Control is between the SGSN and the MS. RLC gives network throughput, LLC gives user throughput.
What is a territory?	A territory is an area of the cell that is used for a certain purpose
How many are there and what are they called?	4: CS, Dedicated data, Default data, Additional data
How does each behave?	Dedicated data is only used for data, default can be used for both but CS is kept out of it unless there is no more CS territory available, additional is data territory beyond default and is released as soon as possible, CS can be used to carry CS and includes default and additional
Is there power control in EGPRS?	Only in Uplink
What is an EDAP and why is it needed?	EGPRS Dynamic Abis Pool: A part of the Abis set aside for EGPRS use. It is shared amongst all TRXs attached to it and provides a 30% saving on Abis capacity compared to fixed allocation. The EDAP is needed because the higher bitrates with EGPRS need more than 1 16kbps Abis subslot

What is the difference between one-phase and two-phase access?	In one phase, the RACH request asks for a TBF. In two phase, the RACH request ask for a single block and uses this to ask for the TBF.
What is a RA?	Routing Area: serve the same function for data as the LA for voice: Allows the SGSN to page the MS
What is its relationship to an LA?	A RA is a subset of an LA. Maxiumum size is the LA size. An LA can have more than one RA.
Which is the trade off in the DEFAULT TERRITORY size?	Small default territory = Few GPRS reason Ho. Big default territory = Better Throughput
Can you have separated (from the VOICE one) signalling for GPRS / EGPRS?	Yes, you can although it is not really used
Which is the channel you are going to use?	PBCCH
Which is the trade off in term of signalling using PBCCH?	Need to use a dedicated RTSL for it
What's the impact of GPRS traffic on the CCCH load?	There is an impact, but there is no evidence so far of any real bottleneck created from data signalling
Why we don't we use PBCCH in CINGULAR?	Basically Blackberry 1st generation doesn't suport it
Which are the other features you can use for cell reselection if you implement PBCCH?	C31, C32
Which is the meaning of C31 and C32?	C31 allows you to prefer a set of BTSs. C32 makes the cell reselection among the one prefered from C31
What is a PCU and what does it do?	Packet Control Unit. Receives the LLC PDUs from the SGSN and breaks them down into RLC Packets for the radio interface. Vice versa in the opposite direction. Responsible for all scheduling, LA and radio resource management for data
How many are there in a BSC?	2i: 2 per BSCU, 8+1 BCSU max, 3i: 4 per BSCU, 6+1 BCSU max
What is a DSP core?	Digital Signal Processor core. Handles the individual Abis subslots and does the actual work.
How many are there in a PCU?	16
What is the maximum number of EDAPs a PCU can handle?	16
What is the maximum number of 16 kbps Abis sub-slots a PCU can handle?	256
What is the effect on the link budget of using 8PSK modulation?	As 8PSK has variable amplitude, the amplifier has to work in linear, not satuarated, mode. There has to be a power back-off to keep operation in linear mode. Back-off is 2 dB for BTS, 4-5 dB for MS

Outline a dimensioning method for combined voice and data traffic?	Erlang B will provide enough spare TSL to guarentee GoS for voice. Data can use these. Formula is a choice between Erlang B and an approximation, which ever requires more timeslots. Number of TSL for data is data load divided by TSL capacity. Total TSL required given by Max(ErlangB(CS),CS traffic(E)+Guard TSL+TSL for data-Dedicated TSL)+dedicated TSL. From here work out TRXs and so on.
What is rate reduction?	A way of including timeslot multiplexing in dimensioning by taking into account CS and PS traffic and PS territory
How big can an EDAP be?	12 * 64 kbps Abis TSL
How many EDAPs can be attached to a site?	There is no limit. It could be one per site or one per TRX, although this is inefficient
How many EDAPS can be mapped onto a single T1?	As long as there is space on the T1, there is no limit
Which are the 3 states of a MS in GPRS?	Ready, Idle, Standby
What does READY mean?	MS is transmitting data or it has just transmitted data … it is in active mode
What does IDLE mean?	Basically the SGSN doesn't know where the MS is
What does STANDBY mean?	SGSN knows where the MS is based on the RA resolution
How do you move from IDLE to READY? And viceversa?	Attach and Detach
How do you move from READY to STANDBY? And viceversa?	READY --> STANDBY / timer. STANDBY --> READY just if you send or receive data
How do you move from STANDBY to IDLE? And viceversa?	GPRS Detach, either implicit or through a timer
What is a TBF in EGPRS?	Temporary Block Flow
Is the TBF in both directions?	no, unidirectional
Can the same TBF be bi-directional (let's say like a voice call)?	no
Which is the basic signalling in order to maintain an UL TBF?	UL TBF and in DL just ACK
Which is the basic signalling in order to maintain an UL TBF?	DL TBF and in UL just ACK
What is the effect of putting data on a hopping TRX?	With no power control there is increase interference to the hopping layer
What is the main objective of EGPRS optimisation?	To maximise user throughput
In EGPRS, how is this achieved?	Mostly through, capacity improvements. C/I improvements will affect the MCS but this is linked to GSM. For EGRPS only we can play with TRXs, Ded TSL, EDAP, PCU, Gb

If a TRX is BLK-SYS when EGENA is turned on, what is the most probably cause?	GTRX=Y and the TRX is not attached to the EDAP
Name some EGPRS KPIs	Throughput, TBF est fail, TBF fail, TBF lost due to flush or MS lost, GMSK share of EGPRS, TBF/TSL, Payload, EDAP congestion (mins/Gb), territory upgrade rejects, territory downgrades, PCU congestion
What is PoC?	Push-to-Talk over Cellular. It is a real-time service
What elements need to be added for PoC?	PoC Server, possible Presence server
How is EGPRS used for PoC?	It is merely a transport layer, PoC is a service that uses EGPRS
Are there re-transmission in PoC?	Not from the PoC server. EGPRS uses normal algorithm
What KPIs are used in PoC?	Start to Talk (STT) time, Voice Through Delay (VTD),Glitches (delay in packet arrival), Lost data), Round Trip Delay (RTT) (depends on user reaction)
What values are normally expected for STT and VTD?	STT: <2s, VTD: <4s
What is the advantages/disadvantages of a low initial MCS	Adv: greater possibility of the data being decoded for MSs in bad quality. Dis: Less range if 8PSK due to power back-off
Define a Microcell	A small capacity cell with an antenna not more than 5m in height
What is the best position for a microcell antenna?	In a grid system, on the side of a building. Not on a corner otherwise the canyon streets will propagate the signal too far. In a non gird system, side or corner of the building wherever best serves the target area.
What are the disadvantages of a micro cell?	Fast moving mobiles may select it and then leave the coverage area very fast. Local congestion because of high traffic
How can these be solved?	Use C2 penalty time to make the cell attractive only to slow mobiles. Run the cell as barred and use hierarchical handovers to move the calls from the overlaying macros
Name some RF systems used in in-building cells	Active or passive Distributed Antenna Systems (DAS), leaky feeders, Yagis in the lift shaft.
If you don't know an answer to a question where do you look?	NED, Jump, Quickplace, mailing lists, ETSI Specs, Nokia Feature Descriptions, Training course material.
Why don't we suggest to have a bigger DEFAULT TERRITORY?	More intracell Ho. Eat up PCU capacity

GSM RF INTERVIEW FAQs

1) GSM PLMN Services

- **Bearer Services**
  Thse services give the subscriber the capacity required to transmit appropriate signals b/w certain access points(i.e., user-network interfaces).

- **Teleservices**
  These services provide the subscriber with necessary capabilities including terminal equipment functions to communicate with other subscribers.

- **Supplementary Services**
  These services modify or supplement basic telecommunications services. These services are offered together or in association with basic telecommunications services.

2) GSM 900
Uplink :890 – 915 MHz
Downlink : 935 - 960 MHz

3) DCS 1800
Uplink : 1710 - 1785 MHz
Downlink :1805 – 1885 MHz

4)

Bands	**Carrier frequencies**
GSM 900	(915-890) MHz / 200 kHz = 125, (1 – 124) ARFCNs
DCS 1800	(1785-1710) MHz / 200 kHz = 375, (1 – 374) ARFCNs

each band having a carrier separation of 200 kHz.

5) **Ciphering** The purpose of ciphering id to encode the transmitted burst so that it cannot be hacked or tapped by any other device before reaching the receiver. The algorithm used for ciphering is the A5 algorithm

6) **Authentication** normally takes place when the MS is turned on with each incoming call and outgoing call. A verification that the »Ki« (security code) stored in the AuC matches the »Ki« stored in SIM card of the MS completes this process.

7) **Equalization** is used to extract the desired signal from the unwanted reflections. It works by finding out how a known transmitted signal is modified by multipath fading, and constructing an inverse filter to extract the rest of the desired signal. This known signal is the 26-bit training sequence transmitted in the middle of every time-slot burst. The actual implementation of the equalizer is not specified in the GSM specifications.

8) **Interleaving** The process of spreading a block of data over a wider time frame by placing data bits from other data blocks in between the original data bits in the block. Interleaving is frequently done in digital system to spread the data so that bits from the same block are not contiguous and bit errors are randomized to the point FEC is more effective. Systems using this technique are more likely to withstand Rayleigh and other bursty fading and interference phenomenon.

9) **Digitization** The digitization of analogue waveforms by pulse code modulation is accomplished in two stages. First the waveform is sampled to produce pulse amplitude modulation (PAM). Short-duration samples are taken at regular intervals which are long compared with the sampling time but short in relation to the highest signal frequency. The result is a train of pulses whose amplitude envelope is the same as the analogue waveform.

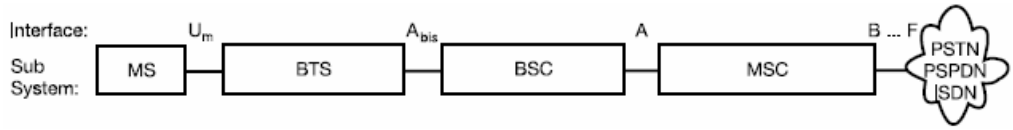
10) **Speech Coding**: An electronic process of sampling and digitizing a voice signal.

11) **Channel Coding**: The application of forward error correction codes to an RF channel to improve performance and throughput.

12) **Frequency Reuse**: A technique of reusing frequencies and channels within communications system to improve capacity and spectral efficiency. Frequency reuse generally utilizes regular reuse patterns.

13) **Cell Splitting**: The process of splitting a cell into several smaller cells. This is usually done to make more voice channels available to accommodate traffic growth in the area covered by the original cell.

14) **Interfaces:**



15) The protocol used on the A_{bis} interface is **Link Access Protocol for the D-channel** (**LAP-D)**, which is adapted from ISDN. LAPD provides the following frame types that can be divided into three groups:

- the unnumbered frames (SABM, DISC, UA, DM, UI),
- the information transfer frame (I)
- the supervisory frames (RR, RNR, REJ, FRMR).

16) WPS

17) MA

18) **MAIO** Mobile Allocation Index Offset: It is the offset index to the Absolute Radio Frequency Channel Numbers (ARFCNs) with the allocated frequenices.

19) **Base Band Frequency Hopping (BBH**)

In baseband hopping, each transmitter is assigned with a fixed frequency. At transmission, all bursts, irrespective of which connection, are routed to the appropriate transmitter of the proper frequency.
The advantage with this mode is that narrow-band tuneable filter combiners can be used. This makes it possible to use many transceivers with one combiner.

Synthesiser Frequency Hopping (SFH)

Synthesizer hopping means that one transmitter handles all bursts that belong to a specific connection. The bursts are sent "straight on forward" and not routed by the bus. In contrast to baseband hopping, the transmitter tunes to the correct frequency at the transmission of each burst.

20) **Cycling Frequency Hopping**

In cyclic hopping, the frequencies are changed, in every TDMA frame, in a consecutive order. For instance, the sequence of frequencies for cyclic hopping between four frequencies may appear as follows:

... , f4, f1, f2, f3, f4, f1, f2, f3, f4, f1, f2, ...

A cyclic sequence is specified by setting parameter **HSN** (hopping sequence number) to 0. There is only one cyclic sequence defined in the GSM specifications. The sequence of frequencies goes from the lowest absolute frequency number in the set of frequencies specified for that channel group, to the highest, and over again.

21) **Hopping Sequence Number (HSN**) In order to spread the interference between all cells using the same hopping TCHs, e.g. in an FLP 1/1 plan, Hopping Sequence Number (HSN) planning is used. HSN is planned in order to avoid correlation between closely located cells.

22) **Discontinuous Transmission**: A feature in mobile systems where transmitters mute when there is no information to send, such as during periods of silence. This feature prolongs battery life in portable phones and reduces interference in wireless systems.

23) **Discontinuous Reception** A feature in mobile systems where receiver mute when there is no information to send, such as during periods of silence. This feature prolongs battery life in portable phones and reduces interference in wireless systems.

24) **GSM Data Rate** = 270.9 kbits/s using GMSK as the modulation technique.

25) **Erlang** A measure of radio usage. One Erlang is equivalent to one telephone line being permanently used.
Grade of Service (GoS): A measure of the success a subscriber is expected to have in accessing a network to complete a call. The grade of service is usually expressed as percentage of calls attempted by the subscriber during the busy-hour that are blocked due to insufficient network resources.

26) GSM 900 is better in terms of coverage and quality.
According to RF basics, if two signals having different frequencies are transmitted with same power, the signal with low frequency will travel much far than the signal with high frequency. Propagation losses will be less for low frequency as compared to a high frequency. Hence if a GSM 900 frequency and a DCS 1800 frequency are transmitted with same power then DCS 1800 frequency will cover only half of the area covered by GSM 900 frequency.

27) **Timing Advance (TA)** The timing advance ensures the bursts arrive at their destination in the appropriate time slot. The mobile transmits a random access burst in the uplink, and the BTS will make measurements, sending an adjustment on the downlink. Timing advance is measured in bits and can be adjusted up to 63 bits, with each bit lasting 3.69 ms.

28) **Location Area** To keep paging performance within a safe range, it is necessary to form clusters and page only the cluster of cells for which the MS is known to be situated. These cell clusters are called Location Area.

29) **Location Update (LU)**: This procedure allows the network to keep track of the mobile station to direct the incoming call.

30) **International Mobile Station Identity (IMSI)**: A unique 15 digit number assigned to a mobile station at the time of service subscription. It contains a mobile country code, a mobile network code, mobile subscriber identification number, and a national mobile subscriber identity.
Temporary mobile subscriber identity (TMSI): This identifier is assigned by the VLR after a mobile station establishes itself in the network. The network then uses this identifier rather than the IMSI when performing various call management tasks.

International Mobile Station Equipment Identity (IMEI): An identification number assigned to GSM mobile stations that uniquely identifies each one. It is a 15 digit serial number that contains a type approval code, final assembly code and serial number.

31) **Absolute Radio Frequency Channel Numbers (ARFCNs)**: A channel numbering scheme used to identify specific RF channels in a GSM radio system.

32) **Power Control:** A technique for managing the transmit power in base stations and mobiles to a minimum level needed for proper performance. Downlink power control applies to base stations and uplink power control to mobiles. Power control is used in nearly all wireless systems to manage interference, and in the case of mobiles, to extend battery life.

33) **Time Division Duplex (TDD):** A duplexing technique dividing a radio channel in time to allow downlink operation during part of the frame period and uplink operation in the remainder of the frame period.
Frequency Division Duplex (FDD): Radio technology using a paired spectrum. This type is typically used in GSM.

34) **Extended cells** have a radius of maximum120 km. They are mainly used for coastal regions where an extended version of macro cells is needed. The capacity of a TRX is reduced to half if extended cells are implemented.

35) **Frequency Division Multiple Access (FDMA):** Method of allowing multiple users to share the radio frequency spectrum by assigning each active user an individual frequency channel. In this practice, users are dynamically allocated a group of frequencies so that the apparent availability is greater than the number of channels.
Time Division Multiple Access (TDMA): A technology for digital transmission of radio signals between, for example, a mobile telephone and a radio base station. In TDMA, the frequency band is split into a number of channels which in turn are stacked into short time units so that several calls can share a single channel without interfering with one another.
Code Division Multiple Access (CDMA): One of several digital wireless transmission methods in which signals are encoded using a specific pseudo-random sequence, or code, to define a communication channel. A receiver, knowing the code, can use it to decode the received signal in the presence of other signals in the channel.

36) Control and signaling channels are used for SMS.

37) Random Access Channel (RACH).

38) **Access Grant Channel (AGCH)**: A downlink control channel used in GSM systems to assign mobiles to a SDCCH for initial assignment.

39) **Slow Dedicated Control Channel (SDCCH)**: A low-speed bi-directional point-to-point control channel used to transmit service request, subscriber authentication, ciphering initiation, equipment validation and traffic channel assignment messages between the mobile and the network.

40) **Physical Channel** The actual radio channel that carries the various logical and traffic channels in a wireless system.
Logical Channel A communications channel derived from a physical channel. A physical channel, i.e. RF channel, typically carries a data stream that contains several logical channels. These usually include multiple control and traffic channels.

41) •**TDMA Frame** : 8 time slots per carrier : 576.92 μs x 8 = 4.615 ms frame duration
• control slot **multiframe** = 51 TDMA frames
• traffic slot **multiframe** = 26 TDMA frames (120 msec)
• **Superframe** = 26 x 51 multiframes (6.12 sec)
• **Hyperframe** = 2048 superframes (~ 3.5 hours)

42) **Frequency Correction Channel (FCCH)** A logical channel in GSM systems used to transmit a frequency correction data burst of all "zeros". The resulting frequency shift seen by the mobile is then used for frequency correction.
Synchronization Channel (SCH) A logical channel used by mobile stations to achieve time synchronization with the network.
Broadcast Control Channel (BCCH) A downlink point to multipoint logical channel in GSM and cdma2000 systems used to send identification and organization information about common control channels and cell services.

43) **Slow Associated Control Channel (SACCH)** A low-speed control channel associated with a traffic channel and used to transmit supervision and control messages between the mobile and the network.

44) **Paging Channel (PCH)** A logical channel used to send messages to mobile station. Used primarily to notify the mobile that it has an incoming call.
Cell Broadcast Channel A downlink point to multipoint logical channel in a GSM system used to broadcast user information from a service center to mobile stations listening in a given cell area.

45) We do not keep BCCH on hopping radio.
BCCH is used to transmit all the overhead information needed for an MS to recognize the network in idle mode, so there is no need for a hopping radio. But we keep the SDCCH and TCH on hopping TRXs so that the MS does not experience call drops when it is either in dedicated mode or during call setup procedure.

46) According to GSM recommendations, there is a delay equal to 3 time slots (=1.73 usec) in between uplink & downlink because of the following facts:-

- If MS receives & transmit simultaneously, it will chew up the battery of the MS.
- The delay of 3 time slot is sufficient enough to detune itself from the downlink frequency & tune to the uplink frequency.
- The difference of 3 time slot in between receiving & transmission is used to process the normal burst that is just received i.e. the process of Adaptive Equalization.
- The difference of 3 time slot in between receiving & transmission is used to perform measurement, process & store result.

47) Traffic channels are defined using a 26-frame multiframe, or group of 26 TDMA frames. The length of a 26-frame multiframe is 120 ms, which is how the length of a burst period is defined (120 ms divided by 26 frames divided by 8 burst periods per frame). Out of the 26 frames, 24 are used for traffic, 1 is used for the slow associated control channel (SACCH) and 1 is idle/unused.
SACCH is used to transmit supervision and control messages between mobile and the network while the MS is in dedicated mode. **Idle burst** is used to differentiate between two consecutive TCH multiframes.

48) **Fast Associated Control Channel (FACCH)** The channel derived by preempting information in a traffic channel. It is used to send handoff and similar messages.

49) **Burst** A term, usually associated with a TDMA system, describing a group of bits or other information transmitted by the system. Also refers to the time the transmitter is on and radiating.

- The **normal burst (NB)**: Used to carry information on traffic and control channels, except for RACH. It contains 116 encrypted bits.
- The **frequency correction burst (FB**): Used for frequency synchronization of the mobile. The contents of this burst are used to calculate an unmodulated, sinusoidal oscillation, onto which the synthesizer of the mobiles is clocked.
- The **synchronization burst (SB)**: Used for time synchronization of the mobile. It contains a long training sequence and carries the information of a TDMA frame number.
- The **access burst (AB)**: Used for random access and characterized by a longer guard period (256 ms) to allow for burst transmission from a mobile that does not know the correct timing advance at the first access to a network (or after handover).

- The **dummy burst (DB)**: Transmitted as a filler in unused timeslots of the carrier; does not carry any information but has the same format as a normal burst (NB).

50) When measuring antennas, the typical measurement is the **Voltage Standing Wave Ratio (VSWR)**. VSWR is a mathematical conversion of return loss, which is easily measured using the scalar analyzer.

51) **Effective Isotropic Radiated Power (EIRP)** A measure of the power in the main beam of an antenna relative to an isotropic radiator.

52) **Polarisation** The radiated field from an antenna is considered to be polarized in the plane of the length of the conductors which is the plane of the electric field, the E plane. Confusion arises when reference is made to vertical or horizontal polarization and it is preferable when referring to polar diagrams to use the E and H plane references.

53) **Fading** The variation in signal strength from it normal value. Fading is normally negative and can be either fast or slow. It is normally characterized by the distribution of fades, Gaussian, Rician, or Rayleigh.

- **Delay Spread** A type of distortion due to multipath resulting in the spreading out or "smearing" of the received signal. It occurs when identical signals arrive via different paths and have different time delays.
- **Doppler spread** The magnitude of the change in the observed frequency of a wave due to the relative velocity of a transmitter with respect to a receiver.

54) **Rayleigh fading** A type of signal fading caused by independent multipath signals having a Rayleigh Probability Density Function (PDF).

55) **Multipath Fading** It is fading due the arrival of multiple versions of the same signal from different locations shifted in time due to having taken different transmission paths of varying lengths.

56) Techniques to minimise Multipath Fading:

Equalization is used to extract the desired signal from the unwanted reflections. It works by finding out how a known transmitted signal is modified by multipath fading, and constructing an inverse filter to extract the rest of the desired signal. This known signal is the 26-bit training sequence transmitted in the middle of every time-slot burst.

Diversity This technique reduces the effects of fading by using multiple spatially separated antennas to take independent samples of the same signal at the same time. The theory is that the fading in these signals is uncorrelated and that the probability of all samples being below a threshold at a given instant is low.

57) Types of Diversity:

- Frequency Diversity
- Time Diversity

58) Types of **Antenna Diversity**:

Polarization Diversity A diversity technique where antennas of different polarizations, I.e. horizontal and vertical, are used to provide diversity reception. The antennas take advantage of the multipath propagation characteristics to receive separate uncorrelated signals.
Space Diversity It consists of two receive antennas physically (spatially) separated to provide de-correlated receive signals.

59) **Frequency Diversity** The simultaneous use of multiple frequencies to transmit of information. This is a technique used to overcome the effects of multipath fading, since the wavelength for different frequencies result in different and uncorrelated fading characteristics.

60) **Time Diversity** The technique used by CDMA systems to overcome the effects of multipath fading. Through the use of a rake receiver, individual elements, or fingers, can be offset in time to account for different arrival times of multipath signals.

61) **Propagation Mechanisms**
Most propagation in the mobile environment is dominated by these three mechanisms:

- **Free space**
  No reflections, no obstructions
  first Fresnel Zone clear
  Signal spreading is only mechanism
  Signal decays 20 dB/decade
- **Reflection**
  - Reflected wave 180 degrees out of phase
  - Reflected wave not attenuated much
  - Signal decays 30-40 dB/decade
- **Knife-edge diffraction**
  - Direct path is blocked by obstruction
  - Additional loss is introduced
  - Formulae available for simple cases

62) **Diffraction** A propagation phenomenon that allows radio waves to propagate beyond obstructions via secondary waves created by the obstruction. Classic types of diffractions are smooth earth and knife-edge.

63) **Knife-Edge Diffraction** Sometimes a single well-defined obstruction blocks the path, introducing additional loss. This calculation is fairly easy and can be used as a manual tool to estimate the effects of individual obstructions. This kind of diffraction is called Knife Edge Diffraction.

64) **Scattering** A phenomenon that occurs when the medium through which a radio wave travels consists of objects with dimensions small compared to the wavelength and diffuses the wave as it propagates through it.

65) **FSPL:**

66) **Fresnel zones** The effect of indirect waves can be predicted by calculating where the reflection occurs in relation to a series of ellipsoids which can be drawn around the line-of-sight path between the transmitting and receiving antennas. These ellipsoids, known as the Fresnel zones, contain the points where reflected waves will follow a path of constant length.

67) **Beamwidth** More properly referred to as the half-power beamwidth this is the angle of an antenna pattern or beam over which the relative power is at or above 50% of the peak power.

68) **Bandwidth** The information-carrying capacity of a communications channel. Usually expressed in Hertz (cycles per second) for analog circuits and in bits per second (bps) for digital circuits.

- 3dB BW
- Absolute BW
- Coherence BW
- Modulation
- Null-to-null

69) **Signal-to-noise ratio** The ratio of power in a signal to the noise power in the channel. This term is usually applied to lower frequency signals, such as voice waveforms.
Front to Back ratio It is the ratio of the gain at 0 degree to the gain at 180 degrees. It provides how well unwanted signals from the rear can be rejected.

70) There are four different **types of handovers** in GSM, which involve transferring a connection between:

- Channels (timeslots) in the same cell (intra-BTS handover)
- Cells under the control of the same BSC (inter-BTS handover).
- Cells under the control of different BSCs, but belonging to the same MSC (inter-BSC handover)
- Cells under the control of different MSCs (inter-MSC handover)

71) The reasons for **Handover Failure** are:

- uplink interference
- downlink interference
- neighbors not well defined
- low uplink RXLev value
- low downlink RXLev value
- large distance between BTS and MS
- discrepancies in the power budget calculations
- low C/I & C/A values

72) **Hard Handover** The hard handover is a break before make handover just like in other wireless systems and must be used where the current and handover candidate base stations do not use the same RF channel.
Soft handover A process of establishing a call connection simultaneously to two separate base stations in a network. This technique allows the use of a dual path in the handover region to improve performance. Soft handover can only occur between base stations using the same RF channel.

73) **SYNC Handover** is the handover between synchronous neighbor cells of the same base station. **ASYNC Handover** is the handover between cells of different base stations (asynchronous neighbors).

74) **Emergency Handover** Emergency handover occurs in following situations

- When there is heavy traffic and congestion in a particular, the calls are forced to handover to another BTS/cell.
- When a particular BTS is undergoing maintenance the traffic is handover to another neighboring BTS.

77) **Vertical handover** refers to a network node changing the type of connectivity it uses to access a supporting infrastructure, usually to support node mobility. Vertical handoffs refer to the automatic failover from one technology to another in order to maintain communication. **Horizontal handover** is the handover between different wireless access points that use the same technology. It is different from vertical handoff in that it involves changing the data link layer technology used to access the network.

78) **Multilayer Handoff**

79) Handovers can be initiated by either the BSC or the MSC (as a means of traffic load balancing).

80) MSC is involved in handover decision making only if cells under the control of different BSCs, but belonging to the same MSC (inter-BSC handover) or if cells are under the control of different MSCs (inter-MSC handover)

81) During its idle timeslots, the MS scans the broadcast control channel of up to 16 neighboring cells, and forms a list of the six best candidates for possible handover, based on the received signal strength. This information is passed to the BSC and MSC, at least once per second, and is used by the handover algorithm.

82) GSM uses a **modulation** format called **GMSK**. In this type of modulation, amplitude remains constant during phase shifts of ±90 degrees. The constellation diagram of a GSM signal thus resembles a circle.

Reasons for using GMSK in GSM:

- The key measurement of this type of modulation is phase error, as there is no magnitude error. Many test instruments can plot this phase versus bits, as graphic representations often paint a picture much more clearly. In this way, the technician can quickly see if the modulation is passing or not.
- GSM uses a constant signal envelope, which means less battery drain and more robustness in the presence of interfering signals.

83) **ASK** simply varies the amplitude of the carrier between two states, one representing a one, the other representing a zero.
PSK the phase of the carrier is shifted, depending on the data to be sent. The simplest form of this is *binary PSK* (BPSK), where two phase states represent either a one or a zero.
FSK, where the frequency is shifted between to states to represent a one or zero, is actually used quite extensively in analog system signaling.

84) **Quadrature Phase Shift Keying (QPSK)** A type of phase modulation using 2 pairs of distinct carrier phases, in quadrature, to signal ones and zeros.
Offset Quadrature Phase Shift Keying (O-QPSK) A type of QPSK modulation that offsets the bit streams on the I and Q channels by a half bit. This reduces amplitude fluctuations and helps improve spectral efficiency.

85) **Minimum Shift Keying** A modulation technique using sinusoidal shaped input data pulses to drive the phase modulator. This results in a linear phase change over conventional QPSK, resulting in lower side lobes and less adjacent channel interference performance.

86) **Quadrature Amplitude Modulation** A type of modulation where the signaling information is carried in the phase and amplitude of the modulated carrier wave.

87) **Pulse Amplitude Modulation (PAM)** A technique for encoding the samples of an analog waveform as part of the PCM process.
Pulse Code Modulation (PCM) The most predominant type of digital modulation in use today. PCM performs an analog to digital conversion of the speech waveform through a sampling process and encodes and transmits the samples in a serial bit stream as 8-bit digital words.

88) **Orthogonal Frequency Division Multiplex (OFDM)** A modulation technique that transmits blocks of symbols in parallel by employing a large number of orthogonal subcarriers. The data is divided into blocks and sent in parallel on separate sub-carriers. By doing this, the symbol period can be increased and the effects of delay spread are reduced.

Frequency Division Multiplex (FDM) The process of placing two or more independent channels next to each other in the frequency domain (stacking the channels) and then modulating a single high frequency carrier with the combined signal is called FDM
Time Division Multiplex (TDM) Transmissions from the same multiple sources occur on the same facility but not at the same time. Transmissions from various sources are interleaved in the time domain.

89) In GPRS, the modulation scheme is **GMSK**; in EDGE, it is **8-PSK**

Gaussian Minimum Shift Keying (GMSK) A modulation technique involving Gaussian filtering of the input data prior to its application to the phase modulator. This results in a narrow occupied spectrum and better adjacent channel interference performance.
8-Phase Shift Keying (8-PSK) Similar to QPSK, 8PSK uses phase locations to determine the pattern. The 8PSK is a higher order modulation scheme, meaning it can transmit more information per shift or symbol. Whereas QPSK transmits 2 bits per symbol, 8PSK transmits 3 bits per symbol. Naturally, this does require a more complex system, as the phase states are closer together.

90) **Co-channel Interference (C/I)** Unwanted interference within a radio channel from another transmitter using the same channel at a different location. Co-channel interference is very common in a frequency reuse system and must be carefully controlled to prevent problems.

91) **Adjacent Channel Interference (C/A)** Out of band power generated in adjacent channels by transmitters operating in their assigned channel. The amount of adjacent channel interference a receiver sees is a function of transmitter and receiver filter characteristics and the number of transmitters operating in the area.

92) **RxQUAL** is a value b/w 0 -7 where each value corresponds to an estimated number of bit errors in a number of bursts.
Each RXQUAL value corresponds to the estimated bit error rate according to the following table

RXQUAL	Bit Error Rate (BER)
0	BER < 0.2%
1	0.2% < BER < 0.4%
2	0.4% < BER < 0.8%
3	0.8% < BER < 1.6%
4	1.6% < BER < 3.2%
5	3.2% < BER < 6.4%
6	6.4% < BER < 12.8%
7	12.8% < BER

93) In GSM there are two types of values presented for BER, namely BER FULL and BER SUB.
The **FULL** values are based upon all frames on the SACCH multiframe, whether they have been transmitted from the base station or not.
The **SUB** values are based on the mandatory frames on the SACCH multifame. These frames must always be transmitted.

94) SQI

95) Base Station Identity Code (BSIC) A unique code contained in messages on the broadcast channels of a cell or base station that uniquely identifies the base station.

96) Advanced Multi Rate (AMR) Codec During 1999, ETSI standardized this new speech codec for GSM. The codec adapts its bit-rate allocation between speech and channel coding, thereby optimizing speech quality in various radio channel conditions. For this reason, 3GPP (under which the next stage GSM speech quality will be realized) has selected the AMR codec as an essential speech codec for the next generation system.

97) Reasons for Call Drop:

- Bad Quality UL or DL or Both.
- Low Signal Strength UL or DL or Both.
- Timing Advancement limit reached.

- If the SACCH frame is not received, then it is considered to be dropped call.
- There is some relation between the number of dropped calls and voice quality. If the voice quality were not a limiting factor, perhaps the dropped call rate would be very low in the network. Calls can drop in the network due to quality degradation, which may be due to many factors such as capacity limitations, interference unfavourable propagation conditions, blocking, etc.

Scenario Based Call Drops:

First scenario in which you can have drops due to congestion is if queuing is enabled, and the queue length is not cleared till a particular threshold.

Second case in which pre-emption is enabled and call priority settings are done. So in that case the call with high priority will be given the preference, either by shifting the present call to other cell (if resources are available) else present call will be dropped because of low priority.

Third scenario is when you have an overload situation, and to overcome it, calls with low priority are dropped (after rejecting the new call and paging requests)

98) Counters

99) Drive testing is required when :

- The quality of the network is ultimately determined by the satisfaction of the users of the network, the subscribers. Drive tests give the 'feel' of the designed network as it is experienced in the field.
- All the parameters for example received power levels from own cell and neighbor cells, FER, BER, MS power control, etc. are low and weak.
- Less penetration level of signals in different regions of the network. These results can then be compared with the plans made before the network launch.
- Once the network goes 'live', the drive test and NMS statistics help in further fine-tuning of the parameters, and it is at this point that a set of default parameters is created for the whole network.

100) **Cell Reselection** After a cell has been successfully selected by the MS, it will start making measurements on its neighboring cells BCCH carriers. If a cell with stronger signal level is found, it will be decided if a cell reselection should be executed.

101) **C1 & C2 Criteria** For an MS in GPRS mode currently on a cell with no PBCCH (only on demand Packet Data Channels) C1 and C2 criteria are used just like for all circuit switched MSs in Idle Mode. in idle mode, the MS continuously calculates the cell selection quantity,

C1. (The name of this quantity in the GSM Technical Specifications is "path loss criterion parameter". As the C1-criterion is based only on signal strength and not on path loss, the term used in this document is "cell selection quantity".) The cell selection criterion is satisfied if $C1 > 0$.

102) **Call Re-establishment** This procedure occurs when the call is dropped after it was established initially so that it can re-establish again.

103) short calls long calls during dt

104) **Call Setup Success Rate (CSSR)** This is the global setup success rate of a call, all the way from the SDCCH to assignment complete message. The proportion of call setup attempts resulting in successful TCH assignment the basic idea is to count all the drops before successful TCH assignment.
Call Establishment Failure Rate (CEFR) CEFR = 1 – CSSR

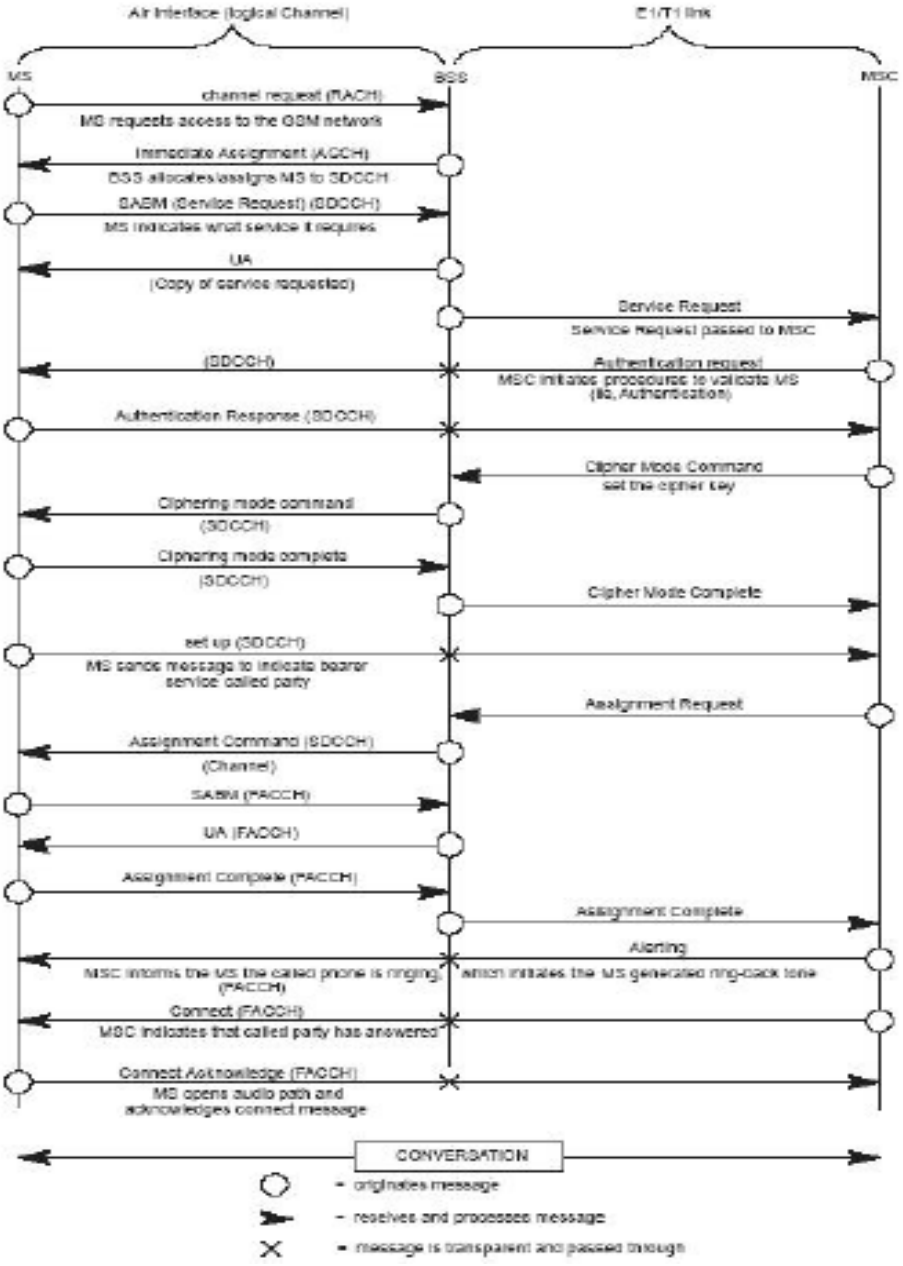
105) **Received Signal Strength Indication (RSSI)** An indication of the average signal strength at the input of a receiver produced by measurement circuitry in the receiver. Such a measurement does not normally include antenna gain or transmission system losses.

106) **RXLEV & RXQUAL** Intercell handover from the serving cell to a neighbor cell occurs when RXLEV and/or RXQUAL is low on the serving cell and better on the neighbor cell. Intracell handover from one channel/time slot to another channel/time slot in the same cell occurs when RXLEV is high but RXQUAL is low.

107) **Bit Error Rate (BER)** A ratio of the number of errors to data bits received on a digital circuit. BER is usually expressed in exponential form.
Frame Erasure/Error Rate (FER) A measure of the number of frames of data that contained errors and could not be processed. FER is usually expressed as a percentage or exponent.

108) **Cell selection** When the MS is powered on, it scans all RF frequencies in the GSM band. The aim is to find the strongest available and valid BCCH carrier.

109) Mobile Originated Call



110) Handovers Procedure Handovers can be initiated by either the BSC or the MSC (as a means of traffic load balancing). During its idle timeslots, the mobile scans the broadcast control channel of up to 16 neighboring cells, and forms a list of the six best candidates for possible handover, based on the received signal strength. This information is passed to the BSC and MSC, at least once per

second, and is used by the handover algorithm. The decision on when to initiate a handover is a function of the following parameters:

- receive quality,
- receive level.

Successful handovers in GSM can take place at propagation speeds of up to 250 km/h.

111) **Registration**This is the process in which an MS informs a network that it is attached.

112) **General Packet Radio Service (GPRS)** A packet-linked technology that enables high-speed (115 kilobit per second) wireless Internet and other data communications over a GSM network. It is considered an efficient use of limited bandwidth and is particularly suited for sending and receiving small bursts of data.

113) In the GPRS public land mobile network (PLMN), two of the support nodes that form the GPRS backbone are the **Serving GPRS Support Node (SGSN)** and the **Gateway GPRS Support Node (GGSN)**. The former is the gateway to data services from within the mobile network; the latter is the gateway from the PLMN to the outside IP world. These nodes are absent in the GSM architecture.

114) **Difference between GSM & GPRS Architecture**

A GPRS mobile unit works remarkably similar to a GSM mobile. If the mobile needs to be contacted or needs to establish a connection, the paging process also works in a very similar manner as the GSM voice calls. In the backhaul, however, things are a bit different. The BSC will route the data call through a GPRS support node. In the GPRS public land mobile network (PLMN), two of the support nodes that form the GPRS backbone are the serving GPRS support node (SGSN) and the gateway GPRS support node (GGSN). The former is the gateway to data services from within the mobile network; the latter is the gateway from the PLMN to the outside IP world.

115) **Gateway GPRS Support Node (GGSN)** A gateway from a cellular network to an IP network.
Serving GPRS support node (SGSN) is the gateway to data services from within the mobile network.

Once data service is assigned to a mobile, it is the job of the SGSN to track the location of that mobile within the network and ensures that the mobile is authenticated and is receiving the correct level of quality of service. It is the job of the GGSN to interface with the outside data world. This is all done independent of the RF interface, as it is on the backhaul side of the BSC.

116) GPRS has four **coding schemes** that can be used, depending on the situation. These schemes are designated as CS-1 to CS-4.

GPRS uses a variable coding system, so that more robust coding is used for situations where the RF will be weak and less where it is optimal - this allows for optimal data throughput.

117) The maximum data rate for a **GPRS** frame, assuming all slots are being used for data, is 8 * 21.4Kbps = **171.2 Kbps**. But you can see that is would only be in the most ideal locations and situations, as there is no error correction at all.

There are nine coding rates and modulation settings in **EDGE**, which allow for data transmission rates from **8.8 Kbps up to 59.2 Kbps** per slot.

118) **Enhanced Data for Global Evolution (EDGE)** A technology that gives GSMA and TDMA similar capacity to handle services for the third generation of mobile telephony. EDGE was developed to enable the transmission of large amounts of data at a high speed, 384 kilobits per second. (It increases available time slots and data rates over existing wireless networks.)

119) **GPRS terminals** are classified depending on their capabilities. Currently three types of classifications are used:

- **Class A** mobile stations can make and receive calls on GSM and GPRS at the same time.
- **Class B** mobile stations can make and receive calls on GSM and GPRS, but not at the same time.
- **Class C** mobile stations need to be manually selected as far as whether they will operate in GPRS or GSM modes. This selection is done at the time of subscription of service by the user; thus, when a customer purchases a class C mobile, he or she must select either GPRS or GSM mode.

120) **Base Station Subsystem (BSS)** That portion of a GSM network that includes the base station, base station controller and transcoders (if used).

121) **The Network Subsystem (NSS)** consists of :

- mobile switching center (MSC)
- The home location register (HLR)
- The visitor location register (VLR)
- The authentication center (AuC)
- The equipment identity register (EIR)

122) **Home Location Register (HLR)** The functional unit responsible for managing mobile subscribers. Two types of information reside in the HLR: subscriber information and part of the mobile information that allow incoming calls to be routed to the mobile subscriber. The HLR stores the IMSI, MS ISDN number, VLR address, and subscriber data on supplementary services.

Visitor Location Register (VLR) The functional unit responsible for managing mobile subscribers currently attached to the network. Two types of information reside in the VLR: subscriber information and the part of the mobile information that allows incoming calls to be routed to the mobile subscriber. The VLR stores the MSRN, TMSI, the location area, data on supplementary services, IMSI, MS ISDN number, HLR address or GT, and local MS identity, if used.

123) The **Equipment Identity Register (EIR)**: The EIR is a database that contains a list of all valid mobile station equipment within the network, where each mobile station is identified by its international mobile equipment identity (IMEI). The EIR has three databases:

- White list: for all known, good IMEIs
- Black list: for bad or stolen handsets
- Grey list: for handsets/IMEIs that are uncertain.

The **Authentication Center (AuC)**: A protected database that holds a copy of the secret key stored in each subscriber's SIM card, which is used for authentication and encryption over the radio channel. The AuC provides additional security against fraud. It is normally located close to each HLR within a GSM network.

124) **Radio Base Station (RBS)** A term used to represent Ericsson BTS.

125) **E1 carrier** It is a PCM carrier having a data rate of 2.048 Mbps. This carrier has 32 8-bit samples packed into the basic 125 usec frame.
T1 carrier The T1 carrier consists of 24 voice channels multiplexed at a rate of 1.544 Mbps.

http://www.telecomtrendz.com/108/nokia-siemens-networks-interview-questions-for-freshers/

nokia siemens networks interview questions for freshers

Posted by TT News Network on February 17, 2011 in Tutorials | 0 Comment

Below Mentioned Questions and answers are the sample questions which are usually asked in **Nokia Siemens Networks technical interview** For Freshers,these are some basic questions that NSN expect from freshers seeking Job in telecommunication sector.

We will update this Section regularly whenever New Experience is shared by students,as of now this is latest update i.e. on **17-02-2011.**

If you have any queries post comments , our expert team will try to answer

[Question] GSM is used on which digital technologies?

[Answer]FDMA & TDMA. Frequency Division Multiple Access (FDMA) refers to the fact that each Base transceiver Station is allocated different radio frequency channels. Mobile phones in adjacent cells (or in the same cell) can operate at the same time but are separated according to frequency. Time Division Multiple Access (TDMA), as the name suggests, is a method of sharing a resource (in this case a radio frequency) between multiple users, by allocating a specific time (known as a time slot) for each user. TDMA timeslots are called as physical channels in GSM as they are used to physically move information from one place to another. The radio carrier signal between the Mobile Station and the BTS is divided into a continuous stream of timeslots which in turn are transmitted in a continuous stream of TDMA frames.

[Question] Which type of analogue modulation technique is used in GSM?

[Answer] Phase Modulation as GMSK (Gaussian Minimum Shift Keying).

[Question] Give advantages, disadvantages and applications areas of following type of analogue modulation techniques?

[Answer] Amplitude modulation (**AM**) is a technique that works by varying the strength of the transmitted signal (source signal frequqency) in relation to the information being sent (carrier frequency). Medium wave radio station is simplest example of it's application area, where the signal travels to much larger distance.

Frequency modulation (**FM**) conveys information over a carrier wave by varying its frequency (contrast this with amplitude modulation, in which the amplitude of the carrier is varied while its frequency remains constant). FM is commonly used at VHF radio frequencies for high-fidelity broadcasts of music and speech. Normal (analog) TV sound is also broadcast using FM. In this technique signal travels to comparatively shorter distance but has very good speech quality.

Phase modulation (PM) is a form of modulation that represents information as variations in the instantaneous phase of a carrier wave. Unlike its more popular counterpart, frequency modulation (FM), PM is not very widely used. This is because it tends to require more complex receiving hardware and there can be ambiguity problems with determining whether, for example, the signal has 0° phase or 180° phase. GSM uses this technique as one of its application area.

[Question] How to define Erlangs?

[Answer] Erlang is the measuring unit of network traffic. One Erlang equals the continuous use of a mobile device for one hour. The traffic is calculated using a simple formula:

$$x \text{ Erlangs} = \frac{(\text{calls per hour}) \times (\text{average conversation time})}{3600 \text{ seconds}}$$

[Question] What do we mean by GPRS & EDGE?

[Answer] GPRS (Genaral Packet Radio Service)-The Internet has become part of everyday life, GPRS gives a direct link between the worlds of the Internet and mobile communications GPRS is different from existing GSM data services. Firstly it allows users to have the same experience as if they were connected to their office LAN. The mobile user doesn't have to connect to the network each time he wants to transfer data; he can stay connected all day. Secondly GPRS allows users to be charged for the actual amount of data they transfer.

EDGE (Enhanced Data rates over GSM Evolution)- EDGE provides a bridge from GSM into the 3rd Generation mobile networks. It uses an advanced GSM modulation technique to provide data speeds of 384Kbits/s but still using the existing 200 KHz GSM channel. EDGE provides the ability to handle wireless multimedia services such as Internet/intranet, video conferencing, and fast electronic mail transfer. One of the attractions of EDGE technology is that it requires minor changes to network hardware and software, and can be introduced into an existing network using the current frequency bands.

[Question] GPRS Stands For?

[Answer] General Packer Radio Service

[Question] EDGE Stands For?

[Answer] Enhanced Data Rate for GSM Evolution.

[Question] UMTS Stands For?

[Answer] Universal Mobile Telecommunication System.

[Question] What are Multiple Access Technique Method?

[Answer] FDMA , TDMA,CDMA are multiple Access Technique Method.

[Question] What are the Duplex Technique.?

[Answer] FDD and TDD are the Duplex Method Available.

[Question] Difference Between Cellular and Cell.

[Answer] Cellular : Networking technology that breaks geographic area into cells shaped like honey comb.

Cell is the radio coverage area of one base transceiver station.

[Question] What are the Types in GSM Network.?

[Answer] GSM 900/1800.

[Question] Modulation Scheme used in GSM?

[Answer] GSMK

[Question] What is SIM?

Answer] Portable Smart Card with memory (ROM-6KB to 16KB-A3/A8 algorithm, RAM-128KB TO 256KB, EEPROM- 3KB to 8KB)

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MobileComm Technologies Academy

WCDMA Optimization Related Questions

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1. What is Significance of Eb/No? On what factors it is dependent? who provides
Eb/No? What is typical Eb/No for AMR 12.2 for Node B and MS?
Answer - Eb_No is related to QOS of a service which in terms related to bit error rate. Technically it is the minimum signal to noise needed by infrastructure equipment after
despreading it signal. This is a value used to compare different infrastructure vendors. Eb_No changes with the service type. Typically Eb_No for AMR 12.2 is ~ 4 db for node B and 8 dB for MS. It is infrastructure vendor (NSN) provides the Eb_No for Node B.
The E_b/N_0 value is the value that needs to be reached for insuring the targeted service quality. This is the ratio between the energy per bit for the related service over the noise spectral efficiency over the whole spreading band.
The spread signal is characterized by the ratio of the energy per chip over the spectral noise density E_c/N_0.

2. What effect is there on signal by spreading and dispreading?
Answer - Spreading will increase the bandwidth of a as signal. A signal of 10 Kb/s will become 40 Kb/s after spreading and will become 10 Kb/s after despreading.
The processing gain term expresses the gain achieved by spreading a narrow band signal over a wideband spectrum.
This gain is the ratio between the spreading chip rate and the actual service bit rate measured at the RLC level

3. Define Processing Gain.
Answer - Processing Gain is ratio between rate of spreaded signal and rate of non spreaded signal.
PG= 10 log (Chip rate /Bit rate)

4. What is a chip rate of WCDMA System? How much is the bandwidth required
for WCDMA?
Answer: - 3840 Kc/s. FDD 5 MHZ of paired band. TDD 5 MHz only.

5. What is the processing gain for 384 Kb/s service?
Answer:- =10*Log(3840/384)
=10*log (10)
=10*1
=10

6. What is the relationship of SF and data rate?
Answer; - They are inversely proportional. Lower the SF higher the data rate.

7. What is the relationship between SF and power required?
Answer - The lower the SF, the more power required.

8. What is the relationship with SF and coverage area of different services?
Answer: - They are directly proportional. Lower SF will have less coverage area.

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For example Coverage area decreases with increased throughput. If we compare 12.2 Kb/s and 384 Kb/s coverage area.12.2 kb/s coverage area will be bigger then 384 Kb/s coverage area.

9. What is the family of codes used for Chanelization in WCDMA
Answer: - Orthogonal Variable Spreading Factor.(OVSF)

10. What is the minimum and maximum SF in Downlink and uplink for FDD Mode?
Answer; - Minimum of 4 and maximum of 512 chips in downlink
Minimum of 4 and maximum of 256 chips in uplink

11. What is the usage of Channelization code in downlink and uplink?
Answer;- Uplink separation of physical data (DPDCH) and control channel (DPCCH) from same terminal.
Downlink separation of downlink connections to different users within one cell.

12. What is the Chanelization code used for PCPICH (PILOT CHANNEL)?
Answer: - C ch(256,0)

13. What is a typical CPICH power?
Answer - CPICH power typically takes about 8~10% of the total NodeB power. For a 20W (43dBm) NodeB, CPICH is around 2W (35.1 ~ 33dBm).
In urban areas where in-building coverage is taken care of by in-building installations, the CPICH may sometimes go as low as 5% because:
1) The coverage area is small since users are close to the site, and
2) More power can be allocated to traffic channels.

14. How much power usually a NodeB is allocated to control channels?
Answer - The power allocated to control channels may depend on equipment vendor recommendation. Typically no more than 20% of the total NodeB power is allocated to control channels, including CPICH. However, if HSDPA is deployed on the same carrier then the total power allocated to control channel may go up to 25 to 30% because of the additional HSDPA control channels required.

15. What is the usage of scrambling code in WCDMA for both downlink and uplink?
Answer; - There is only one frequency in Downlink. SC is used to separate cells.
In uplink it is used to differentiate terminals.

16. How many numbers of SC codes available in Downlink and Uplink?
Answer; - Downlink 512, Uplink several millions.

17. What is the Modulation scheme is used in UMTS for voice service in Downlink and uplink?
Answer; - QPSK in downlink and HPSK (Hybrid Phase shift keying) in uplink.

18. How many slots are there in a WCDMA Frame? How big is a frame in ms. how many chips are there in a slot?
Answer: - WCDMA Frame is 15 slots wide. It is 10ms in length. There are 2560 chips in one slot.
Chip rate is 3840 Kc/s
Length of frame = 10 ms
Number of chips in a frame = 3840 *10=38400 chips

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Number of chips in a slot = 38400/15= 2560 chips.

19. Give a simple definition of pole capacity?
Answer - The pole capacity is the theoretical maximum capacity of the system. In WCDMA, this capacity is only theoretical since, once reached, the system goes in an instable state that leads to its collapse. However it is still a reference for expressing the load.
The uplink noise increases with the loading exponentially. When the uplink noise approaches infinity then no more users can be added to a cell – and the cell loading is close to 100% and has reached its "pole capacity".

Mathematically, to calculate the uplink pole capacity we need to know:
W: chip rate (for UMTS 3,840,000 chips per second)
R: user data rate (assuming 12,200 kbps for CS-12.2k)
f: other-cell to in-cell interference ratio (assuming 65%)
EbNo: Eb/No requirement (assuming 5dB)
AF: Activity factor (assuming 50%)
Pole Capacity = (W/R) / ((1+*f*) * AF * 10^(EbNo/10)) = 120.6
To calculate the downlink pole capacity we also need to know:
α: downlink channels orthogonality factor (assuming 55%)
Pole Capacity = (W/R) / ((1- *α* +*f*) * 10^(EbNo/10)) = 64.06

20. What is typical pole capacity for CS-12.2, PS-64, PS-128 and PS-384?
Answer - With same assumptions as above:
CS-12.2k: 120.6 (UL), 64.1 (DL).
PS-64k: 34.8 (UL), 12.8(DL).
PS-128k: 16.2 (UL), 8.4 (DL).
PS-384k: 16.2 (UL), 2.8 (DL).
PS-384k has only 128k on the uplink, therefore the uplink capacity is the same for both.

21. **Different Idle mode tasks UE performs**
Answer - In Idle mode, the UE has no connection to the radio network
Keeping UEs in Idle mode minimizes the use of resources both for the UEs and in the network. However, the UEs must still be able to access the system and be reached by the system with acceptable delays. For this, the following procedures need to be performed:
- PLMN selection and reselection
- Cell selection and reselection
- Location Area (LA) and Routing Area (RA) updating
- Paging
- System information broadcast

22. What is cell selection criterion?
Answer - Cell selection is based on:
- Q_{mean}: the average SIR of the target cell.
- Q_{min}: minimum required SIR.
- $P_{compensation}$: a correction value for difference UE classes.

$S = Q_{mean} - Q_{min} - P_{compensation}$

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- If S>0 then the cell is a valid candidate.
- A UE will camp on the cell with the highest S.

23. Idle Mode Behaviour is managed by System information send on which L3 Channel?
Answer – BCH

24. How many Radio Bearers (RB) are involved in CS voice call?
Answer – 3
25. How many Service Radio Bearers (SRB) are involved in CS voice call?
Answer – 4

26. SCH channel consists of how many chips?
Answer - 256 chips

27. What do you understand by DRX cycle?
Answer - The UE listens to the PICH only at certain predefined times, reducing power consumption. The periodicity of these searches is set by the system and the time interval is called Discontinuous Reception (DRX) cycle.
Different DRX cycles are used for circuit switched and packet switched services in Idle mode. A separate DRX cycle is also used to page Connected mode UEs in state URA_PCH.

28. Cell Reselection is valid in both Idle and in which Sate in Connected mode?
Answer - CELL FACH

29. Difference between PICH and PCH?
Answer - PICH-Paging Indicator Channel
PCH-Paging Channel
PICH is used to indicate UE to when it should read to S-CCPCH (Carries PCH) whereas PCH is used to carry RRC Message “Paging type 1” which contains actual Paging information.

30. When is System information sent to UE?
Answer - The system information is regularly broadcast to the UE on the BCCH. When a parameter in the system information is changed, all UE in a cell are notified by a paging message or by a system information change indication message.

31. **Explain Timer T3212?**
Answer - Periodic LA and RA updating is used to notify the network of the UEs availability, and to avoid unnecessary paging attempts for a UE that has lost coverage and is not able to inform the CN that it is inactive.
The periodic LA update procedure is controlled by a timer, called t3212, which gives the time interval between two consecutive periodic location updates. The value is sent by the WCDMA RAN to UEs on the BCCH.

32. Explain Near far effect?
Answer;- All users use the same bandwidth at the same time and therefore users interfere with one another. Due to the propagation path loss, the signal received by the base station from a UE close to the base station will be stronger than the Signal received from another terminal located at the boundary. Hence, the distant user will be dominated by the close user. This is called the **near-far effect**. To achieve a considerable capacity, all signals, irrespective of distance, should arrive at the base

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station with the same mean power. A solution to this problem is **power control**, which attempts to achieve the same mean received power for each user.

33. Name three loops in Power control In WCDMA? Explain them briefly.
Answer; - Open Loop
Inner Loop
Outer Loop

Open Loop Power control
The open-loop power control technique requires that the transmitting entity measures
the channel interference and adjusts its transmission power accordingly. This can be done quickly, but the problem is that the interference estimation is done on the received signal, and the transmitted signal probably uses a different frequency, which
differs from the received frequency by the system's duplex offset. As uplink and downlink fast fading (on different frequency carriers) do not correlate, this method gives the right power values only on average.

Inner Loop
In this method the received *signal-to interference ratio* (SIR) is measured over a 667-microsecond period (i.e., one time slot), and based on that value, a decision is made about whether to increase or decrease the transmission power in the other end of the connection. Note that the delay inherent in this closed-loop method is compensated for by making the measurements over a very short period of time. The *transmit power*
control (TPC) bits are sent in every time slot within the uplink and the downlink. There
is not a neutral signal; all power control signals contain either an increase or decrease command.

Outer Loop
The outer loop power control functions within the base station system, and adjusts the required SIR value (SIRtarget), which is then used in the inner loop control. Different channel types, which can be characterized by, for example, different coding and interleaving methods, constitute a channel's parameters. Different channel parameters may require different SIRtarget values. The final result of the transmission process can only be known after the decoding process, and the resulting quality parameter is then used to adjust the required SIR value. If the used SIR value still gives a low quality bit stream, then the outer loop power control must increase the SIRtarget value. This change in the outer loop will trigger the inner loop power control to increase the mobile station transmission power accordingly

34. What is SIR?
Answer - SIR is the Signal-to-Interference Ratio – the ratio of the energy in dedicated physical control channel bits to the power density of interference and noise after dispreading.

35. How many time Inner Loop Power Control happens and what type of fading it
compensates?
Answer - 1500Hz and compensates Fast Fading.

36. What is BLER?
Answer - Block Error Rate

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37. **How is Initial RACH Power is calculated?**
Answer - The initial power on the PRACH - the power of the first preamble – is determined according to equation
P_PRACH = L_PCPICH + RTWP + **constantValueCprach**
Where L_PCPICH is the path loss estimated by UE since it knows transmit & receive CPICH power
RTWP is received Total Wideband Power(uplink interference) measured by RBS
constantValueCprach is used by the UE to calculate the initial power on the PRACH . This parameter is configurable and decides at which level below RTWP preamble ramping will start.

38. What power RACH message Control Part is sent?
Answer - The power of the control part of the RACH message is determined by the power of the last transmitted preamble and by a configurable offset **powerOffsetPpm**

39. Briefly describe why open loop power control is needed and how it works?
Answer - Open Loop power control is used when no feedback mechanism is possible. An estimate of the required power is made from measurements and system information.
This is used for initial network access and finding initial power settings during dedicated mode.

40. Explain the functionality of TPC?
Answer – During Power Control, Transmit Power control(TPC) commands are used to power up or power down based on SIR target in the step of 0.5 dB (1 dB if the connection is made over Iur).

41. How many types of handovers are there in UMTS?
Answer –
Soft/Softer Handover
Inter Frequency Handover
Inter RAT Handover
Core Network Hard Handover
Service based handover to GSM
HSDPA Mobility

42. Explain Soft and Softer handover? Give some advantage and disadvantage for
soft handover. What is the target for soft handover in WCDMA networks?
Answer - In Soft Handover, the UE connection consists of at least two radio links established with cells belonging to different RBSs. In Softer handover, the UE connection consists of at least two radio links established with cells belonging to the same RBS.
It acts as macro diversity since UE is connected to more than one radio link at any given point, adds redundancy and reduces interference.
However there is a tradeoff between soft/softer handover & system capacity.
A UE involved in Soft/Softer Handover uses several radio links, more DL channelization codes, and more DL power than a single-link connection.
Consequently, if all the UEs connected to a particular RNC are considered, more resources are needed in the RBSs, more resources over the Iub and Iur interfaces, and more resources in the RNC. For this reason, the number of radio links involved in

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the Soft/Softer handover must be limited
A typical target for soft handover in WCDMA network is less than or equal to 30%

43. Define Active Set? Pros and Cons of having a small or longer Active Set.
Answer - Active Set consists of group of cells that takes part in soft/softer handover & measure by UE.
Typical size of Active set is 3 or 4 & generally a standard practice in all WCDMA networks.
A small active set size may provide more resources available due to less soft/softer handover but at the expense of handover gain thereby reducing the capacity & link redundancy

44. Which link is required to perform Inter RNC SHO?
Answer -Iur

45. What is “noise rise”? What does a higher noise rise mean in terms of network loading?
Answer - For every new user added to the service, additional noise is added to the network. That is, each new user causes a “noise rise”. In theory, the “noise rise” is defined as the ratio of total received wideband power to the noise power. Higher “noise rise” value implies more users are allowed on the network, and each user has to transmit higher power to overcome the higher noise level. This means smaller path loss can be tolerated and the cell radius is reduced. To summarize, a higher noise rise means higher capacity and smaller footprint, a lower noise rise means smaller capacity and bigger footprint.

46. What is Pilot Pollution?
Answer - Simply speaking, when the number of strong cells exceeds the active set size, there is “pilot pollution” in the area. Typically the active set size is 3, so if there are more than 3 strong cells then there is pilot pollution.
Definition of “strong cell”: pilots within the handover window size from the strongest cell. Typical handover window size is between 4 to 6dB. For example, if there are more than 2 cells (besides the strongest cell) within 4dB of the strongest cell then there is pilot pollution.

47. How many fingers does a UE rake receiver have?
Answer – 4

48. What is “compressed mode”?
Answer - Compressed mode is a physical layer function that allows the UE to temporarily tune to another frequency, and measure the RF environment of another UMTS frequency (e.g. IFHO) or another technology (e.g. IRAT), while maintaining an existing dedicated channel

49. When in 3-way soft handover, if a UE receives power down request from one cell and power up request from the other 2 cells, should the UE power up or down and why?

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Answer - UE will power down because if a cell is able to sustain a good connection with one cell on lower power level it will discard power up messages from other cells. It also helps in maintaining low interference level for other surrounding UE's.

50. Suppose two UE are served by the same cell, the UE with weaker link (poor RF condition) uses more "capacity", why does this mean?
Answer - The UE with weaker RF link will require NodeB to transmit higher traffic power in order to reach the UE, resulting in less power for other UE – therefore consumes more "capacity

51. Under what circumstances can a NodeB reach its capacity? What are the capacity limitations?
Answer - NodeB reaches its maximum transmit power, runs out of its channel elements, uplink noise rise reaches its design target, etc.

52. What is "cell breathing" and why?
Answer - The cell coverage shrinks as the loading increases, this is called cell breathing.

In the uplink, as more and more UE are served by a cell, each UE needs to transmit higher power to compensate for the uplink noise rise. As a consequence, the UE with weaker link (UE at greater distance) may not have enough power to reach the NodeB – therefore a coverage shrinkage.

In the downlink, the NodeB also needs to transmit higher power as more UE are being served. As a consequence UE with weaker link (greater distance) may not be reachable by the NodeB.

53. If you have 3 cells in your Active Set and a drop call occurs, which Cell a Drop call would be pegged?
Answer - Serving Cell in Active Set

54. Is UMTS an uplink-limited or downlink-limited system?
Answer – Initially, A typical WCDMA network is Uplink Limited. Later a Loaded Network becomes Downlink Limites.

55. What is OCNS?
Answer - Orthogonal Carrier Noise Simulator

56. Briefly describe Capacity Management and its functions?
Answer - Capacity Management is responsible for the control of the load in the cell. It consists of 3 main functions:
1. Dedicated Monitored Resource Handling: tracks utilization of critical resources of the system.
2. Admission Control: accepts/refuses admission requests based on the current load on the dedicated monitored resources and the characteristics of the request
3. Congestion Control: detects/resolves overload situations

57. What Resources are monitored for Capacity Management?
Answer –
DL Power
Received Total Wideband power
OVSF Codes

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RBS Channel Elements

58. What Radio Measurements are used for Congestion Monitoring?
Answer –
Downlink Received Power
Uplink Received Total Wideband Power

59. Are System Information Blocks (SIB) transmitted all the time?
Answer - Yes

60. How does UE camp (synchronize) to a NodeB?
Answer –
1. UE uses the primary synchronization channel (P-SCH) for slot alignment (TS synchronization).
2. After aligning to NodeB time slot, UE then uses secondary synchronization channel (SSCH)
to obtain frame synchronization and scrambling code group identification.
3. UE then uses scrambling code ID to obtain CPICH, thus camping to a NodeB.

61. What could be the cause of soft handover failure?
Answer –
Undefined neighbors
One way Neighbor definition
UE issue.
Resource unavailable at target NodeB.
Inadequate SHO threshold defined.

62. What are the three sets in handover?
Answer –
Active Set
Monitored Set
Detected Set

63. What are the major differences between GSM and UMTS handover decision?
Answer –
GSM:
Time-based mobile measures of RxLev and RxQual – mobile sends measurement report every SACH period (480ms).
BSC instructs mobile to handover based on these reports.
UMTS:
Event-triggered reporting – UE sends a measurement report only on certain event “triggers”.
UE plays more part in the handover decision.

64. What are the events 1a, 1b, 1c, etc.?
Answer –
e1a – a Primary CPICH enters the reporting range, i.e. add a cell to active set.
e1b – a primary CPICH leaves the reporting range, i.e. removed a cell from active set.
e1c – a non-active primary CPICH becomes better than an active primary CPICH, i.e. replace a cell.
e1d: change of best cell.

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e1e: a Primary CPICH becomes better than an absolute threshold.
e1f: a Primary CPICH becomes worse than an absolute threshold.

65. What are event 2a-2d and 3a-3d?
Answer –
Events 2a-2d are for inter-frequency handover measurements and events 3a-3d are for IRAT handover measurements.
e3a: the UMTS cell quality has moved below a threshold and a GSM cell quality had moved above a threshold.
e3b: the GSM cell quality has moved below a threshold.
e3c: the GSM cell quality has moved above a threshold.
e3d: there was a change in the order of best GSM cell list.

66. What may happen when there's a missing neighbor or an incorrect neighbor?
Answer –
Access failure and handover failure: may attempt to access to a wrong scrambling code.
Dropped call: UE not aware of a strong scrambling code, strong interference.
Poor data throughput.
Poor voice quality.
Etc.

67. How is inter-frequency Handover triggered?
Answer –
The network decides that inter frequency measurements need to be performed and sends the MEASUREMENT CONTROL MESSAGE with Measurement type set to Inter-Frequency measurements. Generally it will set an Event as well along with the measurements. The following are list of Events that can trigger Measurement Report.
Event 2a: Change of Best Frequency
Event 2b: The estimated quality of the currently used frequency is below a certain threshold and the estimated quality of a non-used frequency is above a certain threshold
Event 2c: The estimated quality of a non-used frequency is above a certain threshold
Event 2d: The estimated quality of the currently used frequency is below a certain threshold
Event 2e: The estimated quality of a non-used frequency is below a certain threshold
Event 2f: The estimated quality of the currently used frequency is above a certain threshold
The Inter-Frequency Handover Evaluation bases its decision on P-CPICH quality measures on the currently used frequency and on one or more non-used frequencies. If the evaluation result is positive, one cell on a non-used frequency is proposed to Inter-Frequency handover Execution.
Inter-Frequency Handover is a hard handover where the UE is ordered by the

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network to tune to another frequency. This means that there will be small interruptions in the data flow to and from the UE.

68. What kind of Handover takes place in Load Sharing?
Answer –
It's a blind handover to the co-located cell. IFHO i.e.

69. What do you understand by IFHO?
Answer –
IFHO – Inter Frequency Handover

70. What do you understand by Directed Retry?
Answer –
When there is a co-existing GSM RAN, excess traffic in a WCDMA cell may be offloaded
to GSM
If a call is chosen for Directed Retry to GSM, the request for the speech RAB will be rejected with cause "Directed retry" and then a request is made to the core network to relocate the UE to a specific GSM cell, using the Inter-RAT handover procedure. This handover is a blind one since the target cell is chosen not based on UE measurements. Therefore, the target cell must be co-located with the WCDMA cell. Co-located GSM cells are assumed to have similar coverage and accessibility as their respective WCDMA cells.

71. What can we try to improve when access failure is high?
Answer –
When access failure is high we can try the following to improve RACH performance:
Increase maximum UE transmit power allowed: Max_allowed_UL_TX_Power.
Increase power quickly: power_Offset_P0.
Increase number of preambles sent in a given preamble cycle: preamble_Retrans_Max.
Increase the number of preamble cycles: max_Preamble_Cycle.
Increase number of RRC Connection Request retries: N300.

72. What is Eb/No requirement for HSDPA?
Answer –
The Eb/No requirement for HSDPA varies with user bit rate (data rate), typically 2 for 768kbps and 5 for 2Mbps.

73. What HS Channels are introduced in HSDPA in L1?
Answer –
HS-PDSCH – High Speed Physical Downlink Shared Channel
HS-SCCH – High Speed Shared Control Channel

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74. How Power Control is implemented in HSDPA?
Answer - Initial Power is set in the same way as open Loop Power control of DCH & there is no further power control on HSDPA Shared Channel HS-DSCH. The Channel Rate is controlled by adaptive modulation & coding formats.
The principles and functionality of the power control for the HSDPA associated dedicated channels are the same as for the DPCH power control.
HS-DPCCH power is an offset relative to DPCCH depending upon whether the UE is in soft handoff or not.
The Power for HS-SCCH is fixed.

75. What FIXED SF is used for HSDPA?
Answer –
SF 16, maximum of 5 codes.

76. What do you understand by CQI Measurements?
Answer – Channel Quality Estimation (CQI) for HSDPA sessions only.
In order to aid scheduling and TFRC selection in the RBS, the UE sends a channel quality indicator (CQI) report on the uplink.
The CQI report estimates the number of bits that can be transmitted to the UE using a certain assumed HS-PDSCH power with a block error rate of 10%

77. What type of Channel Coding is used for Voice and Data services?
Answer –
Voice – Convolution Coding
Data – Turbo coding

More Questions:

How you define the 3G coverage, and how you can improve it
How you troubleshooting the accessibility problems with given example
What the solution for capacity issues, and what parameters you can change to improve the
capacity
How can improve HSDPA service.
How would you start the design process what are the basic inputs required
What are the design KPIs (e.g RSCP, Ec/No,CSSR, DCR)?
What should be the Softer/Soft handover percentage in the network?
What are the effects if Soft/Softer handover increases?
At a certain time max. how many cells can become Active Set for a UE?
How would you start optimization process for a cluster?
How would you analyze drop calls?
What are the Rack receivers?
How does the power control works in WCDMA networks?
What is the difference btw RSSI & RSCP?
What if RSSI becomes high when the RSCP of the active set is low?

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How would you select the atenna ? Which antenna is better 65deg or 90 Deg B.W? under what conditions you would select one of them?

Layer 3 msging for voice call setup.

Layer 3 Msging for IRAT.

What are events 3a, 2d, and 2f?

What is compressed mode?

What is pole capacity?

What is pilot channel pollution? how it can be controlled

what CDR and Acc rate we are running at the moment. So he wanted to know how we went about it. etc..

What do we do with Drive test data? What KPI's can we get from drive test?

look for poor Ec/No. Is it result of poor coverage or pilot pollution? Is it possible to uptilt/downtilt or change azimuth to fix RF conditions: I assume from a long drive you can determine drops rate based on 5min equivalent calls, block rate etc. You can guess uplink interference from UETxpower, BER/BLER for speech quality.

What KPI's do we look at? (using stats etc...)Accessibility and Retainability

What tools do we use?Tems Visualisation, OSS-RC (WNCS and WMRR), Tems data collection, Tems Route Analysis(he uses Actix though - more or less the same), Atoll(or similar cell planning), Stats package (Visual presentation of Ericsson counters).

Explain the call scenario and signaling process when you make a call using a mobile: dialing the number, call acknowledgment, parameters involved, etc.....till the call is successful

what causes call setup failures

the process of Model Tuning (design question) and what parameters are acceptable after you tune the model

In Actix spotlight, what data you will be looking for, what problems you find mostly, recommendations and solutions you make

how you load, analyze log files, what equipments you using

what causes drop calls and handover failures

what triggers the UE to handover between 2G to 3G: how, why, advantage, parameters responsible for that...

RAB services