
BeechLog

The Magazine of Burnham Beeches Radio Club

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GSM technology

I expect like me many of you have been wondering if old phones are of any use to the ham radio fraternity. They seem ideal in terms of size weight and power, not to mention price. (GSM by the way originally stood for Groupe System Mobile, now it stands for Global System for Mobile communications.) I thought I'd do a little investigation to see what I could find out about GSM technology. Here's the result:

I already knew that they used heavy digital compression and time-sharing. In fact the first thing I found out was that GSM uses a combination of Time and Frequency Division Multiple Access. TDMA simply means that several stations can share a frequency by taking turns. The difficult bit is

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Back in the USA

Thursday

Woke up about 5 minutes before my alarm went off. Getting used to American time, too bad I have to go home tomorrow. A quick breakfast, and off to work.

This lunchtime I decide to go off to the local shopping centre. There was a huge car park, nearly full, and a few shops. These were much the same as those back home, but the queues were shorter. I went into the grocery store, and bought 8 AA size Duracells for about £3. Always need those things. Also some blue corn tortilla chips. Well I'm not sure whether they are blue, but they are pretty strange looking. Much of the produce was very familiar though.

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There was a Radio Shack, so I had a look round. The layout was identical to Tandy in Slough High Street, and much the same stuff on the shelves.

None of the other shops were very interesting, so back to work, and to get some food in me. I had a seafood roll-up. This form of food was very popular at the office, and consisted of a foot diameter sheet of, well I'm not sure, I suppose it was a very thin yeast-free bread. You can get this in various colours. It gets filled with whatever you like (you get to choose from a vast quantity of ingredients), and is then rolled up! It was pretty good, and did the job required.

Coming back to the hotel, the strange man appeared out of the gloom, stopped the traffic and waved me across. I had passed several of these on the way home - and I saw that one of them had "POLICE" written across his fluorescent coat. The man who waved me into the hotel had flashing blue lights on his batons.

Anyway I get to my room to find I am locked out! Oh dear, what's happened? Has my credit card bounced? Did they

object to the way I left my room. I didn't really find out, but the receptionist re-activated the card for me.

Well this is my last night, tomorrow I have to go home. I also have to fill up the car - it has to be returned with a full tank. This could be interesting. I had some strange incidents last time I came here. I remember that some cars had a sort of seal across the tank inlet to stop fumes escaping, which meant it was almost impossible to get the petrol in. I also have no idea what sort of petrol to put in. I remember that you have to pay in advance at some pumps. Should be interesting!

Along to the "99" for some sustenance. This time I discover that they have a winter brew Horseshoe Ale, so of course I have to check it. Comparing the regular and winter brews, the latter is undoubtedly more alcoholic, and has that "winter" taste to it. Alas it is still served at 5 degrees, I think it would be better at 50.

So, filled with Schrod (?), scallops and shrimps, I rest my head on the pillow and the next moment off goes the alarm.

Friday

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The last day in the greatest country in the world. This morning I pack everything into my case. It's a squeeze, I don't know why because I have not bought anything big, but it all goes in. Check out, another small fortune on the credit card (hope my company coughs up the expense claim quickly).

Well, it's an unexciting morning, but I manage to lay claim on a bit of equipment I'm going to need later on. Tom, a chap I have been working with, is NK1X, and he insists on getting my email address, so he can arrange a sked on 10 metres. This morning he worked a 2EO with 5 watts to a 10 metre dipole. CW. I have an uncomfortable feeling about this. I wonder whether he has a microphone?

Say my goodbyes, squeeze the laptop into my case, and back onto the road. As I mentioned earlier, I have to fill up the tank, so pull in at the first filling station I see. Now I have been told that you have to pay in advance around here, but somehow I pull up at a "full service" pump. A nice young man offers to do the job. Of course the filler cap is on the wrong side, but it's no problem. I ask him to fill it up with whatever fuel the car needs, so he does.

Here in the US there is a price war, and a gallon of lead-free cost less than a dollar (about 58 pence I kid you not!). So it costs me less than £10 for a tank-full. Have to switch on the air-conditioning, since although it's December, the temperature hit 70 degrees today. That's unusual for Boston, they usually have snow, and the talk today is about global warming. So back on the 93 South. I was wondering whether I would find the airport without a 2 hour detour (like last time I was here), but I need not have worried. The sign appeared about half a mile before the exit. The 93 through Boston turns double-deck, but I keep my cool, and soon I find the car return. Returning a rental car in



the US is a triumph of technology. They type the number into a handheld unit with an aerial, and it sucks the money from your credit card. In my case, I had a "voucher". This means that whatever bill you run up, somehow the company pays, without you having to part with anything. Get to the British Airways check-in desk. No-one is there. Just a man mending the ticket terminal. He suggests pressing a bell-push on a nearby counter, and after a few minutes someone appears. So I check in my case, and now I have four hours before the flight. I am this early because I remembered the traffic jams last time I was in Boston. Now Logan Airport is like the rest of Boston, it is more like a construction site. Heathrow is much nicer, you can look in Dixons and buy a VAT-free minidisk recorder. There is not a lot at Logan, a bar, a duty free shop (with warnings outside - it is an offence if you go in the shop, unless you are en-route to a destination outside the US). But I didn't want to buy any perfume or Scotch. There was another shop which sold American flags and pencils made out of dollar bills. And this one also sold Ghiardelli's chocolate! Now I had a trip round the chocolate factory in San Francisco two

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years ago, and bought a couple of bars back then. This turned out to be pretty good stuff. (Strangely enough, I met a Brit in SF on the internet a while back. He went to "G Square" to enquire about UK dealers, but alas there were none.) So I can present my XYL with this chocolate when I get back, and get in her good books. Hopefully.

As I write I am somewhere over the Atlantic, with gin, California wine, and American Beef inside me. I have a seat near the back, alas noisier than the flight out of Heathrow. So far, the flight has been uneventful, except the take-off. In total darkness.

Well, there is about 20 seconds between each plane charging the runway. As soon as we got airborne, there was a sensation rather like the plane was looping the loop. I am looking out of the window at the time, and I know the plane stayed the right way up. It's probably my age...

On the BBC news during the flight, there is an item about fuel tanks exploding on

747's. I didn't want to know this. It's something about letting the fuel tanks run dry during long distance flights, so maybe I will be OK. If you are reading this, I probably survived.

I am sitting next to an American who works for the Fidelity investment outfit. It must pay well, as he and his wife are going on a holiday cruise to Rome, Athens, and Istanbul. He told me that he was advised to avoid driving in all those countries. Several Americans have told me that the drivers in Boston are aggressive. I thought they were generally relaxed and well-behaved. I think he got some good advice.

Well, It's 9.15 pm in Boston, and 2.15 am in Slough. I wonder whether I will get any sleep tonight. The plane is due to land in about 3 hours, the wind must be favourable as the flight time is less than 6 hours. In any case I should be in Slough by about 6.30 am (there should be a car waiting for me), maybe I will go straight to bed when I get back. Last time I was jet-lagged for days.

As soon as land appeared, the Atlantic clouds vanished, and I could see the UK from 35,000 feet. Being very clear, I could easily make out the two Severn bridges. The towns were lit up a bright orange by the street lights. It was funny how suddenly towns ended, instead of the lights gradually fading out, they ended abruptly. I suppose each town has rules covering the boundaries of street lighting. After Bristol, I couldn't recognise anywhere at all, until suddenly the River Thames appeared winding through Westminster, with all the bridges brightly illuminated. A few minutes later we were down on the runway. Since it was about 5.15 am, the plane pulled off the runway and shut down its engines, and was towed to the terminal. The taxi was waiting for me, and as we found the M4, the "adventure" ended.

Roger GoHZK

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making them think they've all got the channel to themselves. FDMA simply means that the spectrum is split into channels spaced 200 kHz apart. The TDMA works by transmitting taking place during 0.577mS burst periods. There are eight of these bursts in a TDMA frame which lasts 4.615 mS. One channel consists of a single burst per frame. Two channels are needed for two-way communications of course. The result is that four duplex conversations can take place on the same frequency at the same time. (Which is much the same spectral efficiency as NBFM on 2M with 25kHz channels.)

Channels are either common channels, which are used by mobiles in "idle" mode, or dedicated channels which are used for calls in progress. Remember though that these are "virtual channels" - they are simply slots for data to be exchanged, not RF channels!

Dedicated channels contain sequences of 26 TDMA frames. Each sequence lasts 120mS and contains one TDMA frame used for control purposes, 24 for calls, the last being unused. The channels for uplinking and downlinking a call are separated by 3 bursts, so there is maximum separation between transmit and receive periods.

Common channels are used to set up calls and arrange handover between base stations. There are six different types of common or control channel. The Broadcast Control Channel sends base station ID, frequency plan and frequency hopping schedule. The Frequency Correction Channel together with the Synchronisation Channel define when the burst periods happen and the time slot numbering. Another channel is the Random Access Channel which is used by mobiles to log onto the network. The Paging Channel is used to inform mobiles about incoming calls. Finally the Access Grant Channel is used to give a mobile permission to use the signalling channel to set up a call.

The modulation technique is called Gaussian-Filtered Minimum Shift Keying (GMSK). I haven't been able to find out much about it other than it's designed to minimise spurious while still having good spectral efficiency and not needing too much complexity in the modulator.

The digital speech coding is called Regular Pulse Excited - Linear Predictive Code (RPE-LPC). This works in a similar way to MPEG video. The coder predicts the next sample based on the last few. The decoder can also predict the sample the same way. Most predictions are quite close to the actual sample in which case the system will send just the difference between prediction and sample. This needs much less data than sending the complete

The TDMA works by transmitting taking place during 0.577mS burst periods. There are eight of these bursts in a TDMA frame which lasts 4.615 mS.

sample. Speech is divided into 20 mS samples each of 260 bits, giving a data rate of 13kbit/s.

Error correction is added to the speech data with the bits likely to cause the worst errors having better correction. If the sample is too corrupt to correct it is replaced with an attenuated version of the previous sample. Radio channels suffer from bad burst errors, typically caused by impulse interference, so the samples are interleaved (ie shuffled around in time). Each burst in fact carries data from two different samples. The result of interference on an interleaved signal is a reduction in quality rather than complete drop-out for the duration of the interference.

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The system has auto equalisation to minimise the effect of multipath fading. A known 26 bit "training sequence" is transmitted in the middle of every burst. After checking the sequence for errors the effect of multipath on the off-air signal can be calculated and an inverse filter applied. All in less than the blink of an eye!

The final twist to this amazingly complicated system is frequency hopping. The mobiles have to be frequency agile because transmit, receive and adjacent base station monitoring all take place on different frequencies. The GSM system makes use of the ability by applying slow frequency hopping, where each TDMA frame is transmitted on a different carrier frequency. The algorithm for this is sent on the control channel. There are two reasons for frequency hopping - reducing co-channel interference and multipath effects. Both effects will still impair signals but will only cause momentary problems rather than complete drop-outs.

So to answer the question I originally set myself it looks like GSM phones aren't much use to us hams. They are part of a very complicated system and can only be used in conjunction with a base-station (repeater). We'd need frequency converters on the phones (so they could work in the 23cm band for instance) and we'd need to set up a network of intelligent base-stations. And the base-stations seem to need about the same processing power as controlling a Space-Shuttle launch!

Mike G4RAA

PS Quote from a course I was on recently: "Digital systems are like hovercraft - they fly, but only just."

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Dr Grey

A recent issue of Beechlog carried an Internet posting from Dr. Alan Gray G3XQU, a general practitioner in Great Warley, Essex, which he had sent to the newsgroup ZFC.

Dr. Gray has again posted to ZFC and has again given permission for Beechlog to print this very moving message from a fellow radio amateur:

IMITATIONS OF MORTALITY

It is evident that my statistics of posting to zfc have fallen precipitously in the last month. There is a reason...

And I think this should be of interest to everyone here: hopefully later rather than sooner: so please excuse my indulgence. "It's good to talk..."

For the first time in my (adult) life *I* had to 'see a doctor' two weeks ago.

I found it quite extraordinarily difficult - since I was quite aware of all the possibilities of diagnosis, and - although the specialist I consulted was not a close friend, we have known each other professionally for many years.

I have a cancer of the oesophagus.

What started as the occasional 'gulp' in swallowing progressed to an obvious restriction in swallowing. I initially put this down to getting an Aspirin 'stuck' and assumed it was a corrosive, but 'benign' stricture of the oesophagus.

Although the history has lasted some weeks now, it's only in the last week that "danger signs" have emerged: real difficulty in swallowing, and things getting 'stuck' on the way down.

So I had (between my morning and afternoon surgeries) an endoscopy two Mondays ago, with a failed attempt to get the 'scope down, but with a 'suspicious' cytobrush 'smear': and then, on Friday, another go with a paediatric endoscope to get further biopsies, and at least a start at dilating the narrowed bit after getting a

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guide-wire down. Even the paediatric endoscope (6mm?) wouldn't go down though.

It's all very interesting: in the X-ray room I watched the pics on the TV monitor, and was fascinated watching the barium squeezing past the obstruction. I'm as fully aware of all the ramifications as the consultant is. We both know the statistics of the situation. It was rather surreal, the three of us - the consultant gastroenterologist, the senior radiologist and myself discussing in perfectly abstract terms, the various views of *me* swallowing barium on the video. It all makes for particularly interesting conversation... The thing that surprises me though is that I'm *perfectly* well and really don't feel as if there's some nasty cancer eating away...

I was delighted to find that in fact I'm quite good at 'sword swallowing' to get the dilators down. Midazolam as an intravenous 'calming' and memory-zapping agent appeared to have less effect than a half of bitter... Disappointing - I've never tried any IV drugs before...

And aren't nurses *nice*.

I haven't met many since I married one...

Then, CAT and ultrasound scans (U/S liver slices look *exactly* like those on the butcher's slab...) and further regard to statistics to decide upon the next stage of treatment depending on evidence of spread of the primary tumour. My good wife opened a bottle of vintage champers this morning on the news that the scans show no evidence of spread: only the swelling of the oesophagus caused by the primary tumour.

But the one outstanding moment in all this was the one little second of time when my colleague, and good friend, just said: "Er... the cytology is just a little bit worrying..." To change, in an instant, from being me, Gray (as still called by all my immediate friends and lovers...) to becoming ... 'a cancer patient'.

I've been through this (I've just looked

through my database which extends over 26 years) with others, nearly 300 times. I can still look on my circumstances quite dispassionately, and with some considerable degree of scientific interest. And I still look forward with interest to seeing how things will develop. Next week we have to decide upon major surgery *to get rid of it* and whether chemo- and/or radio-therapy should be tried now or later. It's not a very nice cancer to draw in the lottery of life, with no hard and fast rules of treatment. And again, statistic rule...

So I'm taking medical retirement: with outgoings of around 9,000 pounds a month if I take a month off for the op, I don't think it's worth the struggle of only three more years anyway before I had planned to retire at 60.

But a lot of joy this morning with the clear scans. (I told them all yesterday not to say anything whilst doing the scans...) It really makes one appreciate life.

If the worst comes to the worst, I can still look forward to hitting the heroin and working my way through a selection of single malts...

Isn't life strange.

I'll let you know how things go.

(While giving permission to publish, Dr. Gray added the following):

My amateur radio DX-hunting days have ceased - with only a few countries left. But perhaps some of the members may remember me in the 'pile-ups': the *only* person left with all home-made equipment. My only other claim to fame was being the first person outside the USSR to work 100 Russian Oblasts (counties) on all five bands - very difficult indeed on 80 metres. Soon after this, the iron curtain disappeared and all the administrative regions were changed, so I'm pretty sure nobody else did this either. I was obliged to learn a certain amount of Russian, since in the middle of the night on 80 metres, the eastern oblasts never spoke any English...

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And the WW2 electrolytics in my linear amplifier have finally packed up...

Anyway: I still *feel* well. I spent a day+night in Guy's Hospital last week for further biopsies and await the verdict on these at the moment. If they show invasive carcinoma then the operation is really a major undertaking since the tumour is right at the top of the oesophagus and removal will mean taking the larynx as well, leaving me with a permanent tracheostomy and no voice. (And my CW was never all that good either...) So we have to be quite certain about the status of the cancer.

Martyn G3SID

Low Power

For some time hams have been critical of the performance of lower power radio devices, in particular the vehicle 'keys' which operate on 418MHz. Well it's official now, for when Ken Yard of the RA spoke at a meeting of the Low Power Radio Association, he told them that he "was amazed by the poor performance of the majority of these devices".

The main problem, as I have mentioned before, is the devices susceptibility to interference from Tetra, the new emergency services network which uses the 420MHz band. There is also a low power allocation in the 430MHz band, and we all know of the problems that this has brought.

Alan Wood, of Wood and Douglas, has remarked that although the devices meet the standards specified for their operation, these standards do not require testing the devices behaviour when there are strong nearby signals. Hence the arrival of Tetra caught everyone wrong-footed.

The RA is proposing moving the devices

to the 868 to 870MHz band. The low power manufacturers are not happy about this - it is close to other popular frequencies, but at least it should move the problems away from our doorstep.

Education

Some of you might know that my wife has been in full time education for the last 3 years, and this year will be her final year at University for her BA. Also this year my eldest son will start a BA course somewhere up the M1. However, although fore-warned, many students and parents will be in for a big shock this year.

The courses starting this autumn will be the first to feel the full effect of the Governments new student financing scheme. The basic difference is that previously students will have received a grant towards their costs, but now they will be offered a loan to finance themselves, along with being required to pay a proportion of the tuition fees.

With a wife in her final year, and a son starting his first year, the difference has been most striking. My wife still gets a grant under the old system, which is about £2200 per year. My son will have to pay up to £1025 tuition fees, and be offered a loan of a yet undisclosed amount. Assuming this loan is equivalent to the grant, my son will actually receive \$3225 per year less than my wife (i.e. my wife receives £2200, my son pays £1025).

We don't actually know what the actual figures are because Slough Council have not decided yet. In many cases students do not discover until after they have started their new course.

In the past students have often had great difficulty surviving on the cash they have available. With a potential £3500 per year less than before, I shudder to think how many will manage. The actual costs of going to University are difficult to quantify. My wife goes to a college in

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Farewell from Mir

Thanks to

W8ZCF and WF1F

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London, so she travels up there by train and taxi on a daily basis - about 3 days a week. So there are no extra accommodation or entertainment costs, just travel and books. My son will have to pay for all these.

Accommodation in University halls costs are variable, depending on where the university is, and the type of room. Shared rooms are cheapest, although probably not ideal for a 'fresher' who will be unfamiliar with the habits of his/her companion. A single room costs between about £40 and £60 per week, although London halls may be more expensive, and places well up north may be a bit cheaper.

One thing I have discovered is that my sons halls require cheques covering this amount up front. Yes, forty weeks rent in advance, although in three post-dated cheques. So for the average student, that's £2000! Then there is 'key money', i.e. a deposit against damage, and then basic furnishings, like bedding, cooking utensils, clothes, towels, and all the things you take for granted at home.

Then there are course fees. I have already mentioned the potential £1025 tuition fees, but that's not where it stops. There are all sorts of other materials too. If the course is purely academic, books may be the main expense, but there may be trips within the U.K. and abroad, materials used during the work, studio costs, IT costs, research costs, etc.

Also students are not unknown for doing things other than study. A recent survey suggested £16 a week on beer. Young people would probably go crazy sitting in their rooms alone every night. University is a great place to meet people, and who you meet may influence the rest of your life.

It is difficult to come to a sensible total. A BBC survey suggests about £400 per month plus tuition fees. So how is this paid for?

There are three possibilities for most students:

Parents, jobs, and loans.

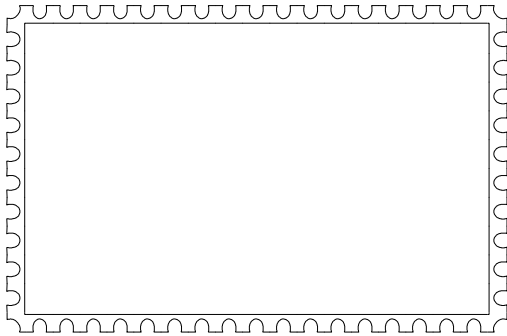
Probably most students will dip into each category. I don't know how much my son will be offered, probably something around £3500 per year. Statutory student loans have low interest rates, and are repaid according to the earnings of the student when he/she starts work. No payments need be made if the income does not exceed £10,000 per year, and the debt 'times out' eventually so if it's not paid up when you're old and grey, it is cancelled.

Students can also get bank loans, free of interest for the period of the loan. But these are probably best used as short term.

Many University students have jobs - MacDonalds, Tesco, etc. My nephew earned cash by playing music in clubs. But

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employers like to own the students, and expect them to work each day they are not at lectures, so it can be difficult to juggle work and study.

Parents - well it depends how wealthy they are, how much spare cash they can afford, and whether they are willing to contribute. This can be a sore point. The press make out students to be a load of scrounging layabouts, and some parents believe this. But finding £400 per month to support their offspring can be very difficult for a great many families.

I don't know how my son and I will manage. All contributions gratefully received!

Roger GoHZK

From the Past

From the August 1987 issue, here we have a report of the latest computer technology...

BIT's 'n PC'S

The hottest news at the time of writing is the launch of Acorn's latest range of computers. Using an Acorn designed 32 bit Reduced Instruction Set Computer (RISC) processor the new models are

claimed to be several times faster than even the fastest IBM type PC.

Unfortunately even the cheapest model, called the Archimedes, seems to be outside the price range for home computers at £799 + VAT, even though it does include a 1Mb floppy and 512Kb of RAM in the price. For an extra £76 Acorn are offering a full 1Mb of memory on the basic machine (Model 305 with 512K, 310 with 1Mb).

Top of the range is the model 440 which, with 4MB of memory, a 1Mb floppy, a 20Mb Winchester and a colour monitor, costs £2499 + VAT. Somehow I don't think I'll be buying one! Graphics and sound are well catered for. The top graphics resolution is 640 X 256 pixels with 256 colours selectable from a palette of 4096. The sound synthesiser has eight stereo channels, each channel adjustable to one of seven preset stereo positions.

Speed is the main selling point of the new range though and they certainly don't disappoint. The Archimedes is reckoned to run Basic programmes four times faster than the Compaq 386, which is the fastest IBM PC clone available. In fact the computer is so fast that Acorn have been able to write 6502 and MSDOS emulation programmes so the new machine will be able to run lots of current BBC and IBM software. There will be a hardware IBM processor board for applications that need complete compatibility.

The theory behind a RISC processor is that if you reduce the complexity of the design the chip can be made to run faster. Personally I have a RISC processor at the heart of my computer, it's a 6502, which when used properly (a la BBC) is a very fast chip.

Several other computer manufacturers are working on RISC designs, not using the Acorn chip set of course. If the speed of the Archimedes is typical then there should be quite a revolution in PC hardware and applications.

Mike G4RAA (I think...)