

KCMC Laparoscopic Course and Video Link Installation Diary

INTRODUCTION

Lillian Broatch, Brenda Longstaff and Liam Horgan from NUGITS based at Northumbria Healthcare Trust, and I visited KCMC between 29th May to 6th June, 2008.

I am Colin Dobbyne, CEO of OR Networks Limited in the UK.

One of our goals was to install a video system into the operating theatre that would allow us to send live video, with two-way audio, from Kilimanjaro's KCMC to Northumbria Healthcare Trust.

The video link would assist the surgeons that were learning the art of laparoscopic surgery, to have the reassurance of a live video link to an experienced surgeon in the UK, for mentoring and training purposes.

Prior to departure, we thought we had achieved all that we could: we had two special telephone lines, called ADSL for fast Internet access, installed in the theatre; an agreement with Tanzanian Telecommunications Company Limited (TTCL) to provide us with guaranteed bandwidth for reliability and consistency of video quality; an integrated services router, which would add the two lines together to get even faster Internet transmissions; and instructions for the two suppliers to commission the system as a whole - and to test it.

DAY 1

So after a late evening arrival and a reasonably early night, we arrived at the hospital at 9am in the morning. It was with some dismay then that we discovered the router was still in stores. When the box was retrieved we then found all the circuit boards loose – it was not even assembled let alone commissioned.

We were eager to get started but etiquette required us to have a meeting with the Director of Clinical Services, Dr Mark Swai – a very nice but very busy man.

So some hours later, we arrived in the theatre block to find the ADSL lines. They were strung across the theatre door and corridor like a clothes line and finally wired into two plastic boxes that were taped to the worktop. It did not inspire me with confidence, however, they were alive and active – a good start.

But now I was faced with the daunting task of having to assemble and configure the router myself, a task I was not looking forward to, primarily because I had never seen a CISCO 1841 ISB before.

I was immediately presented with a Catch 22:

To gain Internet access I had to get the router working of course, and the instructions on how to do that were – yes – on the CISCO website.

The hospital network was also down so there was no way of accessing the instructions via that. We decided that it would be quicker to get the router engineer on a flight the next day – besides, I had other things to be doing.

I decided on a contingency plan of using the TTCL ADSL modem with our video player and to work at half the bandwidth – just in case the router engineer did not turn up or could not get it to work.

We went out for dinner - as usual, Indian curry and beer.

DAY 2

On our arrival the next morning, someone kindly decided to shut the theatre door, crushing the ADSL lines in the process. There was some damage to the outer sheaths but nothing catastrophic.

We successfully used the TTCL modems and got the video links working at half speed (1 mbps) up to the Internet on one ADSL and watching on the other. We had links up and down locally, but not necessarily to the UK. We left it running for a test with Brenda's BBC camera connected.

We then adjourned until the arrival of the router engineer and had a meeting with Professor John Shao. During the meeting, Kevin called Brenda, very excitedly, about the fact that he had randomly used one of the other Internet addresses I had given him, and he saw the operating theatre – a breakthrough – it was working.

We went for lunch with Dr Mark Swai and we had curry.

DAY 3

Finally, the router engineer arrived (Samir from Copycat).

Samir configured the router to permit the sending of data across two lines. It was also configured to have a public address, meaning that anyone on the Internet could connect to it – and therefore, so connect to the live video player.

I was very glad we had called the engineer, since he himself had problems with configuring the router – the system was not working as a whole and we were all very confused. We went for lunch – I had chicken curry for a change.

We then hit a major problem. Samir informed us that the load balancing can only work over two separate networks, not over two IP addresses (the ADSL links) from the same network. i.e. it needed two separate gateways.

In layman's terms, it is like we were trying to send two separate trucks, with half the full load each, on the same road, to the same destination. What we needed to do was send two trucks, on two separate roads, to the same destination.

At this point I had already become suspicious of the integrity of the ADSL and decided to do some tests and speed checks and discussed the lines' configuration with Alan.

TTCL said that they were going to reconfigure the two ADSL lines be over two separate networks. This was done but it still did not work.

It seemed that data was being split across two lines okay, but that one half was being lost, for instance, only one global address was being redirected to the video player (196.46.111.231) the other. 196.43.89.35 was not mapped at all.

We played around with mappings etc and got nowhere. We also tried intelligent load balance i.e. splitting the ratio of the load depending on the speed of each line, not assuming it to be 50/50.

We were really getting nowhere and decided to break for lunch - barbecued goat. We got our heads together and came up with a plan.

Nothing worked, so we decided to do away with the load balance and use a single ADSL line (one truck – one road).

I discussed the configuration at the TTCL end with Alan (TTCL engineer) and he confirmed that the aggregation was not currently being done (we never had a second road!). This would account for why half the data was being lost.

So with time running out, we needed a concentrated effort.

We were busy reconfiguring the ADSL lines and the router, we had written another configuration script for the router, but before we could save it, we had a power cut – 18:00 hours.

DAY 4

We had had a late dinner the previous evening.

At 4pm, Samir, the router guy, had gone home leaving us to it. TTCL were still trying to aggregate lines and I was resigned to getting 1mbps working on a single line as a backup.

DAY 5

The lines were working, not perfectly and certainly not reliably. I was convinced we were not getting the promised guaranteed bandwidth. Brenda was put on nag duty: that is, every time we witnessed a drop in bandwidth, she would call TTCL and nag them to put it back. This is exactly how it was! I think they thought they could steal it back when we were not looking.

We were ready to assemble the rest of the kit and so we had sent out for some batteries for the radio microphone.

As a team, we had already discussed the extra challenges of working in Africa. That nothing can be taken for granted and that you should always expect the unexpected.

Nevertheless, after several minutes of failing to get the radio microphone working, with any of the batteries, that were sealed in their blister pack and good for March 2012, I certainly never expected to find that we had bought 3 duds.

A valuable lesson learned!

I had also spent some time clearing a theatre trolley so that I could use it to put the AV system on, ready to wheel into the theatre. I turned my back for a minute to disconnect some of the devices, lifted them up to place on my trolley only to discover someone had taken it.

The Internet was still intermittent. Sometimes failing completely, sometimes slow, Brenda was being shouted at to shout at them, it was getting very fractious.

TTCL then dropped the bombshell that they actually cannot aggregate lines – ever. I had already resigned myself to that fact and had the system working on one line.

However, they did reconfigure line 1 to be 2mbps up instead of only 1 mbps. Allegedly!

The system was up and working but no audio; the UK side always got the same error - “soundsocket” error. We tried everything, but could not locate fault.

We had only managed to get video to UK with no audio, the BBC who had come to film the debut broadcast had stood down - we were completely deflated.

Nevertheless, We went into theatre for live procedures and I continued to play around to get things working – to no avail. The link worked fine this side of the international networks, anywhere in Tanzania had no problems, anywhere in the UK and it failed.

Just before one operation an alarm went off, a patient was on the table, Liam, who had never heard this alarm before went off to enquire. He came back to tell me it was the “no oxygen” alarm and not to worry - apparently!

DAY 6

The Internet was down again. We had worked out yesterday that, at least every half an hour, you had to call TTCL and nag them to bring back your bandwidth. There was clearly no automatic process guaranteeing our bandwidth, it was a man in a server room manually switching bandwidth between customers depending on who shouted the most. It explained a great deal.

Again we went into theatre for live procedures but there was still no audio.

Since the show must go on and the BBC had arrived, we decided to run the audio over a separate audio/phone internet application.

The first live images started coming through and the BBC took footage. The audio worked well and there was a 5 second delay which we got down to about 2 seconds by the end of the day.

The best news was when Keith Seymour (Northumbrian surgeon) confirmed that he thought the video was very good and certainly good enough to mentor from. At least the principle was proven and now we needed to refine it.

All week Mount Kilimanjaro had refused shake off its cloud cover. I was convinced it would not appear until we had accomplished our mission. And sure enough, on the way to the airport, Kilimanjaro peeped out for about half an hour in all its glory, the only time during the 7 day stay. It was a magnificent sight, our driver took Brenda, Liam and I to Manango gate, the start of the climbs and walks, and we had lunch at the Manango Capricorn Hotel.