When we were asked to do this last year, I was aware that there'd been quite a bit of discussion on the Mad Fizz List Server and there were a couple of threads that had talked about interactions between physic's departments and IS department's and I, I pulled out some things I, I, I took from these threads and I think the major issue tend to be around who has control of systems, and around the same time there was a point, kinda point, debate in medical physics which talked about whether physicists should be doing IS jobs and providing working in information networking and areas like that. And, one of the things the organizers asked us to do was to talk a little bit about, about that subject. And we're not going to give you the answers to these questions today, but the idea was to give, have two speakers who had different perspectives. And originally it was somebody

from a large organization, somebody from a small organization. This year it's not quite that way but it sort of has that flavor. They also asked us to talk about a list of specific topics in IS that physicists often end up dealing with. So, my role in this is as representative of somebody working in a large organization. The British Columbia Cancer Agency, my employer, is the only provider of cancer care in the province of British Columbia, so that's Canadian system quite different from the U.S. system. We service a population of 4 ½ million, and we provide a radiotherapy through four centers on a network of chemotherapy centers. The center I am from is in Colona in the southern anterior, and serves the anterior portion of the province. So, in radiation therapy we provide about 10,000 courses of radiation therapy a year. You see the network of 24

Lenox arranged in four accounts of centers. Our situation in regards to IS has been complicated in the last year or so because our provincial government, which is responsible for all, all, all this care and has reorganized and embedded the cancer agency within the super organization, which is responsible for all the services that are global in nature and really not regionally based, and as part of that reorganization, they have extracted some of the support services like IS, human resources, finance, as core functions that, that, that there are PH provincial health services authority whereas cancer care itself belongs in the cancer agency. So, information systems department, and there's about 26 that work for BC Cancer Agency, and they're now part of our department of about 110, so it's a very large group. They're responsible for one of the things that was

in the cancer agency is, is, is our, is an in house information system which provides patient chart, patient scheduling, which is now managed by PHSA and is being expanded to their other agencies, and on top of that are layered systems like the systems you're interested in like Varis, and the pharmacy network, financial software, etc. And, they're responsible for our network and the servers associated with that. They're responsible for desktop systems and their help desk. Now if we look at the interaction between physics and IS, historically it was very collaborative. It was mutually beneficial, and that was when it was a relatively small organization. But by the time I had joined the BCCA in 1997, that was already breaking down because as the organization gets larger, the people in one group tend not to know the people in the other group so well, so it's harder to build

trust relationships. And, one of the things I was involved in was in, in making a formal agreement between the physics department and IS. And the agreement's based on some, some principals which is, which are based on looking at the responsibilities of each group. IS is clearly responsible for the network, for the desktop systems, for the connections to the outside world and all the general security and the requirements, and they're responsible for providing servers and for general policy. The physics department's responsibilities are around radiation therapy, patient care around radiation therapy, equipment and specialized systems that go with radiation therapy and in house software that we have written to make our systems work well. And, the, the, I think the problem areas come because these two things are not mutually exclusive, and so we, we

put together an agreement that is, I mean it's actually included in the handouts, and it, if you, it looks, it looks kind of motherhood, but by saying up front the, the putting the context there where we have the, where we recognize that there are responsibilities that each side, each side of this agreement has and that there are areas of overlap, it makes, it makes clear and provides a framework for collaboration at the interface. And, we have found it very useful and eliminated a lot of the conflict that, that existed before. And with our change to the new organization, we are, it, this has actually been beneficial and we are working towards an, a new understanding with this different information systems group. I, I, I'm gonna take the privilege of a little bit of editorial comment and I think there are some differences in perspective between physics and IS and I think physics, the

physics group has a great deal to offer IS if they will recognize it because in my experience IS tends to be swamped with a multitude of problems that get thrown at them through their help desks system, and generally these problems are trivial. One of the really, real advantages of having a good relationship with the physics group is that we tend to know which problems are really serious and the ones that need, really need the attention, and this is a real generalization, my impression is that the IS environment tends to promote a need to make a quick fix. If they can see how to solve the problem immediately, they'll do that because they have a whole stack of other problems that are being sent into them, whereas physicists have to understand the problem in depth because we have to be very aware that if you make the wrong solution to the problem, that can

come back and cause you subsequent problems. So we've, I, I think we have a different perspective on problem solving. Okay, to move ahead, the specific topics, the ones that I was selected to talk about, are these three, and the first of these specifications I think is almost impossible to make any very useful comment on. The, the, the problem is really caused by, or I don't know if it's a problem, that it's, it's, it's caused by Muir's law which, where the performance of computer systems tends to double every eighteen months to two years, and in fact, that's not in many ways the problem. The real problem is the corollary of Muir's law, which is Gate's law, which where the software halfs in performance every 18 months and this is because the manufacturer sees that the hardware gets better and, therefore, they do more with the software. And, so the real problem is

that eighteen months from now you probably won't be able to run the software version that comes out then, at least the level that you would like. And, this date is quite, about a year old now, and if you, if you, the, the market consequence of Muir's law is that the,

the new hardware that comes out tends to be very expensive as the manufacturer tries to recoup some of their investment, but the older stuff they're trying to get rid of so the price drops down to pretty much a plateau level at lower performance. And, I think the only comment to make is if you're choosing, if you're trying to choose hardware,the, the idea, the best idea is to try and pick the hardware that's rated the knee of this curve so that you get the best performance for the best, for, for a reasonable price. And, just remember the stuff that's on the right of the curve, that's very expensive, six months

from now will cost the same as your, as, as, as the plateau. However, the general, general comments manufacturers will provide specifications for hardware and, obviously, you have to at least buy at that level. However, be aware that they're not analytically derived. The manufacturer's no real incentive to suggest lower level performance than, than the, the maximum that's available. And for imaging, memory is probably the thing that makes the most difference to imaging performance and so memory is very cheap, buy as much as possible; and be aware that you need to buy lots of disks if you're doing any, any sort of imaging. On our sonar vision system we average almost 70 megabytes per patient, so we generate over 100 gigabytes of, of disk storage in a requirement per year. DICOM is a standard, a standard, a standard for data exchange of, sorry, for the exchange

of images in medicine, and resolved a problem that fifteen years ago every time you wanted to transfer images between two systems, you basically had to write a custom interface, and DICOM was developed to set up some standards for imaging, image transfer, and recently it's been extended in a number of different directions, in particular into DICOM RT which is an extension that includes radio therapy objects so you can transfer plans, _____ data, etc. There's lots and lots of resources on the internet dealing with DICOM. The standards themselves are available at the Nemo website. Nemo owns the copyright on the DICOM standard, and, I'll say there's many sources of DICOM information, and I've print three down here. I don't mean to imply in any way that they are particularly better than any other resource. They just happen to be ones that I've

stumbled upon that I find useful. I do particularly like the first one. The RSNE one is a very good start off overview. DICOM, the DICOM standards address a number of different areas. The address, the communication between systems that are transferring data, and DICOM defines a process for negotiating how a data exchange will happen. So, that two systems, one that, that the calling entity which is the source of the data and the called entity initially negotiate how they are going to transfer the data, they negotiate what formats they are going to transfer the data, and in fact, they decide whether they have the ability, the mutual ability, to understand each other. Once they've reached that stage, the data itself is transferred, and the data is sent as an object which consists of tagged data items. And so, each data item is a couple of numbers that says what that data

item is and then one or more values that, that define the value of the data, and the DICOM standards themselves are the list of what these tagged data items are, and the, the standards also say whether within a particular object a data item is essential or if it's optional. So, for example in a CT image, the size of the image would be a necessary component, and they define what sort of values these components can have. Now, the manufacturer doesn't have to send everything about the object that they're, that they're transferring. They have to send the essential components, but they don't have to send everything, and the manufacturer's expected to publish a conformance statement, and you'll find these on manufacturers' websites, and they tell you how the manufacturer meets the standards and how well the manufacturer meets the standards, and so the

information in there is sufficient to let you know whether you can exchange data between two pieces of equipment, and the conformance standard will also explain what various errors, errors mean. So, if you're, if you are trying to set up a DICOM transfer and you hit errors, this is where you'll find what these errors mean. Now from a practical point of view if you're trying to configure a DICOM system, the important things you need to enter into the, the software are really where, where the system is, where, where the, the, the, if we're defining a target like a portal imager, than you need to tell the calling entity, which for example might be something like sonar vision, you have to tell it where the portal imager is so you'll have to enter the IP address, you'll have to tell it which channel, so, so, so this is a channel on that IP address, and you'll have to tell it the AE

Tiser which is the name of the software that's running on the other end. That will allow the DICOM on the calling end to, to, to target the initial interaction with the portal imager. You should be aware that all, that often pieces of equipment will accept DICOM transfers from anywhere, but they will also, on occasion, only accept DI, the DICOM transfers from specified sources. For example, our linite requires that you say which DICOM sources it will accept data from, and basically you'll put, put in the same sort of data on the call end. In addition to all the information resources in the internet, there's also access to many tools, and I just mention two here and, again, I don't mean to imply that they're especially good. They just happen to be the ones I've used. The IKE for DI common validation tool is available free on the IKE for science and it's a tool that lets

you analyze DICOM transfers so it acts as a, as a, it acts as a dummy DICOM entity and lets you see the content of the, of the transfers, and it's very useful for debugging complicated situations. I should warn you, it's very hard, it's hard to use. It'a a steep learning curve on it, but once you get past that learning curve it gives you very valuable information. And, there's lots of sources for software that you can use. For example, DICOM objects has a package of that, that basically encapulates DICOM, a DICOM server that you can build into. For example, we use this with visual basic. I, I, I'm not going to do this example because there is a big, there is a, the next session is about DICOM. So, the final topic I'm supposed to talk about is security, and there's multiple levels of security issues you might want to consider. First of all, you have to make sure

obviously that your systems are physically secure and nobody's gonna walk out the building with your computers, and then protect your data from interference from the outside world, and you're not an organization, and, and I think probably most organizations that, that is I the information system department's responsibility. But, you have to be aware that you don't compromise that by doing things like installing modems which can jump past any fire walls that the information systems department sets up. And, I, I think it's useful to recognize that your data can be compromised both deliberately but also accidentally, and I think accidentally is probably the, the one that people forget about. Most systems have the passwords, and you should have a clear password policy, and that's usually something the information systems department will specify. However, realize that many of the specialized systems you have, like CT scanners and Truman planning systems, you will have control of the passwords in these and, and often these come with generic passwords, and my suspicion is that many people never change these, and I suspect if you go out into, into the real world you'll find that many systems that come from the manufacturer with a generic password will still have that password, and they're, and they're, and they're therefore vulnerable, and, in fact, it's only comparatively recently that in my department we've adopted a rigorous policy of changing all our passwords on a regular basis. And, finally, use, use strong passwords. What I mean by that are, is, that there are various techniques for, for deducing what passwords are and for hacking into, into systems, and I've given a website here that, that is actually it's quite interesting. It's, it's mostly about how to hack into systems by deducing passwords. But, it tells you, it gives you hints as to how, how to make your passwords more protective. Often your data will be on shared drives that are shared across an organization, and there I think it's very important to protect them from, your data from everybody, including yourself. In our organization we have our basic radiotherapy data, and so things like TMR's, on a shared drive because we need it for our software that relies on it, but we don't want it to be compromised because that could have serious consequences. So, we have it set up so that it's basically it's read only. But we also have it set up so that it's read only by everybody, including the physicists, and in fact we have a special physics administration account that is the only account that has write access to that data so that we are not in a position where we accidentally can overwrite our data. And, recognize that even though you set this up and, as I said, nobody can, people can only read this data, there is somebody, there's a system administrator or somebody who can overwrite that, and it happens that system administrators will make a mistake, and it's therefore important that you have some sort of QA process to make sure that the protections you put in place stay in place. And finally backup. Make sure you have some sort of, some backup of your data so that if things do go wrong, you can get back to where you once been, and the only, the hint there is it it's easy to sit up a system for backup, but remember that you have to check that it actually works, and a particular check that you can actually retrieve the data that you think you're saving. And now, I'm going to pass on to my co-presenter.