Telecommunication Concerns for Radiology Practices

BY HOWARD REIS

While advances in telecommunications have enabled new efficiencies for radiology practices, managing the telecommunication infrastructure remains a major concern for radiology managers.

The role of telecommunications in the advancement of radiology

Radiology practices rely on high speed data communications for their radiologists at home and to transmit large volume files between office and hospital locations. In some cases, gigabit Ethernet networks provide connectivity to secure co-location facilities. Applications such as Voice over IP (VoIP) and Instant Messaging are increasingly part of the normal workflow process.

The following table shows the size of several modalities of medical images and the time it takes to transmit them in both un-compressed and compressed fashion.

Some conclusions from reviewing the table include:

1. Medical images are getting larger, which is primarily due to the number of studies included in an individual exam. This has a direct impact on transmission speed.
2. Studies have been performed to determine acceptable compression ratios which do not have an adverse effect on the diagnosis delivered. Compression is critical for the timely delivery of images to the reading physician.
3. Many hospitals have increased their network capacity and the weakest link in the equation is the connectivity at the individual physician residence. That said, a cable modem or a DSL line is still sufficient in receiving a steady flow of images through the night.

	X-Ray	CT	MR	Mammogram
Size of Exam	30 MB	300 MB	90 MB	150 MB
Compression Ratio	25:1	7:1	6:1	10:1
Size of Compressed Image	1.2 MB	42 MB	15 MB	15 MB
Transmission Time – Uncompressed (seconds)				
DSL	720	7200	6480	3600
Cable Modem	480	4800	4320	2400
T1	320	3200	2880	1600
10 MB Ethernet	50	500	450	250
SONET (OC-3)	36	360	324	180
Transmission Time –Compressed (seconds)				
DSL	28	980	350	350
Cable Modem	19	665	238	238
T1	13	455	163	163
10 MB Ethernet	2	90	25	25
SONET (OC-3)	0.1	3.5	1.3	1.3

Advances in telecommunications and medical imaging

While typical transmission speeds have not changed in the past 20 years, the biggest changes have been in the areas of availability and price. At the hospital end, most facilities have high speed Ethernet available at an affordable price. At the residential end, the technology has evolved from DSL to cable modem to high speed fiber optic lines via services like Verizon FiOS®. Home-based radiologists usually have a choice of transmission media and can often contract with two separate service providers to guarantee connectivity.

Larger studies combined with hospital-wide digital systems have created an environment where additional bandwidth is always necessary. It is often the hospital radiology department that pushes the IT department to obtain additional bandwidth. Data communication companies are most happy to oblige.

The need for telecommunications redundancy (contingency planning)

Despite impressive uptime rates, telecommunications technology isn't always reliable. If high-speed lines are unavailable, the process could come to a halt and patient lives could be at risk.

Practices need to be prepared for phone system failure, circuit or network failure and natural disasters. Visible disasters include fire, flood, power outage, earthquake, vandalism, severe weather, equipment failure, backhoe, labor action and theft. Invisible disasters include fan failure, air conditioning failure, unauthorized access, accidental cable removal, equipment power outage, software changes, temperature and humidity "creep," and cybercrimes.

In case of problems, various redundancies can be employed to ensure things run smoothly. There is more

than one way to effectively replicate high-speed data lines:

- Each critical facility can be connected via an alternative path to the company data center. Those paths can be provided by a single carrier or by an alternate carrier which, by definition, will be connected to an alternate data center.
- The data center itself can be backed up at a second location on the network, or at an off-site location provided by a third party provider. These sites can be places where data can be stored and recovered, or can provide a hot backup for complete operations.
- Ethernet is a technology with built in redundancy, and can be deployed between network locations.
- Voice over IP (VoIP) has also proven to be a (mostly) reliable technology which provides better network reliability and backup when compared to previous options.

An important question to consider - what will an hour (or day, or week) of down time cost and what am I willing to invest to guarantee that it does not happen? In any case, a Disaster Recovery Plan that includes recovery exercises and updates is crucial.

As with the hospital or the office, the home-based radiologist also needs to have a disaster recovery plan. Alternate communication lines, such as a cable modem and DSL from separate providers, are recommended.

Radiology Group Case Study (RAPNY)

I studied the telecommunication infrastructure of an upstate New York practice. For purposes of this paper, we'll call the practice Radiology Practice of New York (RAPNY). The practice has a headquarters location and three additional imaging centers. The practice employs 18 physicians, 4 physician assistants and over 130 support staff members. RAPNY physicians read at three hospitals.

Their primary telecom challenge includes managing the network which is an ongoing task. They must control costs while insuring reliability and transmission speed for their doctors. They need to be conscious of HIPAA, security, and encryption requirements.

The practice replaced their network carrier, a large regional telecommunication carrier, with a smaller, more nimble Ethernet provider. RAPNY also replaced 30 T1s with an Ethernet network, which reduced monthly cost from $40K to $10K. According to the practice Chief Information Officer, "The hardest part of the job has become the easiest."

VoIP has been a benefit as well as a challenge. The practice utilizes four-digit dialing between all sites and has virtually no additional cost on top of the existing data network. However, there are intermittent quality issues as well as latency, priority and usage issues.

The practice is concerned with teleradiology. Connectivity is provided for RAPNY physicians at their homes, where redundant providers are not a viable option. For now, in case of local network failure, doctors must drive to the hospital, which is usually no more than 30 minutes away.

Future Concerns

There will continue to be new applications which will present concerns of a telecommunication nature. Currently online collaboration software (e.g., Webex®) is becoming very popular for group meetings. Recently, iPhones® have become very popular with physicians, including providing the ability to view radiology studies on iPhones®. New modalities with advanced visualization capabilities will present additional challenges. There will be an increase in the use of wireless technologies, starting with microwave and moving toward WiFi and WiMAX. Additional patient involvement (requests for their own images, transferred to other physicians) will become a growing concern.

Conclusions

1. Managing telecommunications will continue to be a critical part of managing a radiology practice.
2. New applications will drive the need for increases in bandwidth.
3. More options will be available as telecommunication providers respond to the needs of this demanding market segment.
4. Decisions regarding telecommunication solutions should always take into account the need for quality patient care.

HOWARD REIS, MBA
is the Director of Business Development for Imaging On Call, a teleradiology company based in Poughkeepsie, NY. Howard has been involved in teleradiology since the early 1990s when he worked on a teleradiology trial with four Boston teaching hospitals while a member of NYNEX Science & Technology. *Howard can be reached at Imaging On Call, 695 Dutchess Turnpike, Poughkeepsie, NY 12603; 888.647.5979; hreis@imagingoncall.com; www.imagingoncall.net.*