

RFoG the Path to the Future

Chapter 1

To me RFoG, or Cable PON is the path to the future for CATV operators. It offers an easy way to deploy fiber to the home in a non disruptive way. Lets look at its advantages:

1. Lower Cost, The price of fiber is lower than coax and the cost for electronics at the headend can be as low as \$100. per customer and the expenses at the customers house, are not incurred until a customer is actually hooked up;
2. Fiber is actually run to the home, opening the door for many uses in the future;
3. Today's RFoG home devices, MicroNodes, NIU, NID, etc. have a bandwidth of 1 GHz but the fiber is good to 2, 3 or ? GHz and thus future bandwidth is assured;
4. All of your DOCSIS infrastructure remains the same, you have just attached the NODE to the side of the house;
5. The set-top boxes that you have already deployed remain the same and duplication of subscriber STB's is avoided;
6. All of the electronics are either at the headend or on the side of the customer's house with all of the increased reliability that this brings;
7. The cost of Outside Plant powering with all of its ancillary cost such as standby power supplies, battery maintenance and testing are eliminated;
8. Fiber is essentially immune to the elements, fiber does not get wet, temperature expansions do not cause splices and connectors to open;
9. Sweeping, CLI, and other normal HFC plant maintenance procedures are eliminated lower the cost of operation. Some systems with RFoG installed have reported that the cost of maintenance is lowered by as much as 90%;
10. Fiber is immune to ingress and CPD, which plague coax plants;

11. Because of RFoG's improved noise characteristics the full 5-42 MHz return path spectrum can be used for data. Today's RFoG systems can support DOCSIS 3.0 with bonding, but also the low noise floor enables 64-QAM upstream transmission, increasing return path bandwidth;
12. Passive optical network equipment consumes less than 80% the power required by the electronics in an HFC environment therefore making in a "Green" technology and Earth friendly;
13. Because the Passive Optical Network used by RFoG is identical to the networks used by (X)PON systems. A (X)PON system such as GPON or EPON can be overlaid on a RFoG network and used to provide bandwidth rich business network services.
14. RFoG is a 3 dimensional service in that service can be expanded through TDM (Time division Multiplexing), FDM (Frequency Division Multiplexing) and WDM (Wavelength Division Multiplexing);
15. Although not entirely true, but thanks to the extensive and effective marketing done by Verizon and others, people now believe that Fiber to the Home is the best service. With RFoG you can easily and cost effectively deploy FTTH;

When I hear of someone doing an upgrade, rebuild or extension, my first question is "are you running Fiber"? If they reply negatively, I then proceed to tell them that they are being very short sighted and wasting a golden opportunity to move into the 21 century.

When I built my first cable systems back in the mid 1970's, 20 channels was state of the art. I was building systems in rural Oklahoma and I can remember saying, " why should I invest in 20 channel equipment, I cannot find enough channels to fill 12." Well, needless to say a few years later satellite delivered channels became available and soon I was struggling for bandwidth and rebuilding. I have never forgotten that lesson and today we are looking at much the same scenario, the ability to build for the future.

Much of the deployment of RFoG has and is in rural systems. Systems that had never upgrade past 550 MHz and are now going to FTTH with 1 GHz bandwidth and an easy path to more if needed.

The major MSO's have been slow to embrace RFoG, mainly because they have billions of dollars invested in their HFC network and have only rolled out RFoG in Greenfield applications.

So maybe for the first time in cables history Main Street is leap-frogging Wall Street.

Cable TV has never been a static industry, from the 3 channel systems in the early 50's to the 5 channels systems in the mid 50's to the first 12 channel tube systems. Then in the early 60s it was transistors, first from AMECO and CAS/CO (both claim to have been first) to the first 20 channel, single octave equipment in the mid 1960's to the first push-pull equipment that used the midband in the later sixties. In the late 60's 2 companies were striving to perfect multichannel broadband 12 GHz microwave. Well Hugh's won and who can even remember Laser Link. The 70's brought the first mass produced hybrid amplifier chips from TRW and 36 channels.

The mid 70's brought satellites and the first satellite delivered signals. Would you believe that the first dishes were required by the FCC to be 10 meters (33feet), had to be licensed by the FCC and cost between \$1-200,000.00 For that you got HBO and a little later WTCG, the original name of WTBS.

Next came 60 channel systems and then Cable started its love affair with fiber with the advent of the HFC (Hybrid Fiber Coax) system. At first nodes were deployed to serve 500 to 1000 homes, then it was 500 homes then 250 and now it is as small as 50 homes per node.

Fiber all the way to the home is the next logical step and RFoG makes it easy, affordable and deployable today. Any new build, extensions, or bandwidth upgrades in selected areas, RFoG should be the 1st consideration. If you have areas that have severe problems with ingress, or radiation, think RFoG.

I remember a high rise condo project we had in Oceanside California. This building had every paging transmitter in North San Diego County on the roof and we could not keep in from picking up outside interference. I could not even sell it so I finally donated it to a local soccer club. A major CATV Broker's son was on the team and the Broker was able to convince the local cable company to donate \$5,000 to the soccer club and get the cable system as a bonus. A fiber to the home RFoG solution would have been a miracle in that system.

There are beneficial offshoots to RFoG. One of these is an RF/optical tap that will allow you to feed customers 1-5000 feet from you distribution lines using fiber between the cable plant and the home. Once the signal is back to the cable plant it is handled as a normal customers signal. (More in Chapter XX)

There are new RF2F (RF to Fiber) hardened transmitters you can begin to deploy fiber at any point in your system, even if you are fiber poor from your headend. Using this equipment you can roll out RFoG fiber to new builds or Greenfields when you need to without reengineering your entire plant. Some people instantly think that the noise would immediately preclude this option, but in normal cases this is not true. We will talk more about this in Chapter XX.

Opportunities abound, I am aware of a number of builds and planned builds into areas that:

1. Were always considered uneconomical to build;
2. Were previously built out with cable and then abandoned;
3. Areas now underserved by major cable companies (overbuild)
4. New developments and subdivisions where the developer wants "Fiber to the Home" and the local cable company cannot or will not comply with the requirement; In some cases FTTH adds \$10-15000 to the sale price of the home.

As an industry and especially the entrepreneurial side of the industry, we need to THINK FIBER and we can prosper through out the 21st century.