What If? Maximizing PCO Potential With Fiber

Private cable operators and competitive local exchange carriers see opportunity in wiring individual buildings. Which technology should they use?

By Steven S. Ross / *Broadband Communities*

Low risk (management, technology and regulatory), good upside potential and a quick route to positive cash flow have brought investors back into the business of serving multiple-dwelling-unit (MDU) communities – once the exclusive domain of private cable operators, or PCOs. The business requires more up-front investment per customer than it used to because systems must now accommodate data, voice and wireless services as well as video.

However, because the inventory of new greenfield rental and condo complexes is still low as the real estate market struggles to recover, PCOs must customize their in-building networks and resign themselves to the paucity of low-hanging fruit. They must also think about which technology to use. Table 1 shows the major technology options available.

The trade-offs shown in the table are fairly well understood in general. However, the explosion in types of content and in network options requires careful modeling to calculate the best approach. Fortunately, Broadband Communities has a model that is a great starting point: Tool 2, available free to subscribers at www.FTTHAnalyzer.com.

This article explores some ways the model can be used to test alternatives for any PCO build.

Broadband deployers in multifamily housing face a trade-off between short-term profitability and long-term revenue potential.

BASE CASE

The base case illustrates the key problem builders of FTTH systems have in existing MDUs. The example given is a 200-unit condominium or rental building with an expected 60 percent take rate by the end of the second year. The cost to pass every unit with fiber in this example is $145,000, of which all but $15,000 is spent in year 1. The extra cost of wiring each unit as customers sign on can be spread out, of course, but the high spending in the first year requires a fair amount of up-front cash.

Adapting existing MDU wiring – whether twisted-pair or coax – saves on deployment cost and brings the system to market faster. This cuts the initial cash requirement but decreases profitability down the road because it reduces revenue potential, especially where the only alternative is twisted pair.

Doing a few model runs to explore these "what-if" scenarios will highlight the issue.

The first run compares cable and twisted-pair solutions with the base case, keeping monthly average revenue per customer constant at $80 per month in year 1, $100 in year 2 and $120 in years 3 and 4. Because so much of the revenue is from low-margin video, the base case assumes content expense at $70 a month per subscriber, rising 5 percent a year through year 4. As we can quickly see, the non-FTTH solutions result in much better profitability – and, more important, debt coverage ratios.

But that base-case revenue projection is actually lower than is typical for an FTTH build. What if we were optimistic and assumed Verizon's FiOS ARPU ($150 a month, with a gross margin before overheads of $50)?

In year 1, debt coverage actually drops in comparison with the base FTTH case because the model conservatively estimates that higher startup costs are needed to market the advanced services for which customers will pay a premium. However, by year 2, the more complex high-revenue option is providing a healthy debt coverage of more than 2x. By year 4, it is more than 5x. That is certainly still below the base cases for FTTB (as enhanced DSL from the node in the basement or as Ethernet over coax), assuming good copper exists in the building in the first place.

> Solutions that reuse existing in-building wiring are less costly than running fiber to each unit, and they can be installed quickly. That's good for short-run profitability, but may limit potential revenues in the long run.

TAKE RATE ISSUES

All cases were initially calculated using a take rate that starts at 50 percent at end of year 1 and rises to 60 percent at the end of year 2 before leveling

DISTRIBUTION TECHNOLOGY	DISADVANTAGES	ADVANTAGES
FTTH – fiber all the way to living units	• Higher up-front cost except in greenfield builds because existing wiring cannot be reused	• Unlimited potential bandwidth • Lowest operating costs • Greatest revenue potential • Good aesthetics because hiding thin fiber in corridors and in living units is easy
Fiber to the building or curb with Ethernet distribution over coaxial or dedicated Ethernet cable	• Less potential bandwidth than FTTH • Less flexibility for Wi-Fi and cellular hotspots in common areas • Higher wiring cost if there is no wiring to reuse	• Lower wiring cost if existing cable can be reused • High bandwidth (up to 1 Gbps in some cases) • Ease of management • Lower cost for customer-premises equipment
Fiber to the building or curb with DSL distribution over copper pairs	• Less bandwidth than Ethernet distribution, especially upstream • Requirement to carefully test wiring ahead of time • Difficulty of serving wireless • Significantly lower revenue potential	• Familiarity of technology for workers • Lower up-front costs because existing wire can be reused • Faster installation because existing wire can be reused • Less disruption from construction • Potential greater compatibility with existing outside plant
Hybrid fiber-coax with DOCSIS and QAM	• Higher power consumption • Limited choice of add-on equipment for Wi-Fi and cellular hotspots • Requirement for set-top box • Reduction in bandwidth per user as more users come online	• Lower wiring cost if existing coax plant can be reused • Ease of providing video through central satellite dish • High downstream bandwidth and potential high upstream bandwidth going forward, as linear video demand declines

Table 1: Technology options for in-building networks

EXAMPLE: 200 DWELLING UNITS, FIBER TO THE UNIT	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Total dwelling units passed	200	200	200	200
Total subscribers at year end	100	120	120	120
Average subscribers for year	50	110	120	120
Equity spent, cumulative	100,000	100,000	100,000	100,000
Debt, principal spent, cumulative	50,000	100,000	100,000	100,000
Cumulative cost to purchase and install customer premises equipment, using year-end customer total	50,000	60,000	60,000	60,000
Cumulative cost to purchase and install fiber cable to units, satellite dish or other headend equipment and to cover door fees, free services, etc.	80,000	80,000	85,000	85,000
Total system construction cost, cumulative	130,000	140,000	145,000	145,000
Direct costs per subscriber, typically for ONT install, in-unit networking, set-top box	500	500	500	500
Marketing	10,000	5,000	2,000	2,000
Cash on hand at year-end, exclusive of investment return	10,000	55,000	53,000	53,000
Investment return on cash on hand	0%	1%	1%	1%
Total cash on hand at year-end	10,000	55,550	53,530	53,530

Table 2: Construction and startup costs in the base case. In these models, users input into shaded cells and the model calculates other values.

off. The average take rate for the year drives revenue, and the average lags the year-end for year 1 (25 percent) and year 2 (55 percent). Are those take rates reasonable? Verizon FiOS has an overall take rate approaching 45 percent. Its take rate for MDUs is confidential but is probably a bit higher. The take rate for smaller telcos using fiber is about 60 percent (the blended average of all FTTH customers against homes passed and marketed is just over 50 percent, and Verizon is responsible for two-thirds of the customers).

Take rates, however, can vary widely. Student housing on a bulk-service plan has an automatic 100 percent take rate. Developers' own systems have 70 percent to 100 percent take rates. An FTTH build in an existing MDU is almost always a competitive overbuild, for which take rates start lower and increase over several years. Nevertheless, FTTH competitive overbuilds tend to have significantly higher take rates than DSL from a distant node. Little U.S. data is available for FTTB.

Of course, because of competitive response, projected take rates may not be achieved. Overbuilders sometimes find their planned or actual builds inspire incumbents to upgrade their own networks and mount credible challenges.

What if a telco serves a multifamily building with DSL from an existing FTTN build, achieving half the base case take rate and half the original base case revenue per customer? The debt coverage ratio would be fine, of course, because there would have been no capital expense. However, the total revenue would be only a quarter of that of the FTTH build, and EBITDA (earnings before interest, taxes, depreciation and amortization) would be a bit less than half as much.

LONG-TERM TRENDS FAVOR FIBER

All the technical and revenue trends seem to favor fiber to the unit:

- In the base case, the cost of passing

NEED MORE INFORMATION ON MODELING?

- Broadband Communities' economic development conference in Tinsley Park, Ill., November 5–7, includes an FTTH modeling workshop and talks by financiers and financial consultants. The conference will be keynoted by the governor of Illinois. See http://bbcmag.com/chicago/ for details.
- FTTHAnalyzer.com includes all five current models (some for investors, some for operating cash flow) with instructions for use.
- The March-April 2013 issue of Broadband Communities carries an article that explores what-if analysis using a model for general community FTTH builds. That article also includes a sidebar explaining what goes into a financial model. See www.bbpmag.com/Features/0313feature.php.

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EXAMPLE: 200 DWELLING UNITS, FIBER TO THE UNIT	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Total monthly revenue per subscriber	120.00	150.00	160.00	170.00
Monthly expenses per subscriber				
Cost of content (calculated for video package in triple play)	100.00	105.00	110.25	115.76
Payroll	5.00	5.00	5.00	5.00
Management	7.00	3.00	2.70	2.70
Debt service	15.77	13.28	8.79	8.79
Total monthly expenses	127.77	126.28	126.74	132.26
Monthly cash flow per subscriber	-7.77	23.72	33.26	37.74
Annual cash flow per subscriber	-93.27	284.62	399.08	452.93
Annual cash flow for system	-9,327	31,308	47,890	54,352
Annual EBITDA	-4,327	41,308	57,890	64,352
INVESTMENT CONSIDERATIONS				
Annual EBITDA as percentage of debt	-8.65%	41.31%	57.89%	64.35%
Annual EBITDA as percentage of equity	-4.33%	41.31%	57.89%	64.35%
Annual EBITDA as percentage of capital cost	-3.33%	29.51%	39.92%	44.38%
Debt service coverage ratio	(0.23)	2.16	4.57	5.08

Table 3: Operating costs and investment metrics in the base case

an MDU living unit with fiber was set at $400 and the cost of wiring an individual unit when the occupant becomes a customer was set at $500. Vendors are continually refining both numbers, and many report costs as low as $250 to pass a unit and $250 to equip it (typically with an ONT that includes a wireless gateway).

- The great need to expand residents' access to cellular voice networks and offload some cellular data communications to residents' Wi-Fi networks has upped demand for upstream bandwidth and also provided a new revenue stream for PCO fiber networks – they can charge wireless operators for cellular access through their distributed antenna systems.

DEBT SERVICE COVERAGE, BASE FTTH CASE VERSUS COPPER, SAME ARPU FOR ALL NETWORKS	YEAR 1	YEAR 2	YEAR 3	YEAR 4
FTTH	(0.86)	0.88	3.78	3.35
FTTB reusing twisted pair for enhanced DSL	(0.81)	1.77	22.92	20.73
FTTB reusing coax for Ethernet	(0.82)	1.62	14.95	13.48

Table 4: FTTB is much more profitable than FTTH in the first few years if existing wiring can be reused and if revenues are comparable.

DEBT SERVICE COVERAGE, BASE FTTH CASE VERSUS COPPER, WITH HIGHER ARPU FOR FTTH	YEAR 1	YEAR 2	YEAR 3	YEAR 4
FTTH	(0.23)	2.16	4.57	5.08

Table 5: After year 1, profitability for FTTH improves substantially if subscribers purchase more services.

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In a brownfield building that has good wiring – especially Ethernet or coaxial cable – fiber to the basement is an excellent alternative to fiber to the home, at least in the short term.

- MDU owners and managers who understand fiber's ability to enhance rental income and property values increasingly welcome fiber. As a result, telcos get marketing help from building staff and often avoid paying door fees.
- Owners and property managers also appreciate the reliability of fiber, as residents tend to blame building management when something goes wrong with their connectivity.
- Revenue has steadily increased as users demand more bandwidth, more video choice and access to new applications.

All that said, the model suggests that where existing wiring is suitable – especially if the copper is in the form of Ethernet cable or coax – FTTB is an excellent alternative to FTTH. It cuts up-front costs in half but still enables most services that FTTH can handle. The biggest exception is perhaps direct cellular access. ❖

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WILL G.FAST MAKE FTTB WITH DSL A MORE ATTRACTIVE OPTION?

A new, high-bandwidth technology for DSL over short distances (such as from a basement to a living unit) is just becoming available. Called G.fast, it's touted as allowing 1 Gbps speeds. So far, it appears to be a useful niche product rather than a general solution because of its technical complexity and potential for interference with commercial and college FM radio broadcasts.

G.fast signals travel over copper using a 100 MHz-wide band centered on a frequency of 107 MHz. This overlaps the 87.7 to 108 Mhz band used for FM radio in the United States. G.fast is supposed to detect the specific channels used by local FM stations and avoid them. In large urban areas, however, every possible FM broadcast band is in use.

The centers of each station's band are separated by 0.3 MHz, and sidebands use pretty much all the space between the channels as well. So less than 80 percent of the total G.fast spectrum is available in urban areas (where most MDUs are). Even in rural areas, older receivers may detect G.fast signals as noise in what would otherwise be blank intervals between FM radio stations. The entire FM radio band might be declared off-limits to G.fast by the Federal Communications Commission once the complaints start pouring in.

In addition, G.fast is less fast than it appears. The International Telecommunication Union and Huawei describe G.fast total bandwidth as a combination of upstream and downstream, so the theoretical limit of 1 Gbps symmetrical is actually 500 Mbps in each direction in 100 MHz of bandwidth. Cut the bands available, and give up more bandwidth for noise cancellation, and the likely throughput is only 75 Mbps in each direction – not bad but not a game-changer, either.

End-user devices govern which frequencies G.fast uses. This makes G.fast somewhat open to abuse by those with technical savvy who want to up their bandwidth while disregarding FM radio listeners or who want to run illegal radio stations using copper DSL wiring as a giant antenna (FM radio receivers try to home in on the strongest signal on each band).

Huawei has released some documents supporting G.fast on the 200 MHz band, and this also appears likely to eventually become part of the ITU standard. That solves most of the FM broadcasters' problems and ups the potential bandwidth while staying well within the parameters of existing QAM systems (often 800 MHz or more over coax). The cost of customer-premises equipment goes up, but if 200 MHz works, you get 150 Mbps in each direction. Not bad. However, that is three years away and depends in part on the G.fast 100 MHz iteration being popular.

To add to the complexity, here's some historical context: Shortwave radio hobbyists (who certainly have less political clout than broadcasters) killed broadband over power line technology even after service providers agreed to patch around transformers causing most of the radio-wave emissions that interfered with shortwavers' hobby.

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