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# Advanced Cable Services in Portland / Multnomah County, Oregon and Their Impact on the Public Rights of Way

As part of our contract with the Mount Hood Cable Regulatory Commission (MHCRC), W&H Pacific has been asked to comment on the advanced cable services offered by AT&T in the Portland/Multnomah County area and the impact of those services on the public rights of way. What follows is our assessment based on our experience with MHCRC and the AT&T cable franchise since the fall of 1999.

Since acquiring the franchise in Portland and Multnomah County, Oregon, AT&T Broadband has upgraded the architecture of the cable plant from a traditional tree and branch architecture to a Hybrid Fiber Coaxial (HFC) architecture. This upgrade has, among other things, made it possible for AT&T to offer cable modem and other advanced services to its customers.

In the impact study submitted by the Alliance of Local Organizations Against Preemption (ALOAP) ("The Impact of Cable Modem Service on the Public Right of Way" prepared by Columbia Telecommunications Corporation, June 2002), the impact of advanced cable services is detailed. Our experience with the Portland/Multnomah County system upgrade leads us to many of the same conclusions. The Rights of Way in the Portland/Multnomah County area have suffered many of the same impacts illustrated in the ALOAP report.

The upgraded architecture in Multnomah County was part of a larger effort in the region. As such the architecture is consistent in design but independent of other networks in the region. Cable modem services have been launched throughout the region over the upgraded networks. Telephony services have been offered in some areas but are not widely available in the Portland/Multnomah County market. However, the network design is consistent with the neighboring networks where these services are offered. Therefore, the upgraded Portland/ Multnomah County network is essentially upgraded to support both cable modem and telephony services.

The impact of an upgraded HFC cable network on public Rights of Way is significant where those upgrades are designed to support advanced services such as cable modem and telephony. In fact, HFC networks based on current technology are rarely implemented to support only video services because the architecture common in these systems is optimized for advanced services and would largely be unnecessary for the delivery of video services alone. Although video-only HFC networks may exist, they would not require the characteristics that support advanced services. Further, the marketing objectives for those advanced services place greater emphasis on commercial and industrial customers, which has led to an expansion

of the network to areas formerly not served by the network. Additional impact on public Rights of Way is primarily driven by these characteristics. Specific impacts include additional cable, fiber optic plant, and equipment installed in the Right of Way. Installation of these facilities burdens the public Rights of Way by occupying physical space and by impeding the public's use of the Right of Way during installation, maintenance and repair activities.

### *Cable and Fiber Optic Plant in the ROW*

The vast majority of the outside plant in the Portland/Multnomah County system is aerial construction in the public Right of Way on poles owned mostly by the local private electric utility or the incumbent telephone provider. Underground plant is paced in conduit or is directly buried in the public Rights of Way in some residential areas and in commercial districts such as downtown Portland.

In the Portland/Multnomah County cable network upgrade, a great deal of coaxial cable was replaced. Although it can be said that the density of cable plant is similar, in many cases the diameter of cable has been increased to improve performance of the system for advanced services. This increase in diameter increases the physical loading on the poles, necessitating pole replacement in some cases, or earlier replacement in other cases.

Fiber optic cable was added to the Portland/Multnomah County system in two areas: between the Headend and the Hubs and between the Hubs and the HFC nodes.

The architecture between the Headend and the Hubs is a modified ring design, providing diverse routes to the Hubs from the Headend. The additional reliability provided by diverse routing is not required to support video services only but is required to provide advanced services such as telephony. Cable modem services also drive this reliability requirement because these services typically compete with ISP services delivered over the incumbent telephone networks, which have diverse routing between switching centers or Central Offices. Diverse routing in the fiber optic plant between the Headend and Hubs provides the reliability required of cable modem and telephony services over the cable network. This additional plant does impact the public Rights of Way.

The architecture between the Hubs and the HFC nodes is a star design in the Portland/ Multnomah County network. This provides a home-run from each node to its Hub, which is where segmentation of the network is managed and maintained. Initially after launching the upgraded network, when video services are the primary service, the degree of segmentation at the Hubs is very small. This means that most of the nodes are being fed with the same content. Also, a high number of the nodes are combined in the upstream direction at the Hubs. For the most part, all of the independent fiber runs to the nodes are carrying the same content, in both the upstream and downstream directions. Separate fiber runs become necessary only after advanced services become dominant in the network, requiring segmentation of the upstream and downstream content. Therefore, these independent runs are redundant and unnecessary in a network if it were to carry video services only. The additional fiber optic cable found in the Portland/Multnomah County network, which is due to the network's capability to deliver advanced services, impacts the public Rights of Way in a number of ways.

### Impact of Aerial Plant

In the best of cases, additional aerial cable can be lashed to existing cable runs, allowing the additional cable to be placed without occupying additional vertical space on the poles. This technique, known as *overlashing*, increases the physical loading on the poles (similar to the effect of increasing coax diameter on an existing run), driving the need to upgrade some poles with larger diameter poles designed for the additional load. This leads to additional construction activity in the Rights of Way, over and above that required for simply adding the additional fiber optic cable.

In cases where there is available vertical space on poles (available "points of attachment"), or along routes where no existing cable runs are present to allow overlashing, new points of attachment are constructed. In these cases, in addition to the added physical loading on the poles, additional physical space is used on the poles. This use of additional pole space can lead to the replacement of poles with taller poles along runs where all points of attachment have been used.

Besides the additional pole loading and use of pole space throughout the network, the star configuration emanating from the Hubs leads to a tremendous cable density in the neighborhoods immediately surrounding the Hubs. The large number of cables and splice enclosures causes the areas around the Hubs to suffer from aerial congestion (see Figure 1, next page), leading to a tremendous burden on the public Rights of Way, driven primarily by the additional cable plant placed to support advanced services.

### Impact of Underground Plant

The ALOAP report illustrates some of the impacts of underground plant, including trenching, damage to other utilities, and restoration efforts in the Rights of Way. During the Portland/ Multnomah County system upgrade, new underground construction led to trenching of new conduit runs in the Public Rights of Way. These new routes tended to be in commercial districts having potential customers for advanced services. Construction of new underground plant requires traffic control, including lane closures and detours. In addition to the temporary impact on traffic flow during construction, access to cable plant for maintenance and repair requires similar traffic control measures over time. These measures prevent the public's normal vehicular use of the affected portions of the Right of Way. Once constructed, the additional underground plant occupies space in the Right of Way for the conduit and clearance to other utilities. Much of the new underground construction and the resulting impacts can be attributed to the desire to deliver advanced services to a new commercial customer base.

## *Additional Equipment in the ROW*

In addition to added coaxial and fiber optic cable, advanced services also lead to the installation of additional equipment in the Rights of Way. The majority of ground-mounted enclosures and equipment shelters are located on private property, and their effect is omitted from this discussion. However, the aerial installation of HFC nodes and pole-mounted power supplies does have a significant impact on the public Rights of Way.

(a)

(b)

(c)

(d)

**Figure 1. Upgrades to the network near a fiber hub in the Portland/Multnomah County area: (a) new conduit along the pole takes up more sidewalk space; (b) overlashed cable; (c) overlashed cable, splice cases, and empty conduit placed for expansion of advanced services; and (d) new conduit in the sidewalk and empty conduit for growth.**

In the upgraded HFC network, amplifiers used in the traditional system architecture are replaced by larger nodes, which typically hang on the same aerial strand as the cable. These relatively large nodes add to the loading on the poles and occupy more space in the Right of Way of an area. The number of nodes in the system is driven somewhat by the physical layout of the network but is primarily driven by the type of services envisioned for the network. A network designed to deliver only video services could easily be based on a node density of one per 2000 or more homes. In order to ensure adequate quality of service for cable modem and telephony services, most HFC networks are typically built with one node for 500 homes (or even less in some cases). While high node density is a positive feature when discussing quality of service, the presence of four times as many nodes has a negative impact on the public Rights of Way and is entirely due to the segmentation requirements presented by advanced services such as cable modem and telephony.

The reliability requirements of cable modem and telephony services have also led to the upgrade of power supplies in the Portland/Multnomah County network. Due to the segmentation of the network, more power supplies are required in the Rights of Way than for a network designed to provide only video services. In many cases, existing power supplies can be upgraded to support additional electrical loads caused by the basic upgraded system. However, the reliability demands of cable modem and telephony services have led to an increase in the backup time supported by the network.

The backup time is the amount of time the network can be battery-powered during a power outage in the commercial power grid. The backup requirement is most important for telephony services, where lifeline services must be supported during a power outage (a basic requirement for the telephone system to support calls to summon public safety aid). Where the previous design standard for video-only services was typically 2 hours of backup time, the upgraded Portland/Multnomah County network has been upgraded to 4 hours or more. While the existing power supply cabinets can support somewhat larger power supply electronics, doubling the battery size can not typically be supported within an existing cabinet. As a result, many existing pole-mounted cabinets have been augmented through the addition of a second enclosure, just for the additional batteries, mounted on the pole just below the existing enclosure. Just as with the addition of cable to the network, additional battery and power supply enclosures have led to added construction activity and the occupation of more space in the public Rights of Way.

### *Conclusion*

While the industry may claim that an HFC network has no more impact on public Rights of Way than an HFC network designed to deliver video services only, our experience with the Portland/ Multnomah County AT&T Broadband system leads us to a different conclusion. As detailed above, cable plant and equipment requirements are primarily driven by the reliability and segmentation requirements posed by advanced services such as cable modem and telephony services. In fact, these requirements are the primary reason for the additional impact on the public Rights of Way caused by the upgraded network.

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## Limitations

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