

Last Mile Solutions for Wallowa County

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There are three basic types of “last mile” solutions for broadband data access in Wallowa County. They are wireless, existing telephone wire line and power line.

Telephone Wire Line Solutions

The prevailing solution that uses the existing telephone wire infrastructure is DSL. There are many different types of DSL solutions, but the four most common are Asymmetric DSL (ADSL), Symmetric DSL (SDSL), Rate Adaptive DSL (RADSL) and ISDN DSL (ISDL).

The biggest limiting factor for all DSL types is the distance from the telephone central office to the customer, measured along the path of the telephone wire. Maximum distance varies based upon the DSL technology used, wire size and wire quality. Maximum speed varies based upon all of those criteria, plus the distance to the customer. See Appendix A for sample tables.

The only solution to the distance limitation is to do what Century Tel did in Harney County. There Century Tel put DSL concentrators (DSLAMs) out in their remote telephone aggregation points. From the remote DSLAMs, they then ran a high speed connection back to the central office. This resolves many of the distance limitations by effectively moving the central office equipment (DSLAMs) closer to the customer.

A solution of this type requires cooperation from the local telephone provider, in our case Verizon. Verizon would need to agree to provide DSL in Wallowa County, do network design and then install the required components, regardless of who is paying for the necessary equipment.

A DSL solution would provide service to a large majority of the county, but it still requires you to have telephone service. DSL is also terrain insensitive, unlike wireless solutions.

Wireless Solutions

There are many different options when it comes to wireless based solutions. You have to decide between licensed frequencies and unlicensed frequencies and proprietary vs. standards based. You also need to decide on network topology (point to multipoint vs. mesh networking).

Point to multipoint is currently the most widely deployed type of wireless infrastructure. It is relatively simple and somewhat scalable. There are solutions available that use both licensed and unlicensed frequencies, both using proprietary or standards based solutions.

In the standards based, unlicensed arena, there are two IEEE standards that are used. The first is 802.11a/b/g (Wi-Fi). This set of standards is well established. There are many hardware vendors and therefore component prices are relatively low. 802.11a is in the

5GHz band while 802.11b/g is in the 2.4GHz band. 802.11a allows for speeds up to 108Mbps and ranges up to 10 miles. 802.11b/g allows for speeds up to 54Mbps and a range up to 15 miles. Generally as the range increases, the speed decreases, though there are exceptions to this (mainly with point to point links).

There are three main weaknesses to the 802.11 series of standards. First they are essentially LAN protocols and were not designed for wide area use. Second security is very weak (essentially non-existent). Third, 802.11 is line of sight only. You have to be able to see the access point from the end user station (with exceptions in short range use). Trees, hills, houses, etc. cause problems if they are in the way.

The second IEEE standard is 802.16a (WiMAX). This is a relatively new standard with limited deployment and very little hardware is available currently. However, 802.16 was designed from the start as a wide area network protocol and 802.16a was specifically designed to provide scalable, long range, high bandwidth last mile applications. Currently, the specification allows for speeds up to 70Mbps and a range up to 30 miles. Additionally, 802.16a allows for operation in any unlicensed frequency band between 2GHz and 11GHz.

802.16 has robust security implemented in the protocol and has support for mesh networking. It also allows for “near” line of sight between end points. It is much more tolerable of trees, etc. than 802.11. 802.16a product availability should improve greatly in 2004.

There are several proprietary wireless solutions available. They generally provide for speeds up to around 50Mbps and ranges of around 10 miles. Most operate in the same unlicensed bands as 802.11a/b/g. They generally provide more robust security than 802.11. Equipment costs, especially end user equipment, are much higher than 802.11 equipment. Continuing support isn’t guaranteed, witness the Nokia Rooftop product.

Power Line Communications (PLC)

Power line based communications is not new. Power companies have been using it for years to monitor and maintain their power networks. What is new is the use of power lines to provide data communications to business and residential customers. Some of the technology used to provide communications to end users is fairly new and is currently only in test deployment. There are three main companies involved in PLC. They are Main.Net, Current Technologies and Amperion. All three companies have test networks deployed in the US.

The biggest attraction to PLC is the wide deployment and availability of commercial power, even in very remote areas. End user PLC devices are designed to be “plug and play” with little or no user configuration required. Speeds of up to 45Mbps are currently available, with the promise of higher speeds on the horizon.

The biggest drawback to PLC is the level of coordination with the local power company that is required to deploy a PLC network. PLC to end users is still an evolving technology but does hold quite a bit of promise due to the wide deployment of the commercial power grid.

Which Technology for Wallowa County?

The big question is which of these technologies is right for Wallowa County? The answer depends on several variables. From the standpoint of requiring no coordination with other entities, the various wireless solutions and probably the best choice. They will also be one of the quickest solutions to deploy.

The biggest downside to deploying a wireless solution in Wallowa County is our environment. To minimize the number of access points, you want to have them as high up as possible. In Wallowa County that generally means mountain tops. The problem here is the severe weather and restricted winter access. The severe weather increases your construction costs and the restricted winter access could cause problems in the event of equipment failure.

If wireless is the best solution, then which flavor of wireless. Unlicensed, standards based solutions are most likely to be the least expensive and more likely to have a long lifespan. 802.11 is well established and is in use for last mile networks and is deployable today. 802.16a is really the right protocol to use for last mile networks, but an 802.16a based network is probably not going to be deployable until mid to late 2004.

A DSL based solution will be probably be cost competitive with and 802.16a solution, and, other than Verizon planning issues, is an immediately deployable technology. A DSL solution would not have quite the same coverage as a wireless solution, as there are a number of residents in Wallowa County that live "off-grid" with no wire based telephone or electric service. Several of these residents are using satellite based broadband Internet service and have expressed an interest in an alternative. For them, DSL and PLC solutions are not an option.

The biggest problem with a DSL based solution is getting Verizon to cooperate. Without their cooperation, a DSL solution really isn't possible.

PLC based solutions tend to have the same drawbacks as DSL based solutions, though the distance issue is not there. A PLC solution requires cooperation with a large, bureaucratic agency. Deployment times may be extremely long.

Both PLC and DSL based solutions use a fairly robust, reliable infrastructure. They are subject extreme weather events, though not like a mountain top wireless access point.

If the winter access and extreme weather issues can be adequately addressed, a wireless based solution is most likely the best option for Wallowa County. If equipment availability issues are resolved, then 802.16a is the best choice. Wireless gives you

relatively quick deployment times and requires no coordination with outside entities, especially large, bureaucratic ones.

OK, we have a network, now what?

So a network type has been chosen, now what do we do? One of the biggest costs of a broadband data network, regardless of type, is customer support. Wallowa County doesn't appear to want to be in the Internet business, but most commercial Internet providers are not eligible for grant funding.

One solution is for Wallowa County to receive grant funding to install and own a broadband data network, then contract out the operation of that network to a third party. In this scenario, Wallowa County retains control over the network, but does not have to build and maintain a support staff. The support services would be on a bid basis, with specific performance criteria, so that county customers get the best possible service at the lowest possible price. Maintenance and expansion of the network would need to be addressed.

Additional services would be added on after successful deployment of the network. Voice telephone service could be provided using existing, successful technologies, as could video (TV) services. These services, along with Internet access, could be revenue streams for the county.

Conclusion

There is no "perfect" solution for Wallowa County's last mile problem, though and of the above solutions address a majority of the problem. As the technologies, and political realities, stand today a standards based, unlicensed solution is probably the best overall fit. There are some not insignificant issues to deal with, but they are not insurmountable.

There are political issues to be dealt with, such as "competing" with existing Internet providers, but no solution is going to be without political issues. The choice is to deal with them or leave our infrastructure as it is now.

If Wallowa County builds a data network, though grant funding, the network could be a revenue stream for the county. Probably not a large revenue stream, but in our situation, every little bit helps.

Improvement of our infrastructure isn't going to magically happen by itself. If we truly want it to improve, we must drive that process ourselves.