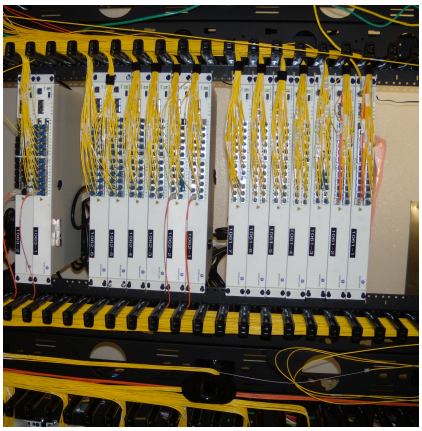

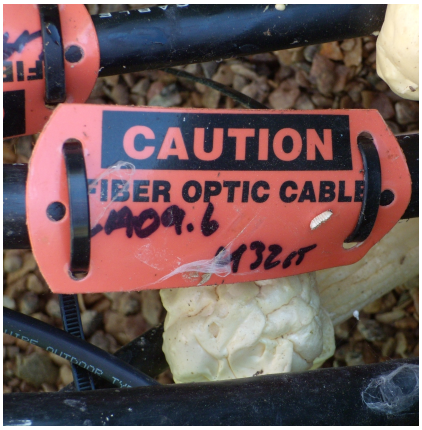

Review of UIA Five Year Expansion Plan

DESIGN NINE
we build networks that perform

Contents

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The telecommunications business is continually evolving. We have made our best effort to apply our experience and knowledge to the business and technical information contained herein. We believe the data we have presented at this point in time to be accurate and to be representative of the current state of the telecommunications industry. Market changes and new technology breakthroughs may affect our recommendations over time.

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Executive Summary

Design Nine was asked to analyze the five year expansion plan proposed by the Utah Infrastructure Agency (UIA).

We examined the model from three broad perspectives:

- **Underlying Assumptions** – The model makes use of many underlying assumptions that are not explicitly stated in the data and formulas used in the model itself. The majority of our effort was focused on verifying, to the extent possible given the budget and short time frame, these underlying assumptions. These are discussed in detail in the *Assumptions Analysis* section of this report.
- **Financial Model Analysis** – We examined the spreadsheet directly, verified formulas, examined the data, and used the services of two CPAs who are familiar with telecom finance models to review the model from an accounting perspective. This is discussed in the *Financial Model Analysis* section of this report.
- **Alternative Model Analysis** – Design Nine has its own proprietary ten year financial pro forma model. Within the time and budget constraints, we have tried to fit the UIA data into our model, including the split SAA/non-SAA market division. This is discussed in the *Alternative Model Analysis* section of this report.

Our work also included a three day visit to Salt Lake City and the Utopia offices. The Utopia group will be supplying network management and operations services to the UIA under contract. This visit included the following:

- Extensive discussions with the Manager of Outside Plant to learn how the network passive and active infrastructure is deployed and maintained.
- Several meetings with the Systems Engineering manager to learn about the overall network architecture, how network operations and service provisioning are managed, and how operations staffing and tasks will be affected by the planned expansion.
- Meetings with the Executive Director, Sales Manager, and CFO to discuss various aspects of the operation, including staffing, operations, financial management, service provider management, and expansion plans.
- A full day in the field making random inspections of stranded and operational network infrastructure. These inspections included passive infrastructure like under-

ground duct and fiber cable, aerial fiber cable, hand holes, cabinets, and shelters. We also examined active network electronics in several locations, including Utopia headquarters, primary backbone equipment shelters, and neighborhood cabinets.

Key Points

- Meeting the take rates is perhaps the fundamental assumption in the model. Operational costs and capital expenditures can be adjusted to meet unexpected circumstances or to adapt to changing market demands, but achieving the proposed take rates will drive all other variables. The minimum build out take rate (25%) and the target take rate (35%) seem reasonable and even conservative, given that the project has already shown that with the right kind of marketing, they can achieve much higher take rates. These target take rates are also in line with what we see in other community broadband projects with good marketing.
- Effective marketing is closely tied to the take rate targets. Open access projects around the country are realizing that an effective, consistent, constant public awareness and marketing campaign is required to meet take rate targets. We believe that the UIA has an effective strategy in this regard, and in fact, other community projects should be emulating their approach.
- The UIA model projects that it will take approximately 30 years to move the project into the black. We believe this is conservative and achievable given careful oversight and good management. If take rate targets are exceeded, this time period could be shortened substantially.
- The UIA model projects adding approximately 21,000 new subscribers over the next five years. We believe this is achievable and reasonable.
- Cost containment and staff management will also affect the ability of UIA to meet its five year financial goals. We believe that the current operations and outside plant maintenance is effective and efficient, and is well-managed from a cost perspective. In execution of the five year plan, it will be important that UIA avoids two problems. One could stem from adding staff and increasing expenditures beyond budgeted amounts to meet sharply increased demand; the result would be budget overruns that could affect the financial targets. The second is the inverse of this–not staffing up and increasing expenditures quickly enough to meet demand; if service and support suffers, customer churn may be higher and could also affect financial goals. We are impressed with the current senior staff and believe that careful financial management and continued attention to providing excellent service and support will minimize these risks.
- The long term success of the project depends in part on the quality and quantity of service providers offering services on the Utopia network. The future success of the network will require attracting more providers offering a wide range of quality services well beyond the typical "triple play" of telephone, TV, and Internet access. Utopia cur-

rently has fifteen providers–an excellent number and higher than any other open network in the United States.

- The Utopia network essentially "future proofs" the member communities from an economic development infrastructure perspective. The Utopia network allows the member communities to say, "*Bring your business to our region. We can supply whatever amount of bandwidth you need to run your business.*" Very few other places in the U.S. can make that claim today. The member communities and UIA are creating, at a minimum, a thirty year asset (fiber, duct) that will be support any level of bandwidth needed to attract new businesses and jobs and retain existing businesses. Fiber is an extraordinarily stable and long-lived asset, with fiber installed by the telephone companies in the seventies still in service today, with greatly expanded capacity simply by upgrading the electronic equipment on each end of the fiber.

UIA Financial Model Analysis

A team of four people have spent more than forty hours analyzing the UIA financial model. Two team members are broadband network designers with more than thirty years experience designing and building networks, including extensive hands-on experience with open access networks that use a business model very similar to Utopia. The other two team members were Certified Public Accountants with a firm that Design Nine uses to assist with the evaluation of open network business and financial models.

The analysis work on the model included:

- All hands meeting to review the various sheets, components, and portions of the model. Identify areas of the model for more study.
- Track data and cell formula data back to the original spreadsheets and analyze how those figures were computed. This analysis included examining both the overall logic and accounting principles applied by the model.
- Examine almost every formula in the source data spreadsheets to ensure their logic and functionality was appropriate.
- Analyze the underlying assumptions and/or variables in order to observe the functionality of the spreadsheets, with a special focus on the "footprints" and "monthly" tabs as it was apparent that most of the resulting data originated from these spreadsheets.
- A second version of the file was saved so that after every test the spreadsheet could be tested again from its original state.
- The analysis generated a lengthy list of questions that were shared and discussed among the team. Some questions were referred back to Utopia staff for clarification. Utopia staff answered all questions promptly and to our satisfaction.
- Testing of assumptions by plugging many of the underlying cost and market take rate figures into an alternative ten year financial pro forma. This testing led us to conclude that the financials assumptions hold up well in the alternative model.

Our conclusion is that the model appears to be correct mathematically and that the formulas and calculations "make sense" by accounting for key costs and revenue. The *Assumptions Analysis* section of this report identifies our evaluation of the underlying implicit and explicit assumptions embedded in this model. Our analysis in no way represents an audited evaluation of the data included in the model.

Assumptions Analysis

The financial model makes use of many underlying assumptions that are not explicitly stated in the data and formulas used in the model itself. The majority of our effort was focused on verifying, to the extent possible given the budget and short time frame, these underlying assumptions. These underlying assumptions, in our view, are as important as the data integrity

of the spreadsheet itself. Listed below are the assumptions we have identified and our conclusions about each one.

- **Markets** – The model segments the UIA service area into three markets: residential, business/institutional, and MDU (Multi Dwelling Unit). This is appropriate and reflects the variance in service prices and maintenance costs for each market segment.
- **Take rates** – The UIA model will not build out or complete the network in a footprint unless a minimum take rate commitment of 25% is obtained, and the model uses a target take rate of 35%. The two tiered approach (minimum take rate to start, target take rate for revenue) is, we believe, conservative, based on the current take rates that have been achieved. If the target take rates are exceeded (e.g. 40% to 50%) the project revenue increases proportionately and the time needed to move the effort into the black is proportionately decreased.
- **Connection charges** - The one time connection charge that will be used in the Special Assessment Areas is the fundamental funding mechanism for the proposed plan. The amount ($3,000) is in line with costs incurred in other fiber to home projects and appears to be appropriately calculated.
- **Use charges** – The monthly use charge that will be assessed for each connected premise in the Special Assessment Areas is also a key funding mechanism for the project. This amount is very close to what we see other projects collecting to cover the cost of operations and debt maintenance.
- **Stranded assets** – The five year plan assumes leveraging the sunk costs of stranded outside plant (primarily passive infrastructure like duct, fiber, handholes, labor, etc.). In areas like Centerville, Payson, and Perry, the financial model assumes a lower cost to connect customers because of this existing but unused infrastructure. Our random inspection of various infrastructure in place in three communities leads us to believe that this infrastructure has been installed properly, is in good condition, and will enable rapid deployment.
- **Estimated costs (engineered)** – The five year plan makes heavy use of estimated construction costs developed over the past several years (that is, the engineering for various footprints has been completed but no construction work has been done yet). Based on the information provided by the Utopia staff, we believe these estimated costs are still reasonably accurate. We note that in the case of equipment and materials estimates, the costs have been adjusted to reflect current prices, and that construction labor costs have also been adjusted by 5% to 10% based on local conditions.
- **Project management costs** – The five year plan proposes substantial new construction. The financial model uses a 10% PM (Project Management) adjustment figure to ensure overall project management costs remain within budget. We believe this is appropriate and adequate.
- **Replacement cycle for equipment** – The model uses an eight year replacement cycle for active electronics (e.g. switches, routers, UPS, etc.). The industry rule of thumb for

this type of equipment ranges between seven and nine years, so we agree with this calculation.

- **Percent of usable stranded assets** – The Utopia staff estimates that about 98% of the stranded outside plant (primarily duct and fiber already in place but not in use) is usable. Based on our random inspections in three communities, we agree that the stranded assets are in excellent condition and are ready for use with little or no maintenance or repairs.

- **Take rate** – The model assumes a target take rate of 35%. This is critical to the overall success of the plan. Based on the existing take rate history of the project, we believe this is appropriate. We note that other community-owned fiber projects are reporting similar initial take rates when there is a well-designed and well-funded marketing and public awareness effort accompanying the market expansion.

- **Operations costs** – In the model, a cost of $5/month/subscriber is allocated to account for network operations, service provisioning, and related support. This appears to be adequate, based on a detailed month by month staffing plan provided by Utopia.

- **Maintenance costs** – In the model, a cost of $1.20/month for every home passed is used to represent the expense of maintaining the network. This figure accounts for both connected customers (with a fiber connection to the premise) and premises passed by fiber and/or duct but lacking an access drop cable to the premise (62,000 addresses). This figure has been calculated by dividing the annual actual cost of outside plant maintenance ($881,000) by the 62,000 homes passed. This yields an annual cost of $14.21 per premise passed, or a monthly cost of $1.18. We believe this is adequate at this time.

- **Core network capacity** – The model assumes that the core network has sufficient capacity to support 15,000 to 25,000 additional customers without significant upgrade and improvement costs. The DWDM (Dense Wave Division Multiplexing) equipment that powers the core backbone network is a modern design that allows for affordable, incremental upgrades as demand increases.

- **Network architecture** – The model assumes that the current network architecture (the logical design of the network) is adequate to support the addition of tens of thousands of additional customers. The core and distribution network architecture uses an MPLS (MultiProtocol Label Switching) mesh design that uses VLANs (Virtual Local Area Networks) to provision individual services for each customer. This is a modern design that can easily accommodate the proposed growth.

- **Service providers** – The long term financial sustainability of the network depends on the project's ability to attract and retain service providers. The network currently has fifteen providers offering a wide variety of services. Of particular note is that four IP-TV providers are on the network, as well as VoIP and Internet access providers. The current number of providers is excellent, and we would expect that number to grow over the next several years as more potential customers are connected to the network.

- **Physical network design** – The model assumes that the physical design of the network is adequate to support substantial expansion. We conducted random inspections of outside plant in three communities over a two day period. We found all facilities to be in excellent shape. Cabinets and equipment shelters were extremely clean--we note that this is not always typical in other networks. We found excellent cable management in place and in use in every cabinet and shelter--we note that this is also not always the case in other networks. Equipment racks were well organized. Cables were labeled, and we noted that equipment cost estimates, maps, and engineering documents included these equipment labels. The physical network is well-designed and well-maintained. We believe that the outside plant design and maintenance is excellent and that simply continuing to deploy the kind and type of physical network already in place is adequate.

- **Reliability and redundancy** – As networks grow in size, the reliability of the network can decrease for a variety of reasons, including poor maintenance and inadequate network architecture. We were particularly interested in the overall network design and its ability to continue to operate despite damage to the network (e.g. a fiber cut by a backhoe, which is one of the most common incidents nationwide). Another common incident is a power outage. The current network is very robust. All equipment cabinets and shelters have UPS (Uninterruptible Power Supply) stand-by power, and shelters with core network nodes have diesel generators that can supply power for up to a week before requiring refueling. The MPLS core network architecture is designed to continue providing service despite outages caused by cable cuts, downed utility poles, and other common accidental damage.

Alternative Financial Model Analysis

Testing the UIA Assumptions

We tested the robustness of the UIA model by plugging many of the cost and market take rate figures into an alternative ten year financial pro forma model that Design Nine uses to develop business and financial plans for open access networks.

This model provides a ten year financial study of a network provided on an open access basis to business and commercial customers in a locality under study. The model uses a set of assumptions based many years of study of telecommunications and broadband networks, and key assumptions do affect the financial projections in large and small ways. This is a planning tool, not a budgetary tool. Note that to keep portions of the model like the Cash Flow Statement and Balance Sheet reasonably consistent, the first year of our model includes all of the legacy capex costs and the total amount of debt currently owed by the project.

The project is carrying a heavy debt load. Our alternative model, using the data and assumptions from the UIA, shows that the five year plan will increase revenue to the point where enough cash becomes available to cover all operating expenses and to begin providing additional cash for pay down of debt.

Note that during the first five years (the proposed UIA build out period) we have kept the take rate at a flat 33%, or approximately the 32.7% "blended" take rate used in the UIA model. This keeps our test model conservative with respect to take rates. Beginning in the sixth year, we project modest increases in the take rate from year to year. The number of subscribers varies slightly from the UIA model because alternative model calculates the homes passed and actual subscribers somewhat differently. The numeric differences are minor and do not affect the overall test results.

- Financial Summary – This page provides a concise one page summary of revenue, expenses, income, cash on hand, and cost of debt. Note that in our model, Net Income starts out negative but begins to turn positive in year ten. This is generally consistent with the UIA model, but given the short time frame, we do not believe we have been able to account for all debt payments, which account for the discrepancies. Project revenue grows consistently and stays well ahead of operating expenses, which provides cash for debt payments. Note also that our model accounts for depreciation of assets, which is not accounted for in the UIA model.

- Financial Assumptions – These two pages provide key assumptions and inputs that affect the entire model, especially the amount of funding available for the project (as debt and equity), and when that funding becomes available. This section also provides inputs on the cost of borrowing funds (term and interest rate). All previous debt incurred has been booked in the first year (Legacy). Borrowing over the next five years matches the UIA model.

- SAA Markets -- The model provides estimates for the same three markets used in the UIA model (residential, business/institutional, and multi-dwelling units (MDUs)). The number of premises in a market segment determine market size and have a major influence on both cost of building the network and potential revenue. Note that this model does not incorporate the notion of footprints, and instead treats each segment as a single market space, and calculations like take rate are applied to an entire market, not an individual footprint. The residential market is separated into two parts; one part pays the $3000 connection fee in advance, and the other group pays the connection fee at a rate of $25/month for twenty years. The revenue from the three markets is distributed in the same proportion as the UIA model. If an alternative approach is used that does not require a lien on the property (i.e. a contract), we believe the take rate would be somewhat higher and would therefore reduce the overall risk proportionately.

- Legacy Markets -- The legacy Utopia customers (approximately 7,586 residential, business, and MDU customers, using the figures in the UIA financial model) are treated as a static group of customers with an average ARPU (Average Revenue Per User) of $35/month. We assume that this customer group does not change over the five year period.

- Take Rates -- Take rate refers to the businesses that actually purchase one or more services from a provider. Take rate is always some percentage of the larger number of premises passed (available market, or Locations That Could Take a Service). We

have used the same take rates that the UIA model uses for the SAA users (33% over the first five years, and increasing annually after that by a small portion).

- Capital Expenses -- The cost of building the network. These numbers have been adjusted to try to match internal cost figures as closely as possible. Our alternative model has an overall capital expenditure amount very close to what is projected by the UIA model. Note that the first year of the model (labeled "Legacy") accounts for the the capex expended since the start of the project. The planned $4 million network upgrades in years 7 and 8 are accounted for in the Capex Summary Table (Active Infrastructure).

- Operational Expenses -- The predicted cost of operating the network is based on staffing cost estimates, office expenses like rent, furnishings, phone and Internet costs, travel costs, and related staff costs. Operating expenditures are grouped into two categories. SG&A (Salary, General, and Administrative) expenses are relatively independent of the number of customers on the network. Operating expenses tend to increase in some proportion to the number of connected customers on the network. Other costs that are included are tied to the actual operation of the network. These numbers have been adjusted to try to closely match Utopia actual costs.

Issues and Opportunities

We note the following issues and opportunities that should be evaluated by the UIA and Utopia staff. We regard none of the issues as serious in the short term (e.g. the next 12-18 months).

- **No self service portal** – Residents and businesses that want to request connections or order services (from providers on the network) must either contact the provider directly and/or interact with Utopia staff. Given the large monthly, sustained increase in customers over the next five years, a self-service Web portal that allows Web orders to be placed for at least some common services may help keep staff costs manageable and help reduce the overall cost of transaction processing.

- **No API for orders** – The current service provisioning system has been developed by Utopia staff and currently has no API (Applications Program Interface) for service providers. An API would allow service providers to enter service order requests directly into the Utopia provisioning software without interacting with Utopia staff. This may be important as the five year plan projects a large sustained increase in monthly orders. Utopia engineers indicate that an API is under development.

- **No maintenance of stranded assets** – There is currently no routine maintenance schedule or program for stranded assets. As these assets are put into service, there will likely be some repairs or replacement required. For example, one equipment shelter with air conditioning equipment has not been powered up since it was delivered four years ago. The cooling equipment will likely require maintenance and/or replacement of some parts (e.g. compressor motor). We do not see this as a major issue but a small Repairs/Replacement budget line item is recommended.

- **Staffing** – The current staffing plan appears to be entirely adequate, but in a period of rapid growth, staff costs can balloon quickly to exceed projected budget amounts. Staff costs should be tracked carefully as the expansion takes place. Conversely, care should be taken to ensure that staff ramps up adequately to meet demand. Staffing on fast growing projects can also lag demand, meaning service quality suffers. So there is a balance between too many staff (inadequate cost control) and too little staff (poor customer service).

- **Operations costs** – The $5.00/month currently allocated seems appropriate and adequate, but this should be tracked carefully over time both to ensure that as growth occurs the amount will fund increased staffing needs AND to see if growth leads to efficiency improvements that might allow this amount to be reduced.

- **Maintenance costs** – While the number currently currently allocated ($1.20/month) tracks with the costs provided by Utopia staff, we are concerned that as more customers are added over time, the overall cost of maintenance may rise, primarily reflected in a need for more staff. This cost should be tracked carefully and reviewed at least twice yearly to ensure that adequate funds are available to hire additional maintenance and outside plant staff as the overall size of the network grows.

- **Business connection charge** - The business connection charge is below what we have seen as the average cost of providing the access (drop) from the street to the typical business. However, the total amount of money involved is low relative to the revenue potential, and this cost can vary widely based on the type of building and distance from the street handhole or aerial splice can. We agree with the current approach of keeping the cost of business connections as low as possible. UIA should track actual costs over time and re-assess this fee annually.

- **Service provisioning** – The current service provisioning software has been developed in-house by Utopia staff. Based on what we were able to observe and learn, this is currently working well. However, as the size of the network grows, as the number of providers grows, and as the kind and type of equipment powering the network increases, the overall cost of software development and maintenance could become an issue. UIA should look at the long term costs and risks of continuing to develop and maintain the service provisioning software internally and compare those costs to the cost of purchasing a commercially supported and maintained service provisioning software platform. If the decision is to continue with the internally developed software, an experienced software development consultant/firm should be retained to perform a thorough code review and to provide ongoing assistance to ensure that the in-house software maintains a high level of reliability, and a budget line item should be developed to identify the true cost of in-house development and maintenance.

- **Equipment replacement cycle** – The actual equipment replacement cycle should be tracked closely to compare it with the projected eight year replacement cycle. If anything, this may be conservative and the eight year cycle could be extended to nine or ten years.

- **Service providers** – The network has been able to expand the number of service providers significantly in the past two years. We believe the project should set a year by year target to increase the number of providers by at least 20% per year, with a special focus on non-traditional (e.g. NOT more voice, TV, or Internet) providers. These might include movies on demand (e.g. Netflix); telemedicine and telehealth services, including specialized independent living services for the elderly; locally attached computer and data backup services; locally attached gaming services that offer low latency connections that improve game performance; local videoconferencing services; and other higher margin services. A focus on the growth of these kinds of services will provide additional incentives for new customers to get connected. More importantly, even a few niche services with high margins for providers could provide an important "bump" in take rates, which would reduce the overall financial risk.

- **In-home installation costs** – The cost of upgrading existing in-home wiring has the potential to depress take rates, especially for TV services. Ordinary Internet access can be distributed in a home using an inexpensive wireless router, without the cost of upgrading or adding new structured cabling (Category 5, 5e, 6 Ethernet cabling). However, maintaining high quality HD TV delivery between the Utopia CPE device and the set top TV box typically requires a cabled (Ethernet) connection. Utopia should encourage local structured cable installers and/or the TV providers to have af-

fordable cabling upgrade packages (e.g. the cost of new cabling billed over a 12 or 24 month period, much like cable TV providers charge for extra set top boxes).

- **Working with incumbent providers** – The Utopia network represents an excellent opportunity for the incumbent TV and telephone providers to deliver new and enhanced services to existing customers via the high quality Utopia fiber connections, without the expense of maintaining a network physical plant. It also offers the incumbents the opportunity to reach new customers in areas where they have no fiber plant and/or no copper plant, at very low cost. Utopia does not compete with these incumbent providers; rather, the private sector providers that use the Utopia network compete with the incumbents. Utopia offers the incumbents an excellent opportunity to add customers and enhance profits.

- **ARRA Stimulus Award** – Near the end of our work, we had an opportunity to review a revised version of the model that accounted for the ARRA stimulus award received. The stimulus funds do not change any of the underlying assumptions, and the additional funds (the 70% BTOP funds) reduce the cost of borrowing by an equivalent amount, and the required 30% match will come from the planned borrowing. Overall, the ARRA funds strengthen the model.

Outside Plant and Infrastructure Review

We spent an entire day in the field, making random inspections of stranded and in-use infrastructure in three communities. We found the network to be well-maintained and in good condition.

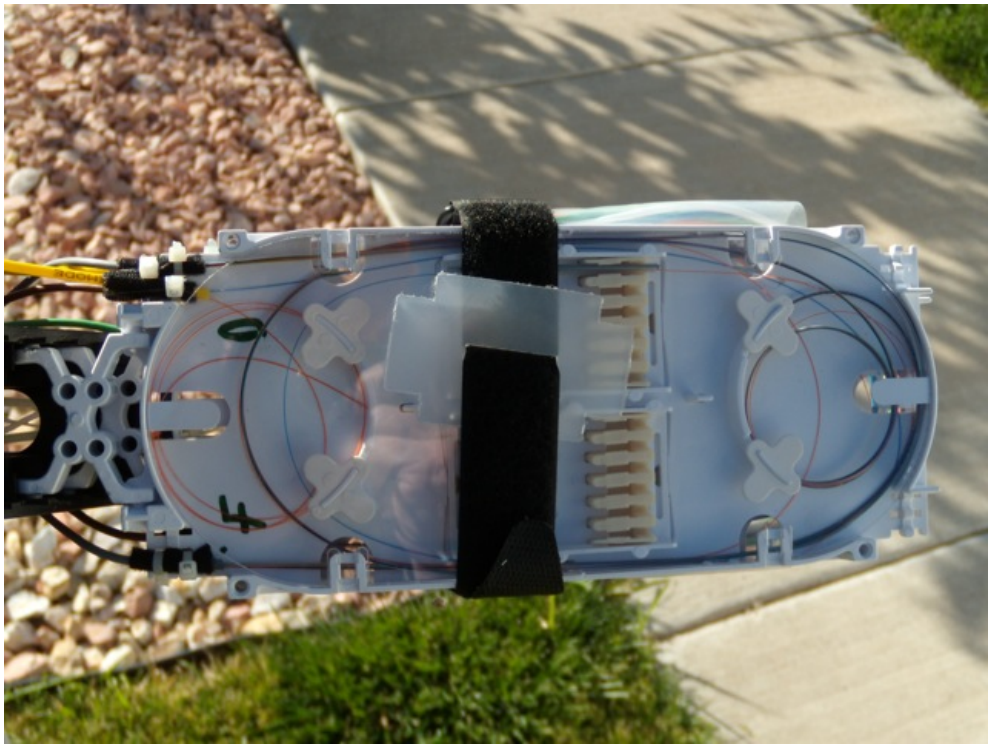
Passive Infrastructure

Aerial fiber cable and splice can.

Riser (on left of pole) brings fiber cable from nearby cabinet to pole for aerial deployment.

Riser is properly attached to pole.

Splice can in hand hole on residential street. Gravel added to aid drainage. Cables are tagged and labeled.

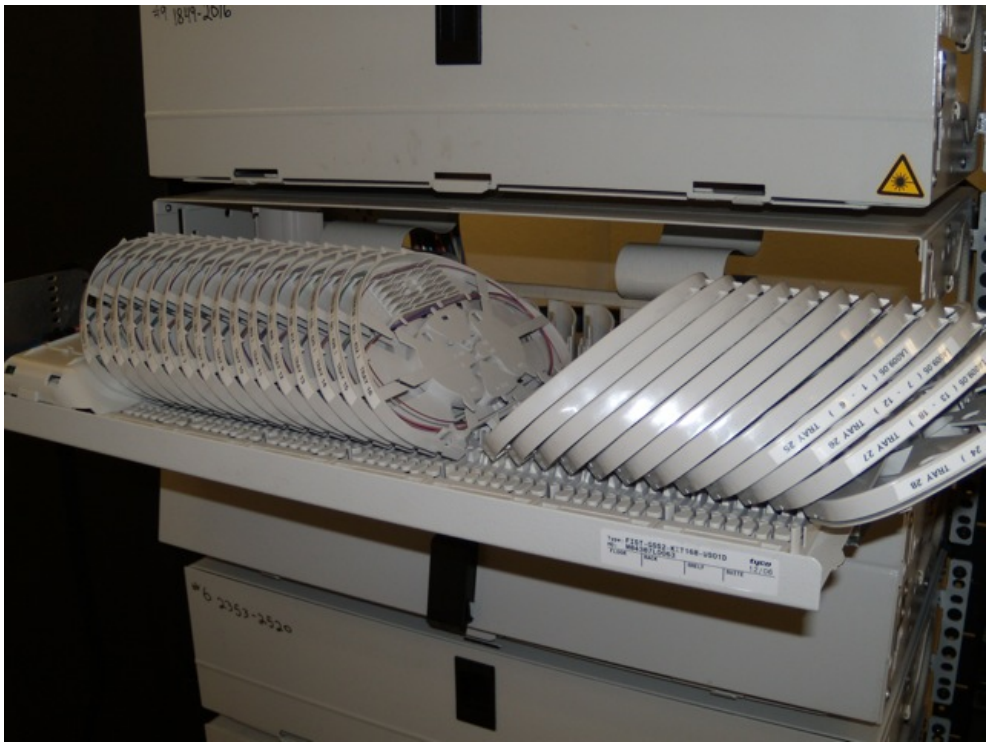


Splice can opened and splice tray folded out. Splice can is dry and clean, and fibers are properly terminated and organized.

Another residential hand hole with multiple fiber cables and a splice can. Drops exiting splice can are labeled.

Interior of hand hole. Fiber cables are tagged and labeled.

Another view of residential hand hole with distribution cables and drop cables.



Cables are terminated in equipment shelters via splice trays. Splice tray organization is excellent.

Equipment huts in the field are properly placed on concrete pads. Interior of huts were neat and clean. Shelters that house core network routers have on-site battery UPS equipment and diesel generators that will provide up to a week of emergency power before refueling is needed.

Another hand hole with duct in place, ready for use. Pull strings are tied off.

Another hand hole with conduit ready for use.

A large hand hole ready for use. This hand hole has ample space conduit to handle a crossing of an adjacent interstate highway and to provide ample cable capacity for a large neighborhood on the other side of the highway. All conduits have pull strings.

Another hand hole with conduit ready for use. Interior is clean and dry, with gravel added to aid drainage. Pull strings are ready for use.

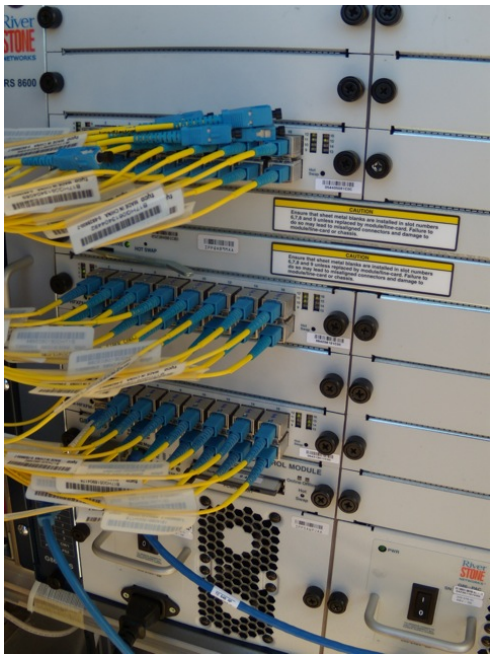
Utopia has an inventory of cabinets ready for deployment. Cabinets in storage are clean and ready for use.

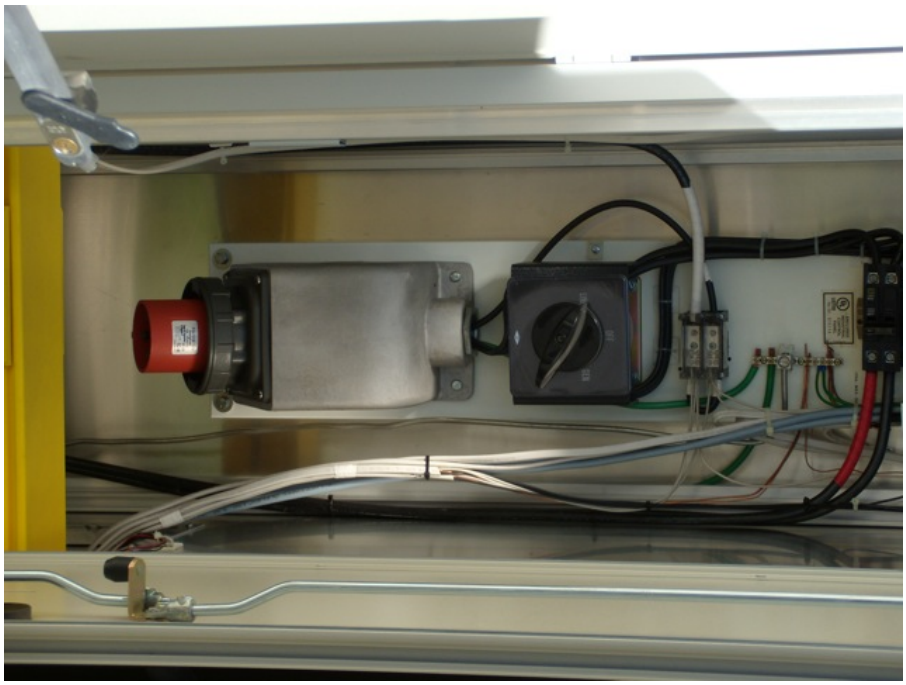
Active Infrastructure

Neighborhood cabinet installed on the edge of a road with a limited right of way. Steel poles protect the cabinet against traffic and poor parking skills.

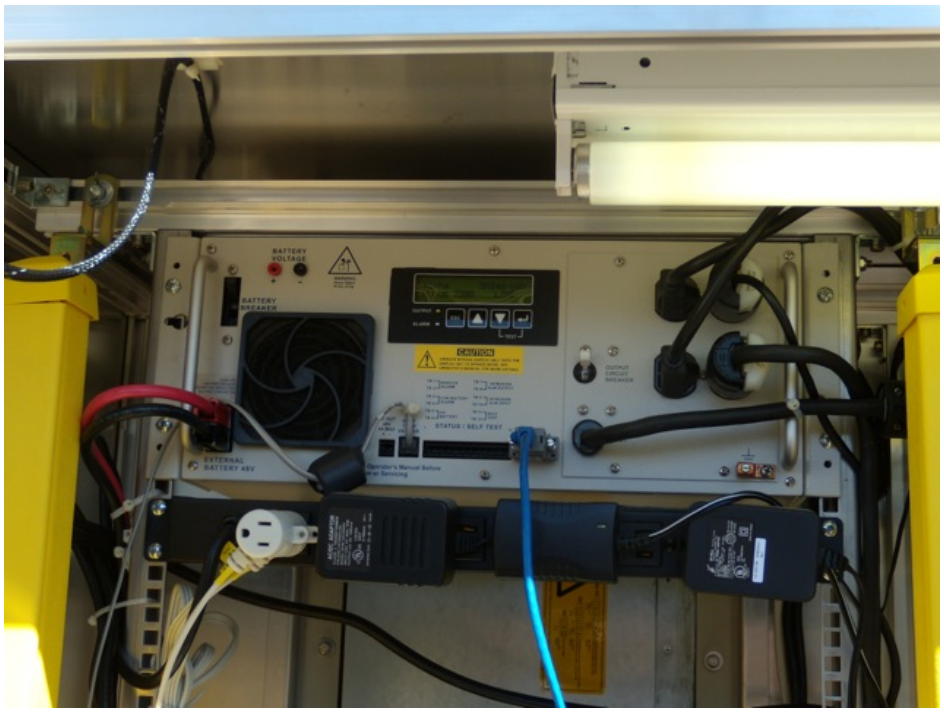
Splice rack side of neighborhood cabinet. Cable management is excellent. All splice trays labeled and well organized.

Active equipment side of neighborhood cabinet. Interior of cabinet is very clean and well organized. Switch below has well-organized patch cables and ample capacity for additional customers.





Cabinet has plug and cut-over switch for emergency generator power.

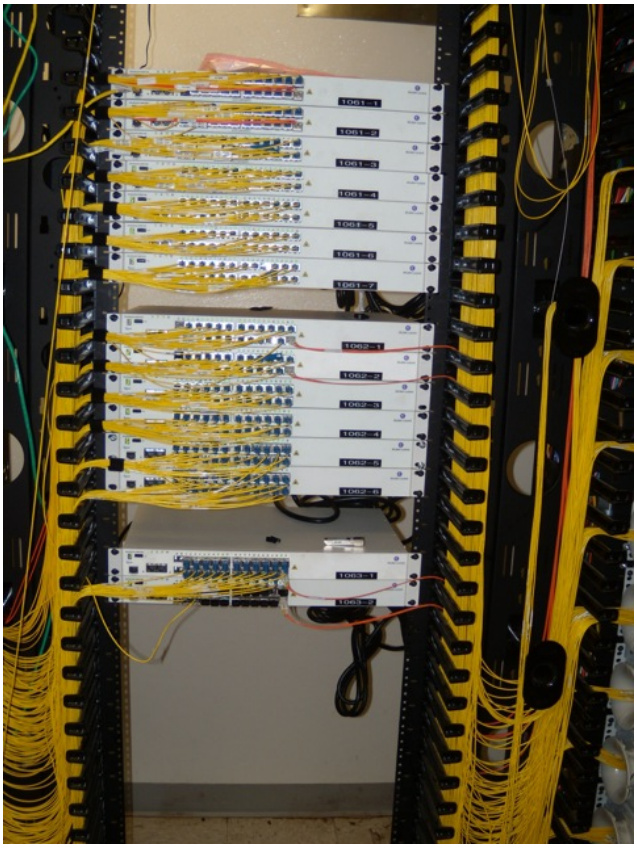


Neighborhood cabinets have UPS (Uninterruptible Power Supply) and batteries that keep the network running for several hours (most electric power outages last less than two hours).

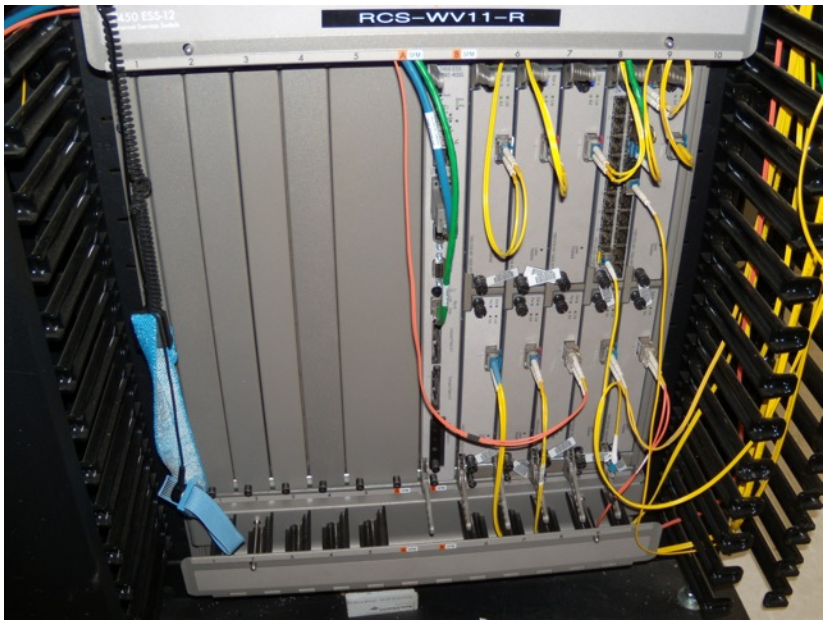
Batteries are neatly organized and in excellent condition (no swelling, cracking, or leaking).

Interior of equipment shelter has overhead cable racks for cable management. All equipment is neatly racked and well organized.

Another view of the interior of an equipment shelter that is neat and clean throughout.



Excellent patch cable management. All switches are neatly labeled for ease of troubleshooting.



Core network router with ample capacity to handle increased customer base.

UPS (Uninterruptible Power Supply) equipment to keep network routers and switches running on battery power.