



Brandon had some follow-up questions to my narrative about data centers. Here are his questions and my response.

**Question # 1:**

When people suggest that ILEAS or Champaign Public Works function as a data center, what might they mean by that? There are 4 different functions they might be referring to: 1) a core node; 2) an Active Ethernet node; 3) a data center for the cities; or 4) a carrier hotel for ISPs/providers.

**Question # 2:**

What are the options for each city or the University operating its own portion of the UC2B network independently if the larger UC2B splits up?

**Question # 3:**

How will UC2B operational staff get access to the core nodes?

**Question # 4:**

How does space rental work at the University facilities in terms of availability, cost, and space priority?

**Combined Answers to all 4 Questions:**

All of the data center purposes you have identified are in the mix of what people have suggested. In order to help understand how the UC2B network design could work for the City of Champaign, I have attached a drawing that I did for Fred last October. (The same design concepts and scenarios described for the City of Champaign also could, and may very well, apply to City of Urbana, Champaign County, Unit 4, District 116, MTD or Champaign Telephone with their different locations and ring combinations substituted as appropriate.)

Champaign will have an IRU for strands of fiber on the 4 Champaign rings as well as on Ring #6 – which goes to METCAD and the County complex on East Washington in Urbana. At the core of the design are two small routers, which would be owned and operated by the City, that would sit in UIUC Nodes 8 and 9 and turn all of Champaign's ring fiber into one big, very-redundant, logical network. When this drawing was made, I specified a separate fiber connection from the data center at City Hall to the City of Champaign's network core, but that could just as easily have been from a data center in the Public Works Building, Champaign Fire Station #6, or even ILEAS.

Once the city's two core routers are in place creating a redundant logical core, Champaign can locate a primary data center and a back-up data center anywhere on any of the 5 rings on which it owns fiber strands. For the purposes of serving the internal and external IT needs of the City, once the two core routers are in place, one location on one ring is just as good for networking as another location on a different ring. The City may have other requirements that are not related to networking that govern where it locates its data centers, but the network will not be a constraint, it will be an enabler.

Last October, the links between Champaign's locations were all shown as 10 Gbps connections. For the next 5 years, that could be overkill. For now, it may be more cost effective for Champaign to make the individual building links 1 Gbps connections and make just the data center connections 10 Gbps. Then in 5 years when the equipment would be up for a refresh, the bandwidth of the links can be increased as needed. That is a financial and functional decision for Champaign to make that does not affect their overall network design – just the electronics they deploy. The City has total control over how its IRU fibers are deployed and used.

Could any of the City's facilities serve as an active Ethernet node for the UC2B FTTH system? Yes, there is nothing in the network design that would inhibit or discourage that. However, there are City-centric operational issues with using a fire station or a library as a network node that might lead the city to prefer not to do that. For example, physical access to the building at all hours may not be practical to provide.

Could any of the City's facilities be used as a carrier hotel for ISP's? Again yes, there is nothing in the network design that would inhibit or discourage such use, but again the City may prefer to not be in that business for its own internal reasons that have nothing to do with the network architecture.

Could any of the City's facilities serve as a central core for the entire UC2B network? No, they lack that capability. To help understand why, I am going to borrow from the 1989 film, the "War of the Roses" – a very dark comedy that some of you may remember.

Imagine that you and your spouse decide to build a house for you and your two children to live in. Assuming that your marriage will last a while, you build a house with a single core set of infrastructures. You probably build one kitchen, one laundry room, one dining room, one living room, one furnace, one garage and so on. That is the most logical and cost effective way to build a house. It is also the most logical and cost effective way to build a network.

However, what if you if built the house with the underlying assumption that you would soon be experiencing a bitter nasty divorce, but really liked the location of the house and both spouses wanted to stay there but never see each other? You would build two kitchens, two laundry rooms, two dining rooms, two living rooms, two furnaces, two garages and so on. That might work better in the event of the two warring spouses trying to share a single structure and not share any infrastructure, but it would certainly be far more expensive and far less logical to build.

Building the UC2B community network so that it is optimized for when the UC2B Consortium falls apart, and Champaign and Urbana each go their separate ways is about as illogical and cost-prohibitive as building a divided “Roses” home from scratch.

Thirty years ago when Urbana, Champaign and the University partnered to form METCAD, I strongly doubt that there was any discussion of how to run two or three separate 911 call facilities after the partnership disintegrated. It made more sense for METCAD to operate as a shared resource for the community than for any of the partners to go it alone.

In that exact same fashion, it makes for Urbana and Champaign to band together and run a Big Broadband system than for either of them to go it alone. Each municipality might take a different approach to expanding the FTTP service areas in their respective city and that is fine, but partnering with each other to run the community network core is the most fiscally responsible and practical.

UC2B was proposed, approved by both City Councils and funded by NTIA and DCEO as a joint effort of the University and the two cities. The network design was optimized to serve that joint effort. There is no evidence to suggest that either city would be better off going it alone, and there is certainly no Federal or State funding available to promote or enable that.

If there were to be a nasty UC2B divorce at some time in the future, there are ways that each city could go it alone, but I want no part of encouraging or enabling such behavior. For better or worse, the University’s facilities are the core of the UC2B network. That is what was proposed. That is what was approved by both cities. That is what was funded.

To take the maximum advantage of the UC2B network, each city will need to locate a small router and possibly a firewall in the UC2B areas of both Nodes 8 and 9. It is anticipated that one quarter of a standard 7-foot telecommunications rack will be more than enough rack space in each node for the small router and firewall.

Those UC2B spaces in each node are designed for a minimal amount of core network equipment from UC2B and from each IRU holder or dark fiber lessee. They are not designed to be locations for the cities’ servers, or other IT equipment. There is no need to locate anything other than core network equipment there.

The University does have some general co-location space in Node 2 that is used for network equipment, servers, and other IT equipment by private firms that provide services to the University. That space was made available on a first-come first-serve basis and it is currently full. However, there are also private facilities in town that offer similar co-location services. Once those private facilities are connected to UC2B fiber, there will be reduced need and demand for the University's general co-location space.

UC2B staff, and the staff of the cities and other IRU holders as well as dark fiber lessees will have 24x7 physical access to their equipment in the two University nodes. Under normal circumstances they will have no need for physical access to that equipment, but in the event that something breaks or needs to be replaced or rebooted, that will be possible at all hours of the day, every day of the year. Each organization that desires to locate core network equipment in the University nodes will need to enter into a standard lease agreement with the University for that rack space, as well as pay for the power it uses and for the cooling of its equipment. The lease rate for a quarter rack is \$75 a month.

Once the UC2B Active Ethernet neighborhood cabinets are operational, UC2B staff will have little need to physically access the UC2B equipment at the network core. Short of a new ISP or provider being connected, or a new Active Ethernet node being turned up, there is not much that needs to be done physically in the UIUC Nodes. Almost all of the physical work involved in activating a new UC2B FTTP customer will be in the appropriate neighborhood cabinet and at the customer's site.

We have reserved enough space in both Node 8 and Node 9 for the UC2B core network equipment to grow to where it could support Active Ethernet nodes across the entire community. We will have 12 neighborhood cabinets for the grants-funded pilot. To cover the entire community would take some 120 total aggregation points. That would mean that we would need another 108 Ethernet ports in each node to serve the entire community with Active Ethernet FTTP. Those 108 Ethernet ports would not take much space.

There is currently one quarter of a rack reserved for each of the planned IRU holders and another two entire racks reserved for ISP's or other organization that may desire to lease fiber. We will run out of potential fiber customers before we run out of rack space for their core network equipment.

Any provider that just wants to utilize UC2B electronics to deliver its services has no need to locate any equipment in the UIUC nodes. Its data will be brought into the nodes on ringed UC2B fiber from wherever they connect to a ring. UC2B merely needs to have available core router ports in each node for that provider to plug into.

# UC2B - City of Champaign Fiber Locations and Ring Design

