Fiber Infrastructure & WUNET 2.0 Improvement

I. Background

The University’s existing fiber optic network consists is an extensive and complex combination of conduits, cabling, and connection/electrical components. The overall design of this internal “backbone” fiber environment includes a variety of advanced and forward-thinking features, e.g., fiber to most buildings, some spare capacity (fibers), standardized components, generator backup for core hubs (distribution points), and cooperative planning and implementation efforts within Washburn. Additionally, the telephone system, cable TV, KTWU, and the fire alarm system (supported in a dual fiber ring) share some conduit, routing paths, and fiber cable. However, there are developing concerns about network performance, a few single points of failure, multi-medium transmission requirements, and an increase in wireless hubs. The following two infrastructure situations create points-of-failure due to electrical and mechanical fiber-to-fiber connections which jeopardize reliability and even network performance.

- Fiber for west campus buildings terminate at Benton and are then passed through on the University’s core 2G network (2 gigabit duplex link with two fibers) to Morgan Hall and then to Bennett (the University fiber core facilities). There are 6 single-mode fibers to Benton from all west campus buildings.
- Fiber “star” hubs or trunk concentration points are located in Benton, Henderson, Morgan, Heating Plant, KTWU, and Bennett.

II. Ideas/Planning/Premises

The University’s growing expectations for a reliable and high-performing network backbone continue to increase; therefore, the following fiber and related infrastructure improvements should be considered as a major step toward creating the next generation network for Washburn – WUNET 2.0:

- Migrate to 2G (dual fiber) network configuration to double campus data performance from each building to the backbone and core equipment.
- Reduce the number of “star” or hub locations and create more direct fiber paths.
- Route all fiber (core) to standard building locations with two entry points (a self-healing strategy supported by advanced data network equipment).
- Add conduit or paths between Morgan and Bennett. Future uses include support for “shadow” notification of any 911 calls to the Shawnee County Emergency center that could also be mirrored to campus police.
- Consider upgrades to the Village remote fiber-based telephone system modules (4) that are on fiber links (2 fibers each) that have caused some outages.
- Use outside contractors for fiber termination and fusions of core trunk lines; ISS staff will install and terminate short fiber runs.
- Consider the recommendations of cable TV evaluation project being conducted now.
• Ensure that fiber planning supports fire alarms and energy management systems (and servers in Bennett).

• Coordinate all proposed plans, projects, and related work with Facilities Services.

III. Priority Project Candidates

The following short and long-term projects identified by ISS as important for meeting network performance, reliability, risk-reduction, and multi-medium transmission requirements.

**Immediate:** Begin project planning to define implementation solutions for:

1. **Benton:** Home-run/fuse all west campus building/trunk fiber cables (each two-fiber pairs) so they route directly to Morgan and/or Bennett. There will be no fiber-related electronics used for “pass-through” in Benton.

2. **KanREN:** Ensure a coordinated plan for fiber-related data network installation/equipment; get Facilities Services’ approval of the recommended physical routing of KanREN conduits (to be installed by Cox).

3. **Garvey:** The initial three single-mode fiber pairs (six fibers) are all allocated (data, KTWU, and a backup pair) and a direct path to Bennett cannot be established without first installing another single-mode fiber pair (via tunnel and contractor assistance from Garvey to Morgan, where it will be fused and passed through to Bennett.

4. **Baseball/softball fields:** Provide wireless coverage. Evaluate (feasibility/cost comparison) of fiber access versus a wireless bridge solution. However, the preferred solution is a wireless bridge, possibly from the tower on Henderson.

5. **Morgan/Bennett:** Remove the fiber cable from old/original conduit and move the traffic to a fiber pair on the 288-fiber trunk; terminate fiber strands for future use.

6. **Mabee Library:** Upgrade fiber link and connectors from the copper distribution closet (custodial space) to their server room. Remove the old fiber from the building head-end to this closet.

7. **Law School:** Develop options for relocating and/or rewiring telecomm/data facilities (switch, server) and consider a redundant campus fiber path.

8. **Washburn Tech:** Upgrade fiber linkage through USD 501. Develop a fiber expansion plan as part of planned fire alarm system upgrade (FY11).

9. **KTWU:** Assist, as needed, with internal Ethernet cable upgrade project (FY11).
**Future**: Defer project planning on the following because they may have to become Facilities Services projects and/or new funding.

10. **Henderson**: Convert the 1st floor telecom corridor into a telecomm closet by installing a wall and door. There will be no changes to Facilities Services’ equipment, e.g., electrical, light dimmer relay.

11. **Henderson**: Address high thermal problems with server room equipment.

12. **International House**: Install a conduit path to Memorial Union (telecom room).

13. **Mabee Library**: Do a total building rewire to upgrade copper cable from CAT-5 to 6.

**VI. Implementation**

It is proposed that ISS undertake the following actions as soon as possible:

1. Develop and define a plan (options, recommendations, preliminary schedule/timeline, and costs) for each of the *Immediate* fiber improvement projects. The “Benton” project to fuse fiber optic cables to form direct connections between west campus building and Bennett Hall will be implemented in two phases: 1) high volume buildings – Henderson, Mabee, LLC, and Law; and 2) other buildings – BTC, Benton, Memorial Union, International House, and West Hall.

Planning for the *Future* fiber/wiring projects will not be addressed at this time. Although planning responsibilities have been designated, input from each other, ISS staff and Facilities Services is expected.

2. Distribute each project plan/proposal to the ISS project leads for review.

3. Determine existing funding sources and amounts (Bob Stoller and Elliott Haugen).

4. Get approval from the CIO and Facilities Services (there is no trenching or construction-related work in any of the proposed “*Immediate*” fiber projects.)

5. Order materials (June, 2010) and arrange for an outside contractor to provide cable routing (in tunnels) and fiber termination work (Phase 1 in July 2010).

6. Reengineer the Washburn-to-USD501-WashburnTech fiber link to establish a direct fiber link from the core Washburn network to Washburn Institute of Technology. This link previously ran through USD 501, but now there will be no USD 501 network devices that operate above layer 1 (physical infrastructure) on this link. Additionally, Washburn and USD 501 are exploring ways to provide co-located backup resources, e.g., mirrored web sites for emergency activation or USD 501 can have network devices on the Washburn campus without having to traverse Washburn's network gear or install a new fiber.

**VII. Status**

ISS completed the two phases of the “*Immediate*” priorities by Spring 2011.