Pasco School District # 1

Network Maintenance Plan

2012-2016

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Current State of Network

Equipment

The district’s network is in various stages of development, with newer buildings generally having better performing equipment. The last major network upgrade occurred in 2004, when the district switched from Nortel to Cisco equipment. The large upgrade was facilitated with ERate funds. In addition to the large upgrade in 2004, a smaller scale upgrade occurred in 2007, when the district purchased equipment for three buildings—Ochoa, Stevens and Chess. As new buildings have been built, new equipment has been installed, the addition of Chiawana in 2008 being the most recent. Information Systems estimates that the average age of its network equipment is 5 to 7 years old.

Bandwidth

The district recently upgraded its internal Wide Area Network bandwidth to 10GB to the Booth and Chiawana buildings and 1GB to all other buildings. This upgrade increased the speed of communication throughout the district and put the district in good standing for the near future.

The district contracts with the Office of Superintendent of Public Instruction (OSPI) K20 network for its external Internet connection. The district currently purchases 150 Mbps of bandwidth. The district’s external bandwidth usage has increased exponentially the past four years. Chart 1 represents the districts usage from 2009 to 2012.
Near Term Obstacles

The district’s obstacles in the next five years largely reflect the problems of other large organizations—increased traffic and growth. However, the district is unique in that its high rate of growth is presenting Information Systems with these problems at an accelerated pace. Below, Information Systems has defined three areas of concern.

*Increasing traffic on internal network*

As more work and classroom activities are moved online and the district’s virtual desktop initiative progresses, the amount of network traffic is expected to increase exponentially. In the Summer of 2011, the district upgraded its internal bandwidth to 10GB to the Booth and Chiawana buildings and 1GB to the remainder of the buildings. With the improvement in network speeds, the older network equipment will become the bottleneck.

*Increasing use of wireless network*

With the increased reliance on Computer-On-Wheels and the advent of tablet devices and smartphones, the district has seen an increase in the amount of wireless devices accessing its network. As the concentration of wireless devices increases, the district’s wireless access points become bogged down, creating a poor and unreliable user experience.

*Increasing use of Internet*

Just recently, the district began hitting its contracted external bandwidth limit (150Mbps) for short periods throughout the day. When the bandwidth capacity is met, users will notice slow web page load times or broken connections. Again, as more classroom and work activities are moved online, poor internet speeds will start to hinder learning and productivity.

Goals

The goal of the district’s network is to consistently offer fast and reliable network and Internet access to its staff and students. Information Systems believes that a school district’s network should provide easy access and exchange of information, resulting in enhanced student learning experiences and increased employee work efficiencies. Listed below are specific actions needed to address the above problems and support the overall network goal.

1. **Accommodate greater use of wireless devices by moving to a higher density wireless solution**

   Information Systems will conduct site surveys at each of the buildings to determine the quantity and placement of wireless access points in order to meet future wireless network needs. In addition to a higher saturation of access points, upgrading to 802.11n protocol will allow for an increased data throughput rate.
2. **Reduce network bottlenecks by standardizing to 1GB switches and 10GB backbones in buildings**
   The majority of network switches have a capacity of 100 MB. As network traffic increases, the switches will reach capacity, creating a bottleneck in the form of network lag to the user. Upgrading to 1 GB switches increases switch capacity ten times and will prepare our network for the increased traffic.

3. **Prepare for greater Internet traffic by increasing the District’s external connection to 300Mbps**
   Currently we contract with OSPI’s K20 network for 150Mbps of external Internet bandwidth. The district will need to increase its external bandwidth to 200Mbps by the end of 2012, and likely perform another increase to 300Mbps by 2015.

4. **Monitor inter-building networking speeds and, when necessary, increase Wide Area Network backbone to 10GB district-wide**
   The district recently increased its WAN backbone; the increase in bandwidth prepares us for the next 5 years. However, as network trends continue, the district will need to invest in additional bandwidth. Information Systems will monitor network traffic and notify district leadership when an upgrade is necessary. Additional bandwidth would bring 40GB to Chiawana and Booth buildings and 10GB to all other buildings.

**Funding Strategy**

Pasco’s demographics give it a unique opportunity to take advantage of the Federal Communication Commission’s ERate program. ERate offers reimbursement based on school district’s free and reduced meal rates; the greater the percentage of students qualifying for the free and reduced meal program, the larger the reimbursement rate. The discount rate applies toward network equipment purchases. Each school is individually assigned a discount rate, while district-wide buildings (Booth, Building 210) are assigned a shared-services rate. See Appendix A for each building’s discount rate.

ERate allows districts to apply for funding two out of every five years. Equipment purchased with ERate funds can be moved to other ERate buildings after three years. In order to minimize cost to the district, Information Systems will use a strategy in which network equipment is purchased for buildings with the highest ERate discount rate and ‘flowed’ to the buildings with lower discount rates. This strategy effectively reduces the district’s realized discount rate.

**Budgeting Needs**

Information Systems recommends upgrading the network infrastructure in two phases. In order to maximize ERate funds, the district will need to participate in the most recent ERate funding year (2012)
and make the phase two purchase three years later (2015). The graphic in Appendix B displays the building purchase plan.

Costs

Table 1 includes a breakdown of costs associated with each purchasing phase. The table outlines the non-discounted cost, which is what the district would be responsible for if ERate funds were not available, and the actual cost. The district will be receiving approximately $2.7 million in equipment for just over $360,000, a realized discount of 87%. The district will need to incorporate Phase I costs into its 2012-2013 budget and Phase II costs into its 2015-2016 budget.

<table>
<thead>
<tr>
<th>Equipment Needed</th>
<th>Unit Price</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10gig fiber install</td>
<td>$10,000</td>
<td>14</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td>10gig expansion modules</td>
<td>$1,450</td>
<td>55</td>
<td>36</td>
<td>91</td>
</tr>
<tr>
<td>3750X-24PF-S switch</td>
<td>$4,200</td>
<td>26</td>
<td>14</td>
<td>40</td>
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<tr>
<td>3750X-24T-S switch</td>
<td>$3,800</td>
<td>27</td>
<td>37</td>
<td>64</td>
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<tr>
<td>3750X-48PF-S switch</td>
<td>$8,200</td>
<td>29</td>
<td>27</td>
<td>56</td>
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<tr>
<td>3750X-48T-S switch</td>
<td>$6,700</td>
<td>58</td>
<td>52</td>
<td>110</td>
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<tr>
<td>AIR-LAP1142N-A-K9 (802.11n)</td>
<td>$600</td>
<td>131</td>
<td>145</td>
<td>276</td>
</tr>
<tr>
<td>APC 1500VA</td>
<td>$700</td>
<td>30</td>
<td>23</td>
<td>53</td>
</tr>
<tr>
<td>Power supply 350w</td>
<td>$285</td>
<td>65</td>
<td>56</td>
<td>121</td>
</tr>
<tr>
<td>Power supply 715w</td>
<td>$600</td>
<td>55</td>
<td>41</td>
<td>96</td>
</tr>
<tr>
<td>Replace Rack in MDC</td>
<td>$2,000</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>SFP-10G-LRM</td>
<td>$750</td>
<td>71</td>
<td>57</td>
<td>128</td>
</tr>
<tr>
<td>SYH6H6RMT-P1</td>
<td>$6,500</td>
<td>11</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td><strong>Non-Discounted Cost (w/ tax)</strong></td>
<td>$1,451,030</td>
<td>$1,298,311</td>
<td>$2,749,342</td>
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<tr>
<td><strong>Actual Cost (w/ tax)</strong></td>
<td>$174,337</td>
<td>$188,354</td>
<td>$362,691</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Network Equipment Maintenance Costs

In addition to the hardware purchases above, the district can expect an increase in its external Internet usage rates. As previously seen in Chart 1, the district’s Internet usage is growing exponentially. Based on growth figures, Information Systems estimates that the district will need to increase the external Internet connection budget at a rate of 27% per year.

Potential Risks
The greatest risk of the above maintenance plan is relying on ERate funds. The ERate program funds network upgrades as a second priority. However, network equipment for the 90% discount buildings is typically fully funded and in recent years, network maintenance for the 80% buildings has been funded.

If the 80% buildings are not funded during 2012, Information Systems will continue to apply for funding in subsequent years. If the 80% buildings are not funded by 2015, then Information Systems will apply for funding for all 90% buildings during Phase II and flow as much equipment as possible to the lower discount buildings. If this occurs, the district will be short equipment and will need to purchase equipment at full market price.
### Appendix A – Building ERate Discount Rates

<table>
<thead>
<tr>
<th>Building</th>
<th>Discount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chess</td>
<td>90%</td>
</tr>
<tr>
<td>Emerson</td>
<td>90%</td>
</tr>
<tr>
<td>Frost</td>
<td>90%</td>
</tr>
<tr>
<td>Gray</td>
<td>90%</td>
</tr>
<tr>
<td>Longfellow</td>
<td>90%</td>
</tr>
<tr>
<td>Ochoa</td>
<td>90%</td>
</tr>
<tr>
<td>Robinson</td>
<td>90%</td>
</tr>
<tr>
<td>Stevens</td>
<td>90%</td>
</tr>
<tr>
<td>Whittier</td>
<td>90%</td>
</tr>
<tr>
<td>Booth</td>
<td>78%</td>
</tr>
<tr>
<td>Building 210</td>
<td>78%</td>
</tr>
<tr>
<td>Chiawana</td>
<td>80%</td>
</tr>
<tr>
<td>New Horizons</td>
<td>80%</td>
</tr>
<tr>
<td>Pasco High</td>
<td>80%</td>
</tr>
<tr>
<td>Twain</td>
<td>80%</td>
</tr>
<tr>
<td>Angelou</td>
<td>60%</td>
</tr>
<tr>
<td>Markham</td>
<td>60%</td>
</tr>
<tr>
<td>McLoughlin</td>
<td>60%</td>
</tr>
<tr>
<td>Livingston</td>
<td>50%</td>
</tr>
<tr>
<td>McGee</td>
<td>50%</td>
</tr>
</tbody>
</table>
Appendix B – Building Purchase Plan

Phase I
- Gray 90%
- Emerson 90%
- Robinson 90%
- Ochoa 90%
- PHS 90%

Flow Phase I Equipment
- Markham 60%
- Angelou 60%
- McLoughlin 60%
- Livingston 50%
- McGee 50%

Phase II
- Longfellow 90%
- Frost 90%
- Stevens 90%
- Chess 90%
- Whittier 90%
- NHHS 80%
- Twain 80%
- Booth NIF
- Bldg 210 NIF
Appendix C – Timeline of Events

2012
   January – Release form 470 (RFP) for bids on Phase I. Select vendor and apply for ERate funding for funding year 2012 (July 1, 2012-June 30, 2013).
   
   February – Begin wireless site surveys in preparation for Phase I equipment purchase.
   
   March – Increase external bandwidth to 200Mbps
   
   July-December- Receive confirmation of ERate funding. ERate funding commitments are released in waves based on priority of services and discount levels.

2013
   April – Purchase Phase I equipment
   
   June – Begin installing Phase I equipment. Installation complete by September.

2015
   January – Release form 470 (RFP) for bids on Phase II. Select vendor and apply for ERate funding for funding year 2015 (July 1, 2015-June 30, 2016).
   
   March – Increase external bandwidth to 300Mbps
   
   July-December- Receive confirmation of ERate funding. ERate funding commitments are released in waves based on priority of services and discount levels.

2016
   April – Purchase Phase II equipment
   
   June – Begin installing Phase II equipment and shift existing equipment to low discount level buildings. Installation complete by September.