

Blackout

A study of the impacts of recent fiber-optic communications outages in Humboldt County, the potential impacts of future outages and the need for redundant fiber-optic connections.

Prepared by:

Redwood Coast Rural Action
Redwood Technology Consortium
Redwood Region Economic Development Commission

April 2007

Principal Author

Jim Hight

Overview

As reported by news media, the Dec. 26-27, 2006 (Tuesday-Wednesday) and Jan. 20, 2007 (Saturday) fiber-optic communication outages caused Humboldt County businesses, agencies and residents to lose most or all of their Internet, long-distance and wireless telecom services. Retail transactions slowed or stopped as credit and debit cards could not be processed, and businesses and agencies experienced varying levels of other delays and interruptions.

To investigate more fully the impacts of these events, the potential impacts of future outages and the need for redundant fiber connections, Redwood Coast Rural Action (RCRA) sponsored this study of the experiences and perspectives of 12 key private and public sector organizations.

Managers at these firms and agencies reported experiencing a wide range of impacts during the December and January events, from a complete disabling of core functions to time-consuming and costly delays. But more significantly, many of the informants interviewed believe that Humboldt County will suffer grave economic and social consequences going forward if the regional telecom infrastructure is not soon upgraded to include redundant fiber-optic connections to regional and global telecom networks.

These potential consequences are in two categories:

1) Future outages, especially those occurring at more critical times, could have much more severe impacts than the December 2006 and January 2007 events.

The recent outages occurred on days when schools and universities were not in session, hospitals had few elective surgeries scheduled and many office-based businesses were closed or had relatively light activity. Future outages occurring at more critical times would have much more severe impacts. If a fiber outage were to coincide with a natural disaster, the resulting impacts on rescue and relief efforts would be nothing short of catastrophic.

2) Without a redundant fiber connection, Humboldt County's economy will suffer.

Informants predict that companies with customers outside this region — particularly information technology and financial service companies — will constrain or scale back their local operations or relocate from Humboldt County entirely if the region does not soon benefit from more secure telecom infrastructure. According to the chief operating officer of one growing IT company, absent a redundant fiber connection, remaining in Humboldt County would soon destroy his firm's reputation with its customer base. A large financial services employer is holding up the creation of 40 professional positions pending the establishment of redundant fiber connections.

Specific Impacts: Private Sector

Bayshore Mall

Retailers at Eureka's Bayshore Mall, which collectively employ approximately 1,200 people, experienced a loss of capacity to process credit, debit and gift cards for purchases during both outages, according to Sue Swanson, General Manager of the mall. Additionally, because of a lack of connectivity to corporate sites, some retailers experienced problems with pricing.

The shutdown of connectivity was more severe on Dec. 26, a day that was busy with day-after-Christmas shoppers and people attempting to use gift cards. Because of the slower pace of shopping on the morning of Jan. 20 — typical for a Saturday morning — transaction processing was slow or intermittent at first, becoming progressively slower and less reliable as the day progressed.

Because most mall retailers are all managed by corporations outside the area, few retailers have dial-up or other backup systems, nor onsite IT staff to handle switching to backup systems, according to Swanson.

The manager of one retail store at the mall reported that her staff accepted credit cards for purchases with manual imprints, which slowed down transaction time. A bigger impact was the loss of pricing and other point-of-sale information, which couldn't be accessed from corporate sources. Additionally, the store lost all voice telephone capability. With no information from AT&T about the fiber outage, the manager and her staff assumed their store computer system had crashed until learning about the community-wide impacts of the outage.

Swanson reported that many retailers contacted her and other mall staff seeking information and assistance, but they had no information and could not contact AT&T's out-of-area phone numbers. She also reported that after the outages, corporate IT managers had difficulty understanding how the telecom capacity for an entire region could be so crippled; even for corporations with hundreds of locations nationally, such events are unprecedented.

Edge Wireless

Wireless telecom service provider Edge Wireless lost 80% of its capacity during the December and January fiber outages, according to Eric Anderson, Director of Engineering. The resulting loss of call activity by customers was costly, although an estimate is not available. But the larger issue was disappointing customers who rely upon their cell phones. "Even though Edge didn't cause the outage, our customers expect a reliable network and we let our customers down," said Anderson. "Their cell phones quit working when they needed them."

Edge has since established a redundant microwave backup system by interweaving some of its cell phone sites and trunks to an existing microwave backbone from Eureka to Ukiah. Anderson says in future fiber outages, the Edge Wireless signals will shift to the microwave path, resulting in a 30% drop in calling capacity. During such events, customers will occasionally hear a fast-busy signal but will still be able to use their phones in most cases. Anderson said that costs of building the redundant system were high.

But Anderson notes that most businesses cannot afford redundant telecom systems, and he predicts that construction of a second fiber line to Humboldt County will have significant economic benefits for the region.

Evergreen Pulp

During both fiber outages, Evergreen Pulp experienced a total loss of communications with its headquarters in Hong Kong, its sister facility in The Netherlands, its customers and other business contacts. With all of its customers in Asia or Europe, Evergreen uses the Internet almost exclusively to communicate because of differences in time zones. The loss of contact with Hong Kong was significant because that office makes daily financial arrangements for Evergreen's cash flow and transmits weekly order information that guides Evergreen in preparing pulp shipments.

Sales and Technical Services Manager Rod Ledbetter said that other than several hours of squandered employee time, the company did not suffer financial losses during the outages. But he considers the events to be "wake-up calls" that have alerted Evergreen to the potential impacts of future outages. Particularly, a longer outage would materially damage the business, which has operated here since 1965 and currently employees approximately 200 people. In addition to financial and operational impacts, an outage would also interfere with the company's ability to transmit its required daily reports to environmental agencies.

Humboldt Merchant Services

A provider of credit card processing services, Humboldt Merchant Services requires consistent and secure access to the Internet. The December and January outages caused acute anxiety for the company's 80 local employees as they scrambled to understand and troubleshoot the total loss of Internet connectivity and long-distance phone service. The December outage alone cost the company approximately \$20,000 in lost production and in the direct expenses of flying staff to another location as a stop-gap measure.

More serious consequences probably lie ahead if redundant fiber is not established, according to President Ken Musante. The December and January outages negatively impacted Humboldt Merchant Services's reputation with its customers. "We are an entity that handles their funds, and for us not to have Internet access even for a short time is very serious," said Musante. "Merchant customers do not understand when you tell them that Internet to the entire county is down. In the world we work in, your Internet access is like your phone dial tone."

Musante explains that his company's corporate parent, First National Bank Holding Company of Scottsdale, AZ, is in a growth mode, having acquired two additional merchant customer portfolios since it acquired Humboldt Merchant Services in 2003. The company may, however slow investments if a secondary connection is not obtained. "Our parent organization appreciates the knowledge base that we have here, but two outages like that are surely going to give them cause to consider their future investments here more carefully."

Security National Master Holding Co.

A real estate finance and development company headquartered in Eureka, Security National depends heavily on telecommunications to conduct its business, which it operates from offices in six U.S. states and Portugal. During the December and January fiber outages, the Eureka headquarters lost all Internet access — including the company's private network backbone — and all voice communications outside the local community. The result was a sharp loss of productivity for Security National's approximately 160 local

employees and its 440 employees in other locations, as well as critical gaps in communication with the company's borrowers, tenants, subcontractors and vendors worldwide.

This short-term loss, however, was relatively minor compared to the potential impacts that Security National will likely experience going forward unless a redundant fiber connection is established to Humboldt County. According to Network Engineer Mark Hodgson, the company has delayed immediate plans to add 40 employees to its Eureka headquarters due to the insecurity of local telecom infrastructure. Future plans could see the company adding as many as 60 more additional jobs locally, but only with more secure telecom infrastructure.

Not only does Security National require reliable 24/7 telecom services to operate effectively, the company may face issues with the Federal Trade Commission over the availability of its data with the fragile communications network infrastructure in Humboldt County.

The 2002 Gramm-Leach-Bliley Act (GLBA) required financial institutions to improve the security of sensitive financial and personal information. According to Justin Balog, Net Operations Manager, Security National has been upgrading the security and efficiency of its IT networks accordingly, but the December and January outages raised questions with Security National's IT department, in conjunction with internal and external IT auditors, about the availability of information. Being at risk for its GLBA obligations may also affect Security National's credit ratings, leading to potential increases in borrowing costs in the millions of dollars. "If we cannot show an efficient way to fail-over our operations so the business impact is minimal, that would have an impact on our ratings," said Balog."

Security National has investigated satellite backup systems but determined that such systems would impose unacceptable delays for voice-over IP and Internet services. "For example, if you're running a web-based application and the normal response time is 15 to 20 seconds per transaction, using the satellite link that goes up to two-and-a-half or three minutes per transaction," said Hodgson.

StreamGuys

StreamGuys, a fast-growing provider of streaming audio and video services, had a satellite backup system in place prior to the December and January outages. After a hectic 20 to 30 minutes of downtime, the company was able to relaunch its systems with connectivity through the satellite. Chief Operating Officer Jonathan Speaker explained that the satellite system costs approximately \$200 per month and provides connection speeds at less than DSL or cable modem rates. "It allows us to function as a stopgap measure for as long as a couple of days," said Speaker. "But we couldn't function at full steam."

Despite having this backup system in place, Speaker reported that the lack of redundant fiber connections in Humboldt County makes it increasingly difficult for his company to operate here. "It's almost like we are a company in a third world country trying to serve America," he said. "It detracts from our brand image."

Speaker said that he and his 13 staff want to continue living and working in Humboldt County. But if this six-year-old business continues growing at its present rate — and the county remains connected to the global telecom system by only one fiber line — relocating outside Humboldt County would become an increasingly likely option.

The Sun Valley Group

A large producer of cut flowers with 700 employees, The Sun Valley Group depends heavily on the Internet for its business. It transmits orders and instructions daily to a subsidiary in Oxnard and fulfills orders for online consumer floral delivery websites nationwide. The company also transacts virtually all of its business with major retail accounts via web-based applications.

Sun Valley did not lose its landline phone systems during the outages, but it lost Internet connectivity and its ability to process electronic transactions. Because these include complex pricing, labeling and shipping data, they cannot be communicated effectively person-to-person over voice lines.

Sun Valley was able to email orders on a wireless laptop to an intermediary who physically took the orders to its Oxnard farm, according to IT Manager Rick Gustafson. Other than overtime payments to some employees, Sun Valley did not suffer any significant financial losses. But had the outage occurred at a busier time like the periods before Mother's Day or Easter, the firm could stand to lose as much \$1 million per day in revenue. Such an event during a busy period would also damage the company's reputation and potentially affect its market position.

The company has since developed a wireless backup strategy that provides what Gustafson calls "very primitive DSL speed." Sun Valley has investigated satellite backup, but accommodating the delays and batch-transmission requirements would require significant restructuring of its operations.

During busy periods, Sun Valley operates around the clock, seven days a week, and to maintain its operations during power outages, the company has installed diesel electric generating systems. Gustafson says the firm considers redundancy for telecommunications just as important, and would likely upgrade its telecom capacity significantly following the establishment of a second fiber line to the county.

Specific Impacts: Public and Nonprofit Sectors

Arcata/Eureka Airport (and associated FAA services)

During both outage events, the Arcata/Eureka Airport and the two airlines it hosts (United and Horizon) lost Internet and Intranet connectivity and both local and long distance phone services (United's Intranet stayed up on Dec. 26-27). Transactions were done by hand, and passengers without receipts or printouts for their electronic tickets were unable to fly. As a result of the outages, on Dec. 26, 16 of 28 scheduled flights were delayed; and on Jan. 20, 14 of 28 flights were delayed and one was cancelled.

The fiber outage broke the connection between the airport's weather monitoring equipment and the Oakland and Seattle facilities that communicate weather data to pilots. To keep the airport running, staff had to manually read the weather gear, and then search the airport terminal for a passenger with a working cell phone (most cell phones did not work) with which to call Oakland. According to Humboldt County Airports Manager Jacquelyn Hulsey, the airlines offered bonuses for passengers with working cell phones. "Airlines couldn't depart for here from other airports until they had weather reports from here, nor could they leave from here," said Hulsey. Lack of weather information also impacted the general aviation (non-commercial flight) airport operations at the county's five general aviation airports. Pilots were unable to call in flight plans to the FAA Flight Service Station Centers.

The loss of the fiber also disrupted two navigation systems operated by the Federal Aviation Administration, according to Pete Peterson, Manager of the Arcata Systems Service Center. These systems included the Runway Visual Range (RVR) system at the Arcata/Eureka Airport, which provides visibility information for commercial flights; and the Radio Communication Outlets in Humboldt County that allows local pilots to communicate directly with the Oakland Automated Flight Service Station. FAA's radar sites and mountaintop communication sites were automatically re-routed to a backup satellite system than FAA established several years ago.

Peterson and Hulseley both reported that the consequences of future outages could be more severe if they occurred during periods of fog or low cloud ceilings. Hulseley also noted that loss of communication functions (including the airport's local landlines and most cell phones) during a natural disaster such as an earthquake or tsunami would be extremely dangerous.

Humboldt County Office of Education

The Humboldt County Office of Education provides administration and curriculum services to Humboldt County's 32 school districts, which collectively encompass 86 schools, 1,159 teachers, 1,503 support staff, and 19,244 students (2005-2006 school year). In this role, the county office has a broad perspective on how loss of Internet connectivity can affect schools.

As it happened, both December 26-27 and January 20 were not school days; nevertheless, the disruptions caused by these outages were significant. As part of its administrative/financial responsibilities for Humboldt County districts, HCOE processes payroll for all public school employees. On December 26, HCOE ran a payroll of approximately 4,300 paychecks valued at about \$10 million. The payroll data was to be transmitted electronically to Bank of America for posting to the Automated Clearing House. But to the alarm of staff, the data wouldn't transmit. With the fiber connection broken, they considered driving the data south to the Mendocino County Office, but were finally able to resolve the situation by transmitting the data over an employee's private DSL service

On January 20, HCOE again experienced a loss as a Saturday workshop with 13 local staff and an outside presenter was cut short because the presenter could only offer an abbreviated session without online resources. Curriculum Specialist Cathy Dickerson estimated the cost at \$1,500.

During school days, a fiber outage could have much wider negative impacts, according to Dickerson. She notes that schools are heavily dependent on Internet connectivity, using email extensively to communicate with staff and parents and with the county office, which not only processes payroll, but also purchase orders, warrants, and financial reports for local school districts.

Additionally, the very possibility of a future fiber outage forces teachers to plan redundant lessons when they're using Internet-based curricula in classrooms. "They need something else at hand of equal value and rigor unless they're guaranteed access. And without redundant connectivity, that's not something they can be sure of," said Dickerson. Beyond the extra planning time, experiencing a fiber outage before or during an online lesson would erode teachers' confidence in technology, potentially causing them to bring fewer of the robust benefits of online curricula resources to their students.

As to payroll, HCOE is currently looking into alternatives, such as satellite transmission, to ensure that its financial obligations to school employees are met.

Law Enforcement 911 Emergency System/Humboldt County Sheriff's Office

The 911 emergency system for Humboldt County, operated by the Humboldt County Sheriff's Office (HCSO), experienced failures of its Automatic Location Information (ALI) functions during both outages, according to Cheri Williams, emergency communications supervisor. When functioning properly, ALI displays a 911 caller's name, address and phone number, enabling dispatchers to route calls to appropriate agencies immediately and to have location information for the rare occasions when a caller can't provide his or her location. During the December outage, the ALI system displayed only callers' phone numbers; during the January outage, some calls displayed names and addresses, while most displayed only phone numbers.

Additionally, the HCSO could not access state law enforcement data such as motor vehicle records and wanted-persons files (access to local warrant information was not compromised). According to Williams, officers commonly request state data on individuals stopped for suspicion of violations, so in a worst-case scenario, a wanted felon could have been allowed to escape.

There was no impact on HCSO's landline phone systems or radios.

St. Joseph Hospital

St. Joseph Hospital (incorporating General Hospital and Redwood Memorial Hospital) is the largest acute care facility and the most significant health care provider in Humboldt County. During the December and January outages, the hospital experienced loss of many vital services, including Internet access and the ability to make phone calls outside of Eureka (including to and from Redwood Memorial in Fortuna). Additionally, the hospital could not use Internet-based system for storing and reviewing medical imagery such as X-rays and sonograms, and only non-networked computers (about 25%) functioned. Compounding the loss of communication was the fact that most staff members' cell phones did not function either.

Because of the timing (with the first outage the day after Christmas and the second on a Saturday) there were very few procedures scheduled when the hospital was disconnected. St. Joseph staff report that the consequences of an outage on busier days could be severe indeed.

In particular, the lack of ability to consult Web-based medical resources or to speak by phone with experts and specialists outside the area would deprive clinicians of tools that they rely on heavily. According to Bob Brannigan, Chief Operating Officer and Chief Nursing Supervisor, "They'll look for cancer protocols, information on new drugs, specific kinds of disease processes, symptoms and treatments literally a hundred times a day." Communicating by phone with clinical experts around the country is particularly vital in this region, given the scarcity of expert specialists and academic hospitals nearby.

Since the outages, St. Joseph's parent organization St. Joseph Health System has installed redundant local servers, storage and communication devices in Eureka so that in future outages, clinicians will have access to medical images, such patients' previous x-rays. St. Joseph Health Systems Chief Technology Officer Scott Cebula said this redundant investment cost at least \$25,000. And in addition to the capital expenditures, the hospital faces ongoing costs for service and spare parts for the local system, many of which must be imported from the Bay Area.

Eureka is the only market in which St. Joseph Health Systems operates where it has invested in such redundant systems because all its other hospitals are located in regions with more secure telecom

infrastructure. In fact, of St. Joseph's 13 health care facilities in California, Texas and New Mexico, only Humboldt County suffers from the lack of redundant fiber connections, according to Cebula. "This is only place that is dependent on a single line. The interruptions we've had there are ones that we have not seen in other markets."

U.S. Social Security Administration, Eureka Office

During the December outage, the Eureka Social Security office was disconnected from its national databases, and its 24 employees were unable to work from approximately 2:40 to the 5:00 pm closing time. Citizens who came to transact business had to return at a later date. On Jan. 20, nine staff members arrived to work scheduled overtime but were released after one hour of idle time.

If a future outage were to shut down the office's connection for a full weekday, approximately 80 to 120 customers would have to return on a later day to transact their business. If such an outage were to occur in the first 10 days of any month, when recipients receive their checks, consequences would be much more severe. Every month approximately 20 to 30 Social Security recipients' checks are delayed or lost in the mail, according to District Manager Bernie Herskovets. Recipients count on being able to obtain a replacement check quickly to buy needed food or pay late rent.

The fiber outage created much longer downtime than the occasional system crashes experienced by the Social Security Administration at its data center in Baltimore, which typically occur two to three times a year, lasting an hour or two at most, according to Herskovets.

List of study informants

Arcata-Eureka Airport

Jacqueline Hulsey, Airports Manager, Humboldt County
Pete Peterson, Dave Ackroyd, Federal Aviation Administration

Bayshore Mall

Sue Swanson, General Manager

Edge Wireless

Eric Anderson, Director of Engineering

Evergreen Pulp

Rod Ledbetter, Sales and Technical Services Manager

Humboldt County Office of Education

Cathy Dickerson, Curriculum Specialist

Humboldt County Sheriff's Office

Cheri Williams, Emergency Communications Supervisor

Humboldt Merchant Services

Ken Musante, President

St. Joseph Hospital

Bob Brannigan, Chief Operating Officer and Chief Nursing Officer, St. Joseph Hospital
Scott Cebula, Chief Technology Officer, St. Joseph Health System
Terry Conrad, CFO, St. Joseph Hospital
Wendy Valdez, Director of Information Systems, St. Joseph Hospital

Security National Master Holding Co.

Justin Balog, Net Operations Manager
Mark Hodgson, Network Engineer 3
Shirley Fuller, Executive Assistant/Office Manager

StreamGuys

Jonathan Speaker, Chief Operating Officer

The Sun Valley Group

Rick Gustafson, IT Manager

U.S. Department of Social Security, Eureka Office

Bernie Herskovetz, District Manager