Industry Analysis:

Data Centers

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Contents

Abstract

This report analyzes Montana's current data center industry assets and the state's ability to further develop this growing industry. Our Regions businesses are following market trends and have been using or plan to use third parties service providers for more of their IT compute and data storage needs. Many SMB's find cloud offerings and help from Managed Service Providers to be a cost effective way to conduct business while keeping IT spending in check. Midlevel Enterprises understand the benefits of collocating their IT Environments to be more cost effective while mitigating risk and to provide better service as opposed to in-house operations. In Montana, there are a surprising number of businesses currently using out of state data management services; they were either in need of these services some time ago or simply were not aware of our ability to service their needs in state. These businesses provide a strong market for data centers, cloud providers and technical services within the state. Some businesses however, are not yet comfortable having their hardware, IT personnel, and data off-site, This market is sure to increase as business owners gain trust in local service providers; this report outlines avenues to encourage such in-state development.

Montana's climate is low risk for natural disasters and other hazards and has a favorable tax environment. This makes Montana a feasible location for large, single tenant data centers. Companies that generate vast amounts of data have the need to build very large, efficient data centers. While Montana has some qualities that are attractive (no sales tax, available land, etc.) to these types of developments, the industry has also identified some weaknesses (lack of data management trained workforce, etc.) that the state must work to overcome in order to be a top competitor for these large installations. This report outlines possible avenues to increase the state's attractiveness to data center development.

This report provides a basic analysis of the data center industry and its potential for growth in the state. The information gathered here is intended to allow the Governor, the Chief Business Development Officer, and the Director of the Department of Commerce to determine which state efforts should be pursued to expand this industry in the State of Montana.

Understanding the Industry

What is a data center?

Known as the server farm or the computer room, the data center is where the majority of an enterprise's servers and storage are located, operated and managed.

There are four primary components to a data center:

- *White space*: This typically refers to the usable raised floor environment measured in square feet.
- *Support infrastructure*: This refers to the additional space and equipment required to support data center operations (power transformers, cooling units, backup generators, etc.)
- *IT equipment*: This includes the racks, cabling, servers, storage, management systems and network gear required to deliver computing services to the organization.
- *Operations*: The operations staff assures that the systems (both IT and infrastructure) are properly operated, maintained, upgraded and repaired when necessary.

How are data centers managed?

Operating a data center at peak efficiency and reliability requires the combined efforts of facilities and IT. The management of IT and data center facilities are often outsourced to third party companies that specialize in the monitoring, maintenance and remediation of systems and facilities on a shared services basis.

- *IT systems*: Servers, storage and network devices must be properly maintained and upgraded. This includes things like operating systems, security patches, applications and system resources (memory, storage and CPU).
- *Facilities infrastructure*: All the supporting systems in a data center face heavy loads and must be properly maintained to continue operating satisfactorily. These systems include cooling, humidification, air handling, power distribution, backup power generation and much more.
- *Monitoring*: When a device, connection or application fails, it can take down mission critical operations. Ensuring maximum uptime requires 24/7 monitoring of the applications, systems and key connections involved in all of an enterprises various workflows.
- *Building Management System*: For larger data centers, the building management system (BMS) will allow for constant and centralized monitoring of the facility, including temperature, humidity, power and cooling.

What does a data center need?

In order to operate a data center must have three primary elements: affordable, reliable power, a safe environment, and good connectivity to the internet. Each of these elements revolves around a business model that cannot afford lapses in service, or downtime. The average reported incident in

downtime as reported in a study conducted by Ponemon Institute[1] was 86 minutes, resulting in average cost per incident of approximately $690,200.

- *Affordable, reliable power*: A data center consumes a lot of power to operate IT equipment and to manage the facility, primarily cooling the IT equipment; Google's most recent Oregon data center has a 37 megawatt load, consuming as much power as 27,400 homes. Data centers must invest in redundant power supplies in order to avoid costly downtime. Access to multiple points of power or sections of the grid is ideal. Backup generators and ample amounts of fuel are also housed onsite should a complete failure of the grid occur.
- *A safe environment*: Locations that are adverse to natural disasters are ideal for data center locations. Avoiding events that may cause physical harm to the facility itself or interrupt connectivity to the internet or power supply reduces risk of downtime. Cool and dry climates also provide benefits for keeping servers in optimal running condition by using ambient air as a resource for cooling; this also reduces the power costs associated with cooling a data center.
- *Connectivity to the internet*: Redundancy is also a benefit in internet connectivity. Data centers need a good fiber optic network that can quickly reach multiple markets. Having multiple network providers increases a data centers flexibility and access to markets.

What are a data center's primary expenditures?

Data centers are capital expensive facilities that make use of the most recent computing technologies. The company's finance group will be responsible for aligning near term vs. long term capital expenditures (CAPEX) to acquire or upgrade physical assets and operating expenses (OPEX) to run them with overall corporate financial operations (balance sheet and cash flow).

- *Construction*: Cost of land, power, public infrastructure, network connectivity, IT equipment, facility management equipment and personnel are all important factors in locating and constructing a data center. Cheap land and power are the company's primary CAPEX concerns in early development; however, other operational and maintenance activities greatly affect the bottom line over time.
- *Operations*: Power is a major draw on a data center's budget but intelligent design and construction of a data center can greatly increase efficiencies and decrease operational costs. This option may not always be available as some data centers must locate in urban areas where space is limited to build new, highly efficient facilities. Data center must operate 24/7/365; this requires constant IT and building management staffing however a relatively small workforce can operate a large data center.
- *Maintenance*: IT equipment is the primary expense in maintaining a data center. Typically, servers are replaced on a 1-2 year cycle. This ongoing expenditure makes state who have waived or do not carry a sales and use tax very attractive. Other maintenance on the facility is ongoing to ensure the reliability of the facility as a whole but does not affect the company's budget as severely as server rotations.

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[1] Appendix K or http://www.emersonnetworkpower.com/documents/en-us/brands/liebert/documents/white%20papers/2013_emerson_data_center_cost_downtime_sl-24680.pdf

How does a data center generate revenue?

Data centers can physically house data in servers that are owned or leased by an outside company. Recently, increased use of cloud technology has reduced costs for some companies by utilizing available storage throughout the internet.

- *Colocation*: This means a company houses their data in a space in a shared facility managed by an appropriate service provider, or data center.
- *Cloud computing*: The practice of leveraging shared computing and storage resources over the internet — and not just the physical infrastructure of a colocation provider — has been growing rapidly for certain niche-based applications. Cloud computing can offer compelling advantages in reducing startup costs, expenses and complexity, however it has significant quality-of-service, security and compliance concerns that to date have delayed full enterprise-wide deployment.

Market Analysis

Demand Forecast

The following information analyzes current demand for the data center industry locally, regionally, nationally, and internationally.

Cisco Systems released a report in 2013[2] forecasting the increase in global IP traffic and demand for data centers and cloud storage. The report suggests that the industry will have a need to process and house a dramatic increase in generated data by 2017. This need represents a significant business opportunity for Montana. Technology will certainly evolve, which will have an impact on how that processing will take place; whether in dedicated data centers or in the cloud in virtualized data centers. Montana can market its attributes as a prime physical location to store data attracting companies looking to expand their physical data footprint.

Cisco Systems Forecast Analysis on Data Center and Cloud Demand			
	2012	2017	% increase
Global data center IP traffic per month	214 exabytes	644 exabytes	201%
Global cloud IP traffic per month	98 exabytes	443 exabytes	352%
Workloads on non-virtualized traditional servers (millions)	1.7	2.3	35%
Workloads on non-virtualized cloud servers (millions)	6.5	16.7	157%

Furthermore, Bizjounal's article dated November 12, 2013 reports that Oracle is currently building four new data centers (two in Germany and two in Canada) expected to be operational in Q2 2014[3]. According to the article, these additions will give Oracle a total of 17 data centers worldwide. These current actions by Oracle would seem to be in sync with an outlook that more data processing is needed to handle expanding data generation in the marketplace.

> Global data center IP traffic will nearly triple over the next 5 years
> – *Cisco Systems*

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[2] Appendix C

[3] Bizjournal article link: http://www.bizjournals.com/sanjose/news/2013/11/12/oracle-bringing-four-new-data-centers.html

According to Mike Ferrucci of Parsec Data Management in Billings, the existing private data centers in Montana are currently only 45% or less of their co-location capacity. This is due to improvements in technology, increased use of virtualization and the cloud, economic impacts of the recession, and businesses that have not yet moved their data offsite. Mike explained that Parsec provides two types of data management services; co-location services whereby Parsec leases cabinet space in its data center to companies that purchase and install in the leased space their own cabinets to manage their data. In short, Parsec leases space to install their customer's cabinets. Parsec's other data management service is one where Parsec owns and operates cabinet's with which it provides data management services. This is commonly referred to as "cloud' service. Not that many years ago co-location service was the predominant data center business model, but changes / improvements in technology are now driving more cloud based service options. Mike explains that there are markets for both co-location and cloud based services. For example, co-location service can still be tailored to better meet a customer's data management needs. Some companies simply want the data management control and the added security that co-location provides. Conversely, cloud based service can be a least cost data management option as customers simply pay a monthly data management fee without the capital outlay to purchase cabinets.

Opportunities exist to:
- Market the State of Montana Data Center's (SMDC) excess capacity to all public entities needing data center services (local governments, schools and universities, etc.), which currently are using other data service providers.
- Market the existing in-state private data center capacity to current in-state businesses that may be using out-of-state facilities or struggling to manage their data in-house, for both co-location and cloud based data management services.

> Existing in-state data centers are at 45% or less of available co-location capacity

Supply – Montana's Industry Players
This section outlines the Montana businesses and public entities that represent our supply of data management services to the industry.

Regional/State Storage Providers

Parsec Data Management
Parsec is a full service Tier III (see Appendix A for Tier 3 definition) qualified, commercial data center located on the Transtech Center campus in Billings.

iConnect Montana
iConnect operates a 47,000 square foot Tier II data center and a separate fiber hotel in Billings. The company also has fiber hotels (facilities that collect and route data but don't store it) located in Bozeman, Great Falls, Helena and Missoula.

MontanaSky Networks

Montana Sky Networks is a company providing data management services in the state and a recent [news story](#)[4] out of Kalispell reports on the development of a $1.4 million regional data center by them at the former Vann's appliance building in Evergreen (Kalispell).

Telco's

The Montana Department of Administration's Information Technology Services Division (ITSD) indicates that several Montana telephone companies (Telco's) operate data centers in the state. A list of those is forthcoming.

State of Montana Data Centers (SMDC)

The State of Montana has invested in two data center locations, Miles City and Helena. These state of the art Tier 3 data centers house public data and by statute cannot compete with private industry.

Large Data Center Operators

Oracle

Oracle, ranked 80th in the Fortune 500 with revenues of $37.1 billion, employs 550 workers in Montana. In 2011 Oracle purchased RightNow Technologies located in Bozeman which had developed customer relation management software. Known as Oracle RightNow, the Bozeman business unit handles the accounting of Oracle's cloud related business. Oracle President Safra Catz stated at the recent Baucus Economic Development Summit in Butte that "We focus our investment in cloud services in Montana." "Why Montana? It's really, really simple: employees are our company. There's been absolutely wonderful work done by Montana Tech and Montana State University (graduates). I will tell you that those people are running our groups."[5] Oracle's presence in Montana makes them an obvious target for the state to attract further large investment into data storage in the state. At present, the company operates 13 large data storage facilities world-wide with four more under construction.

> There's been absolutely wonderful work done by Montana Tech and Montana State University (graduates).
> *– Oracle President, Safra Catz*

Sabey Corporation

Seattle based Sabey Corporation is a major national data center player with Montana connections. According to its website, Sabey Data Centers is one of the oldest and largest privately-owned multi-tenant data center operator/developers in the world.[6]

The website states:

> Sabey Data Centers grew out of Sabey Corporation's forty year history as a designer, builder and operator for leading innovators of the day: Boeing Electronics' clean rooms, ADP's first data center, McCaw Cellular's first cell phone switches, and Exodus Communications, provider of the world's first internet colocation services —all were breaking new ground in

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[4] Daily Interlake Article: http://www.dailyinterlake.com/news/local_montana/article_6f63eb84-5186-11e3-9458-0019bb2963f4.html

[5] Catz, Safra September 17th, 2013 at the Montana Economic Development Summit in Butte, MT

[6] http://sabeydatacenters.com/

industries of world-wide importance. Today, that trend continues both through real estate development and investment with a particular focus on high performance data centers, healthcare & life science research and communications. From IT efficiencies and technology platforms dedicated to solving some of the hardest problems facing health care and life science, Dave (Sabey) is passionate about promoting ideas that positively change the world.

Dave Sabey is a part-time resident of Montana and owns a home in the Flathead Valley. The Schweitzer Administration met with him in 2007 to discuss the prospects for data center development. Tom Kaiserski in 2012 had further discussions with Dave Sabey concerning the potential for large data center development in Montana. Sabey is connected with Providence Health and Services, which is one of Montana's largest health care providers.
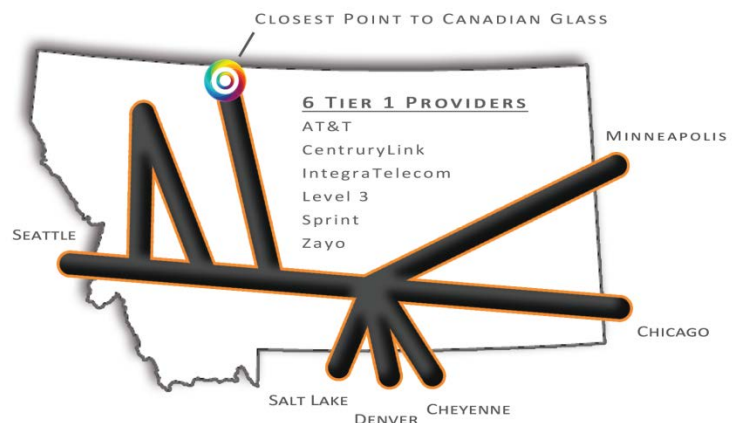
From Providence's website:
> With more than 40 clinics, two hospitals and over 2,000 employees statewide, our health and services organizations work together to provide quality care to those in need. We continue to honor and live by a commitment to compassionate service that the Sisters of Providence began more than 155 years ago. Montana is part of our five-state network, which also serves Alaska, Oregon, Washington and California.

Alex Philp's company TerraEchos, an off-shoot of GCS Research that is developing big data analytics technology in Missoula, advises Providence on its data management needs.

While Sabey has good connections to large data center operators, we also note that Montana based CTA Architects and Engineers is a conduit into Dell.   CTA has designed multiple data centers for the large computer manufacturer to manage and store its data.[7]

National Network Providers

Access to the Internet is obviously necessary to operating any size data center. Our research indicates Montana has generally easy access to all North American network providers. Our research further indicates that the network in Montana has low latency which means data moves fast.[8] Almost every major Tier 1 carrier runs along the I-90 corridor from Seattle to Chicago. Among these carriers are BT/Century Link, Intergra Telecom, Level 3, Sprint and Zayo. Tier 1 carriers offer fast internet connectivity (1+ Gbps), use diverse connections to different central offices, perform network maintenance which does not impact

CLOSEST POINT TO CANADIAN GLASS

6 TIER 1 PROVIDERS
AT&T
CenturyLink
IntegraTelecom
Level 3
Sprint
Zayo

SEATTLE MINNEAPOLIS CHICAGO SALT LAKE DENVER CHEYENNE

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[7] http://www.ctagroup.com/
[8] Appendix G

customers and have a substantial national footprint and backbone. In addition, Montana has a major US/Canada crossing located in Cut Bank.

Russ Fletcher recently ran an article claiming network problems inhibit information technology business development in Montana. Mike Ferrucci refutes that, stating that Montana's network is adequate and he talks to Russ often and in this regard they have agreed to disagree. Other evidence that Montana has adequate network access could be gleaned from Greg Gianforte's recent public comments that IT companies can succeed all across Montana as well as his success developing his Bozeman business purchased and now operated as Oracle RightNow.   In a recent meeting we had with ITSD the staff there confirms that Montana has adequate network facilities. ITSD claims that sometimes it takes effort to sort through fragmented network ownership to get adequate service but it can be done.

Our research indicates that detailed maps showing network locations are not available; our understanding (largely from discussion with ITSD and Mike Ferrucci) is that this type of information is closely held by network providers to retain competetive advantages.

Regional/State Network Providers

A host of small providers operate in Montana including Blackfoot Telecommunications Group, VisionNet, Cutthroat Communications, Speed Connect, Mammoth Networks, Montana Internet Corporation, RTC, and Opticom.   Mike Ferrucci of Parsec explained that the fiber capacity in the state gets better every year because of better equipment and better engineering. However, he emphasized that the entities that own or lease fiber make others pay a premium to use it and because of fragmented fiber ownership, it's costly for data to go from point A to point B. Rural Telco's, Incumbents (CenturyLink), and wholesale providers like Zayo are all Network Providers

Montana Workforce

Current Workforce

According to the US Bureau of Labor Statistics Montana's employment in data processing, hosting and related services has fluctuated over the past twelve years. Explanations for the rise and fall of employment can be attributed to changes in technology, in-state developments, recessionary conditions, and loss of workforce to other markets. The data also shows the number of establishments (employers) has fluctuated as well, likely for

> Montana has generally easy access to all North American network providers.

the same reasons. Annual pay increased steadily in this employment sector however, increasing over $22,000 not adjusting for inflation, a 77% increase in salary since 2001.

Montana Private Industry Employment Statistics, 2001 - 2012 Data Processing, Hosting, & Related Services(NAICS 518210)					
Year	**All Employees**	**Number of Establishments**	**Total Wages Paid**	**Average Weekly Wage**	**Average Annual Pay**
2001	625	84	$ 18,159,000	$ 559	$ 29,074
2002	645	99	$ 19,694,000	$ 587	$ 30,529
2003	673	108	$ 22,460,000	$ 641	$ 33,356
2004	770	111	$ 32,330,000	$ 807	$ 41,969
2005	727	96	$ 29,368,000	$ 777	$ 40,424
2006	677	104	$ 27,804,000	$ 790	$ 41,079
2007	522	66	$ 25,115,000	$ 926	$ 48,159
2008	539	71	$ 27,209,000	$ 970	$ 50,456
2009	634	70	$ 31,667,000	$ 961	$ 49,982
2010	784	64	$ 40,486,000	$ 993	$ 51,629
2011	526	63	$ 25,977,000	$ 950	$ 49,417
2012	503	67	$ 25,866,000	$ 988	$ 51,397
Source: US Bureau of Labor Statistics - Quarterly Census of Employment & Wages (QCEW)					
Compiled 1/10/2014 by the Census & Economic Information Center, MT Dept. of Commerce					

Regional comparisons show that Montana's workforce lags well behind the pacific states but competes with Wyoming and North Dakota.

Regional Comparisons (2012)					
	All Employees	**Number of Establishments**	**Total Wages Paid**	**Average Weekly Wage**	**Average Annual Pay**
California	20,402	1,073	$ 2,511,474,000	$ 2,367	$ 123,098
Washington	5,025	339	$ 367,890,000	$ 1,408	$ 73,214
Oregon	3,668	262	$ 336,709,000	$ 1,765	$ 91,805
N. Dakota	722	27	$ 28,824,000	$ 768	$ 39,940
Montana	503	67	$ 25,866,000	$ 988	$ 51,397
Wyoming	151	27	$ 8,268,000	$ 1,051	$ 54,631

Future Workforce

Montana has 81 degree programs and accreditations in studies applicable to the IT and data center industry, from certificates to doctorates. Private industry also offers a number of training programs, certificates, and accreditations to advance Montana's workforce; as demand requires vendors like Cisco, HP, and IBM can help facilitate/sponsor workforce events and training. Graduates in these studies often leave Montana for better job markets in the IT sector resulting in a low supply of data center qualified employees. Lack of an industry presence in the state has also resulted in curriculum that may not fit industry's needs and exporting of data center qualified workers. However, Oracle RightNow in Bozeman has reported that graduates they have employed from Montana Tech and Montana State University have done an excellent job and are in management positions. Opportunity

exists for Montana's university system to tailor curriculum to the data center industry's needs aiming to increase economic activity and investment by the industry in-state.

Montana's Target Markets

This section analyzes Montana's best suited target markets for development within the industry.

The target market for Montana's efforts to attract data center investment involves both those companies that produce data like financial institutions and those companies that provide data storage and management services like iConnect. Given current market conditions and available capacity within Montana's existing data centers, the state's initial target should be those companies that generate data. Developing this segment of the industry will increase the customer base for network providers allowing for increased investment within Montana's network while creating a stronger market for data centers in the state.

Data Generators

There are a variety of businesses that generate data that Montana can target its marketing efforts toward:

Midlevel data generators
- Midlevel date generators are companies that generate a fair amount of data through their business but not enough to justify building a data center for their own needs. Financial institutions, hospitals, universities, government, and others entities make up the bulk of this market. While they do not generate the largest amount of data in the market, they represent insubstantial portion of the marketplace. Every day more and more of these businesses are choosing to contract out their data and IT services.

Immediate access data generators
- Some companies are required to spread their data regionally in order for a user to rapidly access their data on the network. A prime example of this type of company in Montana is Charter Communications. A recent addition to the state's business community, Charter stores a significant amount of data for its customers who utilize digital video recording (DVR). Customer satisfaction decreases when streaming data (a customer's recorded program) is interrupted likely due to network latency. Locating Charter's data closer to its customer base/network users decreases these disruptions. Charter is currently looking to locate approximately 40 cabinets in the mountain states region.

Single tenant data centers
- Data giants such as Facebook, Microsoft and Oracle are companies that not only conduct business which generates enormous amounts of data, but also construct large data centers to handle the data management needs of their own business operations. As noted previously in this document, Oracle is currently building 4 new large data centers, two in Canada and two in Germany. Attraction of these types of data generators would not make use of the state's existing, underutilized data storage facilities but would spur significant network use and development, putting Montana on the map as a data center location.

Data Managers

Multi-tenant data centers

- This segment includes companies like Parsec and iConnect that operate smaller regional data centers providing data management services to companies that generate significant quantities of data but not enough to warrant owning and operating a single tenant data center.
- Companies like Sabey Corporation that develop large multi-tenant data centers marketed toward larger data generators are also considered data managers.

Single tenant data centers

- Companies that develop data centers to meet their own storage demands will find Montana as a welcoming location with its favorable business climate, safe environment, and unsurpassed quality of life. Microsoft's new data center strategy (noted in footnote 8) is a hybrid single/multi-tenant development. Microsoft is building state of the art data centers where land and power are cheap. When Microsoft builds a large data center they will sequester space for companies they work very closely with and may eventually acquire. The company will then lease third party space, usually in Fiber Hotels, where they may need to interconnect such as in a network exchange (POP) located in every major US city

> Microsoft is pursuing a hybrid strategy in which it builds state-of-the-art data centers in areas where land and power are cheap, and leases third-party wholesale space in key markets where it is expensive to build and operate large server farms.

Case Studies

This section focuses on the current operations of private and public data centers in Montana, network upgrade activities and the development of a hypothetical large data center.

Private Data Centers

Private data centers can have a large economic impact relative to their physical footprint. A standard rule of thumb in the industry in Montana is that 1 cabinet has approximately $250,000 of capital equipment. The local taxes on a single cabinet are approximately $2,000/year. A single cabinet requires a 20 square foot area. iConnect is a 50,000 square foot facility allowing for 2,500 cabinets meaning that when iConnect is running at full capacity they would pay approximately $5 million in taxes annually.[9]

Parsec Data Management

Parsec is a tier 3, 10,000 square foot data center located in Billings, a national fiber optic network backbone and crossroads. Parsec serves midlevel data generators including First Interstate Bank, FiServe, Bell State Bank and Trust (North Dakota), Saba, several healthcare providers as well as many regional data generators. The company is currently operating at ~45% capacity, or 70 cabinets.[10] Parsec's estimated gross annual revenue is $2.1 million and employs 5 people.

iConnect

iConnect is a tier 3, 24,000 square foot data center located in Billings. They serve Expedia/Hotwire, Live Journal, HughesNet, Eagle Roofing of Seattle, and other regional data generators. iConnect is currently operating at ~25% capacity.[11] iConnect also operates 8 fiber hotels across the state and generates approximately $4 million in annual gross revenue. The company employs 4 people to run there Montana operations.

Public Data Centers

Lead by state government, public institutions are beginning to invest in more efficient data storage.

State of Montana Data Centers (SMDC)

In 2006 the State of Montana invested in two data center facilities to more efficiently and safely house the public's data. These facilities are located in Helena and Miles City. Authorized by the 2007 Legislature, the $7.2 million data center in Helena was completed in 2010. SMDC Helena serves as the state's primary data storage location with disaster recovery (DR) services in Miles City. The Helena facility is currently operating at 38% of capacity; that number is down due to virtualization. The facility's efficiency and cost effectiveness increase as available capacity

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[9] Parsec Data management
[10] Information provided by Mike Ferrucci, Business Development Director for Parsec Data Management
[11] iConnect website: http://www.iconnectmontana.com/index.php?pr=HOME_PAGE

decreases, building the case for full-use of the facility. The state facility currently saves the taxpayer approximately $200,000/year.[12]

SMDC Helena employs a rotational heat exchanger called a Kyoto Wheel which takes advantage of Montana's cool, dry climate to cool the servers and other IT equipment. This equipment has drastically reduced the cost of operations at the data center by reducing cooling costs an average of 85%. It has also exceeded physical and digital security standards set by the Internal Revenue Service and Department of Defense.[13]

State of Montana Data Centers	
Helena SMDC	Miles City SMDC
15,000 sq. ft. building	8,500 sq. ft. building
Contains 6,200 sq. ft. raised floor computer room	Contains 2,800 sq. ft. raised floor computer room
Can house 13 rows of racks	Can house up to 6 rows of racks
Has 576 strand redundant fiber connections to campus WAN	Is incorporated into the Department of Corrections facility for increased infrastructure security
Is cooled by KyotoCooling® - "the most innovative cooling technology in the world"	Has access to more than one power grid (WECC and MISO)
Designed by Total Site Solutions – designers of 3,000 data centers worldwide	Site was selected for local economic development purposes, affordability and security for the state's disaster recovery site.
Design incorporates:	*Design incorporates:*
Critical Infrastructure DOD Security Standards	Critical Infrastructure DOD Security Standards
Leadership in Energy and Environmental Design (LEED)	Leadership in Energy and Environmental Design (LEED)
Green Building Rating System	Green Building Rating System

Montana Network / Data Center Developments – Past and Present

Montana communities have been involved in data center attraction efforts in the recent past. For example, Kalispell was close to landing a data center about 5 years ago but the power price was not competitive. Yahoo considered Montana for a data center in 2007. The project went dormant and resurfaced in 2009 but Montana was not selected.   Montana made Dell's short list and another undisclosed company looked seriously at Montana to locate a large data center within the last few years. Montana's competitors have attracted these facilities by offering large tax incentives, or have the ability to provider power at a lower cost. Billings continues to target data centers for recruitment activity. Great Falls indicates they would be interested marketing an all-green power package to companies with strong environmental drivers.

Below are summaries of data center activities within Montana's large communities.

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[12] Appendix F
[13] Appendix E

<u>Billings</u>
As mentioned previously, Billings is home to Parsec Data Management and iConnect Montana. In addition Big Sky Economic Development Authority (BSEDA) and the Department of Commerce have worked together closely over the past two years to attract data centers to the area. A data center summit was held in August 2012 and 3 data center workshops were coordinated with Parsec around the state in the summer of 2013. BSEDA has been recognized by Expansion Solutions Magazine as a top 5 organization for its efforts in data centers attraction. The ranking appeared in the magazine's January/February 2013 issue.[14]

<u>Butte</u>
In September Montana Resources and the Washington Companies announced a grant of $250,000 to the Montana Economic Revitalization & Development Institute (MERDI.) The grant represents a significant part of the funding for the construction, equipment and deployment of a hybrid community fiber optic network that will connect all of the locations of Butte School District No. 1 providing high speed, highly reliable, fault tolerant voice and data transmission.

The network head will end in the MERDI data center, located in the Thornton Building in uptown Butte, and allow high speed, high capacity diverse path internet access and data center services. Utilizing the fiber optic network and data center services, School District No. 1 will seek to achieve its goal to fully realize and harness the power of information technology as a transformative agent on K-12 education with over 5,000 students. In addition, MERDI is working with Montana Tech of the University of Montana and Highlands College on joining the fiber optic network to keep the schools globally competitive by utilizing the high speed, high capacity dedicated network.

The Montana Department of Commerce provided an SSBCI loan in the amount of $316,040 to MERDI for this project and also provided CDBG funds in the amount of $145,460.

<u>Great Falls</u>
Great Falls Development Authority (GFDA) retained Angelou Economics (AE) to complete a data center competitive analysis in 2008.   According to GFDA when they commissioned the study, AE had been hired as site selector for about a third of the competitive location processes (companies that put out an RFP to locate a site) for corporate data centers in the US.[15]

The AE analysis indicated that Great Falls power prices at that time were not competitive with other areas. Since that time the Montana Alberta Tie Limited (MATL) high voltage transmission line has been built, and NaturEner has developed 399 MW of wind power generation and operates two balancing areas north of Great Falls. NaturEner has indicated they have a great interest in working to help develop new large in-state electricity loads such as a data center. They believe they can supply largely green power at approximately $40/MWh; a price competitive and attractive to data center developers. GFDA Executive Director Brett Doney has stated that one angle they haven't pursued, but would be interested in is to package all green power supply offers to take to some of

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[14] Appendix J, page 2
[15] Appendix D

the data center companies with strong environmental drivers such as Google, Facebook, Oracle, and others.

<u>Kalispell</u>

As noted previously, a recent news article[16] reported that MontanaSky Networks plans to build a $1.4 million regional data center at the former Vann's appliance building in Evergreen. Flathead County was awarded a $148,342 Community Development Block Grant by BRD to be loaned to the business for purchase of equipment for the data center. The award letter just went out 1/29.

According to the news article, the idea is to offer a new model of service that will allow local businesses affordable access to sophisticated internet protocol services without the need to hire full-time system administrators, costly high-speed network connections, and dedicated computer servers, according to Tina Oliphant, Vice President of Finance for Montana West Economic Development. The proposed regional data center would employ 16 full-time technicians, installers, and customer specialists and would give new life to a sizable vacant building on U.S. HWY 2 in Evergreen.

Excerpts from a June 1 article[17] in the Daily Interlake reported:

> "The Health Information Exchange of Montana, the Ronan Telephone Company and MontanaSky Networks are cooperating on a build of a middle-mile fiber-optic network with infrastructure stretching from Missoula up through Polson, Kalispell and Whitefish, as well as from Kalispell to Libby. Certain legs of the network are already completed and the rest should be done by the end of the year.
>
> The project was initiated when the Montana Health Information Exchange received a federal award for $13.6 million to create a dedicated health-care network for the exchange of information for health-care providers and to provide higher education in health care.
>
> The nonprofit corporation, founded by five Montana hospitals and two community health centers, was working under the stipulation that its new line be used only for health care, but in the process of building the network it could create excess capacity by adding more fibers within a trench, and then lease those fibers."
>
> The upshot of this partnership has been leveraging a health care grant into a way to expand internet capacity so that multiple businesses could take advantage of increased bandwidth.

<u>Tribal Opportunities</u>

Montana's tribal nations offer unique opportunities for data center development that may be attractive to developers. While no data center development has occurred on Montana's reservations, significant federal monies have been invested in tribal IT infrastructure. Multiple tax advantages and significant resources made available by the tribes may help a company's bottom line as well.

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[16] http://www.dailyinterlake.com/news/local_montana/article_6f63eb84-5186-11e3-9458-0019bb2963f4.html

[17] http://www.dailyinterlake.com/business_and_finance/local_montana/article_58db650e-cb1c-11e2-b88d-001a4bcf887a.html

Tax Advantages
   a) Federal taxes — Tribal income is not subject to the Federal income tax. The Internal Revenue Service has extended the same immunity from Federal income taxes both to tribal corporations formed under the Indian Reorganization Act, and in practice to corporations wholly owned by Tribes. This exemption applies to all income of Tribes and companies wholly-owned by Tribes.
   b) Federal Tax Incentives for Enterprise Communities — tax-exempt bond financing is available to businesses located in an enterprise community, which could apply to reservations. Renewal Communities (RCs), Empowerment Zones (EZs) and Enterprise Communities (ECs) are highly distressed urban and rural communities who may be eligible for a combination of grants, tax credits for businesses, bonding authority and other benefits.[18]
   c) State Tax and Regulatory Exemptions — The Tribes can offer non-Indian businesses indirect relief from State taxes and regulations. Taxes on land and buildings, meaning real property or ad valorem taxes, cannot be applied to a business on trust land, whether it is owned by the Tribes or a non-Indian company leasing trust land. Tribally owned businesses are not subject to state taxation to its income, operations, and property.
   d) Indian Employment Tax Credit — A reservation employer may take as a credit on his federal income taxes 20% of the wages and health insurance costs paid for new employees who are enrolled member of a Indian Tribe (or spouses of an enrolled member of a Indian Tribe) who live and work on the Reservation. Credit has expired and will be voted on this year.
   e) Accelerated Depreciation for Business Property — A business on a Reservation may claim depreciation deduction for property on Indian reservations. The depreciation accelerated rate is four years. Credit has expired and will be voted on this year.

Non-tax Advantages
   a) Tribes have large labor force that can be trained utilizing various Tribal, State, and Federal programs.
   b) Tribal Colleges can be utilized to train and educate the workforce.
   c) The lower wage scale can provide a competitive advantage.
   d) Access to Federal guarantees for loans and other possible investments.
   e) Access to natural resources, such as gas, wind power, hydropower, water, and land.

Hypothetical Scenario to Construct a Large Data Center in Montana

The following analysis outlines the hypothetical development for constructing a new large data center in Montana. Great Falls was selected for the exercise for two reasons:
   1. The availability of existing site data available from Great Falls Development Authority's 2008 data center competitive analysis prepared by Angelou Economics (AE) – see Appendix D.
   2. NaturEner USA, the state's largest wind energy developer, has identified Great Falls as their best market to deliver firm, green energy, and has expressed to the Bureau that they could

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[18]
http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/economicdevelopment/programs/rc

provide that energy for 4 cents per kilowatt hour making it a cost competitive power source to data locations throughout North America.

Hypothetical facility specifications are as follows:
- Tier IV Data Center
    - Multiple backups of every system
    - 99.99% uptime
    - No downtime for maintenance
    - Constant staffing
- Typical Size: 75,000 to 250,000 square feet of raised floor
- 15-20 MW per 100,000 square feet
- 4-5 employees and numerous contractors

The 2008 AE Data Center analysis of a site in the Great Falls Industrial Park revealed strong potential for investment and a recommendation to proceed with in-depth analysis including utility infrastructural evaluation. AE enthusiastically recommended the Great Falls Industrial Park site because of:
- Ample size
- Location in a secure agricultural area
- Very low acquisition costs
- Electrical substation on site with dual feed capability with additional adjacent electrical ties providing further redundancy potential
- Green power potential delivered on MATL
- No abutting or incompatible use concerns

Montana's Competitors

Many states have made efforts to attract data centers to their economies as they generate strong tax revenues and have very little impact on the environment, public services, and infrastructure. This section highlights some of attraction efforts use by some of the nation's top data center locations.

Tax Incentives

The table below depicts some of the tax incentives used by leading data center locations.

	Policy established	Incentive	Limitations	Other comments	Links
Arizona	2013 - new legislation is tailored to assist colocation and multi-tenant facilities	sales and use taxes are exempt for qualified DCs (10yr. Limit)	qualified DC = $50 million new investment in urban areas and $25 in rural	tax incentive can be extended by 10 years if the DC uses an existing vacant structure "sustainable development"	article
Iowa	2008 legislation	sales and use tax exemption for 6 years; $5 million investment tax credit	none found		
Montana	new and expanded industry tax credit	credit is equal to 1 percent of new wages paid in state during the first three years of operation	total full-time jobs must increase by 30 percent or more		site
North Carolina	various state and local tax policies	reduced sales and property taxes	vary		
Oregon		enterprise zones allow for property tax exemptions that reduce payments made by google on $1.3 billion dollars' worth of capital equate to $24 million per year.		these tax breaks remain controversial as some believe they give too much	article

South Carolina	2012 - new legislation	sales tax exemption on equipment and electricity	must be a $50 million facility and hire at least 25 people	legislation in response to losing DCs to N. Carolina	article
Texas		sales and use tax exemption (state only)	20 qualifying jobs and $200 million capex over 5 years; single occupant only; >100,000 sq ft building; not be used primarily by a telecommunications provider to deliver telecommunications services; not be subject to an agreement limiting the appraised value of the data center's property		site
Virginia	2009 legislation	sales and use tax exemption from 2010 to 2020;	minimum $150 million cap. Investment; 50 new jobs with salaries at 150% of average prevailing wage in locality		
Washington	restoration of tax breaks passed in 2010 that expired in 2011	sales and use tax exemptions in rural counties	must be in rural counties; must create 35 new jobs; 100,000 sq. ft. facility with at least 20,000 sq. ft. for servers	after the incentives expiration in 2011 WA began losing DCs to OR	article
Wyoming	2011	1. sales tax exemption 2. $2.25 million maximum grant for community expansion of power and broadband	1.) $50 million capital investment; $2 million per year equipment purchase 2.) grant amount based on capital investment and payroll the business will realize over five years; the business must create a match of at least 125% of the grant amount in payroll and capital expenditure with the caveat that 50% of the match will be in payroll creation. Payroll must be greater than 150% of the county's median wage		site

SWOT Analysis

This section analyzes Montana's strengths, weaknesses, opportunities, and threats within the industry.

Infrastructure	Strength	Weakness	Opportunities	Threats
Fiber network	Intersection of 2 fiber backbones; I-90 corridor is strong; urban strongholds; low latency	Relatively dark (unused); piecemealed network with too many barriers (Telco turf wars)	Development of urban fiber rings; strengthen I-90 corridor; get Telcos to work together	Lack of demand to continue investment in network development
Data centers in place	Small to midsized providers; excellent customer service	Lack of local awareness of services	Tap in to local market; showcase services locally and regionally	Larger regional wholesale providers can provide lower price point
Network providers	6 tier 1 providers; market reach to east, west, north, and south	Fragmented ownership; last mile deficiencies	Brokering cooperation among network providers and telcos	Lack of cooperation among network providers; telco resistance to investment
Power	Competitive power price, renewable power available; net power exporter	Coal based power (data centers like clean energy)	Market Montana's low cost, firm wind power	Lower power costs in other states
Land	Abundant; affordable; industrial parks	Remoteness	Diversity of developed or undeveloped sites	Increased cost to deliver power and connectivity to remote areas

Workforce	Strength	Weakness	Opportunities	Threats
Current workforce	Oracle very pleased with highly educated and reliable MSU and MT Tech graduate hires	Low supply of data center managers, many imported	Increase training; tailored MUS curriculum; leverage MT lifestyle	Out of state competitive workforce
College graduates	Montana has 81 accreditations in applicable studies from certificates to doctorates	Lack of industry presence has hindered the state's ability to keep data center trained graduates and fully shape curriculum to industry demands	New industry presence can help shape curriculum and build the workforce they need	Outside markets provide more employment opportunities

Quality of Life	Strengths	Weaknesses	Opportunities	Threats
Recreation	Abundant outdoor opportunities that appeal to the younger, active workforce sought by data centers	Cold northern climate doesn't appeal to all audiences, no coastline	Leverage Montana's lifestyle in marketing efforts	Competing state with similar amenities
Community	Excellent school system, family centric atmosphere, short commutes, no traffic, low crime	Limited proximity to cultural amenities	Easily become a member of and shape the community in which you live	Larger population centers with greater cultural diversity and amenities

Tax Environment	Strength	Weakness	Opportunities	Threats
Real Property tax	Low cost of land	Tax rate is perceived as too high. Facebook says– state needs to abate 100% for 15 – 20 years	Education about tax policies and incentives. Quantify operating in Montana vs. other states	Termination of tax incentives; politics of tax policies that pick and choose subsidization
Corporate income tax	Montana ranks 7th best in the Tax Foundation's State Business Tax Climate Index.	Multiple factor apportionment formula - per Facebook	Education about taxes	MT ranks 23rd lowest among states levying a corporate income tax
Business Equipment tax (Personal Property Tax)	Recent reduction; relatively low (other states)	Per Facebook - data center companies typically avoid jurisdictions that assess personal property tax or lack incentive programs to offset potential property tax liability.	Education about taxes	Competing states with lower or non-existent business equipment tax
Sales tax	There is no sales tax	Drives up dependence on property taxes	Leverage savings from lack of sales tax against other perceived high tax	Competing states with no sales tax

Financial Incentives	Strength	Weakness	Opportunities	Threats
Tax breaks	No sales tax and New and Expanded Industry tax abatement	Not as large as other states tax breaks	Better market no sales tax and New and Expanded Industry local abatement	Expiration or termination
Low interest loans	CDBG, Montana Board of Investments	Loan criteria may limit applicability	Lock in low interest rates	Increasing interest rates, lack of funding from state legislature
State grants	Work force training grants, BSTF	Grant criteria may limit applicability	Possibility of funds made available for public infrastructure, business equipment and more	Removal of funding by the federal government or state legislature

Environment	Strength	Weakness	Opportunities	Threats
Meteorology	Rather benign meteorological environment; cool dry climate	Wildfires	Reduced energy costs from cooling with ambient air	Snow and wind can cause brief disruption of power supply; wildfires
Geology	Benign geology; little to no risk of disaster	Some locations have seismic activity – resulting in higher insurance expenses	Diverse landscapes, beautiful settings, geothermal heating and cooling are attractive	Yellowstone caldera could create a large earthquake or volcanic eruption

Transportation	*Strength*	*Weakness*	*Opportunities*	*Threats*
Highway	Well maintained network of highways	Rural interconnection highways	Safe delivery of goods and workforce	Weather and flooding in remote areas
Interstate	I-90, I-94, and I-15 provide east-west, north-south interstate access with I-90 and I-15 intersecting in Butte	No interstate access in the northern third of the state, however strong highway infrastructure is present	Access to all regional markets	Weather and flooding in remote areas
Rail	Extensive rail network	Much of rail's capacity has gone to oil, coal, and wheat.	Possible decreased rates in empty return loads	Increased shipment of Montana's natural resources decreases rail capacity
Air	8 large commercial airports, 5 Essential Air Service commercial airports, 120 general aviation airports	Limited number of direct flights	Increase market activity by hosting out of state companies' data would increase demand for air service	Other locations provide more direct air service to multiple markets

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[19] Oracle's Analysis on Montana, see appendix H
[20] Facebook MT Analysis for Data Centers, see appendix I