

# **IPFW Innovate Cloud Service Task Force**

## **(Research Findings)**

**Richard & Andrew**

### **Research Objective:**

- 1) Identify possible IT services that have the potential to move to the cloud.
- 2) Gather and compile the needed information on public cloud services and vendors, platforms, service fees, and related key SLA info, etc.
- 3) Gather and compile the needed information on private cloud vendors, system types and platforms
- 4) Design a set of evaluation metrics for Cloud provider/service selection
- 5) Research on available Services monitoring, tools, and vendors/providers for cloud service performance, availability monitoring
- 6) Identify a list of security rules and regulations and related restrictions and potential impact.

1) For this study, the following IPFW IT services can be moved to the cloud:

- Desktops to become Desktops as a Service (DaaS)
- Disaster Recovery and Business Continuity (backups)
- Print Management
- Office Applications
- Webservers / Websites
- SharePoint / Intranet
- Enterprise Applications
- Event and Room Management software
- Document and Record Management software
- Help Desk ticketing software

2) The following cloud services can provide the cloud platform needed for the migration of most of the services mentioned above. Some of the public cloud services provided by the cloud vendors are listed in the table below:

- VMware
- Microsoft
- Bluelock
- Citrix
- GoGrid
- Amazon
- IBM

Table 1: Public cloud vendors and services rendered

Public Cloud service Provider	SERVICES	SERVICE FEES	SLA
<b>VMWARE</b>	<p><b>vCloud Air:</b></p> <ul style="list-style-type: none"> <li>• Dedicated cloud</li> <li>• Virtual Private Cloud</li> <li>• Virtual Private Cloud OnDemand</li> <li>• Disaster Recovery</li> </ul> <p>Desktop and Application Virtualization:</p> <ul style="list-style-type: none"> <li>• VMware Horizon DaaS</li> <li>• VMware Virtual desktop Infrastructure (VDI)</li> </ul> <p>Virtual SAN (Cloud Storage)</p>	<p>Compute: \$5,978/Month Storage: \$720</p> <p>Compute: \$450/Month Storage: \$240/Month</p> <p>1GB vRAM: \$13.29/Month 1 CPU: \$3.41</p> <p>Compute: \$226/Month</p> <p>Standard: \$35/desktop/month Advanced: \$50/desktop/month Enterprise: \$100/desktop/month Hosted Apps Servers: \$600/Hosted Apps Server/month</p> <p>Trial/ Testing Available Pricing available on request</p>	<p>Dedicated Cloud 99.95% Virtual Private Cloud 99.9% Data Protection 99.9%</p> <p>Cloud Hosted Desktop 99.9%</p>
<b>MICROSOFT</b>	<ul style="list-style-type: none"> <li>• <b>Compute</b> Windows Virtual Machines</li> <li>Linux Virtual Machines</li> <li>Cloud Services</li> <li>RemoteApp</li> <li>Batch</li> </ul>	<p>Network Optimized \$4.90/hr</p> <p>Network Optimized \$4.47/hr</p> <p>General purpose \$0.64/hr</p> <p>Standard \$0.20/hr</p> <p>Compute Intensive Instances \$0.03/hr</p>	<p>Free billing and subscription management support Flexible support plans guaranteed 99.95%</p> <p>99.9%</p> <p>.</p>

	<ul style="list-style-type: none"> <li>• <b>Web + Mobile</b> Websites APP</li> </ul> <p>Mobile Services</p> <p>API Management</p> <p>Notification Hub</p> <ul style="list-style-type: none"> <li>• <b>Data + Storage</b> SQL Database (Database as a service)</li> </ul> <p>Document DB(No SQL DB)</p> <p>Redis Cache Storage</p> <ul style="list-style-type: none"> <li>• <b>Networking</b> Virtual Network</li> </ul> <p>ExpressRoute</p> <p>Traffic Manager</p>	<p>Standard \$0.40/hr</p> <p>Basic \$14.99/Month/unit</p> <p>Standard: \$22.55/day /unit</p> <p>Basic: \$10/Month</p> <p>Premum: max 500GB \$5/hr</p> <p>StandardL \$0.73 per day</p> <p>26GB cache size: \$1.05/hr</p> <p>Zone redundant 450 TB/Month \$0.029 per GB</p> <p>High performance VPN gateway \$0.49 per gateway-hour</p> <p>100Mbps : \$872</p> <p>1billion Queries \$0.54 per Million queries</p>	<p>99.95%</p> <p>99.9%</p> <p>N/A</p> <p>99.9%</p> <p>99.9%</p> <p>N/A</p> <p>99.9%</p> <p>99.9%</p> <p>N/A</p> <p>99.9%</p> <p>99.99%</p>
<b>BLUELOCK</b>	<ul style="list-style-type: none"> <li>• Production Hosting</li> <li>• Test-Dev hosting</li> <li>• Complaint Hosting</li> <li>• SAP Cloud Hosting</li> </ul>	<p>Available on request</p>	<p>Uptime Service Level Agreement (SLA) of 99.99%</p> <p>SLA of 99.9%</p> <p>SLA of 99.9%</p>
<b>CITRIX</b>	<p>Citrix Cloud Platform (IaaS)</p> <p>Desktops-as-a-Service</p> <p>Enterprise Software as a service (SaaS): Enterprise Mobility (XenMobile Cloud)</p>	<p>90days trial (Purchase on request)</p> <p>Available on Request (Monthly plan)</p>	

	<ul style="list-style-type: none"> <li>• Collaboration and Support (GoToAssist, GoToMeeting, GoToWebinar, GoToTraining)</li> <li>• Data Sharing (Share file)</li> </ul>		
<b>GOGRID</b>	<p><b>1. Servers</b></p> <ul style="list-style-type: none"> <li>• Dedicated Servers - Standard</li> <li>• Dedicated Servers - Custom</li> <li>• Cloud Servers – SSD</li> <li>• Cloud Servers - Dedicated Disk (RAW)</li> <li>• Cloud Servers - High RAM</li> <li>• Cloud Servers - Standards</li> </ul> <p><b>2. Storage</b></p> <ul style="list-style-type: none"> <li>• Cloud Storage</li> <li>• Block Storage</li> </ul>	<p>Monthly fee  App Server:\$449  Storage Server:\$599  Database server:\$629</p> <p>Large Monthly: \$328.50  \$0.12 per GB</p> <p>XLarge: \$558.45 per Month</p> <p>XLarge: \$262.80 per Month</p> <p>More than 1,000TB \$0.08 per GB  \$0.12 per GB</p>	Guaranteed 100% Uptime SLA
<b>AMAZON</b>	<p><b>Compute (AWS)</b></p> <ul style="list-style-type: none"> <li>• Amazon EC2</li> <li>• AWS Lambda</li> <li>• Amazon ELB</li> </ul> <p><b>Database</b></p> <ul style="list-style-type: none"> <li>• Amazon DynamoDB</li> <li>• Amazon RDS</li> <li>• Amazon RDS</li> </ul> <p><b>Applications Streams</b></p> <ul style="list-style-type: none"> <li>• Amazon Appstream</li> <li>• Amazon Elastic Transcoder</li> <li>• Amazon SNS</li> <li>• Amazon SWF</li> </ul>	Flexible pricing. Available on request	<p>Less than 99.95% but equal to or greater than 99.0%</p> <p>Less than 99.0%</p>

<b>IBM</b>	<p><b>Business Application (SaaS)</b></p> <ul style="list-style-type: none"> <li>• IBM Meeting</li> <li>• Silver Pop- Email</li> <li>• IBM Navigator</li> <li>• IBM mobile web push</li> <li>• Connection clouds</li> </ul> <p><b>IBM Cloud Infrastructure (IaaS)</b></p> <ul style="list-style-type: none"> <li>• IBM Cloud Managed Services</li> <li>• SoftLayer</li> <li>• IBM Cloud Automated Modular Management</li> </ul> <p><b>Developer Platform (PaaS)</b></p> <ul style="list-style-type: none"> <li>• IBM Cloud Managed Services for SAP Applications</li> <li>• IBM Cloud Managed Services for Oracle Applications</li> <li>• Cloud and Hosted virtual Desktop</li> </ul> <p><b>Cloud Security Services</b></p> <ul style="list-style-type: none"> <li>• Cloud Security Assessment</li> <li>• Cloud Security Strategy</li> <li>• Cloud Network Security</li> <li>• Event and Log Management</li> <li>• Vulnerability Management</li> </ul>	Pricing depends on configuration	99.9%
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3) Some of the private cloud solutions provided by the following vendors are given in the table below:

- Amazon
- Rackspace
- VMware
- IBM
- Microsoft

<b>VENDORS</b>	<b>PLATFORM</b>	<b>SERVICE FEE</b>	<b>SLA</b>
<b>Amazon</b>	Amazon Virtual Private Cloud (VPC)	\$0.05 per VPN Connection-hour	N/A

<b>Rack Space</b>	<ul style="list-style-type: none"> <li>• Dedicated VMware vCloud</li> <li>• Microsoft Cloud Platform</li> <li>• Private cloud Powered by OpenStack</li> </ul>	Available on request	Varies based on plan
<b>VMWARE</b>	vCloud Suite <ul style="list-style-type: none"> <li>• Standard</li> <li>• Advanced</li> <li>• Enterprise</li> </ul>	Pricing available on request	On Demand 99.9% -
<b>IBM</b>	Private Cloud Services <ul style="list-style-type: none"> <li>• IBM Cloud OpenStack Services</li> <li>• IBM Private Modular Cloud</li> <li>• Private Cloud Implementation for Flex, PureFlex, Power and System z</li> <li>• Unified Communications Cloud Design and Optimization</li> </ul>	Available only through sale representative	99.9%
<b>Microsoft Private Cloud</b>	<ul style="list-style-type: none"> <li>• SQL</li> <li>• Exchange</li> <li>• SharePoint</li> </ul>		99.9%

4) In this research, the evaluation metric to be considered are as follow:

- I. Financial metrics like ROI, TCO, CBA
- II. Cost or licensing model (metered service or subscription)
- III. Vendor expertise in industry
- IV. Data portability
- V. Availability of the service based on 24x7x365, service level agreement consideration
- VI. Reliability and uptime for mean time between failure
- VII. Response time for service issues
- VIII. Security available and the number of security vulnerabilities and past events
- IX. End user satisfaction with the service
- X. Effectiveness of the service to meet the business need

5) The following cloud management tools can be used to effectively monitor the cloud service performance and availability:

- **Azure Management Portal:** Microsoft offers the Azure Management Portal which monitors Azure's performance and service.
- **ScienceLogic's Hyper Cloud** monitors both public and private clouds by using API's.
- **Monitis** offers cloud monitoring for Amazon, Rackspace and GoGrid among others.
- **IBM SmartCloud monitoring:** It monitors the health and performance of a private cloud infrastructure, including environments containing both physical and virtualized components.
- **Amazon Cloud Watch:** It is a monitoring service for AWS cloud resources and the applications you run on AWS. It can be used to collect and track metrics, collect and monitor log files, and set alarms
- **Citrix AppDynamic:** It provides the ability to monitor and manage your critical cloud-based applications, ensure application performance pre and post-cloud migration, and take full advantage of cloud elasticity with auto-scaling
- **RackSpace Cloud Monitoring tool:** They are quick and powerful way to continuously monitor the entire infrastructure stack, and a customizable level of detail that pinpoints core issues for speedy resolution.
- **Zenoss cloud monitoring:** It offers an effective solution to monitor cloud infrastructure build on Amazon AWS, Microsoft Azure, VMware and other common cloud platform. It provides a unified management visibility and real-time awareness of the entire cloud infrastructure whether using a private, public or hybrid clouds.

6) The following are some of the privacy and data security laws and regulations applicable to cloud computing system [2]

**a. Privacy and Data Security Laws and Regulations:**

**i. Compelled disclosure to the government**

- Electronic Communications Privacy Act (ECPA); Stored Communications Act (SCA): Protects electronic communications while in transit and while held in storage from disclosure.

**Related restrictions:**

- Allows FBI access to certain business records with a court order
- Also provides for use of National Security Letters (form of administrative subpoena) to obtain records
- The law limits the ability of cloud providers to reveal that they received an order

**Impact:**

- Business owners are reluctant to move their data into the cloud for fear of future compromise.

**ii. Data security issues and data breach notification:** These can be inform of the following:

- Family Educational Rights and Privacy Act (FERPA)
- Gramm-Leach-Bliley Act (GLBA)
- Health Insurance Portability and Accountability Act (HIPAA)
- Health Information Technology for Economic and Clinical Health (HITECH) Act
- Sarbanes Oxley
- State Laws and Regulations
- Section 5 of the FTC Act (for companies who will store consumer information on the cloud)

**Federal Solutions to data security issues and breach notification:**

- a. Certain Federal laws and regulations impose industry-specific data security and/or breach notification obligations for cloud providers such as:
  - Financial institutions (GLBA): Financial Services Modernization Act of 1999
  - Educational institutions (FERPA): The Family Educational Rights and Privacy Act (FERPA) is a Federal law that protects the privacy of student education records.
  - Health care (HIPAA and HITECH)
  - Publicly traded companies (SOX)
    - Generally, an entity cannot contract away its obligation to comply with these industry-specific regimes
    - Some of these statutes, however, require an entity to pass these obligations to cloud providers by contract
- b. Federal administrative guidance:
  - White House CIO Council, which released data security guidelines for federal agency use of cloud computing and
- c. Industry standards:
  - Payment Card Industry Data Security Standards (PCI DSS) for credit card data compliance

**State solutions:**

Many states also impose data security requirements on entities operating in the state or who hold data about state residents. These laws differs according to each states.

- State data protection laws
- State data breach laws



**Related restrictions:**

- Some cloud service providers offer —take it or leave it contracts
  - Some cloud providers offer no transparency into their security programs
- Federal Trade Commission has not done a lot in the line of cloud computing

**Impact:**

- Information management and data manipulation become complicated due to all these rules and there is no guarantee that cloud provider can provide 100% compliance.
- iii. There are also institution specific policies to be aware of when implementing cloud technology. Possible IPFW policies include [3]:
- Privacy and Security
  - Administrative Access to LAN User's Information
  - Data Handling Information
  - Electronic Data Protection Policy
  - Employee Privacy Policy
  - Ethical Guidelines for IPFW Information Technology Users
  - IT Related Incident Response Policy
  - Mobile Data Sync Policy
  - Privacy for Electronic Information
  - Student Privacy Policy

## References

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- [2] L. Hogan, "Cloud Computing: A Primer on Legal Issues, Including Privacy and Data Security Concerns." [Online]. Available: [https://www.cisco.com/web/about/doing\\_business/legal/privacy\\_compliance/docs/Cloud\\_Primer.pdf](https://www.cisco.com/web/about/doing_business/legal/privacy_compliance/docs/Cloud_Primer.pdf). {Accessed: 16-Feb-2015}.
- [3] Technology Policies and Procedures, IPFW, [Online] 2015, <http://www.ipfw.edu/offices/its/policies/> (Accessed: 17 Feb. 2015).