DATA CENTER / CO-LOCATION / CLOUD ENTERPRISE FORUM

Data Center Trends 2019 and Beyond

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BRUNS-PAK
DATA CENTER "HYBRID" SOLUTIONS

"Data Center Enterprise Transformation 2019 with Cybersecurity"

Learn about the continues transformation of data center "solutions" in the year 2019 with cybersecurity and beyond!

The data center comprehensive enterprise solution continues to transform in 2019. This includes considerations for cybersecurity. Learn the "elements" and fundamental concepts associated with the continued transformation. Understand what: Board of Directors, Senior Management, Stock Holders, Trustees, and Tax Payers are looking for in their data center solution. A vendor neutral overview of total cost of ownership vs. risk!

AGENDA

I. *The 2019 and Beyond Data Center Trends with Cybersecurity*

II. *Critical Elements of the Hybrid Data Center Enterprise Solution 2019*

III. *The Decision Process of Total Cost of Ownership vs. Risk (Short Term…Long Term)*

IV. *Commentaries/Examples of 2018/2019*

V. *Closing - Summary - Recap*

Part I

The 2019 and Beyond Data Center Trends with Cybersecurity

The 2019 and Beyond Data Center Trends with Cybersecurity

1) **Cybersecurity continues to evolve and moves to forefront of many enterprise data center considerations**
   - ***Brand Impact***
   - ***Financial Liability***
   - ***Responsible Parties***
   - ***Boards/Trustee Concerns***
   - ***Risk***

2) **The transformation of 2019 of data center enterprise solutions encompasses a hybrid approach optimizing total cost of ownership vs. risk**
   - ***Enterprise***
   - ***Co-location***
   - ***Cloud***
   - ***Disaster Recovery***
   - ***Edge Computing***

The 2019 and Beyond Data Center Trends with Cybersecurity

- ***Modular Data Center***
- ***Cybersecurity***
- ***Regulatory/Compliance***
- ***Opex vs. Capex***
- ***Total Cost of Ownership vs. Risk vs. Best Practices***

3) The 2019 evolution of client "leased" enterprise data centers on premise

- ***Opex Expenditure***
- ***30 Year***
- ***Ongoing 24x7 support part of Opex expenditure***
- ***"Pay As You Grow"***

The 2019 and Beyond Data Center Trends with Cybersecurity

4) The impact of consolidated/transforming

- *Co-location Providers*
- *Cloud Providers*
- *Third Party Support*
- *Legal language of "Damages" entering 3rd party provider contracts*
- *Edge Computing and Latency*

5) Considerations of scalability

- *Low Density (1-3 kW)*
- *Mid-Range Density (4-10 kW)*
- *Mid/High Level Range (8-16 kW)*
- *HPC (16-60 kW)*

6) "Candidacy" of different types of data requiring different type of data center enterprise facilities/reliability

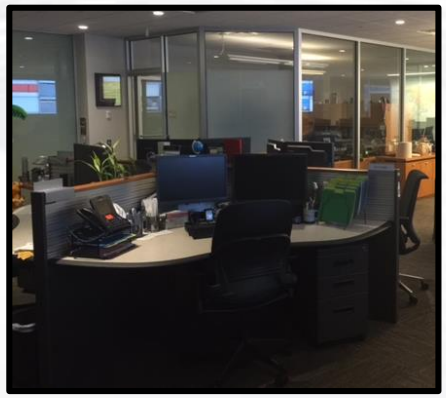
- *Tier I Critical*
- *Tier II*

The 2019 and Beyond Data Center Trends with Cybersecurity

- *Tier III*
- *Tier IV Test/Development*

7) The "Instant Delivery" of goods/services/information and the impact to the data center solution

- *Artificial Intelligence*
- *Work Process*
- *"Brick and Mortor" vs. On-Line*
- *Driverless Vehicles*
- *Education*
- *Payment Methods*
- *Video Conference vs. Travel*



8) Overall impact of cybersecurity

- *? 2018 and Beyond*
- *See 2018 Survey Results*

The 2019 and Beyond Data Center Trends with Cybersecurity

9) European Union General Data Protection Regulation (GDPR)

- *May 2018*
- *Lawful, fair and transparent processing*
- *Limitation of purpose, data and storage*
- *Data subject rights*
- *Consent*
- *Personal data breaches*
- *Privacy by Design*
- *Data Protection Impact Assessment*
- *Data transfers*
- *Data Protection Officer*
- *Awareness and training*

10) California Passes Sweeping Law to Protect Online Privacy

- *June 2018*
- *Can sue companies!*

Part II

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

The Hybrid "2019 Transformation" Enterprise Data Center Elements

FACILITY INFRASTRUCTURE (1)

ENERGY EFFICIENCY/ PROCEDURES/STANDARDS (2)

COMPUTER HARDWARE (3)

EDGE COMPUTING (19)

COMPLIANCE (18)

CYBERSECURITY (17)

LEGAL REPERCUSSIONS (16)

GOVERNMENT/CORPORATE/ UNIVERSITY/NON-PROFIT (15)

MODULAR DATA CENTERS (14)

CAPEX vs. LEASE/OPEX (13)

PERSONNEL (12)

SERVICE LEVEL AGREEMENTS (11)

CLOUD (4) Internal/ External

DISASTER RECOVERY (5)

CO-LOCATION (6)

MIGRATION/RELOCATION (7)

APPLICATIONS (8)

MODULARITY/SCALABILITY /RELIABILITY (9)

COMMUNICATIONS/ NETWORK (10)

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

- ✓ **The critical elements are to be addressed at board/trustee levels:**
  - ***Best Practices***
  - ***Vendor Neutrality***
  - ***Total Cost of Ownership***
    - ***Opex***
    - ***Capex***
    - ***Funding Short/Long Term***
  - ***Modularity/Scalability***
  - ***Risk***
  - ***Schedule of Delivery***
  - ***Cybersecurity Focus***
  - ***Trends***
  - ***Uptime***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

✓ 2019 Continued Evolved Focus

- ***Cybersecurity***
- ***Network***
- ***Compliance/Regulatory***
- ***Damages***
- ***Edge Computing***
- ***Legal Impacts***
- ***Various Levels of Reliability***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

1) Facility Infrastructure

- ***A. Architectural***
- ***B. Civil***
- ***C. Electrical***
- ***D. Fire Protection (EPO Code Change) – Update NEC/NFPA vs. Factory Mutual***
- ***E. Mechanical - CFD Models***
- ***F. Security - Physical***
- ***G. Site***
- ***H. Structural***
- ***I. Geographic Regional Considerations… i.e. southwest hurricanes, west earthquakes, etc.***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

2) Energy Efficiency/Procedures/Standards

A. ASHRAE 9.9 – Higher Inlet Temperatures

- ✓ 80° F
- ✓ 90° F
- ✓ △ t of 20-25° F

B. Containment

- ✓ Hot Aisle
- ✓ Cold Aisle
- ✓ Impact to people

C. DCIM

- ✓ Gartner "Magic Quadrant"
- ✓ Per data centre (UK)
  - *a. Reduction in costs*
  - *b. Integration*
  - *c. Valuable insights*
  - *d. Increased productivity*
  - *e. Environmental benefits*

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

f. Management

g. Envelope

- Applications
- Computer Hardware
- Data Center Facility
- Network
- Data Center Operations

D. CFD Models

- ✓ Why
- ✓ Updates

E. Outside Air to Cool Data Centers

F. Virtualization of Servers

G. LEED – New Data Center Guidelines

- ✓ Written to save "dollars" and be more green
- ✓ Office of Management and Budget to create a strategy
- ✓ DOE and EPA to study server and data center efficiency trends
- ✓ New "data center energy practitioner program"

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

- ✓ New "metrics"
- ✓ Data center LEED guidelines – New – LEED v4

  US Green Building Council (USGBC)

H. ***Unity (close to) Power Factors on UPS Systems***

I. ***Electrical Utility Costs***

- ✓ $.03 per kWh vs. $.12 kWh

J. ***Procedures***

- ✓ Operating
- ✓ MEP
- ✓ Fire Protection
- ✓ Concurrent Maintenance
- ✓ MOP'S / SOP'S

K. ***Standards***

- ✓ Data Center Operating
- ✓ Guidelines

LEED v4 for BD+C: Data Centers

Project Checklist

Project Name:
Date:

Y	?	N			
			Credit	Integrative Process	1

0	0	0	Location and Transportation		16
			Credit	LEED for Neighborhood Development Location	16
			Credit	Sensitive Land Protection	1
			Credit	High Priority Site	2
			Credit	Surrounding Density and Diverse Uses	5
			Credit	Access to Quality Transit	5
			Credit	Bicycle Facilities	1
			Credit	Reduced Parking Footprint	1
			Credit	Green Vehicles	1

0	0	0	Sustainable Sites		10
Y			Prereq	Construction Activity Pollution Prevention	Required
			Credit	Site Assessment	1
			Credit	Site Development - Protect or Restore Habitat	2
			Credit	Open Space	1
			Credit	Rainwater Management	3
			Credit	Heat Island Reduction	2
			Credit	Light Pollution Reduction	1

0	0	0	Water Efficiency		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
			Credit	Outdoor Water Use Reduction	2
			Credit	Indoor Water Use Reduction	6
			Credit	Cooling Tower Water Use	2
			Credit	Water Metering	1

0	0	0	Energy and Atmosphere		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
			Credit	Enhanced Commissioning	6
			Credit	Optimize Energy Performance	18
			Credit	Advanced Energy Metering	1
			Credit	Demand Response	2
			Credit	Renewable Energy Production	3
			Credit	Enhanced Refrigerant Management	1
			Credit	Green Power and Carbon Offsets	2

0	0	0	Materials and Resources		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
			Credit	Building Life-Cycle Impact Reduction	5
			Credit	Building Product Disclosure and Optimization - Environmental Product Decla	2
			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
			Credit	Construction and Demolition Waste Management	2

0	0	0	Indoor Environmental Quality		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
			Credit	Enhanced Indoor Air Quality Strategies	2
			Credit	Low-Emitting Materials	3
			Credit	Construction Indoor Air Quality Management Plan	1
			Credit	Indoor Air Quality Assessment	2
			Credit	Thermal Comfort	1
			Credit	Interior Lighting	2
			Credit	Daylight	3
			Credit	Quality Views	1
			Credit	Acoustic Performance	1

0	0	0	Innovation		6
			Credit	Innovation	5
			Credit	LEED Accredited Professional	1

0	0	0	Regional Priority		4
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1

0	0	0	TOTALS	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

3) Computer Hardware

- ***A. Higher Efficiency***
- ***B. High Performance Computing (HPC) continues to dominate***
- ***C. New Flash Storage***
- ***D. Water cooled to the chip in 2018 and beyond***
- ***E. 52" Deep by 30" Rack!!!***
- ***F. Non-uniform cabinet distribution***
- ***G. "Submerged" systems in cooling***
- ***H. Scale within footprint***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

4) Cloud

- ***A. Managed services***
- ***B. Internal vs. external***
- ***C. Migration to the cloud***
- ***D. Migration Back?***
- ***E. Moves/adds/changes***
- ***F. Trouble shooting***
- ***G. True "partner" of equal financial stability***
- ***H. Downtime: Who Pays? – Evolving 2019***
- ***I. Security Breach: Who Pays? – Dominating 2019***
- ***J. Terms and conditions (Legal Beagles!!!) 2019+ in motion***
- ***K. Production vs. Test/Development***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

L. *Applications conducive to Cloud – General Common Platform – Candidacy*

M. *Where is my data? Who manages? Do you care?*

N. *"New" 2019 United States Legislation – "Company" liability for data – See California*

O. *Speed to delivery of applications*

P. *The 2019 contract language for cloud contracts – cybersecurity / damages*

Q. *Critical vs. non-critical data*

R. *Moves/adds/changes*

S. *Amazon, Microsoft, Google, etc. If interruption – What is impact?*

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

5) Disaster Recovery

A. Synchronous Data Replication

- ✓ **Tier I**
- ✓ **Tier II?**
- ✓ **Tier III??**
- ✓ **Tier IV ??? Test & Development**

B. Distance considerations for Synchronous Data Replication

- ✓ **100± miles**
- ✓ **Latency**

C. Testing of Disaster Recovery Plans

D. Government Regulations

- ✓ **2019**

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

6) Co-Location

- ***A.*** ***Leased data center constructed space***
- ***B.*** ***Capex schedule of delivery minimized***
- ***C.*** ***ROI – see total cost of ownership – 4+?***
- ***D.*** ***Other tenants? – Impact of Security - Dominating 2019***
- ***E.*** ***Downtime: Who pays? - Dominating 2019***
- ***F.*** ***Security Breach: Who pays? - Dominating 2019***
- ***G.*** ***Terms and conditions (Legal Beagles 2019)***
- ***H.*** ***"New" United States Legislation – Progressing – Class action lawsuits?? Settlements***
- ***I.*** ***Financial strength of service providers, survey of "economics" 2018 report – DANGER!***
- ***J.*** ***Moves/Add/Changes***
- ***K.*** ***New 2019 "Internal" self funded co-location "Lease" data center solutions - Trending***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

7) Migration / Relocation

- ***A. Move existing or buy/lease new?***
- ***B. Asset swap outs – seed equipment***
- ***C. General hardware life cycle ± 3-4 years?***
- ***D. Maximize uptime***
- ***E. Multiple phases***
- ***F. Consolidation strategies***
- ***G. Physical cost vs. planning costs (Larger)***
- ***H. Impacts of the network***
- ***I. Move it? – Plan to migrate back? – Resume update!!***
- ***J. Risk of Move***
  - ✓ **Existing**
  - ✓ **Co-location**
  - ✓ **Cloud**
- ***K. Part of Total Cost of Ownership/Risk***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

8) Applications

A. ***Production (Critical) vs. Non-Production Software***

B. ***SPOF Consideration***

C. ***Examples:***

- ✓ **Artificial Intelligence**
- ✓ **Patient Care**
- ✓ **Pharmacy**
- ✓ **Surgical**
- ✓ **Banking**
- ✓ **Stock Trading**
- ✓ **Grading**
- ✓ **Diagnostics**

D. ***Data Analytics – TREMENDOUS! 2019 and Beyond***

E. ***Tier I-IV Applications - Candidacy***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

9) Modularity / Scalability / Reliability

A. ***Optimize***

- ✓ **Computer hardware**
- ✓ **Applications**
- ✓ **Telecommunication (network)**
- ✓ **Facilities**
- ✓ **Service level agreements**
- ✓ **Disaster Recovery**
- ✓ **Cloud/Co-location/Modular Data Center**

Scale with growth!

B. ***Defray CAPEX/OPEX dollars until needed across the board***

C. ***Scale without interruption***

D. ***Reliability past/present/future***

E. ***In house vs. outsource***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

10) Communications / Network – Dominating 2019 and Beyond

- ***A.*** ***Redundant / isolated paths?***
- ***B.*** ***Multiple carriers***
- ***C.*** ***Data breach? Who pays? Significant dominant focus 2019***
- ***D.*** ***Data security? Who is responsible?***
- ***E.*** ***Russian "Impact" to General Elections***
- ***F.*** ***The power of the cloud – iPhone®***
- ***G.*** ***Impact of network loss***
- ***H.*** ***Who manages the network?***
- ***I.*** ***Dominating the news media 2019***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

11) Service Level Agreements

- ***A.*** ***Internal vs. external (client) based***
- ***B.*** ***Government imposed guidelines/performance (i.e. HIPPA, etc.)***
- ***C.*** ***Co-Location / Cloud – 2019 transformation – fine print – Who pays? – How much? – Damages (Legal Beagles 2019!!)***
- ***D.*** ***What does 99.999 availability mean to me when "I go down?"***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

12) Personnel

- ***A. Employee vs. contract personnel***
- ***B. Data Breaches***
- ***C. The Staffing Costs***
- ***D. Why Not Outsource?***
  - ✓ **Share Personnel Costs with Others**
  - ✓ **Share Benefits**
- ***E. Wiki Leaks***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

13) CAPEX vs. OPEX

- **A.** *CAPEX – Capital dollars spent to build/deploy data center across all critical elements*
- **B.** *OPEX – Operating dollar "expense" to financial statements – very attractive*
- **C.** *New trend of internal "OPEX" data center solution 2019*
- **D.** *Cloud/Co-location OPEX?*
- **E.** *Migration Cost – OPEX*
- **F.** *Relocation Cost – OPEX*
- **G.** *Network (Recurring) Cost – OPEX*
- **H.** *Seed Equipment – CAPEX or OPEX*
- **I.** *Total Cost of Ownership vs. Risk*

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

14) Modular Data Centers

- ***A. Speed to Market?***
- ***B. Regulatory Agency Review – AHJ***

  Temporary

  vs.

  Permanent

- ***C. Cost of Pre-Fabricated vs. "Stick Build"***
- ***D. ADA Compliance***
- ***E. High Performance Compute vs. Work Flow***
- ***F. Conducive to Government/Emergency***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

15) Government/Corporate/University/Non-Profit

- ***A.*** ***Data Center Global Initiatives***
- ***B.*** ***The Impact/Goal of being "Green"***
- ***C.*** ***Government regulations to continue to roll-out regarding "Data"***
  - ✓ **Safety**
  - ✓ **Security**
  - ✓ **Liability**
  - ✓ **Storage**
- ***D.*** ***The Role of Downtime***
- ***E.*** ***Parallel – The "Drone" Legislation***
- ***F.*** ***"In the News"***
  - ✓ **Highlights each evening**

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

16) Legal Repercussions

- **A.** ***The most dominant theme of 2019 data center optimization impacting in house vs. outsource***
- **B.** ***The 2016 "Reaction" of 3rd Party Provider "Contracts" (i.e. Cloud/Co-location Companies) to the Liability Issue – Example: $35 per sq. ft. per month to $350 per sq. ft. per month – Trending!!***
- **C.** ***Government fines – No More "Life Lock" – Good Luck! / Class Action Lawsuits***
- **D.** ***Stockholder lawsuits***
- **E.** ***Individual lawsuits***
- **F.** ***Fiduciary responsibility***
- **G.** ***"Non-disclosed" trends***
- **H.** ***GDPR***
- **I.** ***California***

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

17) Cybersecurity – Dominating 2019 and Beyond!

- *5 Types of attacks evolving*

A. *Malicious messages that really look like the real thing.*

B. *Ransomware moves into the cloud and onto your phone*

C. *Point of sale attacks*

D. *Targeting the "1%" individuals – wealth – DANGER! Your Friends!!!*

E. *Espionage and cyberwar*

✓ *CNA HARDY*

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

18) Compliance

- *Data protection compliance – 5 points*
  - ❖ *Personal information protection and electronic documents act*

    PIPEDA

    A. Seeing the personal information
    B. Collecting the record
    C. Considering a complaint
    D. Filing a complaint
    E. Going to court

- *SSAE Standards*
  - *A. SOC 2 Type 2*
    1. *Security*
    2. *Availability*
    3. *Processing integrity*
    4. *Confidentiality*
    5. *Privacy*
  - ❖ *Jatheon Email Archiving Blog*

Critical Elements of the Hybrid Data Center Enterprise Solution 2019

19) Edge Computing

A. ***Edge computing is a distributed information technology (IT) architecture in which client data is processed at the periphery of the network, as close to the originated source as possible.****

B. ***Transmitting massive amounts of raw data over a network puts tremendous load on network resources. In some cases, it is much more efficient to process data near its source and only send the data that has value over the network to a remote data center.****

C. ***Replicate cloud? Not replace.****

D. ***Benefit edge computing ****

- ✓ ***Improves time to action and reduces response time to milliseconds while conserving network resources.***

E. ***Issues****

- ✓ ***Security***
- ✓ ***Licensing***
- ✓ ***Configuration***

*** Tech Target 2/12/18**

Part III

The Decision Process of Total Cost of Ownership vs. Rick (Short Term…Long Term)

The Decision Process of Total Cost of Ownership vs. Risk (Short Term…Long Term)

1) **Most enterprises cognizant of the critical elements.**
2) **Goal of data center solutions is to optimize:**
   - ***A. Best Practices***
   - ***B. Scalability***
   - ***C. Cybersecurity***
   - ***D. Total Cost of Ownership, Opex vs. Capex***
   - ***E. Risk***
   - ***F. Flexibility***
   - ***G. Hybrid***
3) **Risk consideration/impacts**
   - ***A. Networks***
   - ***B. Downtime***
   - ***C. Penalty***

The Decision Process of Total Cost of Ownership vs. Risk (Short Term…Long Term)

- ***D. Compliance/Regulatory***
- ***E. Cybersecurity***
- ***F. Damages***
- ***G. Brand***
- ***H. Minimize "reserve" costs for 3rd party providers***
- ***I. Board liability***

4) The "Me Too" attitude

- ***A. Best Practices***
- ***B. Peer Institutions***
- ***C. Industry Trends***
- ***D. Energy Efficiency***

5) Opex where possible

The Decision Process of Total Cost of Ownership vs. Risk (Short Term…Long Term)

6) **Provide a data center enterprise solution that recognizes and addresses the 2019 and beyond "transformation" elements.**

7) **Leverage the "hybrid" analysis via total cost of ownership vs. risk.**

Part IV

Commentaries/Examples of 2018/2019

Commentaries/Examples of 2018/2019

1) Verizon / Yahoo Announcement

Commentaries/Examples of 2018/2019

2) Gartner analyst - Mr. Dave Cappuccio – VP summarized by Data Center Knowledge

That new role has less to do with managing disparate bits of infrastructure and more to do with selecting the best infrastructure strategy to provide a specific service. The toolbox they can select from includes on premise or colocation data centers and cloud - private, public, or hybrid, on-prem or outsourced.

In addition to the primary data center, that environment is likely to include a secondary data center, some colocation space, a disaster recovery site, DR-as-a-Service, branch-office IT, Software-as-a-Service applications, micro data centers in branch offices, social-networking platforms used by staff, and so on.

- **Latency**
- **Reputation**
- **Service continuity**
- **Performance**
- **Security**
- **Data Protection**
- **Compliance**
- **RTO and DR**

*** 1/4/17 by Yevgeniy Sverdlik**

Commentaries/Examples of 2018/2019

3) **It takes 33 hours to recover from a ransomware attack – 48% said their organizations have been hit by at least one ransomware attack in the last 12 months –** Cyberheist News, November 21, 2016

4) **The top 10 IT issues for education 2018/2019, reiterated in today's report** (*EDUCAUSE 1/18/17*):

1. ***Information security***
2. ***Student success and completion***
3. ***Data-informed decision-making***
4. ***Strategic leadership***
5. ***Sustainable funding***
6. ***Data management and governance***
7. ***Higher education affordability***
8. ***Sustainable staffing***
9. ***Next-generation enterprise IT and***
10. ***Digital transformation of learning.***

Commentaries/Examples of 2018/2019

5) CONGRESS: 'Frankly, the United States is under attack': DNI Coats sounds alarm over cyberthreats from Russia.

- ***DNI Dan Coats tells the Senate Intelligence Committee the U.S. is "under attack" on the cybersecurity front.***
- ***Coats spoke alongside FBI Director Christopher Wray, CIA Director Mike Pompeo and NSA Director Adm. Mike Rogers.***

Director of National Intelligence Dan Coats framed global cybersecurity threats in stark terms on Tuesday, saying: "Frankly, the United States is under attack."

Coats sounded the alarm in opening remarks at a Senate Intelligence Committee hearing on worldwide threats — annual testimony by intelligence chiefs about the greatest dangers to U.S. security.

He said the cybersecurity threats from state and nonstate entities are using technology to target "virtually every major action that takes place" and are one of his "greatest concerns and top priorities."

Russia, China, Iran and North Korea pose the greatest global cyberthreats, but terrorists, criminal organizations and even individuals are engaging in cyberoperations as well, Coats said.

Russia is likely to continue to pursue cyberactions against the U.S. "using elections as opportunities to undermine democracy, sow discord and undermine our values," he said.

Kevin Breuninger | @KevinWilliamB
Published 10:30 AM ET Tue, 13 Feb 2018 Updated 11:59 AM ET Tue, 13 Feb 2018

BRUNS-PAK: Single Point of Failure

BRUNS-PAK
DATA CENTER "HYBRID" SOLUTIONS

The Data Center Single Point of Failure Assessment

Why Your Data Center Needs a Single Point of Failure Study

a single and sometimes small event or failure of a single infrastructure component that can halt your entire data center operation. One example is the cooling system for a data center. Without the cooling system, critical information technology equipment overheats and is rendered useless. A single failed sensor or a ruptured cooling pipe can cause the cooling system to fail and ultimately take out an entire data center.

These events happen in the real world. In 2016, an equipment failure at Delta Airline's Atlanta data center cascaded into a system shutdown, resulting in hundreds of cancelled flights and delaying many others around the world. Lost revenues, refunds, and waived change fees cost the airline millions of dollars over the following week.

When you build a new data center, or maintain one over a long period of time, it is critical to routinely assess the weak links and develop a plan for remediation to prevent a catastrophic failure and major expenses later. The study should be a comprehensive analysis of all infrastructure components that impacts the data center in any way.

SPOF Example Study

When one of the data centers of a global financial company failed, operations were significantly impacted. Despite the actual outage only lasting a relatively short time (about 2 hours), the impacts of the outage were widespread and the recovery period took about half a day. As a result, the client engaged BRUNS-PAK to perform SPOF analysis on the facility where the outage originated as well as all of their data centers in North America to identify areas of risk areas . Although the client has been confident that their facili-ties did not have SPOFs, our analysis demonstrated to them that they did have problem areas, some for example stemming from lack of adequate preventative maintenance and incomplete, outdated or non-existent short-circuit analysis studies.

We provided the client with a risk matrix that identified and prioritized each problem based on potential impact and likelihood of occurrence, along with projected costs to repair each one. Using this data, they were able to develop a long-term capital expense plan to remediate all of the flaws.

Why Trust BRUNS-PAK To Do Your SPOF Study

BRUNS-PAK's experience of over 38 years focusing solely on data centers gives us a unique ability to give you an authoritative account of the potential SPOFs as well as a reliable budget estimate for remediation. Our extensive experience with data centers, servicing many of the top companies around the world, ensures that we won't miss anything and may find things that your team overlooks. We provide services that span all phases of identifying and remediating these issues. We design solutions that do not introduce new problems as we eliminate the old ones. Our ability to provide budget estimates is unique in the industry and helps you develop the plans that you need to move forward. We can help you go beyond simply removing problems by advising you on best practices. All of this is done in a vendor-neutral manner so you get the best option for your situation. We have references from leading companies worldwide.

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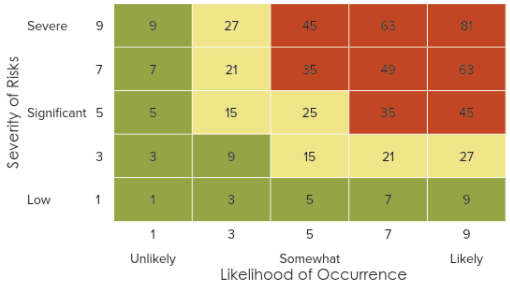
The Data Center SPOF Assessment Process

We provide you with a risk matrix that categorizes the impact and likelihood of every potential SPOF along with an estimate for fixing each one. Our ranking system immediately surfaces the trouble points with the most potential to take out your operations, allowing you to prioritize the repairs and plan for capital expenses. Our team examines your data center operations with a comprehensive view that includes.

Data Center Single Point of Failure Assessment

Exposure	Severity of Risk	Likelihood of Occurrence	Combined Risk
Data center "short/long term" projected computer equipment growth			
Electrical power infrastructure			
Mechanical "cooling" infrastructure			
Fire detection/suppression infrastructure			
Site/facility infrastructure			
BMS (building management system)/controls infrastructure			
Preview electrical/mechanical "incident reports"			
Review procedures for maintenance/trouble shooting			
Commissioning reports			
Short circuit coordination studies			
Lifecycle equipment reports			

Risk Matrix



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BRUNS-PAK: Life Cycle Assessment

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The Data Center LifeCycle Assessment

Why Your Data Center Needs a Lifecycle Assessment

The complexity of a data center makes the ongoing lifecycle management daunting. In addition to managing the lifecycle of the IT Equipment to keep up with current technology and your everchanging business requirements, one must also consider the underlying infrastructure equipment (cooling systems and power systems) that support them. In some cases, if one piece of this critical support equipment fails, it could cost you valuable business and money. That is why it is critical to manage the lifecycle of your data center equipment in a way that optimizes performance while reducing downtime by performing a thorough lifecycle assessment.

A comprehensive assessment should identify any ongoing equipment maintenance issues, as well as leverage energy efficiency with new technology and other potential ways to save money on operating costs. It can provide you insight into if certain equipment/components are beyond their recommended lifecycle replacement windows or at extreme exposure/risk to interruption of the ongoing data center production environment. In addition, an assessment can identify whether or not certain equipment/components are longer supported by manufacturer and/or spare parts availability.

Lifecycle Assessment Example

Let's review an example. A healthcare company experienced a change in personnel and needed a cohesive understanding of their data center infrastructure. They turned to BRUNS-PAK to complete a data center facility infrastructure life cycle assessment to gain better understanding around where there were specific exposures and risk associated with components that were beyond the recommended time frame for replacement. In addition, their lease was expiring on their data center and they needed a short/long term (1/3/5/10 year) program/expense forecast for a planned/scheduled lifecycle replacement program.

The client chose to work with BRUNS-PAK because of our proven process in developing and issuing data center lifecycle assessment for our clients that encompasses information technology's short/ long term and reliability plans, including vendor neutrality, best practices, design/build budget estimates and schedules with "phased" implementation recommendations, and a total cost of ownership vs. risk management analysis.

Why Trust BRUNS-PAk to Perform Your Lifecycle Assessment

BRUNS-PAK works with organizations to strategize and implement nimble, cost effective approaches to deploying and managing IT and facility infrastructure. With more than 6,000 completed projects in 38 years and an unmatched record of success, we have helped clients across all industries, including higher education, finance, insurance, healthcare, shipping, retail, manufacturing, and government, by creating robust design/build solutions for mission-critical data centers that balance ultra-reliability with QoS demands, storage challenges, environmental responsibility, energy efficiency, and capital cost control. BRUNS-PAK has perfected the best practices for IT professionals to assess the health and next steps for their data center strategy and plan.

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The Data Center Lifecycle Assessment Process

The lifecycle assessment should be completed for each of your organization's data centers over 3 years in age. You should recertify your data centers on an annual basis. During our assessment, we will review each of the following areas and provide a health check rating on a scale for 1 to 10. If you pass, we will certify your lifecycle assessment so your organization can prove compliance and data integrity.

BRUNS-PAK experts work on-site to review all of the equipment and processes used in your data center. We then provide a thorough written assessment encompassing the electrical/fire protection/mechanical infrastructure.

Data Center Lifecycle Assessment

Electrical	EOL Date	Health Score
Transformers		
Automatic transfer switches		
Switchgear		
UPS (uninterruptible power supplies)		
Batteries		
Generators		
Power distribution units		
BMS controls		
REPO (remote emergency power off)		
Mechanical		
Cooling towers		
Chillers		
Pumps		
Data center computer room units		
Filter		
Heat exchangers		
Fire Protection		
Detection		
Suppression		
Controls		
Interface		

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BRUNS-PAK: Data Center Facility Consolidation Assessment

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The Data Center Facility Consolidation Assessment – Optimizing the Process of Cloud/Co-Location Migration

Why Your Enterprise Needs a Data Center Facility Consolidation Study

The migration to cloud/co-location data centers over time create an interesting dynamic regarding the remaining data center consolidation strategy. The data center(s) that are to remain/be consolidated for the "short/long" term have varying degrees of uptime associated with the criticality of operations. Many times the designated consolidated data center electrical/mechanical infrastructure requires "improvements" in reliability and consolidation of space in order to optimize the efficiency.

A comprehensive data center consolidation assessment should be performed during the "cloud/co-location' multiple year strategy to identify the options/alternatives/ efficiencies associated with the remaining "data center assets". It can provide you and your senior management with the latest trends, best practices, options, total cost of ownership, and risk factors associated with optimizing the consolidation. The consolidation assessment is correlated to the short/long term cloud/co-location strategy and provides a flexible/modular approach and concept.

Data Center Facility Consolidation Study – Optimizing the Process of Cloud/Co-Location Migration – Example

Let's review an example. A global fortune 100 company determined that their ten (10) year data center enterprise study included an aggressive cloud/co-location migration initiative. The cloud/co-location strategy included consolidation of five (5) enterprise data centers to two (2). The client had identified critical application that would be designated for the enterprise consolidated data centers for the initial five (5) to seven (7) year plan. A result, the client engaged BRUNS-PAK to perform a data center facility on identifying the optimal two (2) data centers to be designated for the consolidation.

We provided the client with a comprehensive assessment of each of the five (5) prospective data center "consolidation" targets after understanding/interviewing the client team regarding their proposed application/hardware short/long term concepts and uptime reliability requirements. BRUNS-PAK "interpolated" all of the above information technology data into data center facility infrastructure requirements. The BRUNS-PAK process than systematically reviewed each of the five (5) potential data center consolidation candidates and make the recommendation for optimal two (2) sites. The recommendations were made based on best practices, vendor neutrality, total cost of ownership, and risk.

Why Trust BRUNS-PAK to do your Data Center Consolidation Assessment

BRUNS-PAK's thirty-nine (39) years of focusing and evolving comprehensive state of the art, vendor neutral, best practice enterprise data center solutions remains a top priority. Our extensive experience in understanding and processing the optimal data center 2019 and beyond "hybrid" solutions encompassing cloud, co-location, enterprise, and network avail our clients/stockholders/taxpayers to an optimized state of the art return on investment while minimizing risk. The BRUNS-PAK process of integrating information technology with facilities is a proven methodology that produces results.

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The Data Center Facility Consolidation Process

The data center facility consolidation assessment is performed in conjunction with the overall data center enterprise strategy. BRUNS-PAK's process encompasses addressing the software applications and corresponding computer hardware platforms/network designated for the "short/long" term residency of the consolidated sites. Ultimately this analysis transforms to the impact to the designated consolidated data centers and/or improvement. Our BRUNS-PAK team process encompasses a consolidation view that includes:

Data Center Facility Consolidation Contents

Section	Description	Topic
I	Executive Overview	Engagement Summary Report Objectives, Critical Exposures, Recommendations
II	Data Center Reliability Considerations	Redundancy Fault Tolerance Maintainability Uptime
III	Data Center Planning Considerations	IT Growth, IT Candidates Consolidation/Enterprise/ Cloud/Co-Lo
IV	Architectural Elements	All
V	Electrical Systems	All
VI	Mechanical Systems	All
VII	Lifecycle Analysis	All
VIII	Fire Protection Systems	All
IX	Physical Security	All
X	Network	Current Status, Reliability, Consolidation, On-Site vs. Off-Site
XI	Conclusions	Comprehensive

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Part V

Closing – Summary - Recap

Thank You!

Mark Evanko – Principal

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