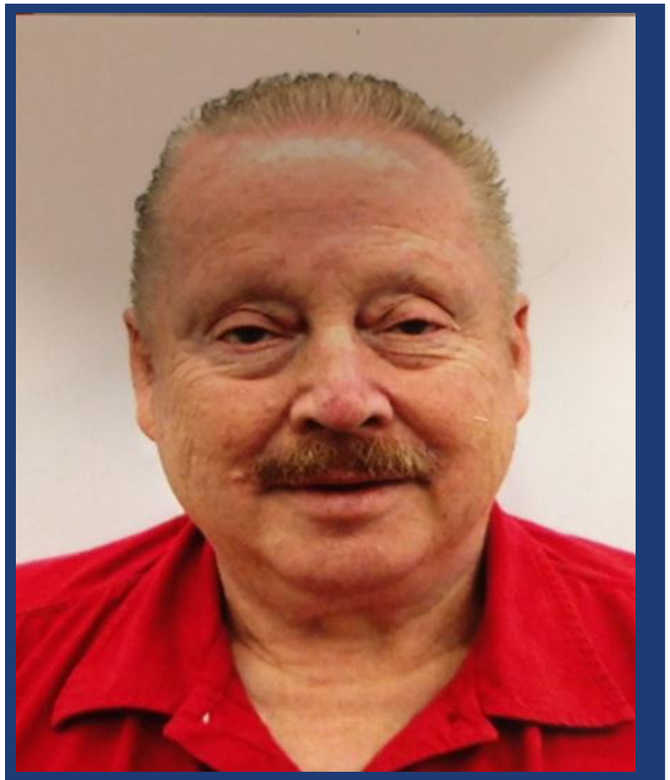
Data Center Site Selection



- **Robert “Bob” Kelley Jr.**
- **RCDD DCDC OSP WD NTS**
- **Principal Consultant**
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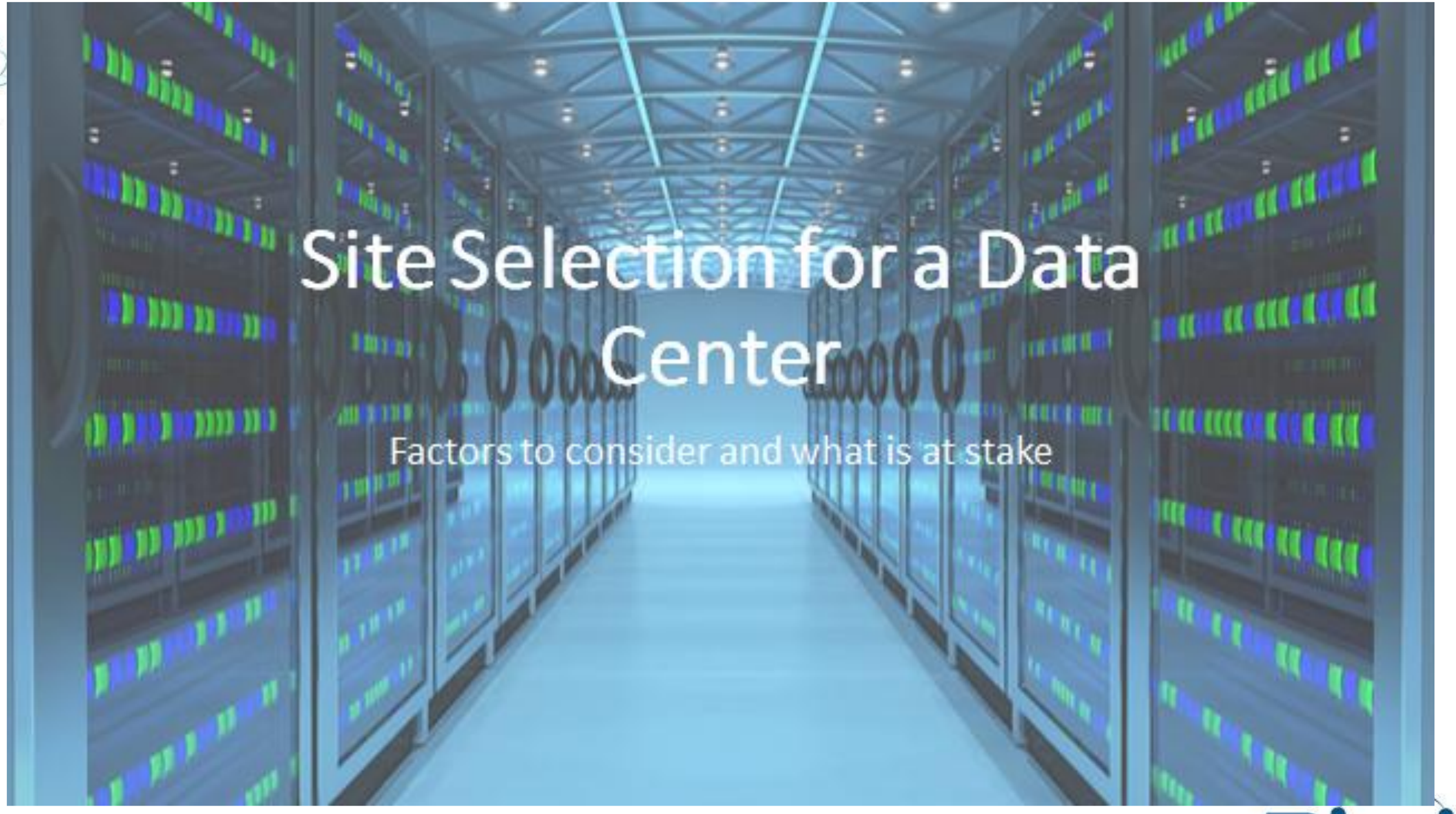


Site Selection for a Data Center

Factors to consider and what is at stake

Bicsi

Importance of site selection

Bad location can cost money more than the Data Center earns.

Datacenter away from users causes latency

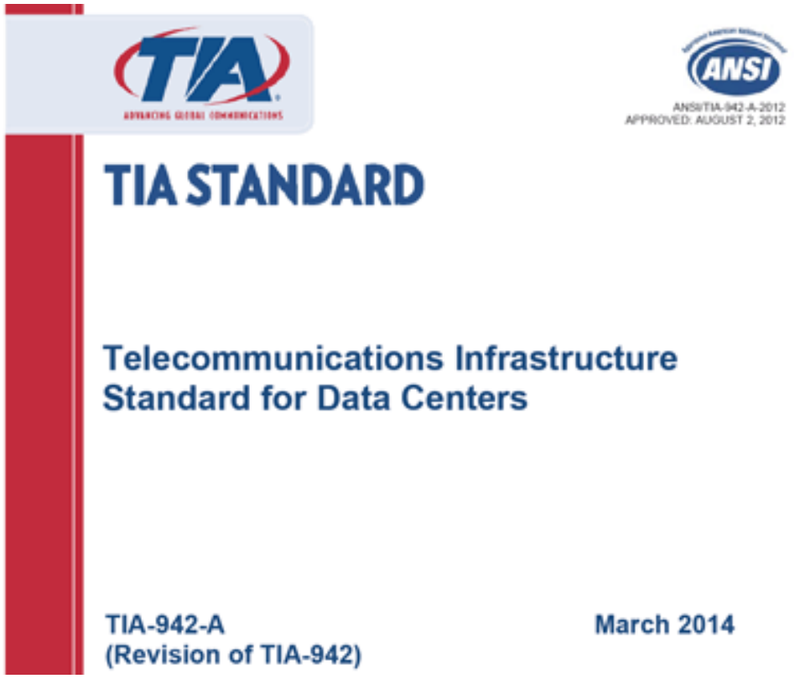
Clients demand hugh uptime

Taxes and operational costs add-up

Threat of natural disasters is real

References for Data Center Site selection

TIA-942 Annex F –Site Selection

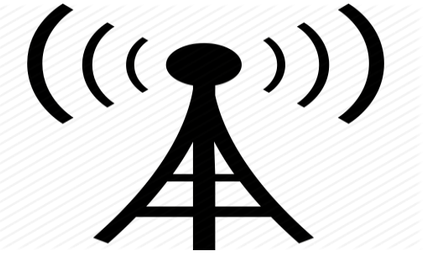


BICSI 002 Section 5 Site Selection

Check availability of resources

Ensure that skilled and educated workforce is easily available

Uninterrupted year-around power supply is a must for datac enters



Reliable high-speed network must be in close vicinity. Preferably multiple networks.

Bad site equals Bad investment

- Poorly selected site is bad for investment
- Unsustainable data center is financially not viable
- Failure in selecting a good site is a costly mistake to make
- Mistake once made, generally cannot be remedied without relocation
- Disruption in service delivery or server downtime is very expensive.

Learn from mistakes of others

- Data center outage cost Delta Airlines $150 million in three days, which was caused by an equipment-failure (Sverdlik, 2016).
- Sears lost $2.2m due to data center outages (Pletz, 2013).
- An AT&T datacenter went offline during Hurricane Sandy which caused websites of the Huffington Post, Gawker, Buzzfeed and Halifax to go down (Preez, 2012).

Cost of data center outage

- Cost of data center outage grew by 38% in 5 years according to study conducted by Emerson and Ponemon Institute (McMorrow, 2016).
- Data center outage costs $9,000 per minute (McMorrow, 2016).
- Customers of datacenter get dissatisfied and can migrate to other datacenter operators.
- If the uptime is not up to the industry standards, datacenter operator may need to lower the prices to get customers.

Networks in Neighborhood

- Network is essential for a data center
- Important to check the infrastructure of network
- Verifying services that can be offered by the network provider
- Ensuring high connection speeds and low latency

Power Infrastructure

- A datacenter requires uninterrupted power supply year-long as it cannot operate without power supply and losses of service disruption are immense (ANSI, 2005).

Ensuring continuous backup power supply to avoid service disruption

Minimizing risk by selecting a location that does not experience power failure factors

Procuring power at a fair price as datacenters consume lot of electricity

Factors to Avoid

High corporate taxes

High property prices

Social or Political instability

Terrorism active or civil war zone

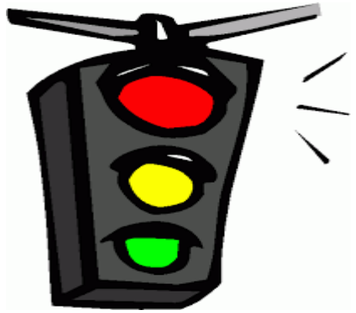
Corrupt government system

Economic instability

Close proximities to avoid

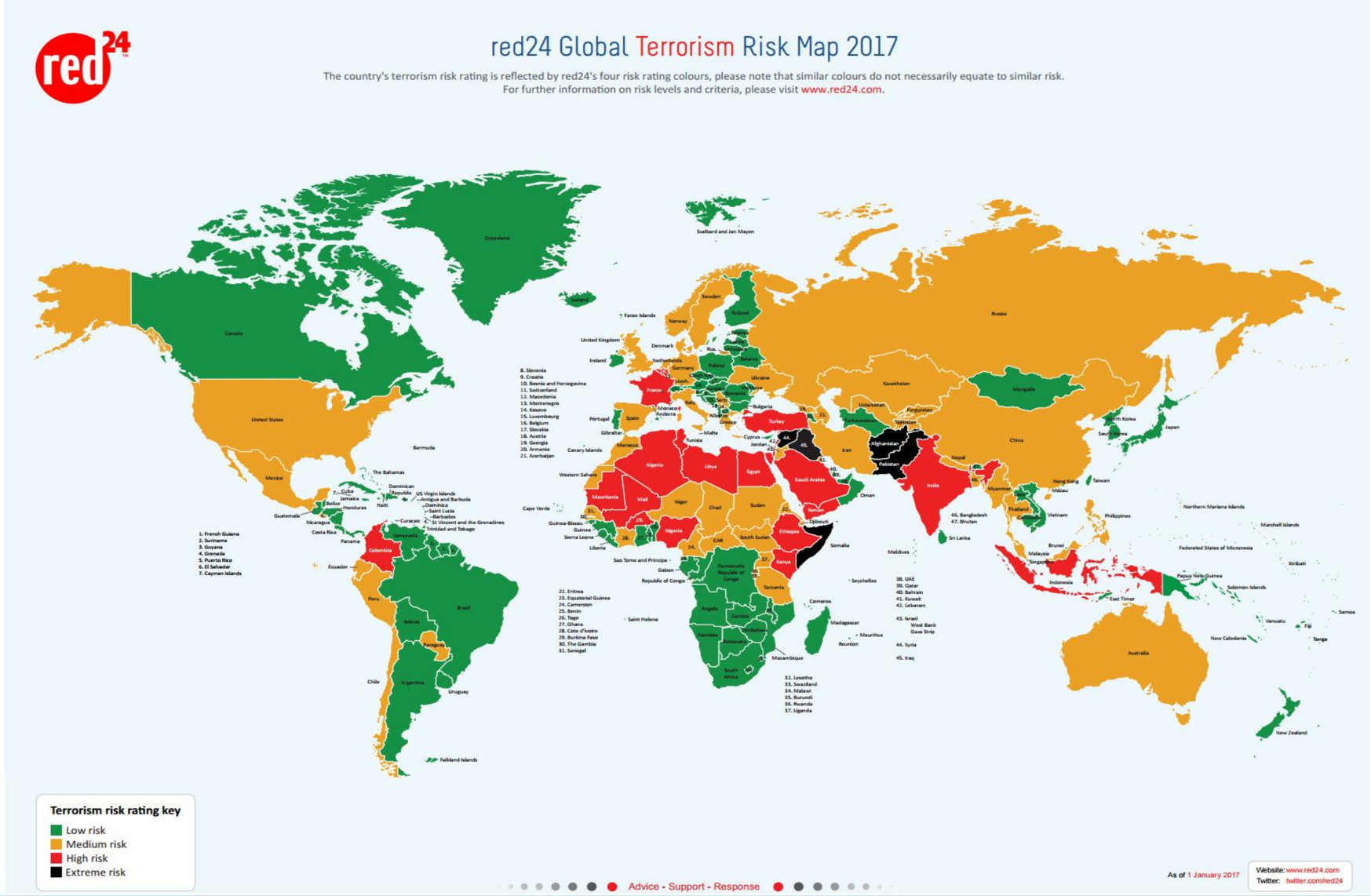
Embassy and public offices as they have higher risk of attacks

Buildings with fire hazards as they can lead to blasts and uncontrollable fire



Highways and direct traffic to avoid a freak accident that can damage datacenter

Global Terrorism Risk Areas



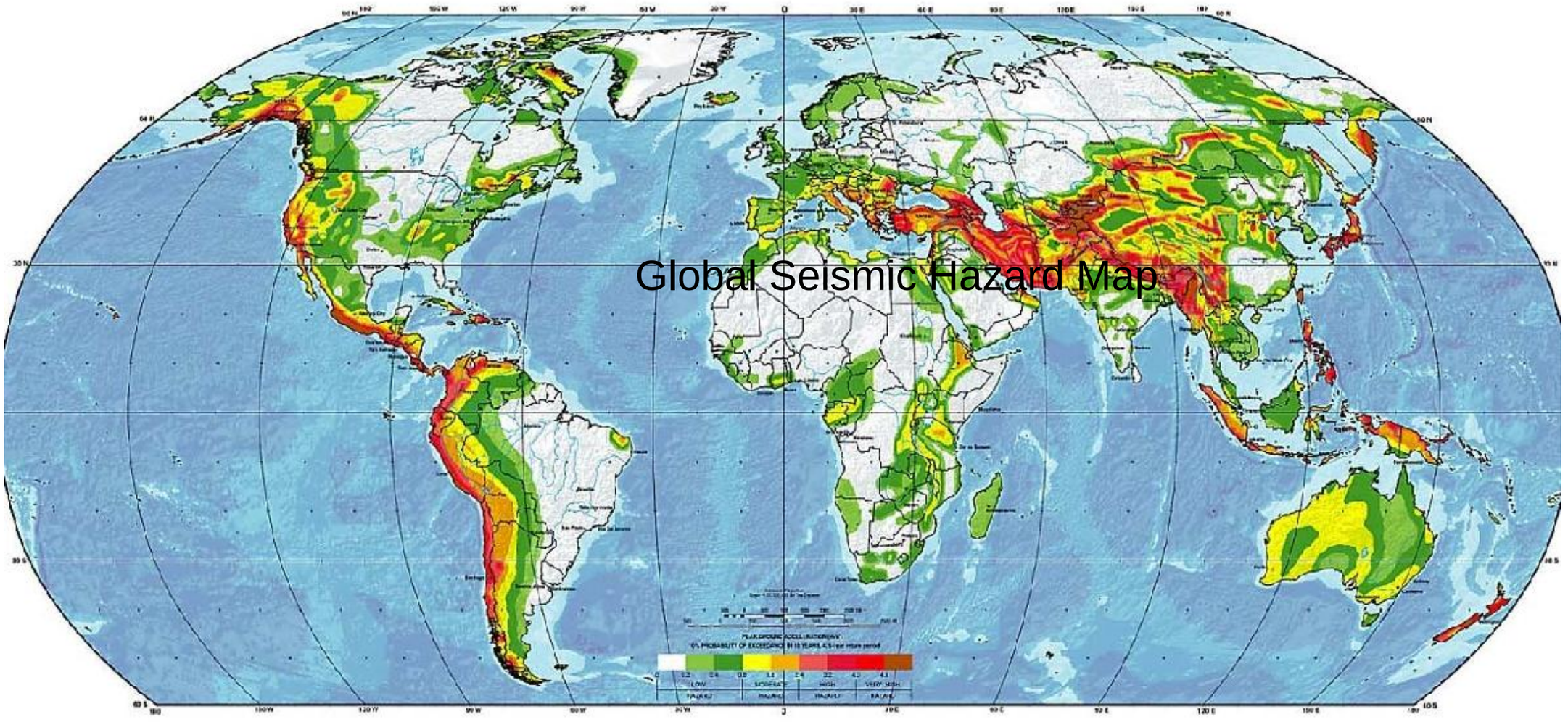
Geography Matters

- An area prone to natural disasters is a bad choice for datacenters.
- Hurricanes, floods, wildfires and earth-quakes are very damaging to operations of a datacenter (Daim, Bhatla and Mansour, 2013).
- Site must be in close proximity with large population area to serve more people with better speed and low latency (ANSI/BISCI, 2011).

Preparing against earth-quakes

- A location with high seismic activity cannot always be ignored.
- In a country like Japan, datacenters must get established in areas with high earth-quake probability.
- Datacenters can be reinforced to withstand major earth-quakes
- Enhanced structural design and effective power management helps mitigate risk of damages from earth-quake (Daim, Bhatla and Mansour, 2013).

Global Seismic Hazard Map

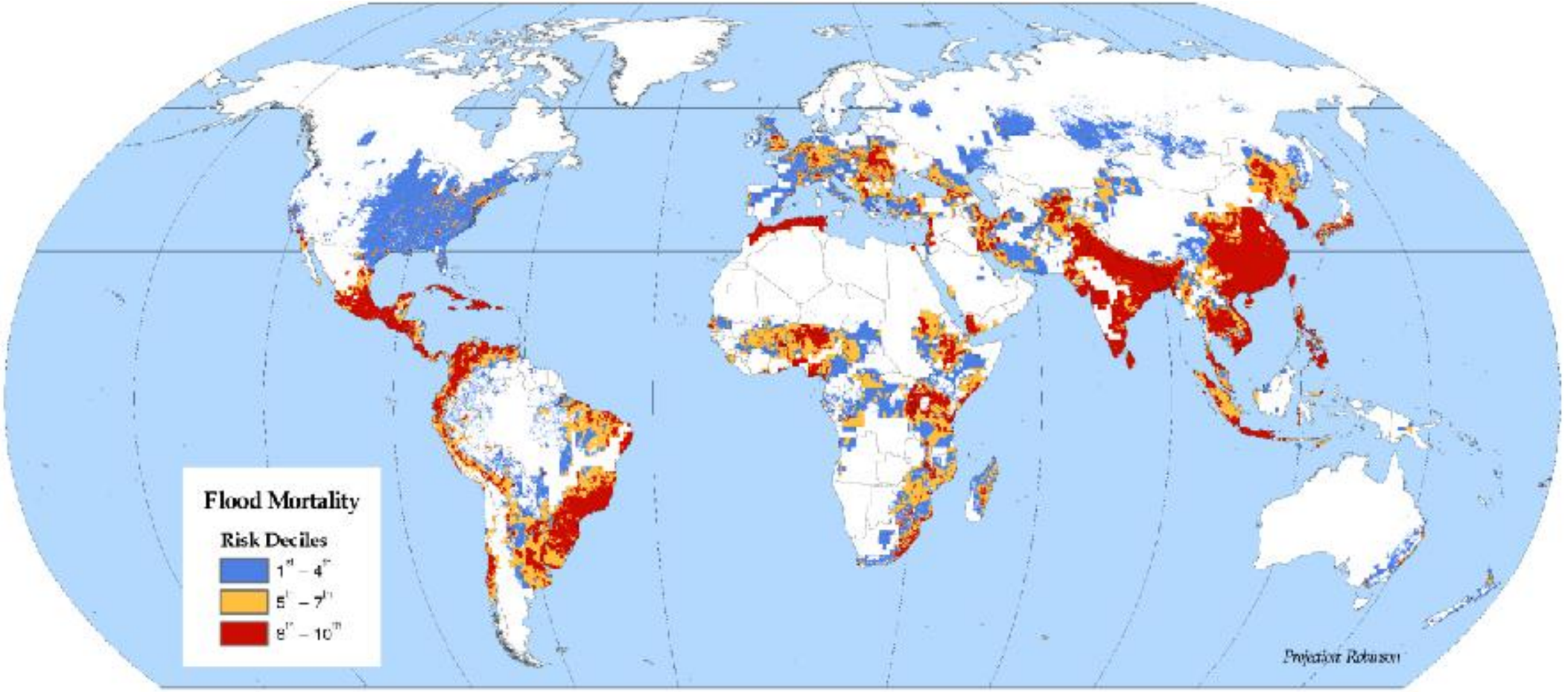


Server room with seismic isolation floor in East Japan Great Earthquake disaster March 11, 2011

Results of failure

Impact of an earth-quake on a datacenter

Global Flooding Hazard



Environmental conditions

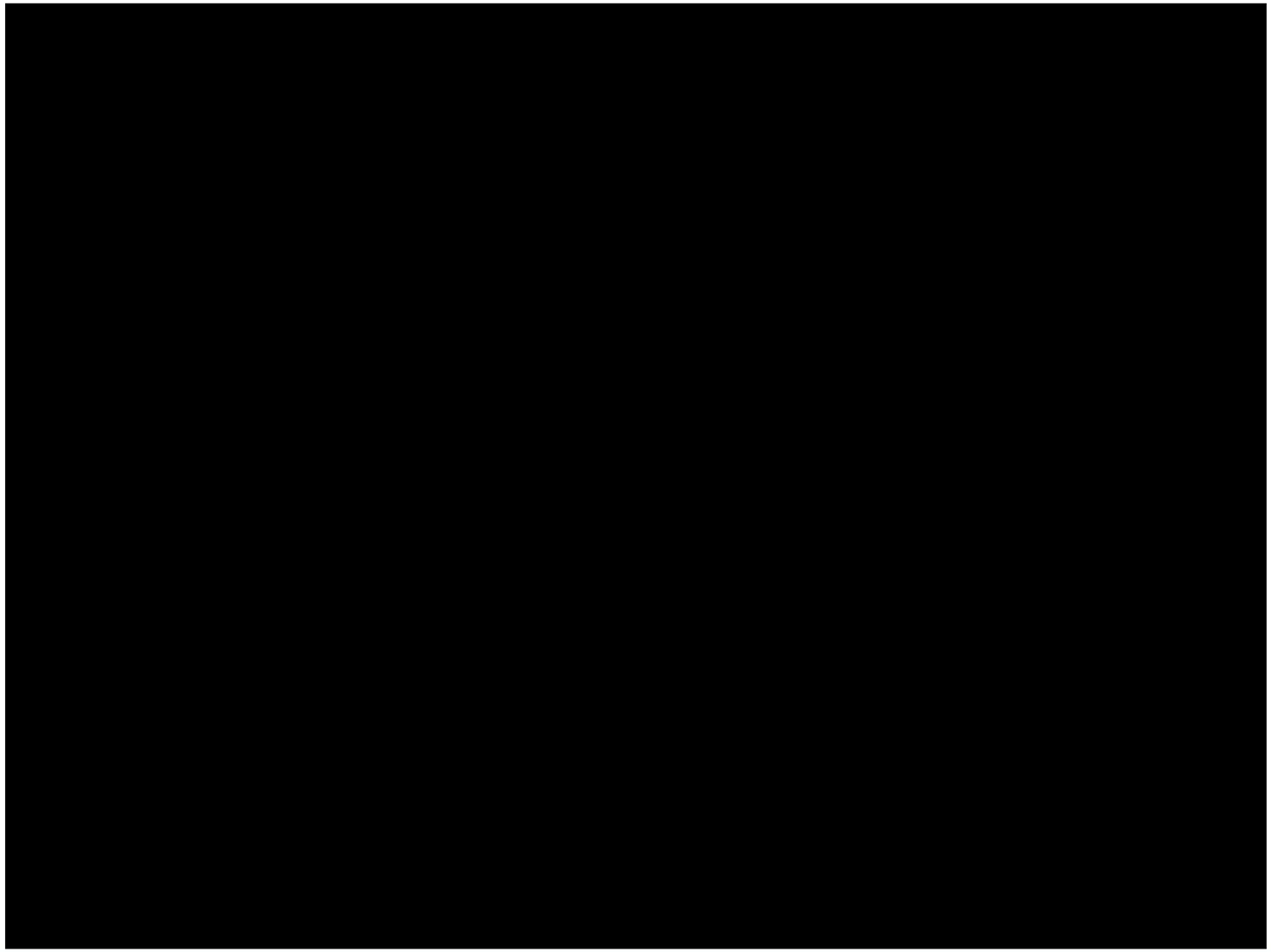
- Heavy rainfall, snowfall and storms are bad for data centers
- Hot environments demand higher use of cooling for data center
- Dry and cold environments are most suitable

Excessive hot sites require more cooling

Moist sites are bad for equipment

Snowfall and snowstorms can harm datacenter efficiency

Flooded Data Center



VODAFONE TURKEY FLOOD

(Servers are under water!)

Results of failure

Floods can completely destroy a datacenter and cause irreparable damage

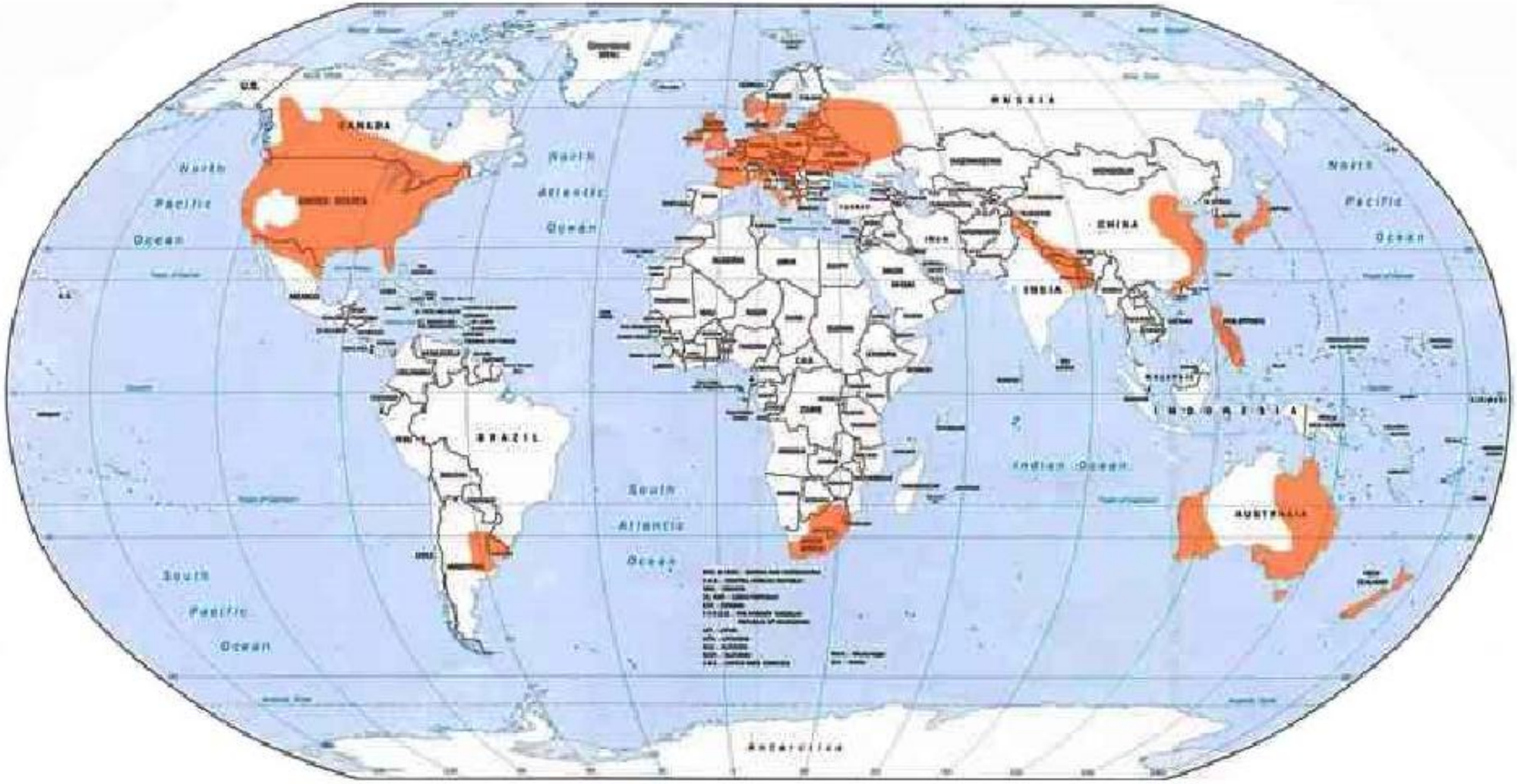
Results of Failure

Example of Sandy Hurricane where fuel barrels are kept open in vulnerable state, raising risk of explosion

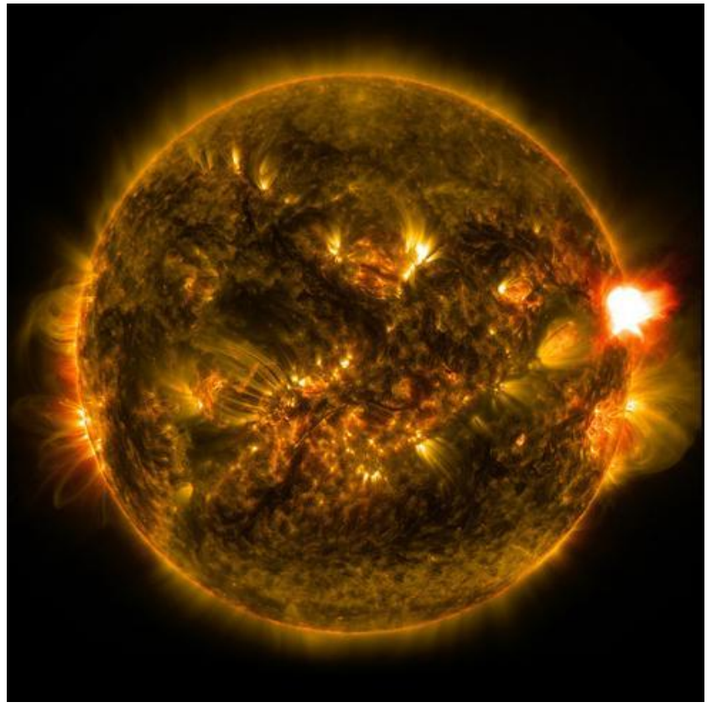
Results of failure

A road accident can disrupt services of a datacenter greatly if close to a road

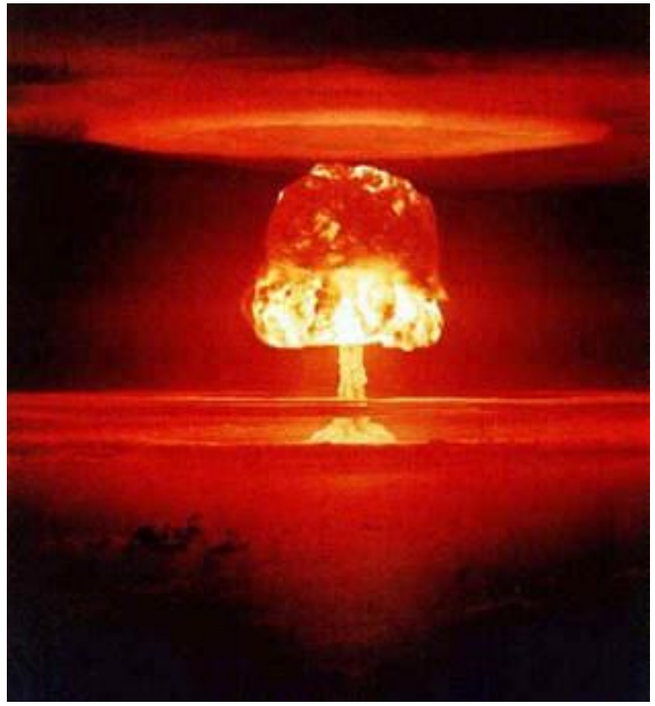
Global Tornado Risk Areas



Catastrophic Electromagnetic Pulse “EMP”



Sun Flair "CME"



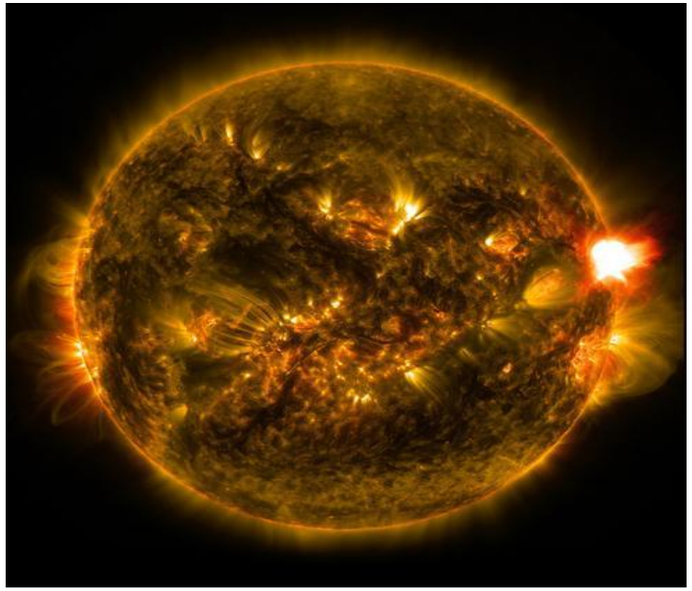
Nuclear Explosion

Solar storm threat

- Solar storms can cause loss of data in datacenters.
- Solar storms are impossible to predict and very difficult to protect from.
- These storms cause damage by means of Electro Magnetic Pulses (EMP).
- Solar storms impact all areas facing the sun equally, making its role in site selection minimalistic.

Risks of Solar Flair

- In September 1859, there was a massive Solar flair discovered by Robert C Carrington.
- Auroras seen were so intense that people could read in their light.
- Intensity of solar flair caused telegraph centers to catch fire
- A solar flair of same intensity today would disrupt satellites, servers and all communication devices.



Solar flair Coronal Mass Ejection

Carrington Flair September 1859.

- Auroras seen in the tropics
- In US so bright people could read newspapers at night from the auroras light.
- Caused fires in telegraph stations
- Today an solar event of this magnitude will disrupt or destroy power grids, satellites and communications facilities

Solar Flair of March 1989

- Quebec power grid disabled. 12 hour blackout.
- Racskpace Data Center lost all power, $3.5 Million refunds.
- Auroras seen in the Florida and Cuba

Near miss July 2014

- Bigger then the Carrington Flair
- Intersected the earths orbital plane at a point one week after the earth passed the point.
- Has it been a direct hit, estimated recovery costs $2 Trillion!

Carrington class CME Narrowly Misses Earth

How much is the Risk of a solar event?

- The Chance of a Carrington magnitude flair hitting the earth in the next 10 years is estimated to be 12%
- Odds of winning the Powerball lottery one in 292 Million
- Odds of a Carrington Event Magnitude Solar Flair in next week (average out over the century) one in 26 Thousand
- It is 11 Thousand times more likely that we will have a Carrington magnitude glair then picking a winning Powerball ticket!

Mitigating the effects of a major ENP on the Data Centers

- Design to minimize damage and permit rapid restoral
- Regular Operational Changes
- After a Warning – What to do????
  - Nuclear 12 – 15 minutes warning
  - Solar CME 36 - 36 Hours warning
- After warning, what should the data center operator do to minimize damage to the center?

References

ANSI/BISCI (2011). *Data Center Design and Implementation Best Practices*. BICSI, pp.82-88.

ANSI (2005). *Telecommunications Infrastructure Standard for Data Centers*. [ebook] ANSI/TIA-942-2005: TELECOMMUNICATIONS INDUSTRY ASSOCIATION, pp.80-83. Available at: https://manuais.iessanclemente.net/images/9/9f/Tia942.pdf [Accessed 20 Nov. 2017].

Daim, T., Bhatla, A. and Mansour, M. (2013). Site selection for a data centre – a multi-criteria decision-making model. *International Journal of Sustainable Engineering*, 6(1), pp.10-22.

McMorrow, V. (2016). *Emerson Network Power Study Says Unplanned Data Center Outages Cost Companies Nearly $9,000 Per Minute*. [online] Vertivco.com. Available at: https://www.vertivco.com/en-us/about/newsroom/corporate-news/emerson-network-power-study-says-unplanned-data-center-outages-cost-companies-nearly-$9000-per-minute/ [Accessed 18 Nov. 2017].

Pletz, J. (2013). *The price of failure: Data-center power outage cost Sears $2.2M in profit*. [online] Crain's Chicago Business. Available at: http://www.chicagobusiness.com/article/20130604/BLOGS11/130609948/the-price-of-failure-data-center-power-outage-cost-sears-2-2m-in-profit [Accessed 18 Nov. 2017].

Preez, D. (2012). *Inside AT&T's Hurricane Sandy disaster recovery operation*. [online] ComputerworldUK. Available at: https://www.computerworlduk.com/it-management/inside-atts-hurricane-sandy-disaster-recovery-operation-3416619/ [Accessed 18 Nov. 2017].

Sverdlik, Y. (2016). *Delta: Data Center Outage Cost Us $150M*. [online] Data Center Knowledge. Available at: http://www.datacenterknowledge.com/archives/2016/09/08/delta-data-center-outage-cost-us-150m [Accessed 18 Nov. 2017].

Thank You!!

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