Overview of Largest Data Centers

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Previously presented overview of some of the largest US data centers

Several assumption were made in the original study

- Building assumed to be square
- Examining satellite photo indicate most building are rectangular likely due to HVAC requirements so actual length can be little longer
- 3 Years ago Google Mayes county with ~1000,000 sq-ft was the largest known data center but now there are several comparable size data center
- SuperNAP Las Vegas with 2,200,000 sq-ft is the largest known operating data center and more than twice largest Google data center

Bigger building may translate to longer fiber runs!

* Data provided here is as is, there is no guarantee on their accuracy as it relies on 3rd party articles and/or estimate.
Google Mayes County vs SuperNAP Las Vegas

Google Mayes County
Some Facts About Mega Data Center Trend

- Google has \(~14\) data centers around the world consuming 260 MW or 0.01% of total power capacity on the planet
- As of July 2013 both Google and Microsoft each have in the 900k-1000k servers
- SuperNAP Las Vegas based on Dell Scorpion pulling in 35 kW/rack
  - SuperNAP is located in Las Vegas for having least amount of natural disasters
  - Las Vegas also is a hub for dark dark fiber from .COM era
  - At power density of \(~1400\) W/sq-ft the challenge is cooling Vegas
- Standard Facebook storage rack has power capacity of 8 kW
  - Facebook uses 3 tiered storage with total storage capacity of 100 PB.
* Dana Hull, San Jose Mercury News, April 22 2011

** Status as of April 2011

*** Longest Run Estimated to be = 2*√(area)=603 m

# Tulsa Times May 3 2007 states 1.4M Sq-ft plant assume data center is 70% of plant

## Various media reported likely size to be ~500K Sq-ft

### Median size of data centers in US 190000 sq feet

### Longest run assuming 190000 sq feet area =√(area)=132.9 m
Largest operating data center grow from ~ 1M sq-ft to 2.2M sq-ft

Longest cable length grow from 600 m to 900 m
- Longest cable when Langfeng Data Center become operation will be ~1.5 km

Longest Run Estimated to be = 2*√(area)=603 m
- A typical rectangular building will have slightly longer cables

Median size of data centers grow from 190000 sq-feet tp 225000 sq-ft

Median longest run assuming square building grow from ~130 m to ~145 m.
Equinix has 83 data centers worldwide to head to head in term of area with Microsoft
- Equinix website state 5.8 M sq-ft of data center but adding all the data centers only sums to 3.3 M sq-ft

Equinix are moderate size
- Expect cable distribution to be bi-modal
- 100 m within one data center or vault
- 1-2 km to adjacent building
Longest Run Estimated to be = 2*v(area)=300 m
- A typical rectangular building will have slightly longer cables

* Total area for each city was only provided to calculate each size of each Bldg it was estimated based on the ratio of Bldg power capacity to total power to calculate the Bldg size.

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How Big Are They

- **Total floor space for top operator is ~29 M sq-ft**
  - The total power consummation assuming if all operated at 1400 W/sq-ft would be ~41 GW!
  - The networking related PD could be ~10 GW and ~ 5 GW could be SerDes+Opics PD and directly impacted with what we do in .bs!
Without Efficiency Improvement the Total (PON, Router, Transport) Projected Power Consumption Could be ~1/3 World Power Generation

* Energy Consumption, Rodney Tucker, Photonic IO Conference, Santa Fe 2012
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Summary

- During 802.3bm study phase an SMF reach of 500 m was more than adequate to address nearly all data center but no longer is the case
  - Minimum reach needs to be 1 km with target of 2 km
  - A 2 km reach will also address building to building application

- In 2011 Google was the 1st to build a data center with area of ~1M sq-ft several time larger than other operating data centers
  - SuperNAP in Las Vegas with area of 2.2M sq-ft takes the crown
  - In 2014 there are numerous data center approaching or even larger than 1 M sq-ft
    - Building ~1 M sq-ft data center is now the norm
    - Bigger is better

- With data centers power dissipation growing exponentially power dissipation has to be a key metric in .bs.
References

- Dana Hull, San Jose Mercury News, April 22 2011
- http://www.datacenterknowledge.com
- http://www.equinix.com