Top 10 Areas for Industry Attention in 2019

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TOP 10 AREAS FOR CLOSE ATTENTION IN 2019

• What should data center owners, managers, & operators expect?

• Which innovations will make a difference?

• Where are problems & challenges likely to emerge?
Drilling Down for the Sake of Time…

1. Big Cloud builds push the ecosystem to its limits
2. Worried governments step up oversight & regulation
3. The transition to distributed resiliency will not be smooth
4. Edge data center hype outruns deployment
5. Connectivity is king: Operators work to build the fabric
6. Skills shortage will force new strategies
7. Climate change forces fresh review of resiliency planning
8. Economics will drive acceptance of data center AI…eventually
9. Growing threats will necessitate new ‘zero-trust’ approaches
10. “Programmable power” unlocks efficiencies, agility
1. Big Cloud Builds Push the Ecosystem to its Limits

- Hyperscale demands push suppliers, builders, power to the limits

- Big cloud has encouraged:
  - customized designs
  - placement of contract facilities staffing
  - custom (& low cost) IT
  - co-engineering of facility equipment
  - wholesale & multi-tenant capacity

- In some regions, demand may strain/outpace supply – for power, staff, real estate, connectivity, equipment, components, water, other resources
The Great Buildout

Data center UPS power (net MW, global)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total 91,188 MW</th>
<th>Total 114,796 MW</th>
<th>Total 141,671 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>17%</td>
<td>24%</td>
<td>30%</td>
</tr>
<tr>
<td>2020</td>
<td>21%</td>
<td>22%</td>
<td>21%</td>
</tr>
<tr>
<td>2023</td>
<td>62%</td>
<td>54%</td>
<td>49%</td>
</tr>
</tbody>
</table>

**Cloud**
CAGR 18.3%

**Multi-tenant**
CAGR 7.9%

**Enterprise**
CAGR 3.4%

Hyperscalers include:
Alibaba, Amazon, Apple, Facebook, Google, IBM, Microsoft, Oracle, SAP, Tencent

Hyperscalers lease capacity to:
- supplement growth
- rapidly establish presence
- create PoPs for customer on-ramps
- test new markets (some lease for all <1MW requirements as policy)

Source: 451 Research Data Center Monitor, Q2 2018

Uptime Institute Research, 2018
2. Worried Governments Step Up Oversight & Regulation

• Governments globally are concerned about
  › The profits & power of large IT companies
  › National dependency on invisible infrastructure…
  › Market power of major players

• The result:
  › More government vigilance
  › More law suits & investigation
  › More oversight
  › More regulations
  › More taxes
## Select Regulations, Taxes & Potential New Initiatives

<table>
<thead>
<tr>
<th>JURISDICTION</th>
<th>RULE</th>
<th>INTENDED EFFECT</th>
<th>KEY DATE</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>California (US)</td>
<td>Statewide Net Neutrality</td>
<td>Limits advantages and disadvantages “pipes” owners can provide content providers</td>
<td>Enacted September 30, 2018</td>
<td>Effective date is blocked by litigation filed by the US federal government</td>
</tr>
<tr>
<td>Russia</td>
<td>Draft Law: On an Autonomous Internet System</td>
<td>The bill calls for placing the domains .ru and .ph under government control and would make installation of the Russian state surveillance system SORM mandatory</td>
<td>Bill drafted May 27, 2016</td>
<td>Not yet advanced, subject to revision</td>
</tr>
<tr>
<td>UK</td>
<td>Discussion Paper: Building the UK financial sector’s operational resilience</td>
<td>The discussion paper seeks input on ways to improve the effectiveness of IT resiliency in the UK financial services sector.</td>
<td>NA</td>
<td>Intended to address IT resiliency shortcomings that have caused recent IT outages in the UK’s financial sector, possibly via a framework.</td>
</tr>
<tr>
<td>European Union</td>
<td>Network and IS Directive</td>
<td>Combat cybercrime</td>
<td>Enacted August 1, 2016</td>
<td>Member States have to transpose the Directive into their national laws by May 9, 2018 and identify operators of essential services by November 9, 2018</td>
</tr>
<tr>
<td>China</td>
<td>New Security Directive</td>
<td>Prevent “the spread of illegal and harmful information”</td>
<td>Effective November 30, 2018</td>
<td>Requires social media businesses, online forums, video services and search engines to routinely collect detailed user information and to establish systems for reporting this information to the police when requested</td>
</tr>
</tbody>
</table>
3. The Transition to Distributed Resiliency Will Not Be Smooth

- Outages will continue as more applications & services are supported on a low-cost base
- Incidents at big operators show the complexity of:
  - distributed & replicated databases
  - global traffic management systems
  - embedding availability zones into service offerings
- M&E & network failures can cause IT problems that cascade across a network
- Painful lessons will be learned as the industry evolves to a more distributed approach

24% of survey respondents say outage incidents impacted services delivered from multiple data centers
69% single site
7% did not know
4. Edge Data Center Hype Outruns Deployment

• The explosion in demand for small, edge data centers is coming – but not yet

• Issues with security, costs, business models, integration, networking, & 5G rollout will hold back large-scale deployments

• Micro data centers promise to meet new edge demands for:
  › efficient upgrades of network closets
  › supporting IoT data analysis, storage, & resiliency in smart factories, buildings, etc.
  › next-gen nodes for 4G & 5G (very fast, sub-4ms latency)

• 2019 will not be the breakthrough year
  5G, driverless cars, immersive & augmented reality, & AI not yet mature

• Ownership & control of small facilities & edge networks has to yet settle into a clearly investible pattern
5. Connectivity is King: Operators Work to Build the Fabric

• Demand for fast, private & secure network connections to trading partners & cloud operators continues to grow

• Large operators & suppliers of SDN fabrics are working to become essential providers in a software-driven, distributed world

• New SDN fabrics & partnerships are likely
  › Colos & network-aaS specialists to collaborate

• Greater competition should – over time – lead to lower-priced, more dynamic connections
Interconnection Bandwidth Forecast

Bandwidth = total capacity provisioned to privately & directly exchange traffic, with a diverse set of counterparties & providers, at distributed IT exchange points inside carrier-neutral colo data centers.

Source: “Global Interconnection Index, Volume 2,” Equinix, September 2018, Page 6
6. Skills Shortage Will Force New Strategies

• Even with automation & AI, staff shortages are set to intensify
• Operators -- especially big ones -- will work to diversify the talent pool, with new initiatives, hiring strategies, & new workforce training
Finding Qualified Candidates is a Challenge for Many

22% We had recent staff cuts (within the last two years).
14% We are expecting staffing cuts.
17% We are having difficulty retaining staff, as they are being hired away.
38% We are having difficulty finding qualified candidates for open jobs.
36% None of the above.

Staffing: Please select any of the following statements that apply

Uptime Institute's global annual survey of data center operators, 2018, n=538
Ops & Management, Security Roles are Hardest to Fill

What disciplines or skill sets are most needed in your organization to support IT infrastructure? Select areas of expertise that are particularly critical and difficult to hire for:

Uptime Institute's global annual survey of data center operators, 2018, n=526
7. Climate Change Forces Fresh Review of Resiliency Planning

• The risks associated with climate change may be more varied & extensive than IT planning had previously anticipated

• Rising seas, higher & frequent floodwaters, more violent storms, & other effects may obsolete data center risk assessments of three or five years ago

• Reassessment should:
  › focus on coping with flooding or drought, high winds, & warmer temperatures
  › involve local govt, utilities, & telcos with local DR plans
  › include multi-site IT resiliency planning when essential services may be unavailable for an extended time
Many are not Adapting to Climate Change Risk

- **45%**: We are not adapting to climate change impacts at this time.
- **33%**: We are re-evaluating technology selection (i.e. evaporative cooling, free cooling hours) based on shifting temperature ranges, water availability, etc.
- **26%**: We are rigorously reporting IT/Data Center energy and carbon to corporate sustainability.
- **19%**: We are preparing for increased severe weather events.
- **14%**: We are re-evaluating site selection based on higher temperatures, increased flooding, or water scarcity.
- **11%**: We are taking steps to mitigate increased flood risk.

Is your organization revising policies and/or planning to revise data center policies to adapt to climate change?

Uptime Institute's global annual survey of data center operators, 2018, n=709
8. Economics Will Drive Acceptance of Data Center AI…Eventually

- AI-based approaches to analyzing risk & efficiencies will be proven at scale
- DCIM-based cloud services (DMaaS) will drive mainstream acceptance of AI
- Existing focus has been on use cases that deliver tangible savings:
  - shortening alarm lead times & root-cause analysis
  - improving PUE
  - optimizing utilization levels
- Predictive maintenance & peer benchmarking have been stand-out developments – more coming in 2019...
  - failure-rate predictions
  - budgetary impact modeling
  - supply-chain forecasts
  - modeling of design changes & configurations
AI Use Cases in Data Centers

Industrial Automation
- Best-placement recommendations
- Peer benchmarking
- Design & configuration modeling
- PUE optimization
- Efficiency analysis
- Demand forecasting
- Capacity Planning
- Risk Analysis

Risk-mitigation scenario planning
- Automated break/fix services
- Predictive maintenance
- Failure-rate prediction modeling
- Incident tracking & analysis
- Anomaly Detection

Perception Automation
- Language translation
- Speech recognition
- Image recognition
- Facial recognition

Engagement Automation
- Equipment sound analysis
- Equipment firmware updates
- Customer segmentation
- Churn analysis
- Chatbots
- Virtual assistants
- Fraud analysis

7x24 Carolinas & Atlanta Chapters 2019 SUMMER MEETING

- Security vulnerabilities to corporate IT now encompass mission-critical facilities
- As data centers become smarter & more connected, the threats grow
  - IP-based controls & equipment
  - vendor support of BMS/BAS & equipment
  - more cloud-delivered operational services
- Newer threats include
  - site location details published (Wikileaks published a 2015 list of Amazon’s, claims of others on the dark web)
  - claims of Chinese “spy chips” on Supermicro motherboards
- Organizations can take nothing on trust
  - more stringent policies for equipment, services, contractors, suppliers, staff
  - conditional-access policies – granting access to specific network resources only if certain conditions are met (time of day, location of access, etc)
10. “Programmable Power” Unlocks Efficiencies, Agility

- Software innovation, switches & Li-ion batteries enable power capacity to be pooled & managed
- Reserves of power may be matched to SLAs or immediate needs
- Analytics identifies opportunities to reduce power consumption or sell to the grid
- Customers test products, big suppliers getting involved
Two For The Road

• Expect impacts from cloud build out, worried governments, security concerns, staffing shortages, & (in some regions) climate-change effects

• Interconnections & AI a reality for many in 2019, if not already; edge & software-defined power… probably not yet
Thank You! Questions?