

Compute the total cost of building a data center that houses 10 ExaBytes of HDD.

Factors to consider –

- HDDs
- Networking
- Racks
- Building (real-estate),
- Power
- Cooling etc

4U box –

Cost : 20,000 \$ per unit

1 '4U box' can hold 64 HDD

Storage in 1 '4U' box = 64 X 8 TB

Number of 4U boxes required = 19,532 units

Totals cost = 20,000 X 19,532 = 390,640,000 \$

=====

48U Rack –

1 Rack can hold up to 10 '4U' units



Tripp Lite SmartRack SR48UB Rack (ventilated)

\$1,545 [online](#)

★★★★★ 1 review

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Black · 27.7 in x 47 in x 95 in

Tripp Lite's SR48UB SmartRack enclosures are designed for secure, high density server and networking applications in IT environments. Designed with provisions to integrate cooling, power distribution and cable management, SmartRack enclosures make ideal homes for mission-critical ... [more »](#)

Tripp Lite SmartRack SR48UB Rack (ventilated)

1545 \$

Storage in 1 rack = 10 X 64 X 8 TB

(number of \$U boxes in 1 rack X number of HDDs in 1 4U box X storage in 1 HDD)

Number of racks needed = $[10 \times 10^{18} / (10 \times 64 \times 8 \times 10^{12})] = 1954$

Number of racks needed = 1954

Total cost for racks 1545 \$ X 1954

3,018,930 \$

Total cost 393,658,930 \$

4U chassis -



ARK Ark Technology Inc.

ARK IPC-4U600 Black 1.2mm SECC Zinc-Coated Steel 4U Rackmount Server Chassis 3 External 5.25" Drive Bays

★★★★★ (42) | [Write a Review](#)

In stock.

- 3 External 5.25" Drive Bays
- 1 80mm Fans 1 120mm Fans

1 Chassis / 1 Rack

Number of 4U Chassis required = 1954

Total cost = 1954 X 87.99 \$

171,932.46 \$

Total cost = 393,658,930 \$ + 171,933 \$

393,830,863 \$

Networking –

Intra rack communication : Infini band switch

A network switch (also called switching hub, bridging hub, officially MAC bridge) is a [computer networking device](#) that connects devices together on a [computer network](#), by using [packet switching](#) to receive, process and forward data to the destination device. Unlike less advanced [network hubs](#), a network switch forwards data only to one or multiple devices that need to receive it, rather than broadcasting the same data out of each of its ports. [Source – Wikipedia]



Mellanox InfiniScale IV IS5022 QDR InfiniBand Switch – 1665.99 \$ X 2 X 1954

(Cost per unit X number of units needed per rack X number of racks)

Total cost = 6,510,728 \$

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Inter rack communication : Access switch



Cisco Meraki Cloud Managed Switch MS220-48 Switch - 48 ports - managed

\$2,559 [online](#)

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48 - 9.7 lbs - 19.1" x 17.3" x 1.7"

The Cisco Meraki Cloud Networking architecture enables Plug and Play branch deployments and provides centralized visibility and control across any number of distributed locations. The Cisco Meraki MS is the industry's cloud managed switch, combining the benefits of cloud-based ... [more »](#)

1 Access switch / 40 racks

Number of units required = 1954 / 40 = 49 units

Cost = 49 X 2559 \$ = 125,391 \$

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Total cost = 6,636,119 \$

Land :

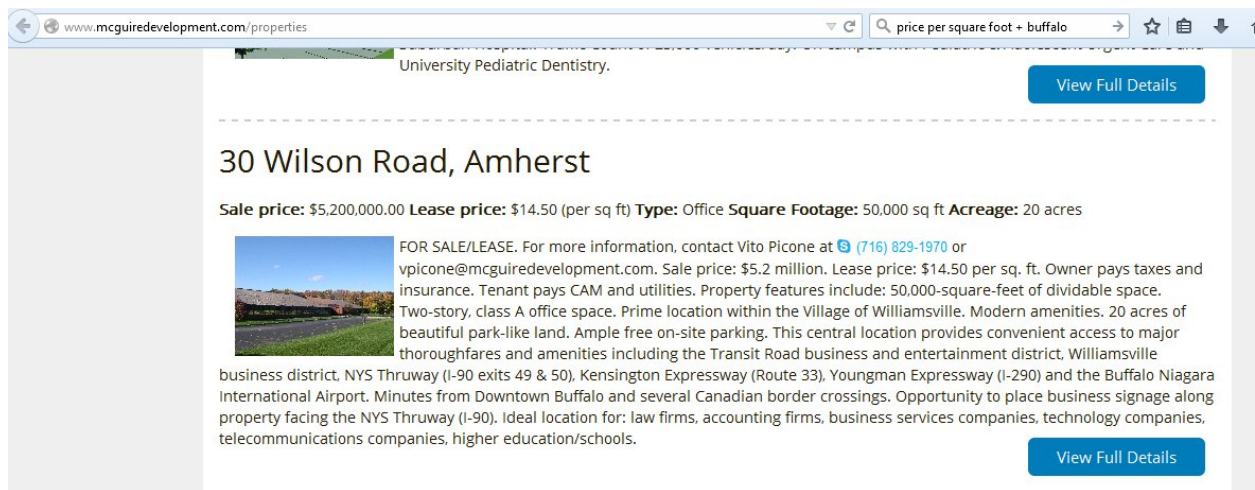
Dimension of 1 rack : 27.7 in X 47 in X 95 in

Area occupied by all the racks = $27.7 \times 47 \times 1954 = 2,543,912.6$ sq inches = 17,667 sq feet

Provide adequate gaps between racks and include area for other facilities.

Total area = 35,334 sq feet

Lease : Avg price per sq foot for business in Buffalo - ~ 14.5 \$ / sq ft / year



The screenshot shows a web browser window with the URL www.mcguiredevelopment.com/properties. The page displays a property listing for "30 Wilson Road, Amherst". The listing includes the following details: "Sale price: \$5,200,000.00", "Lease price: \$14.50 (per sq ft)", "Type: Office", "Square Footage: 50,000 sq ft", and "Acreage: 20 acres". A small photograph of the property is shown on the left. The text describes the property as a two-story, class A office space with 50,000-square-feet of dividable space, located in the Village of Williamsville. It mentions modern amenities, 20 acres of beautiful park-like land, and ample free on-site parking. The location is described as central, providing convenient access to major thoroughfares and amenities including the Transit Road business and entertainment district, Williamsville business district, NYS Thruway (I-90 exits 49 & 50), Kensington Expressway (Route 33), Youngman Expressway (I-290), and the Buffalo Niagara International Airport. It is noted as being minutes from Downtown Buffalo and several Canadian border crossings. The listing also mentions the opportunity to place business signage along the property facing the NYS Thruway (I-90). The ideal location is listed as: law firms, accounting firms, business services companies, technology companies, telecommunications companies, higher education/schools. There are two "View Full Details" buttons on the page.

University Pediatric Dentistry.

30 Wilson Road, Amherst

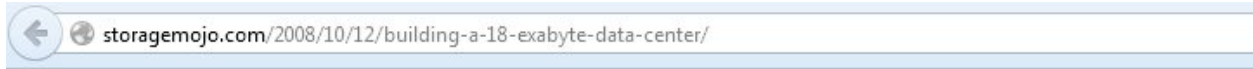
Sale price: \$5,200,000.00 **Lease price:** \$14.50 (per sq ft) **Type:** Office **Square Footage:** 50,000 sq ft **Acreage:** 20 acres

FOR SALE/LEASE. For more information, contact Vito Picone at (716) 829-1970 or vpicone@mcguiredevelopment.com. Sale price: \$5.2 million. Lease price: \$14.50 per sq. ft. Owner pays taxes and insurance. Tenant pays CAM and utilities. Property features include: 50,000-square-feet of dividable space. Two-story, class A office space. Prime location within the Village of Williamsville. Modern amenities. 20 acres of beautiful park-like land. Ample free on-site parking. This central location provides convenient access to major thoroughfares and amenities including the Transit Road business and entertainment district, Williamsville business district, NYS Thruway (I-90 exits 49 & 50), Kensington Expressway (Route 33), Youngman Expressway (I-290) and the Buffalo Niagara International Airport. Minutes from Downtown Buffalo and several Canadian border crossings. Opportunity to place business signage along property facing the NYS Thruway (I-90). Ideal location for: law firms, accounting firms, business services companies, technology companies, telecommunications companies, higher education/schools.

Total cost = $35,334 \times 14.50 \$ = 512,343 \$$

Power :

(Includes cooling)



At \$500/sq. ft. the data center would cost an additional \$60 million. YMMV.

Oh, and redundancy is extra.

Power

The drive's operational power consumption is 10 watts. Drives alone eat 20 megawatts. Side note: disk power consumption is the reason that storage vendors find differentiation on power consumption elusive.

Assume 1 250W server for every 100 drives means another 5 MW for servers – a low-side estimate. Leaving aside network infrastructure and lighting, the HVAC load for 25 MW is around 12.5 MW, according to some rules of thumb.

Let's round up and call it 40 megawatts. You'll want to locate this facility near the Columbia River to get cheap hydropower – maybe next door to Google in The Dalles, Oregon.

I haven't deciphered BPA power pricing, but I'd guess 40 MW would run about \$2 million a month. Copan, much less.

Power required for a 1.8 Exa byte data centre = 40 MW

(approx) power required for a 10 Exa byte centre = 40MW X 5 = 200 MW

Electricity rates in Buffalo –

https://power2switch.com/NY/Buffalo/			price per square foot + bu		
\$ 37 BUFFALO ELECTRIC RATES					
Plan Name		Plan Length	Rate		
Champion Energy Champ Saver-12		12 months	\$0.09872 / kWh		
Just Energy Buckeye 12 Price Guard		12 months	\$0.0735 / kWh		
Just Energy Buckeye 24 Price Guard		12 months	\$0.076 / kWh		
Champion Energy Green Energy-12		12 months	\$0.095275 / kWh		
Bounce Energy Express Move 6		6 months	\$0.089 / kWh		
ConEdison Solutions 12 Month Wind		12 months	\$0.1316 / kWh		
Just Energy 1-Year Price Protection		12 months	\$0.115 / kWh		
Bounce Energy Terrific 12		12 months	\$0.065 / kWh		
Bounce Energy Terrific 12		12 months	\$0.066 / kWh		
TriEagle Energy Green Eagle 9		9 months	\$0.089 / kWh		
Constellation 12 Month Default		12 months	\$0.0489 / kWh		
Constellation 12 Month Fixed Default		12 months	\$0.0749 / kWh		
Bounce Energy Terrific 12		12 months	\$0.109 / kWh		
TriEagle Energy Green Eagle 12		12 months	\$0.093 / kWh		

Total power cost = 200 X 1000 X 0.07 = 2800 \$ per day

Total Cost of the data center :

Networking costs : 6,636,119 \$

Data storage : 393,830,863 \$

Land : 512,343 \$

400,979,325 \$