

THE EVOLUTION OF DATA CENTERS

From Room-Sized Mainframes to Hyperscale Powerhouses

A Journey Through Computing History & North Carolina's Rise in Interest

April 6, 2026





A data center (DC for short) is a dedicated physical facility that houses computing systems, storage devices, and networking equipment — along with supporting infrastructure such as power supplies, cooling systems, and security measures — designed to store, process, manage, and distribute data and applications.



Compute

Processing millions of transactions per second



Storage

Petabytes of critical business data



Networking

High-speed connectivity and distribution



Security

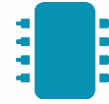
Physical and cyber threat protection

FAYETTEVILLE ^{NC} FROM MOONSHOT TO SMARTPHONE



Apollo Guidance Computer (1969)

Processor Speed	0.043 MHz
RAM	32 KB
Storage (ROM)	72 KB
Weight	70 lbs
Transistors	~12,300



Modern Smartphone (Today)

Processor Speed	~3,000 MHz
RAM	8-16 GB
Storage	256-1,000 GB
Weight	~6 oz
Transistors	~16 Billion

100,000x more processing power in your pocket today than what landed humans on the moon

1940s-1950s

The Mainframe Era



ENIAC (1946) — 30 tons, 1,800 sq ft, 18,000 vacuum tubes, 150 kW. The Pentagon, CIA, and West Point build dedicated computer rooms. Military secrecy demands physical security and environmental controls.

1960s-1970s

Corporate Computing



IBM builds the first official data center. Transistors replace vacuum tubes, cutting size by 90%. IBM System/360 becomes the enterprise backbone. Temperature/humidity control becomes standard.

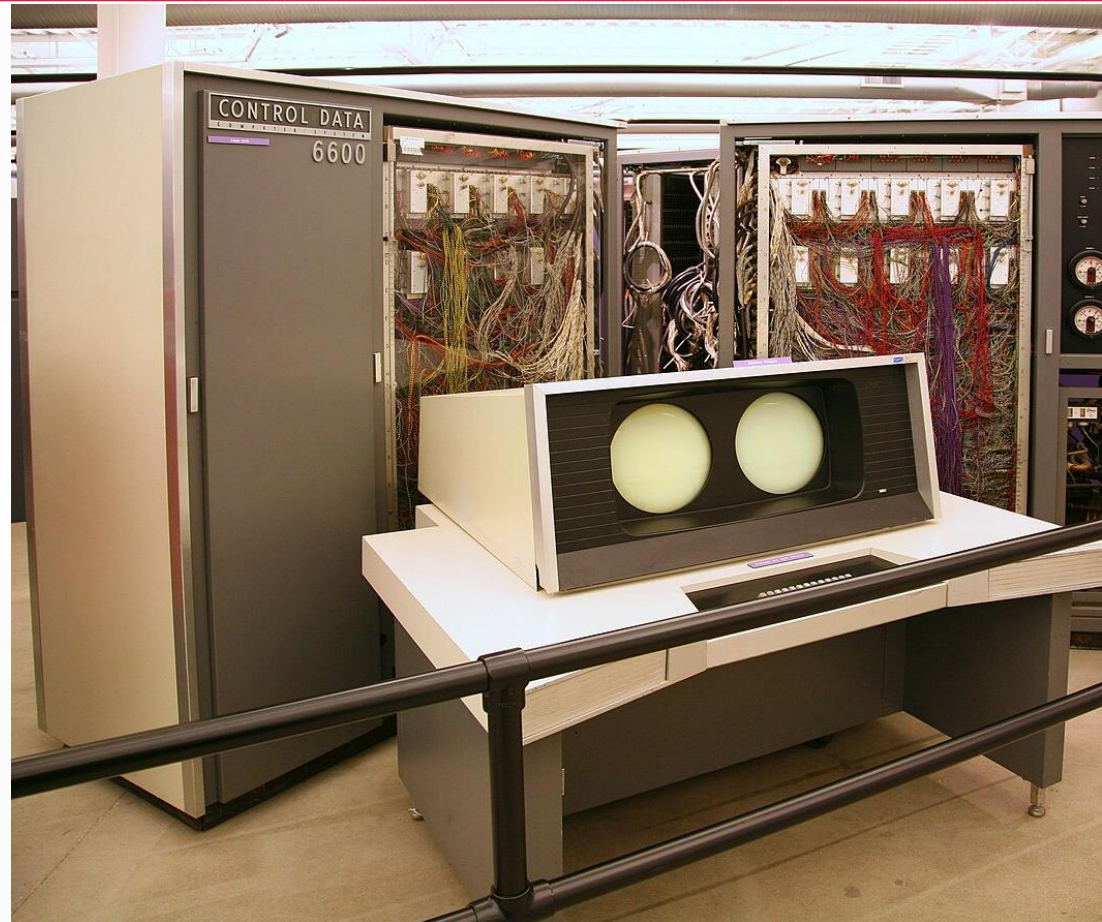
1980s-2000s

PC & Internet Revolution



Client-server architecture replaces mainframes. The dot-com boom drives massive facility construction. VMware introduces virtualization (1999). Uptime Institute creates the tier classification system.

Control Data
Corporation's (CDC)
6600, used for nuclear
weapon-related labs



1964	CDC 6600	3 MFLOPS	Room-sized	<i>First supercomputer</i>
1975	Cray-1	160 MFLOPS	C-shaped tower	<i>100 MFLOP barrier</i>
1985	Cray-2	1.9 GFLOPS	Liquid-cooled	<i>First liquid cooling</i>
1996	ASCI Red	1 TFLOPS	85 cabinets	<i>First teraflop</i>
2008	Roadrunner	1 PFLOPS	288 racks	<i>First petaflop</i>
2022	Frontier	1 EFLOPS	74 cabinets	<i>First exascale</i>

From 3 million ops/sec (1964) to 1 quintillion ops/sec (2022) — a 333 TRILLION-fold increase

Exascale-class HPE Cray
EX Supercomputer
Oak Ridge National
Library, Tennessee
1.102 quintillion FLOPS



FAYETTEVILLE N.C. PROCESSING POWER GROWS AS DEVICES SHRINK



Moore's Law: transistor count doubled every ~2 years for five decades



A smartphone is 100,000x faster than Apollo 11's guidance computer



Today's \$10 microcontroller rivals 1960s supercomputers



Apple M1 chip: 2.6 TFLOPS — matching a 1990s supercomputer

Moore's Law drive structural miniaturization and power gains

TIER I	<p>Single path power & cooling, no redundancy <i>Small business, dev/test</i> <i>Examples: Small operating entities, development lab</i></p>	<p>99.671% uptime</p>	<p>28.8 hrs/yr downtime</p>
TIER II	<p>Single path with some redundant components (N+1) <i>Mid-size organizations</i> <i>Examples: hospitals, universities, local government</i></p>	<p>99.741% uptime</p>	<p>22 hrs/yr downtime</p>
TIER III	<p>Multiple paths, concurrently maintainable <i>Enterprise & commercial</i> <i>Examples: co-location DCs with rental racks/cages like Fayetteville-based Advanced Internet Technologies (AIT) & Plan C Crypto</i></p>	<p>99.982% uptime</p>	<p>1.6 hrs/yr downtime</p>
TIER IV	<p>Fully fault tolerant, 2N+1 redundancy <i>Mission-critical / hyperscale</i> <i>Examples: AWS, Google, Microsoft</i></p>	<p>99.995% uptime</p>	<p>26.3 min/yr downtime</p>
TIER V?	<p>Military, Ultra-low fault tolerant, multifaceted redundancy <i>AI/Next-Gen Mega Campuses</i> <i>Examples: OpenAI Supercomputing Clusters (Texas, Iowa, VA, etc.), Adani (India)</i></p>	<p>99.999% uptime</p>	<p><12 min/yr downtime</p>

402.74 million

TERABYTES OF DATA CREATED EVERY DAY



Always-On Reliability

99.995% uptime for mission-critical ops



Scalable Compute

Instantly scale from 1 to 1,000+ servers



Security & Compliance

Physical, cyber, and regulatory protection



Global Connectivity

Low-latency access for billions of users



Disaster Recovery

Geographic redundancy protects data



AI & Cloud Power

Enabling AI training, cloud, and IoT



Massive Power

Hyperscale facilities need 100-400 MW — like powering a small city. Data centers consumed 4% of U.S. electricity in 2023, projected to double by 2030.



Cooling & Sustainability

Advanced liquid cooling, free-air economizers, water-efficient systems. Operators pursue carbon-neutral operations and renewable energy.



Fiber Connectivity

Dense fiber-optic networks, carrier-neutral interconnection. Low-latency to major internet exchanges and cloud on-ramps.



Physical Security

24/7 surveillance, biometric access, mantrap entry, perimeter fencing. SOC 2, ISO 27001, and HIPAA compliance.



Skilled Workforce

Electrical engineers, HVAC technicians, network architects, security specialists with mission-critical experience.



Strategic Location

Low natural disaster risk, available land, proximity to fiber routes and power, pro-business regulatory environment.



How Data Centers Spread Across North Carolina

WEST (2006-2015)

Google (Lenoir)
Apple (Maiden)
Meta (Forest City)

500+ MW

capacity

PIEDMONT (2015-2023)

Microsoft (Catawba)
Corning/CommScope
AT&T, Disney, Wipro

800+ MW

capacity

TRIANGLE & EAST (2020-Present)

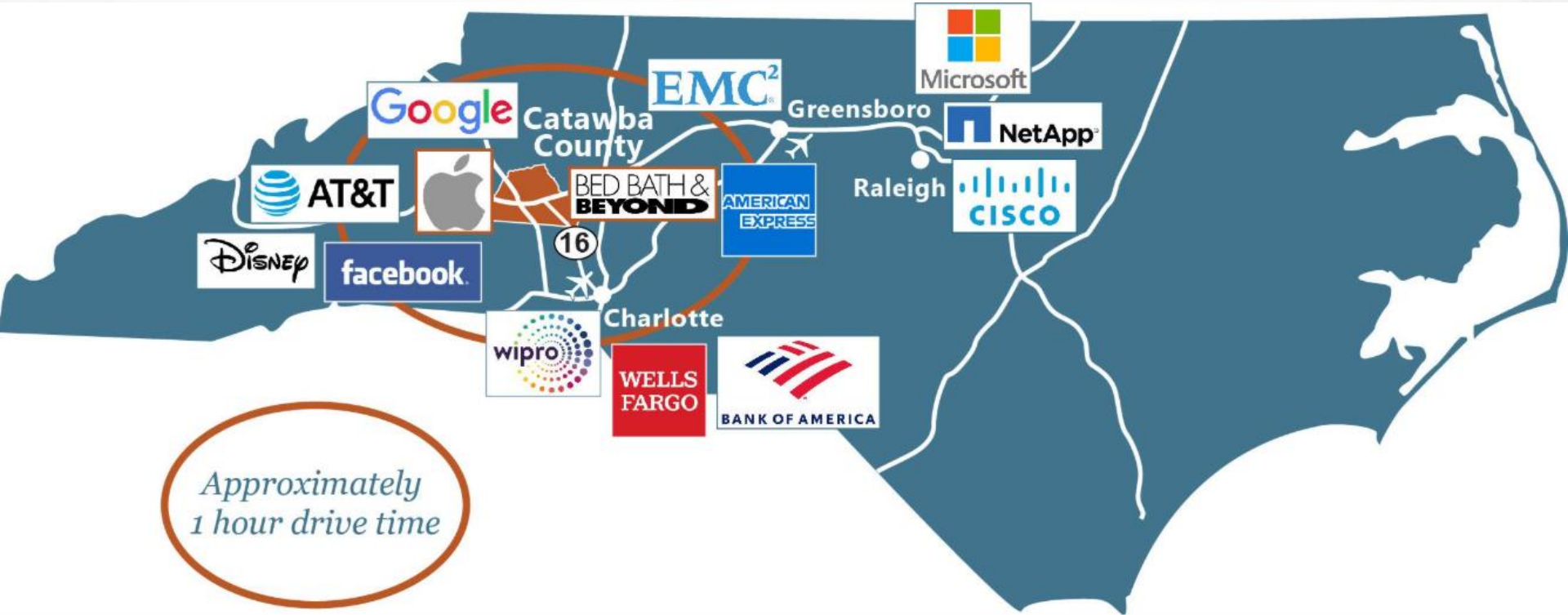
Digital Realty, CyrusOne
American Tower
WhiteFiber (Madison)

1,200+ MW

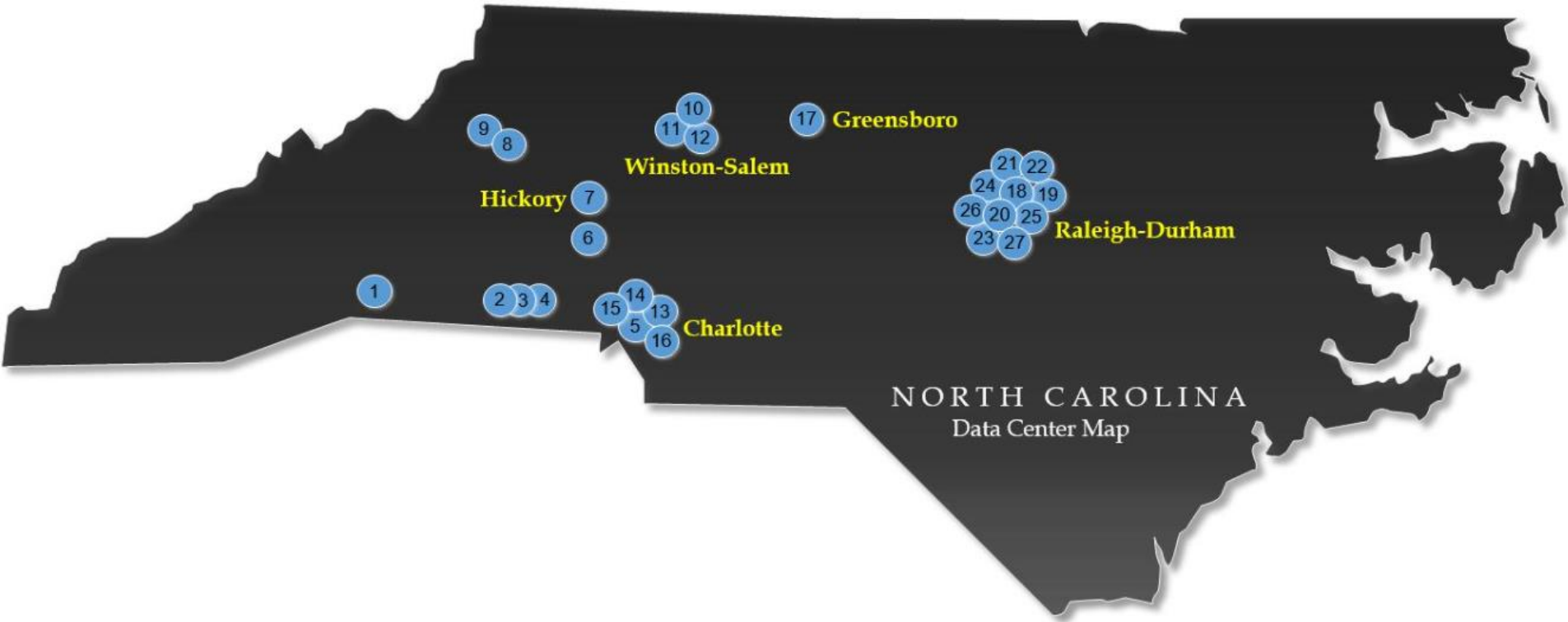
capacity

EASTWARD EXPANSION: Amazon \$10B in Richmond County | \$19.2B campus in Tarboro | Microsoft's 1,385-acre Person County megasite | Power demand projected to double from 3 GW to 6 GW

WHY NORTH CAROLINA?



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Amazon Web Services

\$10B

Richmond County

1,200 acres, 20 buildings, 3.7M sq ft near 2.24 GW Duke Energy plant

Microsoft

\$1B+

Person & Catawba Counties

1,385-acre megasite in Person County; 4 new Catawba facilities

Google

\$1.2B

Lenoir, Caldwell County

Ongoing expansion of flagship NC campus, one of Google's earliest

Meta (Facebook)

\$750M+

Forest City, Rutherford Co.

Three data center buildings with continued multi-building expansion

Apple

\$175M

Maiden, Catawba County

237,600 sq ft expansion to 500,000+ sq ft flagship campus



Reliable Power Infrastructure **4.5 GW**

Duke Energy contracts grew from 3 GW to 4.5 GW. Access to 2.24 GW power plants. Utility commitment to supporting growth.



Fiber Optic Leadership **3,700 mi**

NCREN spans 3,700 miles of fiber. CommScope and Corning produce 40% of world fiber supply. Dense carrier connectivity.



Pro-Business Economy **Top 10**

Top 10 state for business tax climate. Electricity ~15.76% below national avg at ~8.5c/kWh. Special data center tax incentives.



World-Class Talent **250+**

RTP: 7,000 acres, 250+ companies. Duke, UNC, NC State produce top-tier engineering and IT graduates.



Low Natural Disaster Risk **Zone 1-2**

Low seismic zone rating. Inland locations avoid major storm damage. Favorable climate reduces cooling costs.



Abundant Land & Infrastructure **1000s acres**

Massive tracts for hyperscale campuses. Strong highway, rail, airport, and deep-water port access.



Power Infrastructure Expansion

Duke Energy must scale from 4.5 GW to 6+ GW. New substations, transmission lines, and generation capacity critical. Operators pledging not to increase consumer electricity prices.



Workforce Development

Apprenticeship programs adding data-center-focused electrical and HVAC tracks. Community college partnerships near major sites. Siemens adding 350+ jobs in the Carolinas.



Community & Government Partnership

Balancing rapid development with community needs. Environmental impact assessments, water management, transparent engagement. Streamlined permitting while maintaining standards.



Sustainable Energy Solutions

Commitment to renewables and carbon-neutral operations. Heat-recovery, energy-efficient building envelopes, on-site renewable infrastructure. NC's 2025-2029 strategic plan includes sustainability.



THE FUTURE IS BEING BUILT IN NORTH CAROLINA

From room-sized mainframes to hyperscale campuses worth billions, data centers are the infrastructure of our digital future — and North Carolina is leading the charge.

\$50B+

Invested in NC

40+

Operating Facilities

6 GW

Projected Demand



 **FAYETTEVILLE**^{NC}
AMERICA'S CAN DO CITY

FayettevilleNC.gov