



Interactive Activity: What Tools Power Your Research?

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Breakout Categories

- Networks, Data Transfer, & Security
- Software & Workflow Systems
- People, Organizations, and Communities
- Data Repositories & Storage
- Computing Resources

Each group is tasked with mapping out the tools, resources, or supports needed to power a specific research project, based on their specific group category. Additionally, you all will need to brainstorm with your group members what new tools, resources, or supports will be needed to solve the research challenge.



Scenario: Monitoring Dairy Cattle Health

You're part of a research project monitoring dairy cattle health. Each cow wears a device that collects data about its behavior and digestion. You notice that cow #208 shows a drop in rumination and activity over the last 24 hours. The various teams supporting the research project need to figure out what's happening and how to respond.

Your team is responsible for just one part of the research system that makes this project successful. Specific to your group's category, you'll need to map out the tools, resources, or supports needed. Additionally, you'll need to identify what's needed to help detect, analyze, and respond to cow #208's health alert.

- Write your ideas on the shared poster board
- Include specific tools, technologies, or resources
- Pick one person to share your findings
- Prepare for a 1 minute share out per group

Report Out: Monitoring Dairy Cattle Health

Networks, Data Transfer, & Security	Rfid tag and collect using local central server or cloud. Network: wireless or satellite to collect and analyze via dashboard. What platform is the data stored Security: only auth users can access. Dual factor. Transfer: Azure, AWS, when will it be available and how frequently captured
Software & Workflow Systems	Cattle Scan (wireless, digital, early detection, rumination, lightweight on ear) device to count when not chewing and alert via baselines. Who gets notifications: farmer, vet, IT
People, Organizations, and Communities	Researchers, farmers, agricultural community, consumer groups, USDAs, AHMS, State Ag department
Data Repositories & Storage	AWS and Azure. Google Drive, OneDrive. Power BI or LLM. Visualization tools and AAA Repo: FarmOS (web, opensource); Open Ag Data Alliance (share amongst farmers)
Computing Resources	Detect the issue by using a cloud based system. AWS. Analyze the issue. Use python. Backup system to protect data (AWS?) Sensors, AI/ML to analyze and predict disease and recommend action, reducing labor. Cloud computing data storage and monitor via mobile apps/dashboards

Full Scenario: Monitoring Dairy Cattle Health

Your research team manages a dairy herd equipped with **Afimilk smart collars** that track each cow's rumination, behavior, and eating patterns.

One morning, your **dashboard** flags Cow #208—her activity and rumination have dropped sharply in the last 24 hours.

You alert the **veterinary team** and review **historical herd data** stored in **Amazon Web Services (AWS)**, while **student researchers** gather barn temperature and humidity readings from **wireless sensors** connected through a **secure farm Wi-Fi network**.

Using **MATLAB** and **Python-based predictive models**, you run **simulations** on your university's **high-performance computing (HPC)** cluster to assess how different treatment options might affect milk yield and recovery time.

Throughout the day, you collaborate with **data scientists, IT staff, and animal-science students** in virtual meetings on **Zoom** and share results through a **GitHub** repository linked to the institution's research **data portal**.

Scenario by Category: Monitoring Dairy Cattle Health

Networks, Data Transfer & Security

- Smart collars send data through barn Wi-Fi and secure cloud connections
- Data moves safely using encrypted channels
- Network engineers and IT staff maintain reliable, protected data flow

Software & Workflow Systems

- Tools like Afimilk, MATLAB, and Python help track and analyze animal health
- Dashboards visualize patterns in milk yield, activity, and temperature
- Researchers use step-by-step workflows to keep data organized and repeatable

People, Organizations & Communities

- Collaboration among researchers, veterinarians, IT staff, and students
- Training and communication help everyone interpret the data and act quickly
- Partners include the university's computing center, vendors, and agricultural networks



Scenario by Category: Monitoring Dairy Cattle Health

Data Repositories & Storage

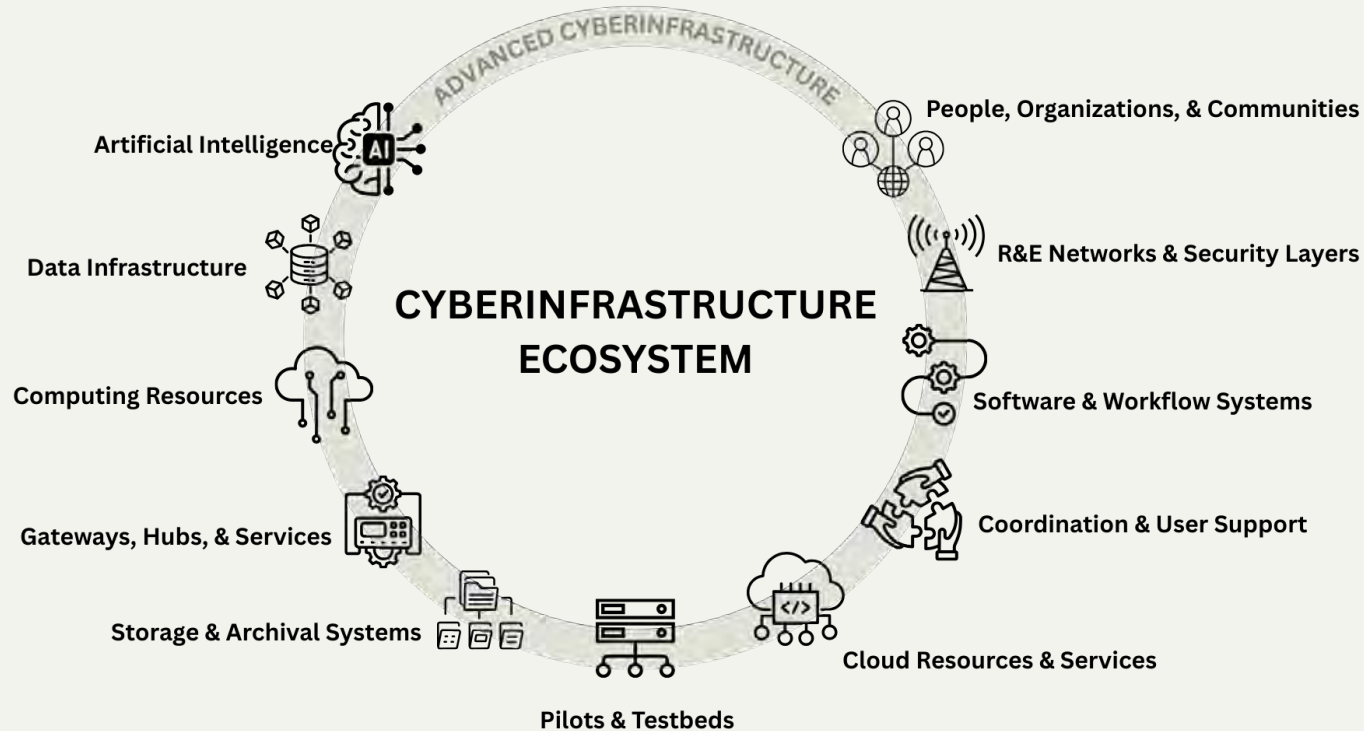
- Herd and environmental data stored in secure cloud platforms (like AWS or university storage)
- Data is backed up, shared responsibly, and used for long-term studies
- Data stewards and librarians ensure everything stays organized and accessible

Computing Resources

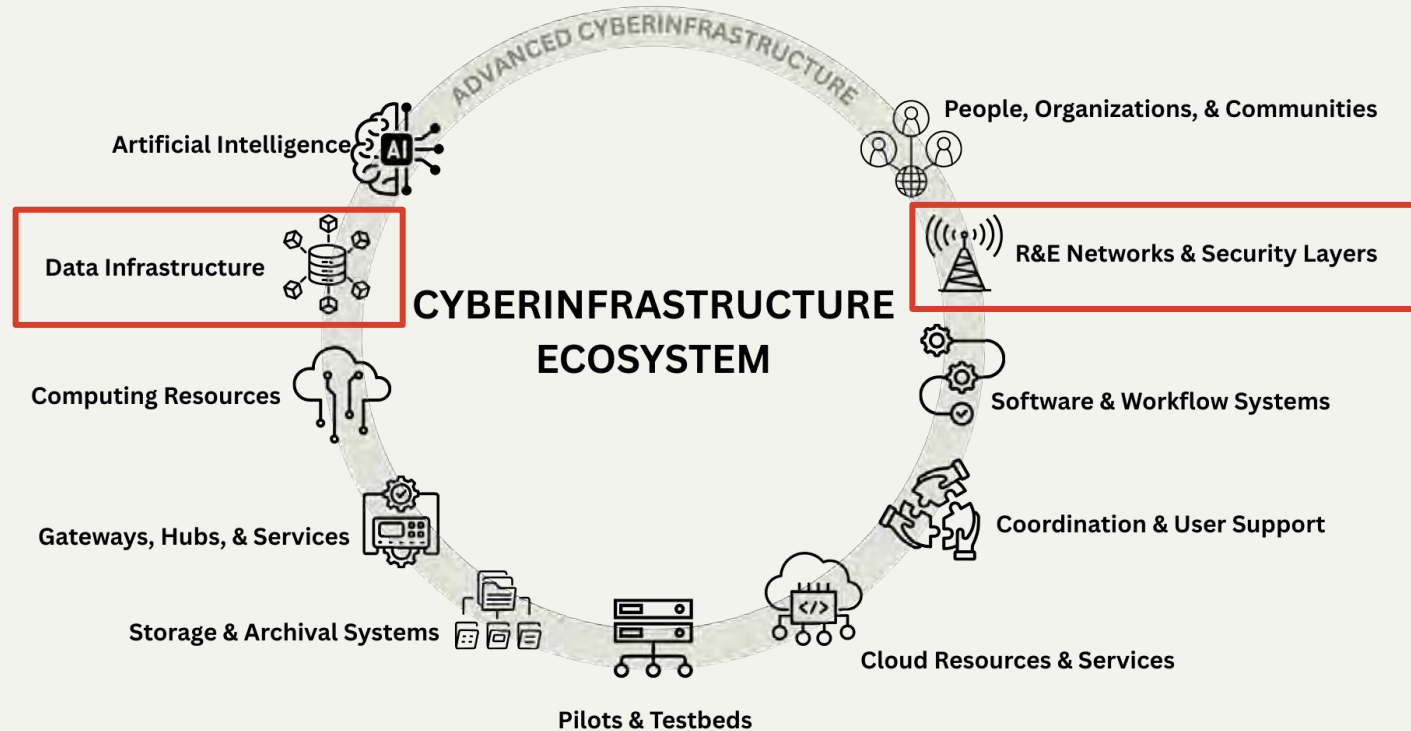
- Predictive models run on a campus computing cluster or cloud resources
- These systems handle large datasets and simulations that personal computers can't
- HPC support staff and research computing facilitators help researchers run analyses efficiently



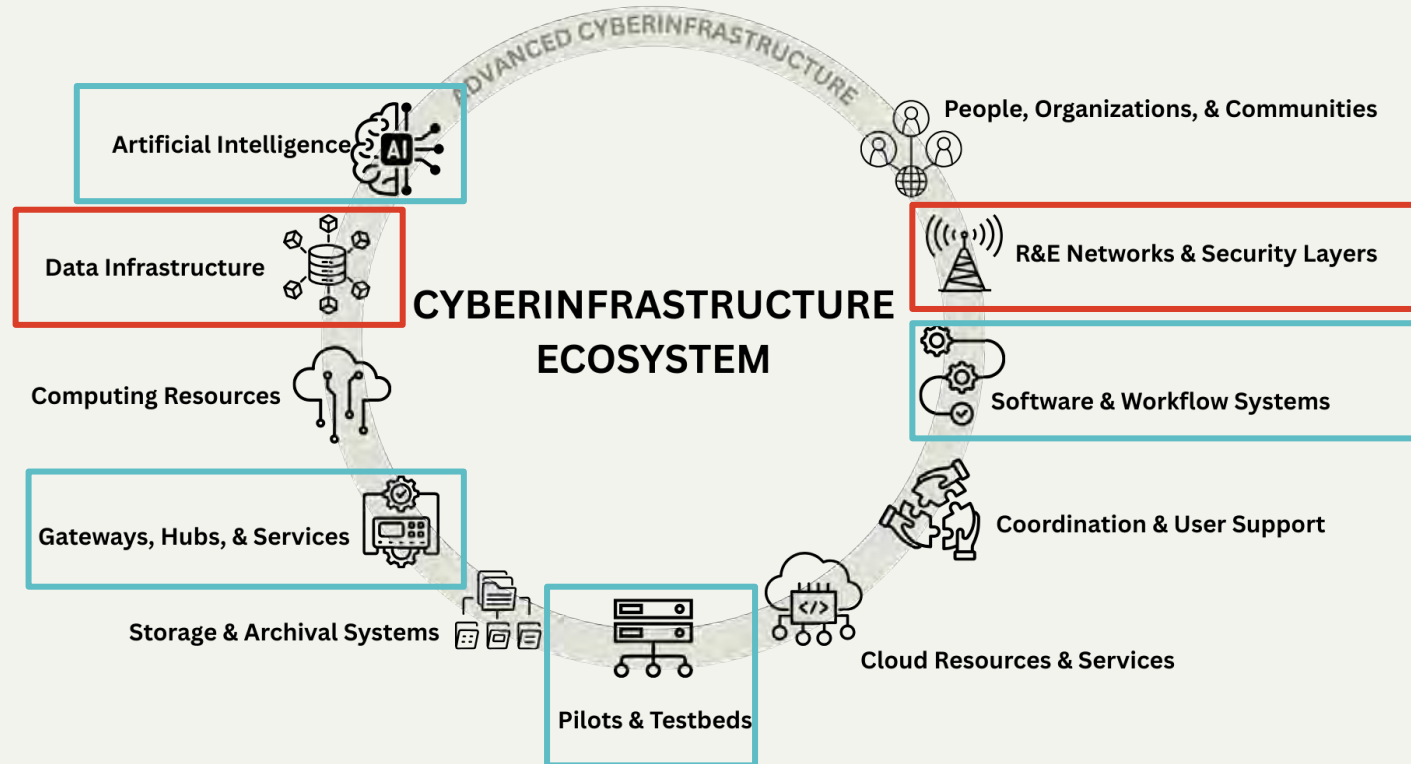
Connecting the Dots



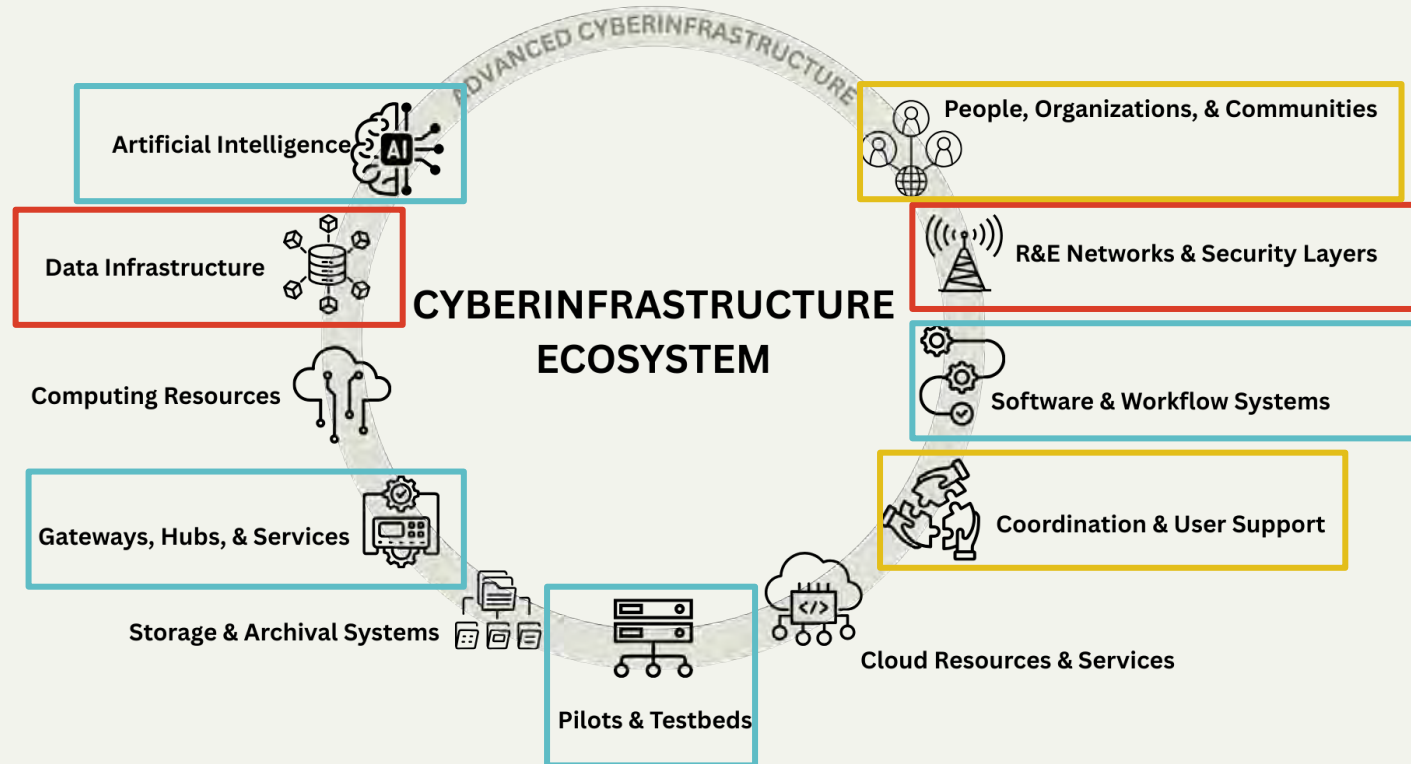
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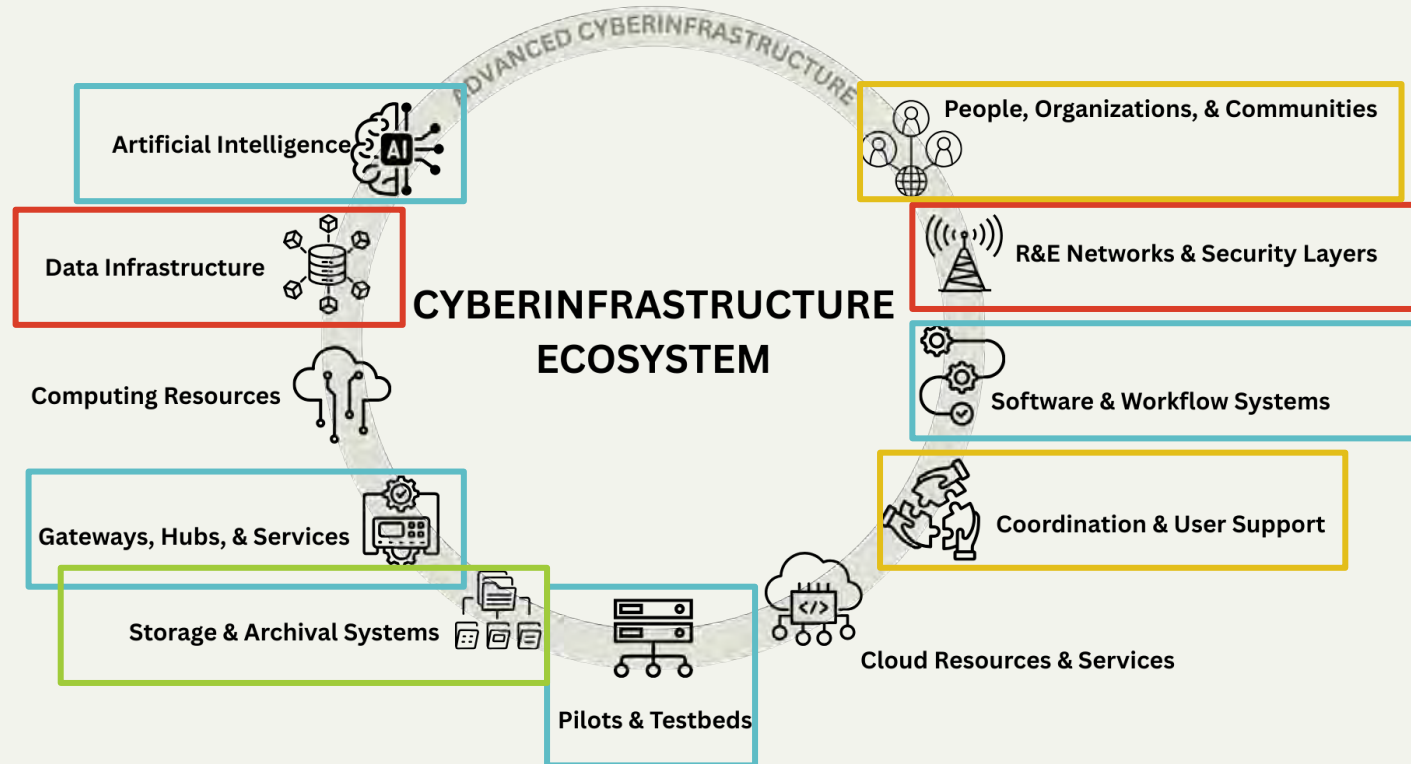
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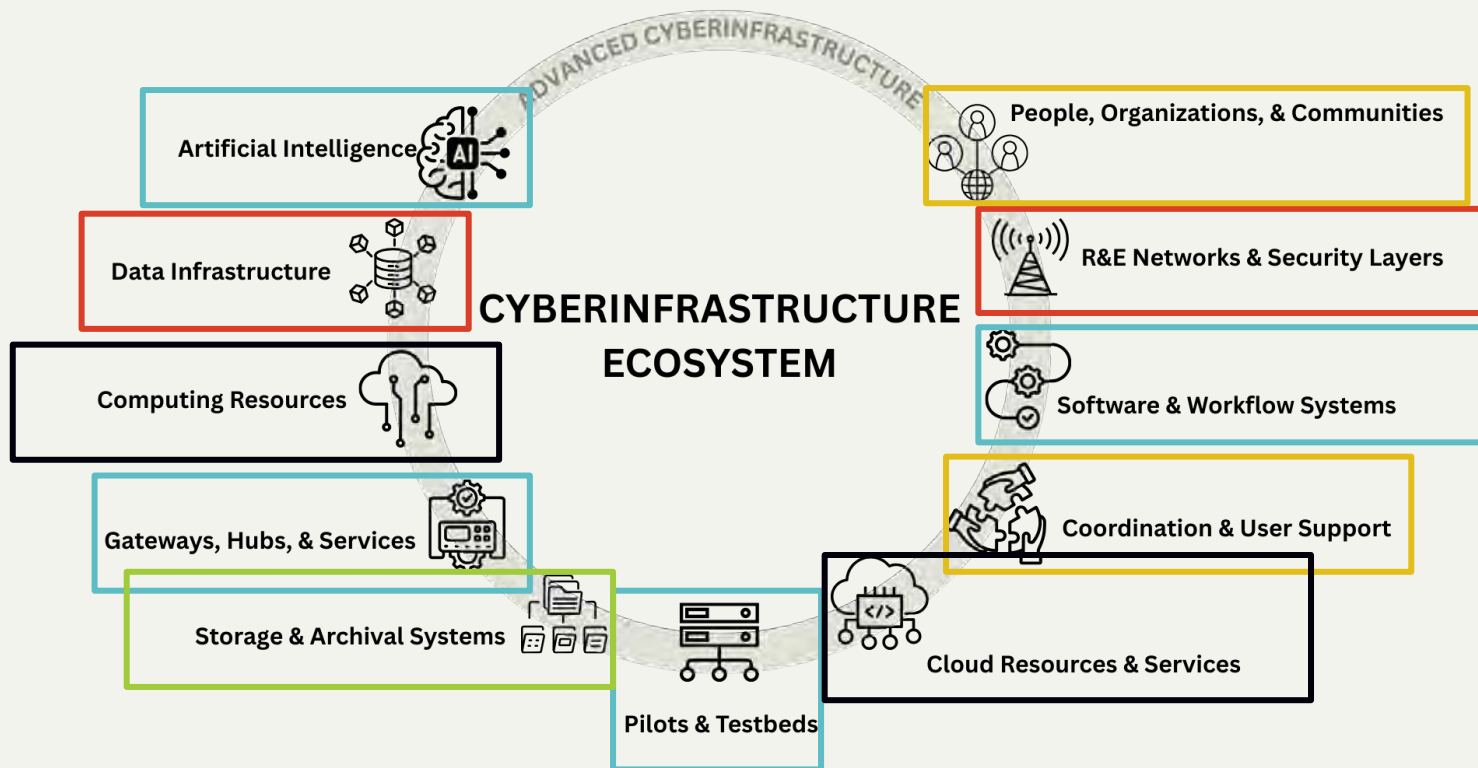
Connecting the Dots



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Reflection: What Powers *Your* Research?

Think about your own research, teaching, or creative practice:

- What tools or technologies do you rely on every day?
- Where and how do you store and manage data?
- Who supports you?
- What computing or cloud resources help you analyze, display, model, or share results?

What is the cyberinfrastructure that guides your work?

What's one area where your research could be more efficient or impactful with better cyberinfrastructure?

