Patch Notes: Seeding Data Ecosystems

Reconfiguring Information Transfer in Space, Across Time

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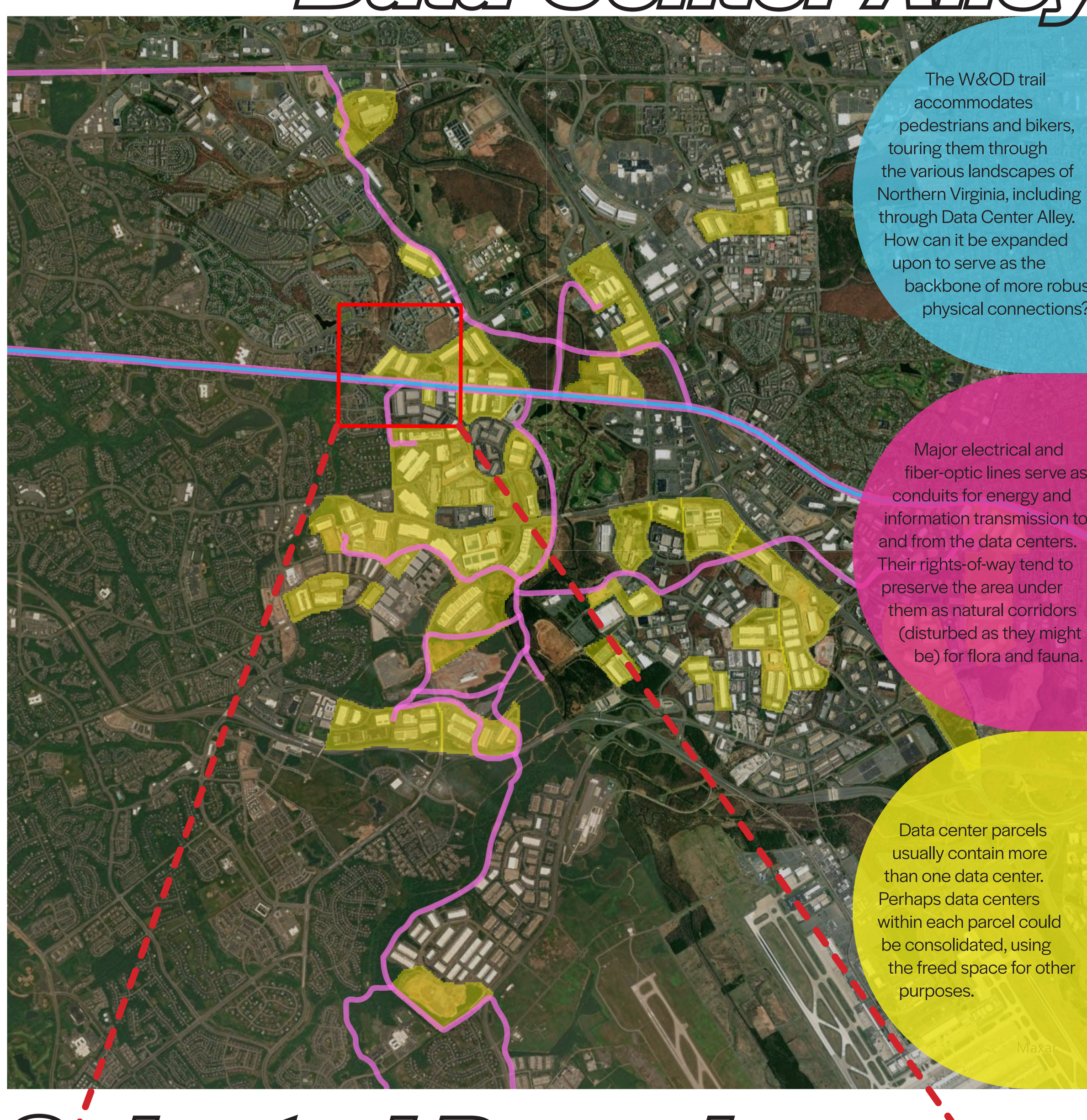
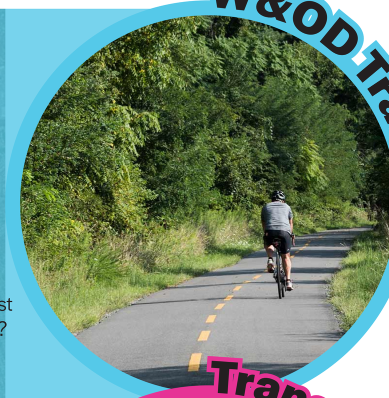
Previously, we examined the way large influxes of government funding, many coincident with an uptick in defense and intelligence spending, became codified as changes in the built environment, particularly in transportation infrastructure. We then examined the spatial context around data centers, the latest sites of prodigious investment, in order to forecast what might come next. This time, we'll propose a corrective vision for data centers, so that they might become something to be sustained, rather than retired.

The Bigger Picture: Data Center Alley



W&OD Trail

The W&OD trail accommodates pedestrians and bikers, touring them through the various landscapes of Northern Virginia, including through Data Center Alley. How can it be expanded upon to serve as the backbone of more robust physical connections?



Transmission Lines

Major electrical and fiber-optic lines serve as conduits for energy and information transmission to and from the data centers. Their rights-of-way tend to preserve the area under them as natural corridors (disturbed as they might be) for flora and fauna.

Data Center Parcels

Data center parcels usually contain more than one data center. Perhaps data centers within each parcel could be consolidated, using the freed space for other purposes.

Selected Parcel: Amazon Data Centers

Pedestrian Networks

Pedestrian networks, concentrated in residential communities, are interrupted by the data center parcels. How can we connect these networks through these areas, making them accessible to more people?

Water & Natural Areas

Waterways, like this one adjacent to this data center parcel, function as existing natural areas. Perhaps these remnant ecosystems can be expanded upon, serving as inter-species connective corridors, enjoyed by the communities that sandwich it.

Data Center Footprints

The individual data center footprints within each parcel are large enough that each separate footprint can be considered for its own purpose. Their uses could support one another: for example, one could serve as housing, another could serve as a community center, and the third could serve as a garden.

Connections Between Spaces

Virtual Connections, Physical Detachments

Virtual connections seemingly collapse the previous material and temporal impositions of communicating and sharing information across large distances. However, the reality is that these impositions still exist. Data centers are part of the physical infrastructure required to facilitate virtual connections, fulfilling the functions of storing, processing, and distributing digitized data. They have footprints measured in millions of square feet (51 million sq. ft in Northern Virginia, as of March 2024), and require energy inputs measured in megawatts, the unit used to talk about the energy consumption of state populations.

As massive concentrations of material resources in space, the detachments inherently caused by the data center form are two-fold. Firstly, as centralized concentrations of physical components (servers, routers, storage systems, cooling systems, power generators), data centers are industrial places located at great remove from the majority of people that they distribute data to. This majority will likely never see these data centers up close, and therefore does not need to confront the hulking masses of equipment that undergirds their experience of data creation and access. We'll reivisit this in the Global Economies theme. Secondly, even up close, data centers are obscured infrastructures, hiding their components behind windowless walls and heavily-surveilled fences. They have building footprints that can be measured in football fields, with additional moats of asphalt parking lots and service roads. In this way, they function as barriers and restricted zones in their local built environment, segmenting and disconnecting the landscapes they are present in.

Restoring the Network

To reconnect the spaces broken-up by the physical footprint of data centers in the local context, the surrounding communities must first have access to and through the areas currently occupied by data centers. This requires, at a minimum:

- access not only for automobiles, but also for pedestrians, bikers, and those using public transportation.
- removal of physical barriers, such as barbed wire, electric fences, controlled-access areas, and defensive landscaping
- removal of some data center structures to open up the occupied space to reimagination, not only by people, but for other living things as well. People are not the only ones detached from land and environment by data centers.

System Update

Tommy Thompson Park

Toronto, Canada

An abandoned port facility development was reclaimed first by wildlife. Following their lead, the space was converted to a park and nature reserve. Pedestrian paths allow park visitors to see how these species have reimagined and transformed this landscape together.

Connections Across Times

Remote Short-Term Memory

If we aim to scale down resource consumption driven by data center development, we must wrestle with how to store, process, and distribute the quantities of data we produce. Techno-optimists may believe we'll find a technological solution, managing to store digitized data on smaller servers that somehow consume less energy. We haven't achieved that yet, but the temperature continues to rise, especially in areas immediately within the vicinity of data centers. A non-technological path forward requires a reckoning with the amount of digital data we produce, and how seriously we plan to sustain these systems over time.

According to the businesses that design, build, and maintain them, individual components within a data center have lifespans estimated at 4-5 years, while the overall data centers have lifespans estimated somewhere between 15 and 20 years. The critical determining factor of this estimation is the productive value of the data center outperforming the cost to repair and maintain existing components in addition to the economic incentive to replace components entirely with newer, potentially more efficient models. This constant turnover of components— their planned obsolescence— is a hallmark feature of the business of modern technology. In other words, these systems are not built to last.

On-Premise Long-Term Memory

For millennia before digitized data, people have been creating, storing, and sharing information in written records and oral histories. For eons before that, life on the planet has been doing the same, both through passing down genetic information that instructs cells on how to reproduce, develop, and organize themselves, and through repeated gestures and remembered interactions stored within inter- and intra-species relationships. Life-sustaining knowledges are situated, shared, and thus preserved within the assemblage of species on the land. We have been reshaping our environments to accommodate fleeting data centers. How can we reimagine forms of information management to accommodate long-term growth within the living contexts they are situated in?

System Update

Piedmont Grassland Restoration

Central Virginia, USA

Species native to the Piedmont grasslands have root and bulb systems that have propagated themselves for centuries, if not millennia. However, due to agriculture, urban development, and subsequent fire-suppression, these native ecosystems have been in a state of decline. Recent initiatives, including prescribed burns, have helped to activate dormant mechanisms lying just below the ground's surface.

Connections With Others

Global Economies

We've seen that data centers function as centralized repositories of data. They are accumulations of capital: in addition to the data itself, they are concentrations of material, resources, and labor that oversees these. With the land solely optimized for industrial warehousing and distribution of data, other crucial systems have been displaced. These displaced systems must be accounted for elsewhere, in other locations. Excess capital (profits) generated from the data centers allows for the purchase and import of these necessities from outside locales.

Food systems and agriculture are fundamentally dependent on local environmental factors, including climate, water sources, and soil quality. Data centers take up space previously used for food production; they alter the local climate by covering the landscape with impervious surfaces and emitting intense amounts of noise, carbon, and heat to run; and they consume immense quantities of water, used for cooling. This means that, when the data centers expire out of use, depreciate out of financial viability, or exhaust their energy and water inputs, the populations dependent on their economic output will find themselves in a food desert, without the means to feed themselves either with local agriculture or imported produce. The effects are cascading. Other key sectors, including utilities, housing, education, healthcare, and civic infrastructure will also begin to evaporate once the data centers collectively approach end-of-life and take their economic benefits with them.

Local Ecologies

If the fate of the land is strapped solely to the data centers which are designed to fall out of use, then the land without data centers might be considered a wasteland. Instead, where and how can abundance be found in the land? How can the land continue to provide for the communities that reside on it, and how can these communities reciprocate so that the two mutually sustain and strengthen one another? By building up local capacity, outsized dependence on data centers can be mitigated. Finding abundance in local capacity requires strengthening the foundations of social relations: food, housing, healthcare, and education. Abundance can also be found by situating people among the diversity of lifeforms on the land. As Ruth Wilson Gilmore says: where life is precious, life is precious.

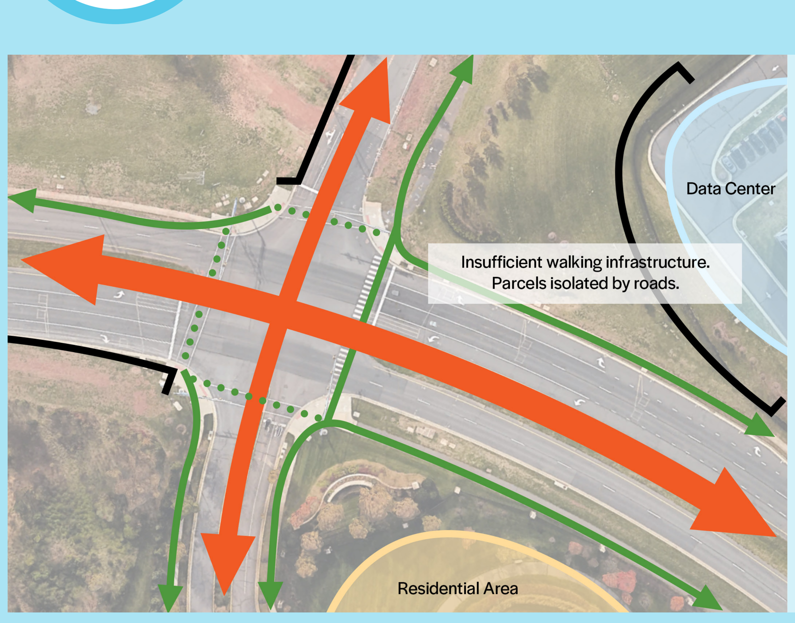
System Update

Wiijindamaan Indigenous Land-based Futurity

Kitchener - Ontario, Canada

A development and application of urban land co-management strategies rooted in traditional Indigenous land-based practices and knowledges. It is a land restoration project with the goals of: securing and producing sustainable foods and medicines; increasing local biodiversity through habitat restoration and reintroduction of native species; and building community capacity through mobilizing knowledge.

A Pathways



Currently, existing multi-modal networks are few and far between, contributing to the isolation of residential and industrial (data center) zones.

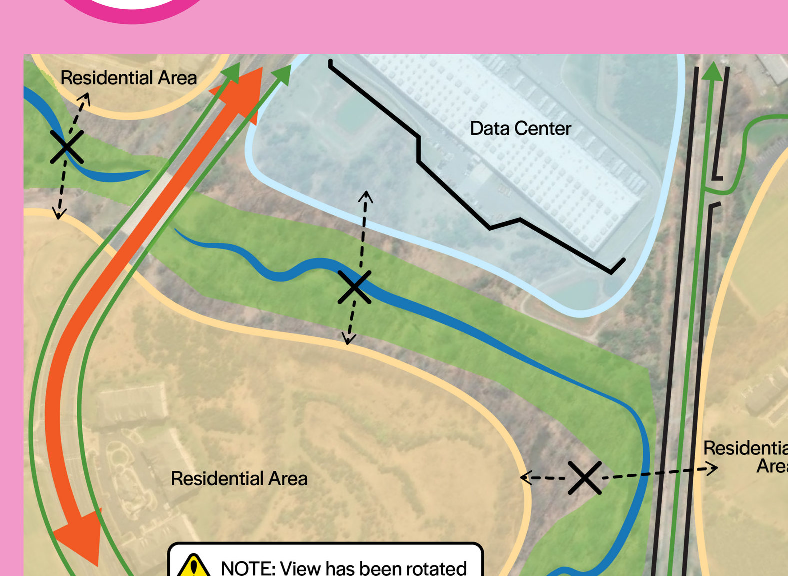
be to improve pedestrian, bike, and public transit networks, particularly around what are currently auto-centric road crossings.

A near-term step towards better connectivity between spaces around data centers would involve the addition of :

- wider sidewalks
- buffer zones between bike-ped paths and roads
- more accommodating intersection areas
- bus stops
- bike racks

These multi-modal infrastructures would help to reclaim these connective routes for people rather than automobiles.

B Public Spaces



Currently, green spaces between residential zones are broken up both by auto-centric transportation infrastructure, as well as the data center parcels. Defensive landscaping further functions to sever lines-of-sight, resulting in disjoint landscapes that do not communicate with one another.

A near-term step towards more interconnected green spaces, facilitating interactions between assemblages of living species and different environments, would be to open up spaces as public areas and repurposing tracts of land for more public purposes, such as play areas, gathering spaces, and community gardens.

C Functions

Currently, the data center parcel functions as a barrier between the surrounding parcels with different zoning designations, disconnecting them. These zoning designations tend to favor a single economic purpose for each zoned parcel.

A near-term step would be to rezone the data center parcel in its centralized location for a mix of uses, turning it into a regional gathering place where the surrounding zones begin to blend into one another. Existing data center structures could be repurposed into multipurpose community spaces.