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Reports

Defining and Putting into Practice Tribal Digital Sovereignty

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Abstract

This article advances the concept of Tribal Digital Sovereignty (TDS) as a critical framework for understanding and governing the digital futures of Tribal Nations. TDS encompasses the entire digital ecosystem: infrastructure, software, policy, and human capacity. Drawing on Federal Indian Law, Indigenous governance traditions, and global debates on digital sovereignty, the article situates TDS as both a continuation of longstanding assertions of sovereignty and a necessary response to 21st-century technological challenges.

To operationalize this framework, the article adapts Benjamin Bratton's stack model to highlight how Tribal Nations can exercise sovereignty in digital spaces, for example, by building broadband networks, establishing data governance offices, and developing culturally grounded digital tools. The article concludes by calling for comprehensive strategies that integrate legal infrastructure, capacity building, and economic planning to ensure Tribal Nations are not merely users of global systems but sovereign architects of them. In doing so, it charts a path toward a Sovereign stack aligned with the long-term flourishing of Indigenous Nations in a networked world.

Keywords: Tribal Digital Sovereignty; Indigenous Data Sovereignty; broadband and infrastructure; digital governance; sovereignty and self-determination; community informatics

Introduction

This article begins by painting a broad picture of the origins, definitions, and uses of sovereignty, creating a base from which to argue for the application of the encompassing term of Tribal Digital Sovereignty. By engaging in the broader global legal, philosophical, geopolitical, and practical dimensions, this article presses for digital sovereignty in the Tribal context as an application of self-governance. Referencing global applications of digital sovereignty, and then situating it within a Tribal sovereignty setting, the foundation is laid for Tribal Digital Sovereignty (TDS). After discussing TDS's theoretical underpinnings, we move to practical applications, including a model for structuring these implementations. The article concludes by calling for comprehensive strategies that integrate legal infrastructure, capacity building, and economic planning to ensure that Tribal Nations are not merely users of global systems but sovereign architects of them.

The discourse on sovereignty is evolving beyond traditionally accepted meanings and practices. This is evidenced by how federally recognized Tribal Nations in the United States are asserting their rights beyond territorial and legal boundaries into digital domains. The emerging field of TDS encapsulates the exercise of Tribal self-determination and governance over digital infrastructure, data, networks, and all forms of digital participation. As the digital realm becomes

increasingly central to governance, economics, and cultural preservation, a critical examination of TDS is timely and necessary.

Methodology

The field of TDS is rapidly emerging. However, at the time of publication, there were no reference books and only a few scholarly articles on the subject. This article offers a foundational definition of the field. The methodology of this chapter involves a multi-method literature review that combines a library-based search of scholarly works focusing on sovereignty, digital sovereignty, Indigenous Digital Sovereignty, and data sovereignty; internet-based research to evaluate evolving uses and definitions in policy and practice; source mining from journal articles and emerging texts; cross-referencing texts with relevant government documents; and reviewing global white papers on digital sovereignty, data sovereignty, digital jurisdiction, Indigenous Data Sovereignty, and Tribal Digital Sovereignty. This approach enables a comprehensive understanding of the overlapping and, at times, conflated domains of data and digital sovereignty within Indigenous, Tribal, and global contexts. Additionally, ChatGPT was used as a tool for grammar and spell checking, organization of the sections of this article after it was already written, and generating working drafts of charts from information already provided.

Reconceptualizing Sovereignty

A substantial body of academic work covers sovereignty—its histories and applications, and the legal and cultural frameworks that shape its meaning. Within the United States, an entire field of Federal Indian Law is dedicated to the recognition and exercise of Tribal sovereignty, which remains the foundation of governance and jurisdiction in Indian Country. This article builds on those scholarly and legal traditions, while also encouraging readers to consult the cited sources for deeper engagement with the complexity of sovereignty in both Indigenous and Western contexts.

Sovereignty, as traditionally defined within Western legal and philosophical frameworks, remains a contested colonial concept. Scholars such as Couture and Toupin (2019) and Bonilla (2017) emphasize that sovereignty, as a legal construct, is deeply embedded in colonial practices of dispossession and imposed rule over Native populations. Its history is inseparable from subjugation, colonialism, and imperialism, and it continues to be framed in those terms within Western discourse and international law (Couture & Toupin, 2019, pp. 2318–2319). Bonilla (2017) further argues that the very concept of sovereignty originated during the Age of Discovery (c. 1400s–1600s), where it operated as a legal technology to justify claims to Indigenous lands, establish treaty regimes, and impose Europeans' so-called civilizing process. In this sense, sovereignty itself is literally grounded in practices of dispossession (Bonilla, 2017, p. 332). Yet even as the term is informed by its colonial legacy, Tribal Nations continue to redefine and reclaim sovereignty on their own terms—including in the digital realm, where governance of infrastructure, data, and networks has become a critical expression of self-determination.

Despite the colonial origins of sovereignty, Tribal Nations in the United States are recognized as possessing *inherent sovereignty* that predates the US Constitution, a principle affirmed through federal caselaw. US Tribal governments exist as sovereign nations and distinct political entities, with a government-to-government relationship with the United States rather than as racial groups. This distinction is central to the governance of Indian Country and other Tribal communities, where sovereignty underpins jurisdiction, citizenship, and lawmaking. It also forms the foundation for federally recognized Tribes to extend sovereignty into new domains—including the digital realm—by developing enforceable Tribal codes and regulatory structures over infrastructure, data, and communications. For Tribal Nations in the United States, however, sovereignty has always signified more than legal recognition; it is a lived practice of self-governance, territorial authority, and cultural continuity.

This situation is unique as Indigenous peoples globally often lack the same legal recognition of sovereignty, leaving them without comparable jurisdictional authority in digital governance. In international Indigenous contexts, sovereignty is often asserted without a state-sanctioned legal basis, particularly in digital spaces. Nonetheless, parallel movements such as Māori data sovereignty in Aotearoa/New Zealand demonstrate that Indigenous assertions of authority over information and technology extend well beyond the US context.

Though the term *sovereignty* and its uses by federally recognized Tribal Nations in the United States have expanded philosophically to include data, spectrum, and food, I argue that the focus should remain on sovereignty itself rather than its modifiers. This article therefore emphasizes sovereignty as the *central organizing framework* for understanding how Tribal Nations in the United States—and Indigenous communities globally—are redefining and reclaiming governance in the digital era as a vital expression of self-determination. It is within this context that the concept of Tribal Digital Sovereignty emerges, offering a framework that translates these longstanding assertions of sovereignty into the governance of networks, data, and digital infrastructure.

Digital Sovereignty: An Evolving Discourse

The term *digital sovereignty* dates to the 1990s, with meanings and applications shifting across geopolitical contexts internationally. This new body of knowledge began as a legal construct debated within international law and cybersecurity circles. However, it subsequently gained broader geopolitical and economic significance as governments responded to issues like surveillance, cyberattacks, misinformation, and artificial intelligence (AI) ethics concerns. These dynamics influenced both national and international policies regarding data localization, digital infrastructure, and regulatory control. Consequently, digital sovereignty has become multidimensional, encompassing legal, infrastructural, economic, and human rights considerations.

Early internet theorists framed cyberspace as a domain beyond state control. The 1996 “Declaration of the Independence of Cyberspace” positioned cyberspace as inherently resistant

to traditional notions of sovereignty, framing the internet as a self-governing space removed from national governance (Barlow, 1996). But this perspective changed quickly, as we will see.

Global Digital Sovereignty

By the late 1990s and early 2000s, nation-states began asserting their authority over the digital realm. Russia and China were early advocates of "internet sovereignty," arguing for the right to regulate and control their national cyberspaces in opposition to the US-dominated narrative of internet freedom (Couture & Toupin, 2019, p. 2313).

Following the 2013 Edward Snowden revelations about mass surveillance by the US National Security Agency, concerns over foreign access to data sparked a wave of sovereignty-focused policies worldwide. The rise of cloud technology shifted the focus back to sovereign power and the role of state regulation over data and its flow. This represented the initial discourse within the European Union (EU).

In Europe, digital sovereignty has evolved as both a regulatory and industrial strategy. The EU's General Data Protection Regulation (GDPR), in effect since 2018, serves as the world's leading framework for individual data protection and digital rights, reflecting a values-based approach to sovereignty (Chander & Sun, 2023, p. 232). The development and 2020 launch of GAIA-X, a pan-European cloud infrastructure project, illustrates the EU's efforts to establish control over data storage and processing, reduce dependency on US-based tech giants, and foster homegrown innovation (Autolitano & Pawlowska, 2021). Digital sovereignty in the EU began as "countering US and Chinese digital companies coming into the market and as a way to fend off encroachment of companies from these countries in the European market" (Chander & Sun, 2023, p. 232).

France, Germany, and Italy have led the way in advancing the European digital sovereignty agenda, striking a balance between market competition, cyber defense, and technological innovation. Recently, strategic autonomy (another phrase for digital sovereignty) is being pursued through investments in AI, quantum computing, and semiconductor manufacturing—technological sectors viewed as critical for future power and independence in the EU (Broeders et al., 2023). By the 2020s, European digital sovereignty aimed to balance market protection with the need to avoid excessive protectionism. At the same time, digital sovereignty was increasingly recognized not only as a matter of economic competitiveness but also as a safeguard against cyberattacks and a growing emphasis on individual data protection. The GDPR is now the gold standard of privacy protection for individuals (Chander & Sun, 2023, p. 232).

In contrast, the United States has not developed a cohesive academic or policy framework for digital sovereignty. This silence is often attributed to Silicon Valley's dominant role in the global tech economy, where US firms such as GAFAM (Google, Apple, Facebook, Amazon, Microsoft) control extensive data flows, digital platforms, and cloud infrastructure. As a result, discussions about sovereignty are often subdued or reframed in economic rather than regulatory or political terms.

Countries such as India and Brazil have also started to assert digital sovereignty to protect local industries and ensure national security in the Global South. In India, the emphasis on data localization within its Personal Data Protection Bill exemplifies efforts to make sure that data generated in the country stays under domestic jurisdiction. Through initiatives like the African Union's Digital Transformation Strategy, African nations are examining sovereignty models rooted in development, inclusion, and cultural autonomy (Avila Pinto, 2018).

Digital sovereignty, as a term, varies in meaning depending on who uses it and the context in which it is applied (Couture & Toupin, 2019, pp. 2317–2318). The term suggests power, control, independence, and autonomy. Additionally, there is a growing discussion about digital and data sovereignty as a response to settler colonial processes and the ownership of the internet and data by Indigenous peoples. These different perspectives highlight that digital sovereignty is a multidimensional and evolving concept—entwined with legal, political, economic, and technological elements. While often state-centered, it is increasingly adopted by other actors, including Indigenous communities, to challenge dominant digital colonial structures and reclaim control over their digital futures (Sheikh, 2022).

It is from this literature review that the term and concept of TDS is posited and derived. Digital sovereignty, in its global uses, is widely accepted and discussed. When looking at this term from a Tribal lens, coupled with the fact that US federally recognized Tribes derive sovereignty in a political sense, it is a natural extension for Tribal Nations to exercise sovereignty through self-governance over their digital realm, just as they do over education, healthcare, and other facets of self-determination.

Data Sovereignty vs. Digital Sovereignty

While the terms *data sovereignty* and *digital sovereignty* are often used interchangeably, they are conceptually distinct. The first term primarily concerns the ownership, governance, and security of digital information—its content, storage, and use. Within the European context, data sovereignty is defined largely in jurisdictional terms, focusing on where data resides and under which laws it falls. And while the EU's GDPR provides a model for individual data protections, it fails to address the collective governance frameworks that are central to Indigenous and Tribal contexts. For Tribal Nations, this includes community data, language archives, cultural knowledge, and administrative records.

By contrast, Tribal Digital Sovereignty offers a more expansive governance model. It encompasses the full digital ecosystem—including the infrastructure, software, regulatory codes, and human expertise required to manage digital life. In practice, this includes establishing enforceable Tribal codes that regulate data privacy, cybersecurity, spectrum management, and intellectual property, while ensuring the protection of cultural data and the promotion of digital equity. TDS thus provides an integrative framework for Tribal governance in the digital age, linking sovereignty, technology, and cultural stewardship.

Indigenous Data Sovereignty vs. Tribal Digital Sovereignty

In recent years, the concept of Indigenous Data Sovereignty (IDS) has gained significant scholarly attention, particularly in relation to decolonizing data governance and strengthening nation building. IDS focuses primarily on the governance of data—its collection, ownership, storage, and ethical application. Carroll et al. (2019) emphasize that Indigenous Nations must govern their own data ecosystems as a fundamental expression of sovereignty and self-determination. Indigenous-led data systems, they argue, are essential for reclaiming knowledge, exercising governance, and shaping policies that reflect community values and priorities. The IDS framework thus provides an important foundation for understanding how Indigenous peoples worldwide are asserting authority over data creation, ownership, and use (Carroll et al., 2019).

In response to the growing awareness of IDS and its importance in Indigenous efforts toward self-determination, a movement has developed. In 2019, the Global Indigenous Data Alliance (GIDA) developed the CARE Principles—Collective Benefit, Authority to Control, Responsibility, and Ethics—as a counterpoint to the FAIR Principles (Findable, Accessible, Interoperable, Reusable) that dominate open data and scientific research. CARE prioritizes community benefit and cultural responsibility, providing an ethical framework for Indigenous data governance. However, despite growing recognition, no binding or enforceable legal mechanisms currently exist at the national or international level to mandate IDS practices. Many Indigenous communities continue to face resource and infrastructure barriers that limit their ability to operationalize these principles effectively.

However, a notable distinction exists between IDS and TDS; they do not describe the same governance model. While IDS focuses primarily on the ethical uses and storage of data—its collection, ownership, storage, and ethical application—TDS encompasses the governance of the broader digital ecosystem: infrastructure, software, regulatory codes, policy, and human capacity. It includes both the physical networks and the intangible data flowing through them, as well as the legal and regulatory frameworks that govern those systems, whether Tribal or non-Tribal. IDS is a subset of TDS.

The academic literature on TDS remains limited, despite Tribal Nations' having defined the term through their practice. As digital systems become increasingly complex and essential to everyday life, Tribal Nations must strengthen their capacity to exercise authority across all these domains. In practice, this includes establishing enforceable Tribal codes that regulate data privacy, cybersecurity, spectrum management, and intellectual property, while ensuring the protection of cultural data and the promotion of digital equity. TDS thus provides an integrative framework for Tribal governance in the digital age, linking sovereignty, technology, and cultural stewardship.

Before looking at the practical applications of TDS and why implementing them is critical to Native governance, we start with some historical context.

Legal Foundations: Tribal Sovereignty and the Trust Relationship

TDS represents the extension of Tribal self-governance into digital spaces, paralleling how sovereignty is already exercised in healthcare, education, and economic development. While global discourse on digital sovereignty often centers on state control, national security, and regulatory responses to cyber threats, TDS is rooted in community-based governance and cultural context. It integrates technological infrastructure with social, cultural, and political dimensions of Indigenous self-determination, transforming digital policy from a technical issue into a matter of sovereignty and survival.

The urgency of articulating TDS has increased as the global meaning of digital sovereignty continues to evolve. Early legal frameworks emphasized jurisdiction and state control over digital assets. Today, digital sovereignty encompasses complex geopolitical questions of privacy, cyber warfare, misinformation, and algorithmic governance. Within this landscape, Indigenous Nations must assert their own frameworks for digital governance—ones that prioritize cultural sustainability, relational accountability, and collective well-being rather than purely economic or security-driven imperatives.

Although limited academic literature explicitly defines Tribal digital sovereignty, its presence is evident in practice. Tribal Nations across the United States are already building broadband networks, establishing data governance offices, protecting cultural archives, and engaging in federal- and state-level policymaking. These efforts constitute lived expressions of digital sovereignty, even in the absence of formal acknowledgment or complete theoretical models. Recognizing and expanding upon this practice is essential to developing a comprehensive understanding of TDS as both a scholarly concept and a practical governance framework.

TDS is firmly grounded in the longstanding legal doctrine of Tribal sovereignty and the federal government's trust responsibility to Tribal Nations. Federal Indian Law recognizes that Tribal Nations possess inherent sovereignty predating the US Constitution, a principle affirmed in cases such as *Worcester v. Georgia* (1832), which declared Tribes "distinct, independent political communities," and reaffirmed in *Santa Clara Pueblo v. Martinez* (1978). These precedents establish that Tribal Nations maintain the right to self-govern, define membership, and regulate internal affairs.

The trust relationship obligates the federal government to protect Tribal lands, resources, and political integrity—a responsibility that arguably now extends to digital infrastructure, spectrum, and data governance. In a 21st-century context, equitable access to broadband and control over digital networks are as integral to sovereignty as territorial jurisdiction. As Tribal governments develop telecommunications codes, cybersecurity frameworks, and digital governance policies, they are exercising legally recognized sovereign powers, consistent with these longstanding doctrines.

Grounding TDS in established principles of Tribal sovereignty and the trust relationship bridges historical governance with emerging digital realities. It transforms digital infrastructure from a site of dependency into an instrument of sovereignty—one that enables Tribal Nations to

define, protect, and govern their digital territories according to their own laws, values, and visions for the future.

Tribal Digital Sovereignty and Self-Determination

For Tribal Nations, particularly in North America, digital sovereignty is exercised via self-determination practices and includes the entire digital ecosystems, data policies, and legal codes governed by Tribal authority. While global discourse on digital sovereignty often centers on state control, national security, and regulatory responses to cyber threats, TDS is rooted in community-based governance and cultural context. It embodies a more holistic and community-focused concept compared to many state-centric definitions. Similar approaches are emerging in Indigenous communities in Australia, New Zealand, and several African nations, where digital sovereignty is linked to language preservation, knowledge transmission, and cultural security.

TDS extends Tribal self-governance into digital spaces, paralleling how sovereignty is already exercised in healthcare, education, and economic development. It integrates technological infrastructure with social, cultural, and political dimensions of Indigenous self-determination, transforming digital policy from a technical issue into a matter of sovereignty and survival.

Tribal Digital Sovereignty: In Practice

Despite the limited academic literature on or formal acknowledgment of TDS, its presence is evident in practice. Tribal Nations across the United States are already participating in activities that signal *lived expressions* of digital sovereignty. They are building broadband networks, creating and enforcing Tribal codes for data use, establishing data governance offices, protecting cultural archives, developing educational content, engaging in federal- and state-level policymaking, and participating in national and international discussions on digital policy. Recognizing and expanding on this practice is essential to developing a comprehensive understanding of TDS as both a scholarly concept and a practical governance framework. These actions reflect not only the assertion of sovereignty in new domains but also the reinterpretation of sovereignty through the lens of contemporary technology and Indigenous governance.

"Supporting Tribal Digital Sovereignty as an Exercise of Self-Determination": Resolution NC-24-008

In response to the emerging field of TDS, in 2024, the American Indian Policy Institute (AIPI) at the Sandra Day O'Connor College of Law at Arizona State University launched the Center for Tribal Digital Sovereignty (CTDS) in partnership with the National Congress of American Indians (NCAI). This center is the first of its kind in the United States and at any university. In June 2024, the Tribal constituency of the NCAI passed Resolution NC-24-008 "Supporting Tribal Digital

Sovereignty as an Exercise of Self-Determination." This resolution, as defined by Tribal Nations, states that:

> Tribal Digital Sovereignty is the umbrella term that encompasses the exercise of sovereign authority over physical and virtual network infrastructure and the intangible, virtual digital jurisdictional aspects of the acquisition, storage, transmission, access, and use of data, including policy developments that impact a Tribal Nation's digital footprint in both real-world and virtual spaces. Tribal Digital Sovereignty encompasses all aspects of a Tribal Nation's digital plan and footprint, such as Tribal codes, managing data protection, digital equity, network infrastructure, development of funding sources, education, healthcare, public safety and law enforcement, economic and community development, and capacity building. (NCAI, 2024)

At the time of publication of this article, Tribal Nations are not only actively using the term *Tribal Digital Sovereignty* but also exercising their inherent right to self-determination over their digital ecosystem. This encompasses decision-making authority over digital infrastructure, data, services, software, cybersecurity, and all technologies utilized within Tribal jurisdiction. Just as Tribes govern healthcare, education, and economic development, they must also govern their digital lives (see figure 1).

Components of Tribal Digital Sovereignty

TDS involves not a singular activity but many that span the following continuum:

- **Infrastructure:** Ownership and control of broadband and telecommunications systems.
- **Network Sovereignty:** Deployment and management of the physical network that enables connectivity.
- **Data Sovereignty:** Governance over the flow, use, and protection of information.
- **Legal Frameworks:** Enactment of Tribal codes and policies that govern digital practices.
- **Jurisdictional Frameworks:** The enforcement of TDS on tribal lands is outlined in recent litigation via an amicus brief submitted in *Alario v. Knudsen* filed in support of Plaintiff-Appellee by the Confederated Salish and Kootenai Tribes and the NCAI (Amici Curiae, 2024).

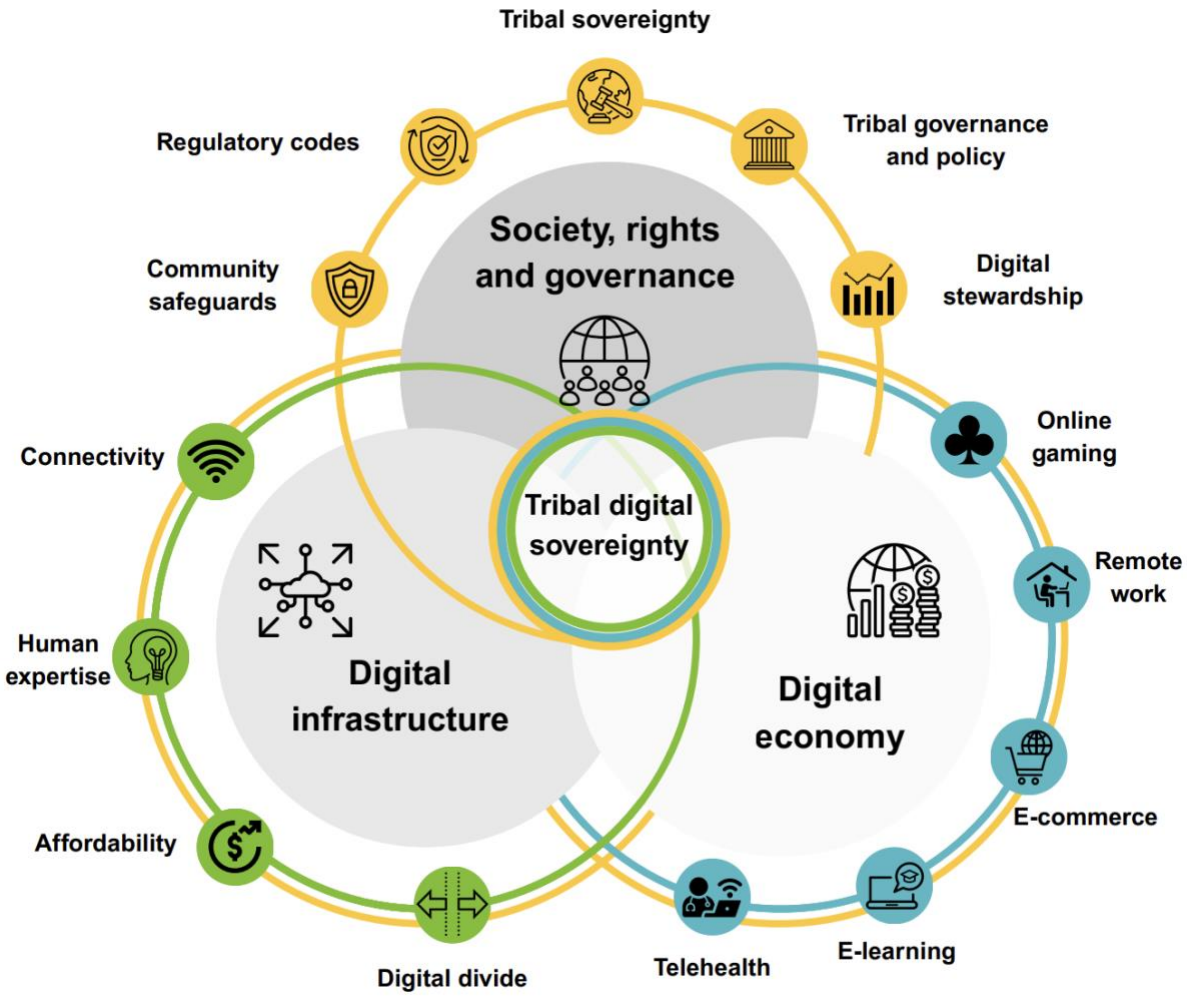

Figure 1: TDS diagram (American Indian Policy Institute Center, 2025)

Practical and Proactive Applications of Tribal Digital Sovereignty by Tribal Nations

Developing a comprehensive and proactive TDS plan requires a strategic roadmap that may or may not include some of the recommended components outlined in this section. Every Tribal Nation should develop a plan based on its specific community needs. Successfully applying a developed plan would require on-the-ground implementation across various interconnected domains. The applications that follow illustrate how sovereignty would be applied through planning, community investment, and governance and policy development. (See also the article in this issue titled “Proactive Solutions in Implementing Tribal Digital Sovereignty.”)

Planning

1. **Infrastructure Planning and Maintenance:** Tribes must ensure ongoing investment in broadband infrastructure, including the upgrading and sustaining of fiber, wireless, and satellite systems. Infrastructure development must be coordinated with planning offices and integrated into Tribal land use plans and emergency response systems.

2. **Data Storage and Management:** Establishing sovereign data centers and sovereign cloud systems allows for control over cultural, administrative, and research data. Long-term planning must include archival strategies, metadata standards rooted in Indigenous values, and compliance with Tribal protocols. This is just beginning to be discussed in Indian Country.

Community Investment

3. **Digital Equity Implementation and Continuity:** Addressing digital inclusion through community programs, device distribution, digital literacy training, and subsidized internet access ensures that all citizens can meaningfully engage in the digital ecosystem. Historically, programs like the Affordable Connectivity Program and NTIA digital equity grants supported efforts like these, but it remains to be seen how this work will be supported now that the Trump administration has rescinded this funding (Richter et al., 2025).

4. **Economic Sovereignty:** Tribal Nations can utilize digital platforms for business development, e-commerce, telework opportunities, and expanding Tribal enterprises. Control of digital infrastructure and platforms empowers economic resilience and autonomy, especially in remote communities.

5. **Educational Use:** TDS enables Tribes to govern educational technologies, online learning platforms, and culturally responsive curricula. Digital sovereignty in education encompasses the development of language revitalization tools, local e-learning platforms, and protocols for student data privacy and protection.

6. **Building Capacity:** Investing in community education, certifications, digital badging, internships, and partnerships with higher education institutions strengthens local digital expertise. Training programs in IT, data science, cybersecurity, infrastructure development, and AI enable Tribal Nations to operate and govern their digital ecosystems independently.

Governance

7. **Tribal Codes and Legal Frameworks:** Developing Tribal-specific codes that regulate digital activity is critical. These should cover topics such as:
    - Data governance and digital ethics
    - AI development and usage policies
    - Cybersecurity and breach response

- Use of technology for cultural knowledge protection
- Digital rights, privacy, and consent

8. **Creation of Regulatory Bodies:** Tribes should consider forming or designating a digital governance office or interdepartmental committee responsible for overseeing implementation, regulation, and advocacy related to digital sovereignty. This entity can manage digital policies, licensing, and compliance.
9. **Governance Codes by Application Area:**
    - Regulatory Use: Licensing for digital services, jurisdiction over internet operations, and enforcement authority.
    - Data Storage: Standards for storage and sharing of sensitive data (e.g., tribal enrollment, health records).
    - Educational Use: Policies for edtech vendors, digital testing platforms, and content development.
    - Cultural Use: Protocols for digitization and access to sacred and ceremonial materials. Tribal IRBs.
    - Enterprise Use: E-commerce platforms, intellectual property policies, and tech entrepreneurship.
    - Gaming: Integration of digital gaming platforms with economic development and Tribal codes.
    - Cybersecurity: Mandatory standards for digital hygiene, incident response, and staff training. This already applies to Tribal Nations with gaming enterprises, but this must be administered on the enterprise side.
    - AI: Oversight committees for AI projects, ensuring compliance with ethical standards and cultural values.

TDS is ultimately expressed through the daily decisions made by communities, leaders, and institutions regarding how digital tools are accessed, deployed, and governed. These practical applications represent a living sovereignty—an extension of self-determination into the digital age. Success relies on coordinated planning, capacity development, and Tribal codes that address both contemporary challenges and enduring cultural principles.

Operationalizing Tribal Digital Sovereignty: A Model Framework

Since the 1990s, Tribal Nations, organizations, and leaders have actively shaped their own digital ecosystems. Their advocacy, discussed at length in this journal's first article, has focused on broadband access, digital equity, and equitable infrastructure investment grounded in the federal trust responsibility. The COVID-19 pandemic made visible the depth of digital inequities

across Indian Country. Federal relief funding, paired with longstanding Tribal advocacy, accelerated infrastructure development and shifted the national discourse from a "digital divide" to "digital equity" and now to "digital sovereignty." Yet despite these historic federal investments, significant gaps remain. And the picture is not improving. In 2025, portions of these federal funds were clawed back, highlighting ongoing structural instability.

Even so, Tribal Nations continue to advance digital sovereignty through self-determined governance, infrastructure development, and innovation. To support their efforts, Tribes would benefit from a way to conceptualize TDS's emerging framework. I propose an adaptation of Benjamin Bratton's (2016) stack model of planetary-scale computation, with modifications to fit the context of TDS. In software and digital systems, a *stack* is a layered collection of technologies, frameworks, or platforms that together create a functioning whole. *Planetary-scale computation* "signifies the application of immense, globally distributed computing power to tackle Earth-spanning problems" (*Planetary-Scale Computation*, 2025). Since global problems such as climate change or resource scarcity are vast and affect all humans, solutions require an equally immense interconnected system of digital, physical, and organizational infrastructures, such as cloud platforms, data centers, subsea cables, satellites, devices, interfaces, and governance regimes.

Reinterpreted through an Indigenous perspective, Bratton's stack model becomes more than a description of technology—it becomes a way to map power, control, and governance in the digital age. Indigenous analysis quickly reveals how colonial dynamics extend into cyberspace, embedding digital infrastructures with systems of extraction, surveillance, and dependency. At the same time, the stack offers a scaffold for imagining sovereignty differently: each layer becomes a site where Tribal Nations can assert agency, governance, and jurisdiction. In this sense, digital sovereignty is not abstract but layered—requiring intervention from physical infrastructure to legal codes, from user interactions to global regulatory arenas.

The concept of a Tribal stack provides both a theoretical and practical framework for building and sustaining TDS. Each layer is interdependent: economic sovereignty is impossible without foundational infrastructure, and legal governance is meaningful only when there is the capacity to enforce it. For a graphic depicting the Tribal stack see Appendix II. In the 21st century, the forces shaping community life—cloud platforms, smart systems, and AI—penetrate deeply into governance, education, and cultural life. Understanding these systems as layered architectures of power enables Tribal governments to design interventions that reassert sovereignty at multiple levels simultaneously.

Bratton's stack reminds us that sovereignty in the digital age is not exercised in a single domain but across interconnected layers of infrastructure, law, economy, and culture. When reframed as a Tribal stack, it becomes a tool for conceptualizing and operationalizing digital self-determination. It asks the critical questions: Who controls these layers, and how should Tribal Nations assert self-governance within them? In answering, Tribal Nations are not merely adapting to the digital age but rebuilding sovereignty for it.

Bratton's theory of global digital power describes six interconnected layers—Earth, Cloud, City, Address, Interface, and User—that together form a vertical architecture of planetary

computation. His model illustrates how profoundly digital systems structure life, from material resources on the ground to global political and economic institutions (Bratton, 2016).

Earth Layer: The Foundation of Sovereignty

At the base of the stack lies Earth: the minerals, land, energy, and biosphere that make computation possible. Tribal lands are among the richest sources of rare Earth elements such as lithium, copper, and other materials essential for powering digital systems. Yet extraction continues under colonial models, often without consent, benefit sharing, or sustainability. At the time of writing this article, the Apache Stronghold fight for Oak Flat is a stark example of this process and has been ongoing since 2014 (University of Notre Dame, 2020). As many have discussed, for Tribal Nations this layer is not simply about resource control—it is about stewardship. Indigenous knowledge systems offer models of relationality and responsibility that can guide ethical digital extraction and challenge exploitative paradigms at their root (Lewis et al., 2025). For Indigenous groups, asserting sovereignty at this layer means developing protocols for responsible extraction and benefit-sharing agreements, and demanding free, prior, and informed consent before any technological development occurs on Tribal lands.

However, for federally recognized Tribal Nations, asserting digital sovereignty can and should extend further by utilizing the same self-determination and governance policies that have been developed for healthcare, education, economic development, and similar areas. This combination of self-determination policies provides a strong set of tools for Tribal Nations to assert digital sovereignty.

Cloud Layer: The Sovereign Sky

Most people are familiar with the term *the cloud*, but the actual data stored in the cloud resides on Earth (Earth layer) in tangible hardware systems. Cloud infrastructures—data centers, fiber backbones, global platforms—regulate how data flows and who gets to store, analyze, and benefit from it. Today, clouds are owned by a small number of corporations that operate more like geopolitical states, leaving Tribal Nations reliant on external entities for digital services.

Bratton accurately describes the cloud as planetary in scope. However, Tribal Nations, by creating their own sovereign clouds that connect to other Tribal sovereign clouds, provide a degree of control similar to that of corporate actors. One corporate example of this process is Amazon Web Services. AWS separates hosted data by geographic zones, allowing developers to deploy different versions to specific users in various countries according to local laws and policies (Bratton, 2016, p. 123).

Clearly, this dependency undermines Tribal data sovereignty. Indigenous data—ranging from language archives to health records—often resides on servers governed by laws that do not acknowledge Tribal jurisdiction. This leads to a loss of control, raises privacy concerns, and creates potential for exploitation. In exerting digital sovereignty, Tribal Nations must negotiate protections with organizations that operate clouds in which the Tribe's data might reside.

Furthermore, Tribal Nations establish their own sovereign clouds, Tribal data centers, and localized storage systems.

Tribally owned cloud systems, sovereign broadband infrastructure, and data governance frameworks offer powerful alternatives, forming part of a Tribal Nation's digital sovereignty planning. Through strategic investment and intertribal collaboration, Tribes can build their own data centers on sovereign lands, define access protocols, create Tribal codes for enforceability, and ensure that data generated by and for Indigenous peoples remains within their jurisdictions. Furthermore, they can develop redundancies for their networks by encrypting data before sending traffic to other Tribal sovereign clouds in the nation.

City Layer: Territory and Smart Sovereignty

Smart cities, Internet of Things (IoT) systems, and digital planning tools like digital twins are increasingly shaping how communities are regulated and governed. For Tribes, this is still in the conceptual stage since smart technology relies on broadband connectivity, and Tribes are working to bridge the digital divide by constructing sovereign smart infrastructure. However, Tribal Nations are already discussing what they call Smart Rez (instead of Smart Cities).

Governing this layer of the stack involves designing and implementing smart Tribal communities with Indigenous-led planning, data sovereignty, and integrated Traditional Ecological Knowledge (TEK) and Indigenous Knowledge Systems. These systems can often be opaque and misaligned with traditional spatial knowledge. Many Native communities already integrate Geographic Information Systems (GIS), remote sensing, planning software, and other technologies but they often rely on federal or commercial tools that are not designed for TDS.

Sovereignty in this context refers to utilizing technology to enhance housing, transportation, resource management, and emergency services based on terms defined by Tribal values and supported by Tribal codes and policies. Smart Rez must navigate the complexities of Tribal governance and the potential for unequal access to technology.

For Tribes, the City layer extends to Tribal jurisdictions—reservation lands, trust lands, and urban Indian communities. Digital infrastructure planning must reinforce Tribal jurisdiction and provide equitable access for citizens regardless of geography. This includes Tribal broadband utilities, municipal-scale wireless networks, and regional partnerships that protect Tribal control.

Address Layer: Who Names the Land? Beyond Digital Jurisdiction

Addresses, IP spaces, and geolocation systems determine how entities exist in digital space, yet most fail to recognize Tribal lands, political identities, or sovereignty. A longstanding example is the improper mapping of Tribal lands in digital navigation systems, where inaccuracies have material consequences for governance, service delivery, and civic participation. Few Tribes have access to sovereign digital domains (e.g., *.tribal*), despite some participation in the Internet Corporation for Assigned Names and Numbers (ICANN), the global body that oversees internet

addressing. At the time of writing, several Tribal Nations are also working toward the development of sovereign clouds for their data.

The inadequacy of address systems is not merely technical but deeply political. For instance, the Navajo Nation continues to face well-documented addressing challenges that affect not only mail delivery and GPS services but also voting rights (Pepion, 2023). Google Plus Codes have been proposed as an alternative for mapping physical addresses on Tribal lands, though adoption remains limited. Importantly, Tribal leaders and policy organizations began discussing these tools as early as 2020 (Howard, 2020), underscoring the longstanding urgency of these issues.

Yet the Address layer in the Tribal stack extends far beyond physical locations. In the era of the IoT, addresses enable not only people and places to be located but also objects, environments, and even biological entities. Without addresses, IoT cannot function. This raises critical governance questions: How should Tribal Nations regulate the addressing of "things" on their lands and within their networks? What policies will safeguard communities when every object, plant, or cell could potentially be assigned an address, generating exponential volumes of data about Tribal territories and citizens? As this layer evolves, Tribal governments will need to shape addressing systems to reflect sovereignty, protect cultural and ecological knowledge, and prevent extractive uses of geospatial and object-based data.

Interface Layer: The Digital Face of Culture

The interface is the point where users interact with machines—through apps, touchscreens, keyboards, voice assistants, or other platforms. However, interfaces are never neutral. They encode cultural assumptions, privilege certain languages, and reflect epistemologies rooted in Western and colonial worldviews. These design choices shape what users can and cannot do, subtly enforcing whose knowledge systems are considered "default" in the digital world.

For Tribal users, the interface often becomes a site of friction and exclusion. English-dominant platforms and colonially embedded metaphors make Native languages, values, and cultural logics invisible or inaccessible. For example, dropdown menus and input fields rarely accommodate Indigenous naming conventions or characters, and voice-recognition systems frequently fail to process Native languages. These structural exclusions not only alienate users but also contribute to the underutilization of digital tools within Tribal communities, reinforcing inequities in access and participation.

Reclaiming the interface is therefore central to TDS. Sovereignty at this layer requires designing culturally respectful, language-inclusive, and Tribally developed platforms. Indigenous design approaches—rooted in Native epistemologies and community practices—offer models for rethinking human-computer interaction beyond Western defaults. The Cherokee Nation is doing just that with its sovereignty-driven AI governance model (*Cherokee Nation*, 2025). Language revitalization tools, such as mobile apps for immersion learning or keyboards for Indigenous orthographies, extend sovereignty into the digital domain by embedding cultural survival into everyday digital interactions. Similarly, Tribally grounded AI assistants and chatbots can serve as

both technical tools and cultural actors, preserving oral traditions, kinship knowledge, and ceremonial practices within digital environments.

At its core, sovereignty at the interface layer is about ensuring that digital technologies reflect Indigenous identity rather than erase it. By designing and deploying tools that embody Indigenous values, languages, and protocols, Tribal Nations can transform interfaces from sites of exclusion into spaces of continuity, resilience, and innovation. In doing so, they assert sovereignty not only over infrastructure and data but also over the cultural experience of digital life itself.

User Layer: From User to Nation

At the top of Bratton's stack is the User layer. In conventional digital systems, the user is framed as an individual—most often a consumer—with limited agency over the systems they engage. This framing reduces people to data points, behavioral profiles, or customers within platforms designed to extract value rather than empower communities. For Tribal Nations, such a framing is profoundly inadequate. Tribes are not simply collections of individual users; they are sovereign governments, knowledge holders, and collective entities with responsibilities to future generations.

Reframed through a sovereignty lens, the User layer is not about passive participation but about collective self-determination in digital systems. A digital sovereignty framework repositions the user as a sovereign actor, whether it is an individual Tribal citizen exercising control over personal and cultural data or a Tribal government asserting its jurisdiction over cyberspace. This shift recognizes collective rights, not just individual rights—a principle deeply embedded in Tribal law and international Indigenous advocacy. For example, Indigenous intellectual property rights extend to songs, designs, and knowledge systems that cannot be reduced to individual ownership. Similarly, collective governance must extend to algorithmic systems that increasingly shape economic opportunity, information access, and cultural representation. In thinking about this, Krystal Tsosie (Navajo) comes to mind with her work at the Tsosie Lab for Indigenous Genomic Equity and Justice at Arizona State University. The Tsosie Lab's research "emphasize[s] the importance of Indigenous Data Sovereignty in genomics, or the rights of Indigenous people to control genomic data that comes from their land and people" (Schnebly, 2024).

Tribal Nations also face the challenge and opportunity of preparing their citizens to engage this layer as builders and leaders, not just users. Digital sovereignty in the User layer requires capacity building in computer science, cybersecurity, UX design, and data governance, ensuring that Tribal members are not only consumers of external systems but architects of Indigenous-controlled digital futures. Education initiatives, digital literacy programs, and partnerships with universities or Tribal colleges play crucial roles here. By equipping citizens with the knowledge to design, govern, and critique digital technologies, Tribal Nations transform users into sovereign agents of innovation.

Ultimately, sovereignty at the User layer means rejecting the consumerist logic of mainstream platforms and affirming that users are not isolated individuals but members of Nations. By asserting jurisdiction over how their citizens engage with digital systems, and by building pathways for Tribal citizens to shape those systems themselves, Tribal Nations redefine the top of the stack. In this reframing, the user is not merely the endpoint of technology—it is the sovereign Nation itself, exercising digital self-determination.

Building a Sovereign Tribal Stack

Tribal Nations must move beyond mere participation in the stack that Bratton expresses—*they must actively build their own Tribal stack*. From Earth to User, each layer represents not only a site of technological infrastructure but also a domain of power where sovereignty can be asserted, data reclaimed, and systems reimagined in alignment with Indigenous values. This work extends far beyond technical design; it encompasses cultural survival, legal recognition, and philosophical commitments to collective well-being.

TDS therefore requires new protocols, new alliances, and new architectures. At the Earth layer, it means defending spectrum, land, and natural resources as the foundations of digital infrastructure. In the Cloud, it demands sovereign storage systems and data governance codes. In the City, it involves embedding Tribal jurisdiction into regional planning and broadband initiatives. The Address layer answers the question of who has authority to name, map, and locate Tribal spaces—both physical and virtual. Interfaces must reflect Indigenous languages and worldviews rather than erase them, while at the User layer, sovereignty requires educating and empowering Tribal citizens to be architects of their own digital futures.

This Indigenized approach underscores a key principle: sovereignty does not end at the borders of Tribal land. It also resides in the cloud, in the code, in the protocols, and in the everyday experiences of digital life. By claiming each layer of the stack as a sovereign domain, Tribal Nations shift the digital world from a site of dependency and extraction to one of self-determination and continuity.

The path forward lies in designing and governing a *sovereign stack*: one built with Tribal law, stewarded by Tribal technologists, and guided by cultural protocols that prioritize intergenerational responsibility. Such a stack would not only safeguard data and infrastructure but also foster the long-term flourishing of Indigenous Nations in a networked world. In this vision, TDS becomes more than just a defensive posture against colonial technologies. It becomes a proactive architecture of governance, resilience, and innovation.

Challenges to Implementing Tribal Digital Sovereignty

Despite progress, several barriers continue to hinder the full realization of TDS:

- Few tribes have digital governance codes or regulatory bodies. At this time, it is unclear which Tribal Nations, if any, possess digital governance regulatory codes or what regulatory body, if any, they have for enforcement.
- Infrastructure for data storage and network maintenance remains limited. Although recent federal investments in infrastructure aimed to mitigate this issue, the clawing back of those allocated funds may prevent Tribal Nations from achieving the planned capacity in a timely manner.
- There is insufficient capacity for data stewardship and legal enforcement. Human resources are needed. In 2025, the Chickasaw Nation of Oklahoma created a director of data stewardship position, the first position of its kind in the Nation.
- Reliance on flawed or externally produced data sets undermines sovereignty. Inaccurate and incomplete data sets prevail in Indian Country. This reality is not new. For the past 20 years, I have advocated for more robust and accurate research. Yet this deficiency still requires attention.

Indigenous research protocols, such as CARE and FAIR, provide valuable foundations but need to be expanded into enforceable codes and sovereign storage systems. Data sovereignty must transition from reclamation to proactive governance that aligns with tribal priorities and values through digital sovereignty planning.

For additional discussion of facing these challenges, see the article in this issue titled "Proactive Solutions in Implementing Tribal Digital Sovereignty."

Roadmap to Proactive Tribal Governance over Digital Spaces

Proactive governance over digital spaces requires strategic planning and implementation aligned with Tribal values and principles of sovereignty. A practical roadmap would envisioned TDS as a multiphase process tailored to the unique contexts of each Tribal Nation. Below are the key components of such a roadmap:

1. **Community and Governmental Assessment:** Start with a thorough evaluation of digital assets, infrastructure, capabilities, and needs. This involves assessing internet access, cybersecurity vulnerabilities, workforce skills, and community priorities related to digital technologies. By engaging community voices through consultations, listening sessions, and surveys, Tribes can ensure the roadmap reflects local aspirations and cultural priorities.
2. **Asset Mapping and Infrastructure Audit:** Perform a comprehensive inventory of current digital infrastructure, including towers, fiber lines, networks, and data centers. This step allows Tribes to pinpoint gaps and opportunities and to plan for upgrades or new investments. Mapping also offers essential leverage when seeking federal funding.

3. **Legal and Code Review:** Examine existing Tribal codes and regulations related to data, IT, and communications. Develop or update legal frameworks to address emerging areas such as data sovereignty, AI governance, digital privacy, and intellectual property rights. Model codes can be adapted from intertribal organizations or collaborations with legal scholars.
4. **Capacity Building and Workforce Development:** Establish or expand training programs to increase digital literacy, cybersecurity awareness, and technical expertise within the community. Partnering with Tribal colleges, regional universities, and national networks like the American Indian Higher Education Consortium and the American Indian Science and Engineering Society can help cultivate a sustainable workforce.
5. **Creation of Digital Governance Structures:** Create or designate a Tribal digital governance office or working group to oversee the implementation of policies and infrastructure projects. This body would coordinate efforts across departments (e.g., IT, education, economic development) and represent the Nation in national broadband and digital equity policy forums.
6. **Development of Tribal Codes and Data Protocols:** Draft and adopt new policies that formalize digital sovereignty principles. These should cover the governance of sensitive cultural data, AI usage, cybercrime, and information-sharing agreements.
7. **Secure Data Storage and Sovereign Cloud Solutions:** Develop data centers or sovereign cloud solutions that ensure data remains under Tribal jurisdiction. These can be constructed through partnerships or managed by Tribal IT departments. Addressing data localization and security is essential to operationalizing sovereignty.
8. **Strategic Investment and Economic Planning:** Embed digital governance within broader economic development plans. Investments in broadband infrastructure and digital entrepreneurship support Tribal economies while strengthening sovereign control.
9. **Cybersecurity and Risk Mitigation:** Integrate cybersecurity policies, threat detection, and response mechanisms. Tribes should develop emergency response plans for digital breaches and engage in information sharing with trusted partners such as the Tribal-ISAC (Information Sharing and Analysis Center).
10. **Monitoring, Evaluation, and Sustainability Planning:** Regularly assess the effectiveness of digital strategies using metrics that reflect community-defined outcomes, including participation, access, data protection, and economic impact. Build mechanisms for feedback, adaptation, and long-term sustainability.

This roadmap is not prescriptive but provides a flexible framework that can adapt to various scales and contexts. The objective is to shift from *reactive* digital policy to *proactive* digital governance grounded in larger Tribal rights and values, such as self-determination, technological innovation, and cultural continuity.

Conclusion

TDS represents a critical frontier in the ongoing struggle to assert Tribal self-determination in the 21st century. It is not limited to questions of access or connectivity but extends to ownership, governance, cultural continuity, and long-term vision. TDS reframes digital infrastructure and data not as neutral utilities but as sovereign domains that must be designed, regulated, and protected by Tribal Nations themselves.

As global actors grapple with the implications of digital control—ranging from cybersecurity and AI to misinformation and algorithmic governance—Tribal Nations must be recognized not merely as stakeholders in policy discussions but as sovereign governments with distinct rights, obligations, and cultural frameworks. This recognition requires moving beyond deficit-based models of the "digital divide" toward a sovereignty-centered approach that foregrounds jurisdiction, governance, and cultural authority.

This article calls for comprehensive, proactive strategies for developing and strengthening TDS, including:

- **Legal infrastructure** such as Tribal telecommunications codes, data sovereignty laws, and cybersecurity regulations rooted in Tribal law and Federal Indian Law.
- **Capacity building** through training Tribal citizens in digital governance, data science, UX design, cybersecurity, and other technical fields so that communities are not only users but also architects of digital systems.
- **Economic planning** to ensure that investments in broadband, spectrum, and cloud infrastructure generate sustainable economic sovereignty and are not undermined by dependency on external providers.

Through such efforts, Tribal Nations can define and govern their own digital futures—futures grounded in sovereignty, resilience, and self-determination. TDS is not simply a protective measure against external threats; it is a proactive governance framework that ensures Indigenous values, languages, and worldviews are embedded into the architectures of digital life.

Ultimately, the recognition and operationalization of TDS demand a sovereign stack—a layered, holistic approach to governing digital systems that affirms sovereignty at every level, from Earth to Cloud, from Address to User. In claiming this sovereignty, Tribal Nations move from being subjects of digital systems to being sovereign designers of them, charting a course toward flourishing, innovation, and cultural continuity in a networked world.

The framework of TDS carries significant implications for both academic scholarship and applied practice. For researchers, TDS opens new avenues for examining how sovereignty is asserted in digital contexts, extending longstanding debates in Federal Indian Law, Indigenous studies, and critical data studies into emerging domains of cloud governance, AI, and digital infrastructure. Future scholarship must grapple with questions such as: How can Indigenous epistemologies reshape theories of sovereignty in cyberspace? What models of digital governance emerge when grounded in Tribal law rather than state or corporate frameworks?

And how might the sovereign stack serve as a comparative tool for analyzing other global movements in Indigenous data and digital sovereignty?

For practitioners, TDS provides a roadmap for building governance capacity within Tribal Nations. This includes drafting and implementing Tribal telecommunications codes, establishing data governance offices, creating sovereign cloud infrastructures, and developing cybersecurity strategies tailored to community needs. Equally important are investments in digital education and workforce development that prepare Tribal citizens to serve as technologists, policymakers, and cultural stewards of their digital domains.

By bridging theory and practice, TDS highlights the urgency of designing systems that not only close connectivity gaps but also embed Indigenous values and laws into digital architectures. In doing so, it ensures that Tribal Nations are positioned not as peripheral users of global networks but as sovereign designers of their own digital futures.

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Appendix I

Expanded Comparison of Digital Sovereignty Concepts and Indigenous Applications

Concept	Definition/Scope	Example Applications
Data Sovereignty	The right to own, manage, and control data—especially sensitive and personal data. Includes regulation of access, privacy rights, and control over data use and storage.	Tribal health data laws, data-sharing agreements, community data repositories
Digital Sovereignty	The broader political and technical governance of digital systems, infrastructure, and content by states or other entities. Encompasses content moderation, national internet policies, and control of digital infrastructure.	GDPR (EU), China's cyber sovereignty policies, US debates on TikTok and infrastructure
Digital Jurisdiction	The assertion of authority over digital content, data, and infrastructure based on geographical or legal boundaries. Often related to data localization and regulatory enforcement.	Tribal telehealth platforms asserting jurisdiction over health records and spectrum
Indigenous Data Sovereignty	The right of Indigenous peoples to govern the collection, access, and use of data related to their communities, grounded in cultural and collective rights, often with decolonial critiques.	Te Mana Raraunga (NZ), CARE principles, First Nations OCAP (Canada)
Tribal Digital Sovereignty	The application of self-determination and sovereignty principles to the full digital realm, including infrastructure, data, codes,	Broadband sovereignty, AI regulation, Tribal education platforms, local digital codes

	services, AI, and community engagement.	
Tribal Network Sovereignty	The physical and policy-based ownership and deployment of network infrastructure. Network-building as an exercise of sovereignty and a means of enabling digital access.	Southern California Tribal Chairmen's Association's TDVNet, Navajo broadband builds
Individual Digital Sovereignty	The ability of individuals to control their digital identity, data, and the technologies they use. Includes digital literacy, access to tools, and consent over data sharing.	Personal data portals, digital consent tools, community training in data literacy. EU.
Community Digital Equity	Policies and programs aimed at ensuring all community members have equitable access to digital technologies and services. Addresses affordability, access, and education.	Affordable Connectivity Program (ACP), community mesh networks, digital skills training
Cybersecurity in Indigenous Contexts	Protection of Indigenous digital ecosystems from threats. Encompasses cybersecurity strategy, encryption, threat awareness, and digital incident response aligned with cultural values.	Tribal IT security frameworks, partnerships with Tribal-ISAC, encryption policies
Economic Digital Sovereignty	Use of digital infrastructure to promote local economic resilience and self-determination. Includes support for Indigenous tech entrepreneurship, data sovereignty as economic asset, and network ownership.	Tribal broadband enterprises, local tech incubators, data centers as revenue sources

Appendix II: The Tribal Stack Graphic